ALSTON & BIRD
333 South Hope Street, 16th Floor
Los Angeles, CA 90071-1410

213-576-1000
Fax: 213-576-1100
www.alston.com

Edward J. Casey | Direct Dial: 213-576-1005 | Email: ed.casey@alston.com

November 15, 2017

Via Hand Delivery

Board of Directors for the
Orange County Water District
18700 Ward Street
Fountain Valley, CA 92708

Attn: Denis Bilodeau, Board President

Re: Proposed OCWD Resolution No. 17-11

Dear Directors:

As legal counsel for the Irvine Ranch Water District ("IRWD"), we are sending this letter to object to the Orange County Water District's ("OCWD") proposed Resolution No. 17-11 ("Resolution 17-11").[1] For the reasons detailed below, IRWD urges the OCWD Board of Directors ("OCWD Board") to not adopt Resolution 17-11. Specifically, the findings (the "Original BEA Findings") in Resolution Nos. 16-4-37 and 14-4-45 ("BEA Resolutions")[2] that "Supplemental Sources" includes recycled water were legally correct, and for the OCWD Board to now adopt Resolution 17-11 and find to the contrary based on supposed "clerical errors,"[3] would run afoul of the purpose underlying the basin equity assessment ("BEA") that is stated in the OCWD Act[4]; State policy encouraging the use of recycled water; and statements made in OCWD's own documents. Further, it would be legal error for OCWD to correct the

[1] Resolution 17-11 is entitled "Acknowledging Clerical Errors In The Numerical Calculations Of Total Groundwater And Supplemental Water In The Fiscal Year 2016-2017 And 2017-2018 Basin Production Percentage Resolutions, Confirming The Basin Production Percentage Calculations For Fiscal Years 2016-2017 And 2017-2018, And Reaffirming The District's Long-Standing Interpretation Of The OCWD Act To Exclude Locally Produced Reclaimed Water From The Definition Of Supplemental Sources of Water."

[2] Refer to Exhibits 1 and 2 to this Letter.

[3] It is difficult to fathom that this supposed error in the Original BEA Findings was "clerical" when this same "error" occurred in BEA resolutions for a number of years prior to the two most recent BEA Resolutions, and the Original BEA Findings are consistent with the demand projections in the Annual Engineer's Reports (see p. 9 of this Letter).

[4] Water Code – Appendix, Chapter 40, Chapter 924 of the Statutes of 1933, as amended.

alleged clerical errors in the Original BEA Findings without noticing and holding a full public hearing. The finding of the amount of Supplemental Sources is critical to the determination of the Basin Production Percentage ("BPP"), which, in turn, determines the amount of BEA that producers may have to pay. In fact, under the strict formulas provided in the OCWD Act for determining the BPP, reducing the amount of Supplemental Sources provided in the legally correct findings in the original BEA Resolutions – which Resolution 17-11 would do – necessarily changes the BPP. Revising such critical determinations affects all groundwater producers in the Orange County Groundwater Basin ("Basin") as well as the Basin itself. Therefore, such actions can only be taken after holding a full public hearing on all aspects of the BEA Resolutions.

SUPPLEMENTAL SOURCES INCLUDES RECYCLED WATER

1. Statutory Purpose

Section 31.5(b) of the OCWD Act sets forth the purpose of the BEA:

> "The proceeds of the basin equity assessments imposed and collected shall be used to equalize the cost of water to all persons and operators within the district and to acquire water to replenish, the groundwater supplies of the district."

The potential inequity which the BEA is meant to address arises when one producer overproduces groundwater because it is cheaper than other supplemental sources of water, which places a greater strain on the Basin (to the detriment of all groundwater producers), while another producer avoids overproduction of groundwater by using supplemental sources of water, which are typically more expensive than groundwater to produce.

The history underlying the addition of Section 31.5 to the OCWD Act – as explained in OCWD's own historical document – confirms this statutory purpose. As stated at page 33 of "A History of Orange County Water District" (a document available on OCWD's website)[5]:

> "The OCWD Act was amended in 1969 to implement Owen's proposals. He envisioned that each year engineers would determine how much water could be safely pumped from the basin to meet the estimated total needs of the district. In most years this figure had been less than the total estimated need, which must be made up with imported water. The estimate of water to be pumped from under-ground versus that to be imported is expressed as a percentage figure, the basin production percentage (BPP). While producers are theoretically obligated to take water in that ratio, OCWD does not necessarily expect them all to do so. In some cases, as in the coastal area, OCWD may want one producer to pump

[5] Refer to Exhibit 3 to this Letter.

> less than the stated percentage. In other cases, a producer may not be able to obtain MWD water and therefore has to pump all groundwater.
>
> Historically imported water costs much more than groundwater, so providers were reluctant to purchase more than they required to meet their obligations. If the BPP were to work, the cost of imported water had to be subsidized so producers would use it instead of groundwater. In order to make the cost equitable for those who take imported water, OCWD assessed producers who pump more than the BPP based on the difference between the cost of the additional groundwater pumped, and the cost of an equivalent amount of MWD water purchased. This assessment is known as the basin equity assessment (BEA)." (Emphasis added.)[6]

There is no difference between MWD imported water and recycled water with respect to the application of the statutory purpose of the BEA. Both sources of water reduce groundwater pumping from, and stress on, the Basin. Both sources of water cost significantly more than groundwater to produce. Therefore, both sources of water need "to be subsidized so producers would use it instead of groundwater," and that subsidy is the BEA. The Legislature foresaw the potential for non-MWD sources of water to be included as "Supplemental Sources" when it expressly defined "Supplemental Sources" to include water produced from the Metropolitan Water District of Southern California, "but is not limited to" MWD water. (OCWD Act, Section 31.5(c)(1) (emphasis added).

2. State Policy

State policy expressly encourages the use of recycled water. For example, in March 2013, State Water Resources Control Board updated the State of California's Recycled Water Policy ("Policy").[7] The Policy highlights water recycling as a crucial component of the State's overarching policy goal of achieving a sustainable water future despite the daunting challenges that face California. The Policy's central premise is that the "State Water Board and Regional Water Boards will exercise the authority granted to them by the Legislature to the fullest extent possible to encourage the use of recycled water." (Policy, at p. 1.) The Policy adopts a goal of increasing "the use of recycled water over 2002 levels by at least one million acre-feet per year (afy) by 2020 and by at least two million afy by 2030." (*Id.*) The Policy goes so far as to

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[6] Other groundwater producers have also acknowledged the statutory purpose of the BEA. For example, refer to Exhibit 4 to this Letter, which is a letter dated February 18, 2010 from Mesa Consolidated Water District ("The Basin Production Percentage (BPP) and BEA were established and incorporated into the OCWD District Act in 1969. The BPP and BEA allow OCWD and the producers to control basin pumping and help ensure that the producers have similar overall water supply costs. By maintaining water supply cost equity for all of the producers, no agency is disadvantaged.").

[7] Refer to Exhibit 5 to this Letter.

say "The State Water Board hereby declares that, pursuant to Water Code sections 13550 *et seq.*, it is a waste and unreasonable use of water for water agencies not to use recycled water when recycled water of adequate quality is available and is not being put to beneficial use." (Policy, at p. 1.)

OCWD has recognized the importance of these policies. For example, in its response to the Grand Jury in 2014,[8] OCWD stated that "maximizing the recycled water supply in any region should be the first priority for sustainable water resource management." OCWD's "Compilation of Policy Principles" (2015)[9] states that "additional water recycling" can "benefit the entire County." Further, OCWD is currently advocating for a full credit for recycled water used for potable reuse purposes in the ongoing statewide debate over conservation as a way of life related legislation. [10] It is OCWD's position that anything short of a full credit would discourage the maximum reuse of recycled water.

Yet, despite these statements expressing support for recycled water, the position stated in Resolution 17-11 – that Supplemental Sources does not include recycled water – creates a disincentive against, and imposes a penalty on, a producer's production and use of recycled water. That disincentive is not only contrary to State policy, but it is also arbitrary. In determining whether recycled water is a Supplemental Source, OCWD apparently draws a distinction associated with the location of the sewage used to generate the recycled water. As stated by OCWD's legal counsel at the OCWD Board meeting held on August 3, 2016,[11] recycled water that uses sewage located outside the land boundaries of the Santa Ana River Watershed would qualify as a Supplemental Source, but recycled water that uses sewage located within those boundaries would not qualify as a Supplemental Source. (Exhibit 8, p. 13.) That arbitrary distinction has no basis in the statutory purpose of the BEA and, as explained below, is not supported by the plain meaning of the term "Santa Ana River Watershed."

3. <u>The Santa Ana River Watershed Is A "River System"</u>

In 1982, OCWD's legal counsel opined in writing that recycled water is not a Supplemental Source when the source of wastewater is located within the boundaries of the Santa Ana River Watershed.[12] That analysis, which was comprised of only a single paragraph, ignores the nature of the Santa Ana River Watershed. According to the Merriam-Webster

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[8] Refer to Exhibit 6 to this Letter.

[9] Refer to Exhibit 7 to this Letter.

[10] Refer to Exhibit 7A to this Letter.

[11] A transcript of that meeting is provided at Exhibit 8 to this Letter.

[12] Refer to Exhibit 9 to this Letter.

Dictionary, a watershed is "a region or area bounded peripherally by a divide and draining ultimately to a particular watercourse or body of water."[13]

OCWD staff has also acknowledged the Santa Ana River Watershed as a drainage area.[14] (Exhibit 10, pp. 121-122.) Within this area, certain surface waters drain to the Santa Ana River. Water in the Santa Ana River provides natural replenishment to the Orange County Groundwater Basin.[15] Thus, the Santa Ana River Watershed is a water system. More specifically, as OCWD itself stated in its 1963 Complaint filed to adjudicate the water rights to Santa Ana River, "from the standpoints of geography, geology and hydrology, the Santa Ana River Water System is one watershed and one basin." (Exhibit 12, p. 16; emphasis added.)[16]

Viewing the Santa Ana River Watershed as a water system is consistent with the statutory purpose of the BEA. Water that is part of, or "inside," this system cannot be a Supplemental Source because such water is part of the water system that replenishes the Basin and the BEA is intended to relieve or reduce groundwater pumping from the Basin. In contrast, water that is not part of, or is "outside" of, this system must be considered a Supplemental Source because use of such water would reduce groundwater pumping. Accordingly, such supplemental water must be promoted (or "subsidized" to use the words from OCWD's History presentation) through proper application of the BEA. As recognized by OCWD staff, the sewage used by IRWD to generate its recycled water is not part of the Santa Ana River System since it would not drain to the River.[17] In fact, existing law and regulation prohibit the discharge of wastewater into the Santa Ana River System.[18] Therefore, IRWD's recycled water must be treated as a Supplemental Source under the OCWD Act.

4. The Financial Harm To IRWD

By not treating IRWD's recycled water as a Supplemental Source, IRWD and its customers have been harmed by millions of dollars. As recognized in OCWD's own documents, IRWD suffers $4 million to $6 million per year when OCWD wrongfully fails to

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[13] https://www.merriam-webster.com/dictionary/watershed

[14] Refer to Exhibit 10 to this Letter; deposition testimony of John Kennedy.

[15] Refer to Exhibit 11 to this Letter; excerpt of OCWD's 2015 Groundwater Management Plan.

[16] Refer to Exhibit 12 to this Letter.

[17] Exhibit 10, pp. 121-122; Exhibit 13 to this Letter (excerpts of deposition testimony of Michael Markus), pp. 29-30.

[18] *See* State Water Resources Control Board Order No. 2006-0003-DWQ, Statewide General Waste Discharge Requirements for Sanitary Sewer Systems.

treat recycled water as a Supplemental Source.[19] That loss, as OCWD has stated, is the "collective gain for the remaining 18 Producers." (Exhibit 14, p. 3.) That loss is imposed on IRWD even though OCWD acknowledges that IRWD has the legal "right to the sewage." (Exhibit 10, p. 127.) Thus, OCWD's policy "sends negative pricing signal for development of reclaimed water projects." (Exhibit 14, p. 4.) Yet, OCWD persists with that negative policy in order to secure all of the wastewater for its own recycled water facility.[20] (This facility is known as the Groundwater Replenishment System ("GWRS").) As one OCWD document[21] succinctly said, "If the current structure disincentivizes producers from buying GWRS water directly or building their own reclaimed water projects, so what?"[22]

5. The Legislative History From The 1990s

a. "Other" or "Neutral" Water – OCWD staff has responded to IRWD's position by claiming that recycled water should be classified as "other" water under Section 31.5(d)(3) of the OCWD Act. Notably, that section is limited to the District's annual engineer's report and does not extend to the legal findings and determinations that the OCWD Board must make when adopting the BPP and BEA. (Refer to Section 31.5(g) of the OCWD Act.) Yet, even relying on that inapposite subsection in the OCWD Act runs contrary to OCWD's prior position. In this litigation, OCWD has stated, under penalty of perjury, that "other" water is synonymous with "neutral" water.[23] In fact, OCWD's annual engineer's reports state that recycled water is neutral water.[24] Yet, in 1998, OCWD sought to amend the OCWD Act to add "neutral" water as a classification of water. As stated in OCWD's January 1998 agenda document[25]:

> "...the OCWD Board took action to create a new class or water referred to as 'Neutral Water'. This will require an amendment to the Orange County Water District Act which must be approved by the California State Legislature. With this new 'Neutral Water' category in place, the OCWD Board will have more

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[19] Refer to Exhibit 14 to this Letter. Refer also to Exhibit 15 to this Letter for other OCWD calculations of IRWD's monetary losses.

[20] Refer to Exhibits 16, p. 5; Exhibit 10, pp. 92-93.

[21] Refer to Exhibit 17 to this Letter.

[22] OCWD improper treatment of recycled water also infects OCWD's determination when IRWD "exports" groundwater outside of OCWD's boundaries. Refer to Exhibits 18-20 to this Letter.

[23] Refer to Exhibit 21 to this Letter (OCWD's supplemental interrogatory answers.)

[24] Refer to Exhibits 22 and 23 to this Letter.

[25] Refer to Exhibit 24 to this Letter.

> discretion over classification of water supplies in calculating the Basin Production Percentage." (Emphasis added.)

However, that proposed legislation was later withdrawn by OCWD and, therefore, "neutral" water was not added to the OCWD Act. Thus, OCWD lacks the legal authority to classify a source of water as "neutral" water. In fact, when that proposed legislation was withdrawn, OCWD recognized the need to propose additional legislation "to clarify the status of reclaimed water in the calculations of the BPP and BEA."[26] That amendment was not sought by OCWD, and, instead, OCWD Board decided "the Act would remain silent on this issue."[27]

Silence, however, is not the same as an express exclusion of recycled water from the definition of "Supplemental Sources" in the OCWD Act. When Section 31.5 was added to the OCWD Act in 1969, the use of recycled water as a water source was not prevalent. Yet, the Legislature defined "Supplemental Sources" in a flexible manner to account for sources of water that may be developed in the future; hence the use of the phrase "but is not limited to" in the statutory definition of Supplemental Sources. When such a subsequently developed source of water meets the statutory propose of the BEA (as recycled water does), then a court should interpret the statute to include recycled water as a Supplemental Source. The omission of the words "recycled water" from the definition of Supplemental Sources should not preclude a court from interpreting the statute to fulfill the Legislature's intent and policy objective.

b. 1991 and 1995 – OCWD staff points to the amendment of the OCWD Act in 1991 to expressly include the words "reclaimed water" in the definition of Supplemental Sources and the 1995 amendment that removed those words as conclusive evidence that the Legislature intended recycled water to not qualify as a Supplemental Source. Yet, that position fails for multiple reasons.

First, it is hornbook law that "cleanup" or "technical" legislation cannot be interpreted by a court to effectuate a major change in policy. (*Jones v. Lodge at Torrey Pines P'ship*, 42 Cal.4th 1158, 1171 (2008); *Ailanto Properties, Inc. v. City of Half Moon Bay*, 142 Cal.App.4th 572, 589 (2006).) The 1995 amendment to the OCWD Act was technical cleanup legislation.[28] Therefore, that amendment cannot be interpreted to have effectuated the major policy change advocated by OCWD staff, namely, that recycled water cannot be considered a Supplemental Source. Divining such an intention on the Legislature's part from the 1995 Legislation is particularly problematic given the sparsity of the record for that amendment, leading OCWD's legal counsel to opine at the August 2016 OCWD Board meeting that "the 1995 change, it's much – we've not yet found any clear reason why that change occurred." (Refer to Exhibit 8,

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[26] Refer to Exhibit 25 to this Letter (OCWD's March 1998 Board agenda item).

[27] Refer to Exhibit 26 to this Letter (Minutes of OCWD Board meeting, March 18, 1998).

[28] Refer to Exhibit 27 to this Letter.

p. 21; emphasis added.) OCWD staff also recognized that the obtuse explanation for the 1995 amendment is "confusing." (Exhibit 10, p. 80.)

Second, whatever the Legislature's intention was in amending the OCWD Act in 1995, the intention of OCWD in seeking that amendment is clear – and it had nothing to do with the statutory purpose underlying the BEA. Instead, OCWD sought the amendment to promote the purchase of its own recycled water by groundwater producers. Simply put, if OCWD treated recycled water as a Supplemental Source, then OCWD's own recycled water would be too expensive for groundwater producers to purchase.[29] Hence, the need for OCWD staff to classify recycled water as "neutral" water, a position not supported by the statutory purpose behind the BEA. Yet, when classifying a source of water that does not affect OCWD's own water sales, OCWD takes a position consistent with IRWD's interpretation of Section 31.5. For example, OCWD treats "conserved water" as a Supplemental Source even though that water is located within the land boundaries of the Santa Ana River Watershed. (Refer to Exhibit 34 to this Letter.) Thus, OCWD treats two similar situated classes of water inconsistently, with conserved water qualifying as a Supplemental Source and recycled water not qualifying as a Supplemental Source, even though only recycled water yields actual ("wet") water for use.

A FULL PUBLIC HEARING IS REQUIRED FOR THE OCWD BOARD TO ACT ON RESOLUTION 17-11

If the OCWD Board intends to proceed with Resolution 17-11, then it must hold a full public hearing. The OCWD Act requires a public hearing when the OCWD Board establishes the annual BPP. (OCWD Act, Section 31.5(f).) The BPP is defined as a formula under Section 31.5(c)(2) of the OCWD Act:

> "'Basin production percentage' means the ratio that all water to be produced from groundwater supplies within the district bears to all water to be produced by persons and operators within the district from supplemental sources and from groundwater within the district during the ensuing water year."

Under that formula, reducing the amount of Supplemental Sources (which occurs when recycled water is backed out of Supplemental Source), reduces the denominator in the formula, which necessarily, leads to a higher BPP. Under the statute, the numerator in the BPP formula is the amount of groundwater to be produced in the upcoming year, which is the finding required under Section 31.5(g)(1) of the Act. That amount relates to groundwater *demands*. In contrast, OCWD staff apparently uses expected groundwater *supplies* for the numerator in the BPP formula.[30] Whether accounting for groundwater supplies in the setting of the BPP is good groundwater management or not, the statute only allows expected groundwater demands

[29] Refer to Exhibits 28-33 to this Letter.

[30] Refer to Exhibit 35 to this Letter.

to be the numerator in the BPP formula. Since the OCWD Board found groundwater demand to be 294,000 af and 303,000 af in the original BEA Resolutions[31] (the Resolutions make no mention of the expected amount of groundwater supplies), the "corrected" numbers for Supplemental Sources in Resolution 17-11 would increase the BPP resulting to 82% and 80% for 2016-17 and 2017-18, respectively. Use of any other formula or "policy" to arrive at a different BPP is flatly contrary to the OCWD Act.

Accordingly, since revising the amount of Supplemental Sources would cause the BPP to be changed, the OCWD Board must hold a full public hearing before acting on Resolution 17-11; otherwise the OCWD Board would violate the OCWD Act. At such a public hearing, the OCWD Board should hear, take, and receive all competent evidence presented regarding the need for basin equity assessments, production requirements and limitations in general, as required by the OCWD Act.

Very truly yours,

Edward J. Casey

EJC/ysr
Enclosures

cc: Michael Markus, OCWD General Manager
(w/encls.) *Via Hand Delivery*
Joel D. Kuperberg, OCWD General Manager
(w/encls.) *Via Hand Delivery*
Doug Reinhart, IRWD Board President
(w/encls.) *Via Hand Delivery*
Paul Cook, IRWD General Manager
(w/encls.) [Via Email]

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[31] Those demand numbers match exactly the demand projections in the corresponding annual Engineer's Report. (Exhibit 22, pp. 23-24; Exhibit 23, p. 22.) Notably, the demand projections in those reports do not back out or exclude IRWD's recycled water. (Exhibit 22, Table 5; Exhibit 23, Table 5.) The consistency between the Original BEA Findings and the Annual Engineer's Reports belies OCWD's current claim of a clerical error in the Original BEA Findings.

RESOLUTION NO. 16-4-37
ESTABLISHING THE BASIN PRODUCTION PERCENTAGE, PRODUCTION LIMITATION AND DETERMINING THE NEED AND DESIRABILITY TO LEVY BASIN EQUITY ASSESSMENTS AND AMOUNT THEREOF

WHEREAS, pursuant to Section 31.5 of the Orange County Water District Act, an engineering report on water production and the condition of water supplies within the Orange County Water District has been filed and presented to the Board of Directors of said District, and a hearing relating to said production and condition of water supplies was held on Wednesday, March 16, 2016; and

WHEREAS, a duly noticed public hearing was held on April 20, 2016 and evidence submitted for the purpose of determining the need and desirability of levying Basin Equity Assessments and the amount thereof, as well as the need for establishing production requirements and limitations and the extent thereof, and said matters having been submitted to the Board of Directors for its findings and determinations; and

NOW, THEREFORE, the Board of Directors of the Orange County Water District does hereby resolve as follows:

Section 1: That the Board of Directors does hereby find and determine for the ensuing water year July 1, 2016 to June 30, 2017 as follows:

a. The estimated total amount of water to be produced by all persons or operators within the District from the groundwater within the District is 294,000 acre-feet.
b. The estimated total amount to be produced by such persons and operators from groundwater and supplemental sources is 380,000 acre-feet.
c. The basin production percentage is 75 percent. There are no basin production requirements.
d. The production limitation is 75 percent for all 19 retail groundwater producers. The surcharge for production in excess of the production limitation is $0 per acre-feet.
e. The Basin Equity Assessment and production requirements and limitations from groundwater within the District established by this resolution are necessary for the protection of the water supply of the District.
f. The Basin Equity Assessments for that pumping originating from the water quality projects operated by the Mesa Water District (Colored Water Removal project), Irvine Ranch Water District (Irvine Desalter and Wells 21 and 22), City of Tustin (Desalter), and City of Garden Grove (Nitrate Removal project) shall be exempt from the 75 percent production limitation and surcharge rate.
g. The Basin Equity Assessment shall be set at $0 per acre-feet for agricultural irrigation use producers who do not have a supplemental water connection, and that such amount is reasonable.
h. The Basin Equity Assessments to be levied against all other persons and operators in a dollar amount per acre-foot of water produced from the groundwater supply (in excess of the basin production percentage) for all purposes including irrigation are as follows:

Table 1 - Basin Equity Assessments

AGENCY	BEA ($/AF)
City of Anaheim	210
City of Buena Park	532
East Orange County Water District	530
City of Fountain Valley	532
City of Fullerton	531
City of Garden Grove	549
Golden State Water Company	533
City of Huntington Beach	548
Irvine Ranch Water District	525
City of La Palma	512
Mesa Water District	535
City of Newport Beach	560
City of Orange	534
City of Santa Ana	515
City of Seal Beach	518
Serrano Water District	484
City of Tustin	505
City of Westminster	544
Yorba Linda Water District	516
All producers for agricultural irrigation use	688
Producers for agricultural Irrigation Use without MWD Access	0
All Others	527

i. The amount of each such Basin Equity Assessment is reasonable.

j. During the ensuing water year, upon the District giving published notice thereof, pursuant to Section 6061 of the Government Code, in a newspaper of general circulation printed and published within the District at least 10 days prior to such hearing, a subsequent public hearing may be held to modify the basin production percentage, any Basin Equity Assessments, any surcharge, or any production requirement or limitation established by the District.

Section 2: That pursuant to Section 31.5(h) of the Orange County Water District Act, all persons and operators who produce 25 acre-feet or less of water from groundwater within the District shall be excluded from the levy of the Basin Equity Assessments and production requirements and limitations provided for herein.

Section 3: The Board of Directors finds and determines that the establishment of the basin production percentage, production requirements and limitations, and the adoption, levy and imposition of basin equity assessments and surcharges are exempt from the California Environmental Quality Act ("CEQA") under State CEQA Guideline §15378(b)(2) since they involve continuing administrative activities such as general policy and procedure making.

Section 4: Based upon the staff report and presentation, the proposed fiscal year 2016-17 budget

presented by the General Manager, and the testimony and evidence presented at the public hearing, the Board of Directors finds and declares that the adoption, levy and imposition of the basin equity assessments and surcharges do not constitute a "project" within the meaning of CEQA and are exempt from CEQA under Public Resources Code Section 21080(b)(8) and State CEQA Guidelines §§ 15378(b)(4) and 15273, because the basin equity assessments and surcharges: (a) involve the creation of government funding mechanisms or other government fiscal activities which do not involve any commitment to any specific project which may result in a potentially significant physical impact on the environment; and (b) are for the purposes of meeting operating expenses (including employee wage rates and fringe benefits), purchasing or leasing supplies, equipment or materials, meeting financial reserve needs and requirements, and obtaining funds for capital projects necessary to maintain the level of service within the District's existing boundaries.

Section 5: That the Secretary of this District is hereby instructed and directed to give notice of the Basin Equity Assessments as required by the Orange County Water District Act, and to file a Notice of Exemption in accordance with CEQA.

CONSENT CALENDAR

The Consent Calendar was approved upon motion by Director Dewane, seconded by Director Anthony and carried [9-0] as follows.
Ayes: Anthony, Brandman, Dewane, Green, Flory, Nguyen, Reyna, Sheldon, Yoh
Absent: Bilodeau

2. Approval of Cash Disbursements

MOTION NO. 16-56
APPROVING CASH DISBURSEMENTS

Payment of bills for the period March 31, 2016 through April 13, 2016 in the total amount of $5,552,903.11 is ratified and approved.

3. Approval of Minutes of Board Meeting

MOTION NO. 16-57
APPROVING MINUTES OF BOARD MEETING

The minutes of the Board of Directors meeting held March 16, 2016 are approved as presented.

4. Resolution Congratulating Mesa Water® for its Conservation Achievements

RESOLUTION NO. 16-4-38
CONGRATULATING MESA WATER DISTRICT ON ITS CONSERVATION EFFORTS

WHEREAS, Mesa Water District (Mesa Water®) has supplied safe and reliable water to its service area for more than 55 years; and

water for a total of $445 per acre-foot of water produced by said persons during the ensuing water year for purposes other than irrigation.

Section 4: Pursuant to Section 29 of the Orange County Water District Act, the Board of Directors of the Orange County Water District does hereby provide that the operator of any water producing facility within the District which has a discharge opening not greater than two inches in diameter and which does not provide domestic or irrigation water for an area in excess of one acre, in lieu of filing a sworn statement as to the production of groundwater, may pay a fixed Replenishment Assessment and Additional Replenishment Assessment in the amount of $445 for water produced in the ensuing water year, namely July 1, 2017 to June 30, 2018.

Section 5: Based upon the staff report and presentation, the proposed fiscal year 2017-18 budget presented by the General Manager, and the testimony and evidence presented at the public hearing, the Board of Directors finds and declares that the adoption, levy and imposition of the Replenishment Assessment and Additional Replenishment Assessment do not constitute a "project" within the meaning of the California Environmental Quality Act ("CEQA") and are exempt from CEQA under Public Resources Code Section 21080(b)(8) and State CEQA Guidelines §§ 15378(b)(4) and 15273, because the Replenishment Assessment and Additional Replenishment Assessment: (a) involve the creation of government funding mechanisms or other government fiscal activities which do not involve any commitment to any specific project which may result in a potentially significant physical impact on the environment; and (b) are for the purposes of meeting operating expenses (including employee wage rates and fringe benefits), purchasing or leasing supplies, equipment or materials, meeting financial reserve needs and requirements, and obtaining funds for capital projects necessary to maintain the level of service within the District's existing boundaries.

Section 5: That the Secretary of this District is hereby instructed and directed to give notice of the levy of the Replenishment Assessment and this Additional Replenishment Assessment as required by the Orange County Water District Act, and to file a Notice of Exemption in accordance with CEQA.

4. Resolution D

Upon motion by Director Dewane, seconded by Director Anthony, the following resolution was unanimously adopted [9-1].
Ayes: Anthony, Bilodeau, Dewane, Green, Nguyen, Sarmiento, Sheldon, Whitaker, Yoh
Noes: Vanderbilt

RESOLUTION NO. 14-4-45
ESTABLISHING THE BASIN PRODUCTION PERCENTAGE, PRODUCTION LIMITATION AND DETERMINING THE NEED AND DESIRABILITY TO LEVY BASIN EQUITY ASSESSMENTS AND AMOUNT THEREOF

WHEREAS, pursuant to Section 31.5 of the Orange County Water District Act, an engineering report on water production and the condition of water supplies within the Orange County Water District has been filed and presented to the Board of Directors of said District, and a hearing relating to said production and condition of water supplies was held on Wednesday, March 15, 2017; and

WHEREAS, a duly noticed public hearing was held on April 19, 2017 and evidence submitted for the purpose of determining the need and desirability of levying Basin Equity Assessments and the amount thereof, as well as the need for establishing production requirements and limitations and the extent thereof, and said matters having been submitted to the Board of Directors for its findings and determinations; and

NOW, THEREFORE, the Board of Directors of the Orange County Water District does hereby resolve as follows:

Section 1: That the Board of Directors does hereby find and determine for the ensuing water year July 1, 2017 to June 30, 2018 as follows:

a. The estimated total amount of water to be produced by all persons or operators within the District from the groundwater within the District is 303,000 acre-feet.
b. The estimated total amount to be produced by such persons and operators from groundwater and supplemental sources is 395,000 acre-feet.
c. The basin production percentage is 75 percent. There are no basin production requirements.
d. The production limitation is 75 percent for all 19 retail groundwater producers. The surcharge for production in excess of the production limitation is $0 per acre-feet.
e. The Basin Equity Assessment and production requirements and limitations from groundwater within the District established by this resolution are necessary for the protection of the water supply of the District.
f. The Basin Equity Assessments for that pumping originating from the water quality projects operated by the Mesa Water District (Colored Water Removal project), Irvine Ranch Water District (Irvine Desalter and Wells 21 and 22), City of Tustin (Desalter), and City of Garden Grove (Nitrate Removal project) shall be exempt from the 75 percent production limitation and surcharge rate (70% for IRWD).
g. The District shall implement the Coastal Pumping Transfer Program in FY 2017-18 and shall modify the BEA for Producers participating in this program as shown.
h. The Basin Equity Assessment shall be set at $0 per acre-feet for agricultural irrigation use producers who do not have a supplemental water connection, and that such amount is reasonable.
i. The Basin Equity Assessments to be levied against all other persons and operators in a dollar amount per acre-foot of water produced from the groundwater supply (in excess of the basin production percentage) for all purposes including irrigation are as follows:

Table 1 - Basin Equity Assessments

AGENCY	BEA ($/AF)
City of Anaheim	216
City of Buena Park	423
East Orange County Water District	538
City of Fountain Valley	399
City of Fullerton	524
City of Garden Grove	423
Golden State Water Company	421
City of Huntington Beach	485
Irvine Ranch Water District	523
City of La Palma	390
Mesa Water District	467
City of Newport Beach	552
City of Orange	413
City of Santa Ana	516
City of Seal Beach	512
Serrano Water District	469
City of Tustin	509
City of Westminster	541
Yorba Linda Water District	387
All producers for agricultural irrigation use	707
Producers for agricultural Irrigation Use without MWD Access	0
All Others	520

j. The amount of each such Basin Equity Assessment is reasonable.

k. During the ensuing water year, upon the District giving published notice thereof, pursuant to Section 6061 of the Government Code, in a newspaper of general circulation printed and published within the District at least 10 days prior to such hearing, a subsequent public hearing may be held to modify the basin production percentage, any Basin Equity Assessments, any surcharge, or any production requirement or limitation established by the District.

Section 2: That pursuant to Section 31.5(h) of the Orange County Water District Act, all persons and operators who produce 25 acre-feet or less of water from groundwater within the District shall be excluded from the levy of the Basin Equity Assessments and production requirements and limitations provided for herein.

Section 3: The Board of Directors finds and determines that the establishment of the basin production percentage, production requirements and limitations, and the adoption, levy and imposition of basin equity assessments and surcharges are exempt from the California Environmental Quality Act ("CEQA") under State CEQA Guideline §15378(b)(2) since they involve continuing administrative activities such as general policy and procedure making.

Section 4: Based upon the staff report and presentation, the proposed fiscal year 2017-18 budget presented by the General Manager, and the testimony and evidence presented at the public hearing, the Board of Directors finds and declares that the adoption, levy and imposition of the basin equity assessments and surcharges do not constitute a "project" within the meaning of CEQA and are exempt from CEQA under Public Resources Code Section 21080(b)(8) and State CEQA Guidelines §§ 15378(b)(4) and 15273, because the basin equity assessments and surcharges: (a) involve the creation of government funding mechanisms or other government fiscal activities which do not involve any commitment to any specific project which may result in a potentially significant physical impact on the environment; and (b) are for the purposes of meeting operating expenses (including employee wage rates and fringe benefits), purchasing or leasing supplies, equipment or materials, meeting financial reserve needs and requirements, and obtaining funds for capital projects necessary to maintain the level of service within the District's existing boundaries.

Section 5: That the Secretary of this District is hereby instructed and directed to give notice of the Basin Equity Assessments as required by the Orange County Water District Act, and to file a Notice of Exemption in accordance with CEQA.

CONSENT CALENDAR

General Manager Markus removed Item No. 18, *Recommended Change to Policy for Developing New Local Water Resources*, from tonight's Agenda.
Director Green removed Item No. 6, *SAWPA Budget Contribution*, from the Consent Calendar.
Director Green noted she would be voting "No" on Item No. 30, *Consideration of Modifying RA and Additional RA*, based upon a recent court decision that states the fee imposed by OCWD is property-related and therefore subject to Proposition 218.
The remainder of the Consent Calendar was approved upon motion by Director Dewane, seconded by Director Anthony and carried [10-0] as follows, with Director Green voting "No" on Item No. 30.
Ayes: Anthony, Bilodeau, Dewane, Green, Nguyen, Sarmiento, Sheldon, Vanderbilt, Whitaker, Yoh
Noes: Green: Item No. 30

2. Approval of Cash Disbursements

MOTION NO. 17-51
APPROVING CASH DISBURSEMENTS

Payment of bills for the period March 30, 2017 through April 12, 2017 in the total amount of $4,113,670.70 is ratified and approved.

3. Approval of Minutes of Board Meeting

MOTION NO. 17-52
APPROVING MINUTES OF BOARD MEETINGS

The minutes of the Board of Directors meetings held March 15, 2017 are approved as presented.

A HISTORY OF ORANGE COUNTY WATER DISTRICT

About the cover: Groundwater flows from an artesian well west of Anaheim in the late 1890s.

CONTENTS

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FOREWORD

By Shawn Dewane, President, Orange County Water District

The Nature of Groundwater

To understand the work of Orange County Water District (OCWD, District) is to understand groundwater. Born of ancient rains and held deep underground, groundwater is Orange County's wellspring—a critically important water resource that is largely invisible and yet saturates the lives and livelihoods of millions of people.

Groundwater is water that accumulates and is stored beneath the surface of Earth in aquifers. Like an underground sponge, an aquifer is a porous mix of sand and gravel that is filled with water. Some aquifers are shallow; others are thousands of feet deep and stretch across hundreds of miles. The High Plains aquifer, for example, extends 174,000 square miles from South Dakota to Texas.

A groundwater basin consists of one or more aquifers surrounded by non-water-bearing material. Inside the basin, the aquifers are divided and shaped by *aquitards*, clay or silt layers that restrict movement of water between the aquifers. Water enters the groundwater basin by percolation through the ground, or by underground flows of water from an adjoining aquifer. Movement of groundwater is extremely slow and usually measured in feet per year. Water percolates into the basin naturally through rain and river flow, or artificially by creating facilities to enhance natural percolation, such as a percolation pond. The rate of percolation depends on the underlying soil conditions. Open, sandy soil, for example, enables faster percolation than clay or silty soil.

Global Significance of Groundwater

Groundwater represents about two-thirds of the world's freshwater supply (Goldin 1983, 64). This hidden water is tapped for irrigation and other uses throughout the world. While some countries carefully manage groundwater supplies, other countries are depleting groundwater reservoirs at a rapid rate. Limited availability of surface water further exacerbates the overdraft problem. Drought conditions, such as those in the West, place additional pressure on groundwater supplies—if aquifers go dry, the consequences spell disaster.

The United States faces its own groundwater management challenges. Groundwater remains the most undervalued and abused resource in the water industry. Thanks to pumping technology and relatively inexpensive energy, groundwater has been mined recklessly even in California. From San Diego to the Central Valley, you can see the consequences of overdrafting in land subsidence (sinkage), irreversible structural changes to aquifers, and in coastal areas salt water intrusion. According to Marc Reisner in *Overtapped Oasis*, in California and the West's high plains alone, water is being taken and not replaced at a rate of five trillion gallons per year.

Numerous references, including *The World's Water*, *The West without Water*, and *The Atlas of Water*, note that hundreds of aquifers, particularly in areas of low rainfall, are being pumped faster than they are replenished. When those "wells" go dry, we will see the effects in our food prices, property values, and the land and rivers we once enjoyed. In some parts of the world, the effects will be dire—starvation, disease,

and increased political conflict and tension. Unless political leaders worldwide take action toward managing the world's water supplies, within a few years a water crisis of catastrophic proportions will explode upon us.

Regional Significance of Orange County's Groundwater Basin

Though it lies underground, groundwater is a significant natural resource here in the state. It represents almost 150 million acre-feet of water—triple the supply of the State's surface supplies (Blomquist 1988, 4). People have been using the State's groundwater for thousands of years. Water seeping from underground springs sustained California Indians in arid lands. The Desert Cahuilla went further and hand-dug wells called *"temakawomal"* deep into the earth. Descending stair-steps provided access to the water. Later, as Europeans settled in California and established farms and ranches, groundwater supplies were used in earnest. People dug wells and tapped aquifers to irrigate croplands and hoof stock.

Orange County's groundwater basin began forming millions of years ago as mountains eroded and ocean and riverine sediments filled a deep valley, trapping Santa Ana River water within layers of sand and gravel. The deepest aquifers of the groundwater basin still contain pristine "fossil water" that fell to the ground thousands of years ago. The water Orange County drinks today may have entered the basin one year, 100 years, or 1,000 years ago, depending on the location and depth of the well.

Orange County's groundwater basin has a usable capacity of over one million acre-feet. This vast basin reflects an interesting geology. The sandy soil under Yorba Linda, Fullerton, Anaheim, and Orange provides relatively good access for water on the surface to reach deep aquifers while clay layers that underlie other areas impede percolation. These restrictive clay layers limit the reach of OCWD's recharge areas, but they also limit the extent and depth of pollution within the basin.

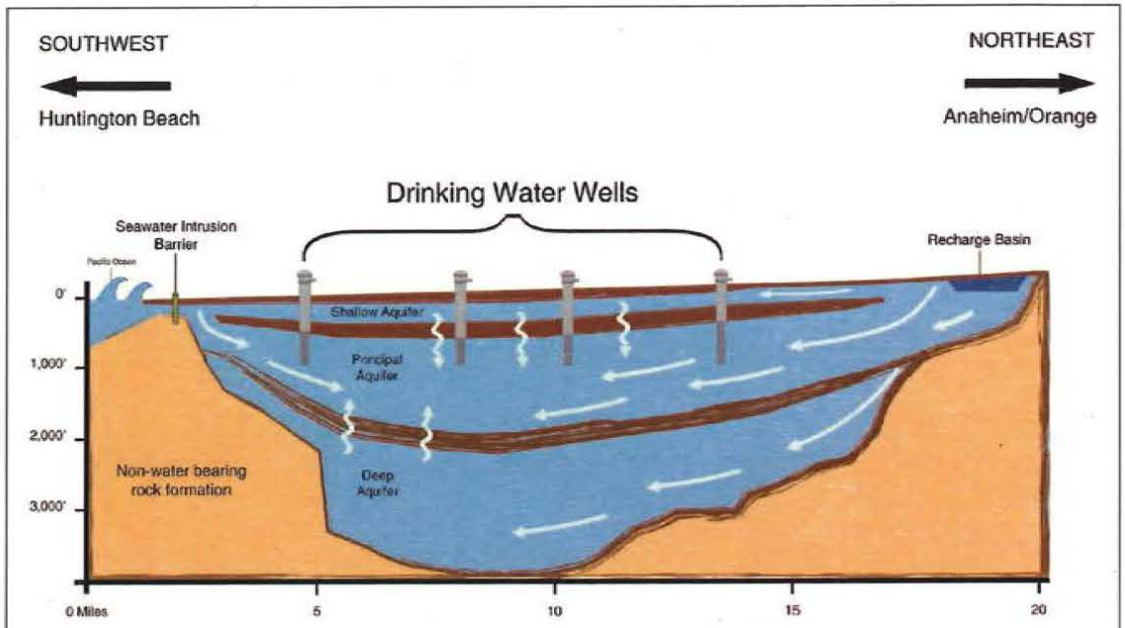
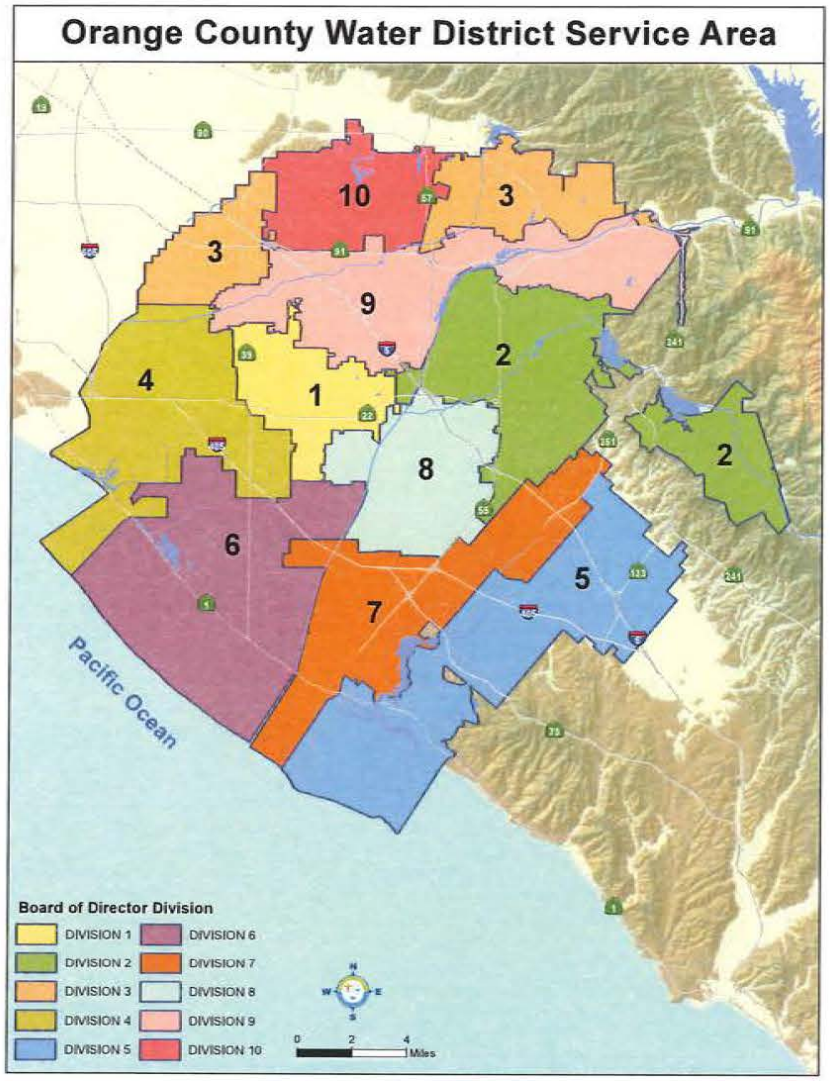


Figure 1. Orange County's Groundwater Basin is managed by the Orange County Water District. The basin stretches from the Pacific Ocean to Anaheim and reaches depths of up to 4,000 feet. The basin stores millions of acre-feet of groundwater that supplies 2.4 million residents in north and central Orange County through more than 200 drinking water wells.



OCWD relies on the "ecosystem services" of the groundwater basin to manage water supplies. The water from the Santa Ana River is naturally purified and stored without the need for extensive piping networks to transport it. Further, it is not subject to evaporation like water stored in a surface reservoir, and the basin cost nothing to build—compared to a price tag of billions of dollars to construct a surface reservoir today (if an environmentally satisfactory location could be found). Properly managed, the groundwater basin provides a renewable resource for current and future generations, and in times of drought, ensures water reliability that otherwise could be compromised. Responsible management also ensures a basin that provides a solid foundation for city infrastructure, as well as environmental benefits to plants and animals that depend upon rivers, streams, and wetlands.

The Orange County Water District has always viewed groundwater management as a long-term process. Eighty years after its inception, the District continues to be guided by vision and vigilance. It is my distinct honor to serve as president of its Board of Directors. The Board, together with staff, recognizes the pivotal role the District plays in water resource management. Its innovative Groundwater Replenishment System is its legacy and a testament to its commitment to groundwater stewardship. Please join me in exploring the Orange County Water District's remarkable 80-year history.

PREFACE

This history of the Orange County Water District (OCWD) is based in large part on a document prepared for OCWD by Joseph J. Milkovich & Associates of Huntington Beach, California. The document, entitled *A History of the Orange County Water District and the River It Runs*, was primarily the work of Barbara A. Milkovich, Ph.D. Algoe Ensley, former OCWD Records Manager, prepared the original acronym list and the glossary.

That document was submitted to OCWD in March 1998 and subsequently updated and reorganized to reflect the latest information in water issues and OCWD programs. Renamed *A History of Orange County Water District*, it was published in book form in 2003. Further updated and expanded by The Acorn Group, this second edition was released in 2014.

INTRODUCTION

In 1860 William Brewer, professor of agriculture at Sheffield Scientific School at Yale, accompanied the first geological survey party to study the terrain of California. He kept a detailed journal of his experiences. His early description of the broad riverbed of the Santa Ana River would still be quite accurate if the river had not been confined to a channel in Orange County. Even today during floods, the Santa Ana River appears formidable as it rushes to the sea. One can imagine that, loosed from its banks, it could flood the wide coastal plain now covered by asphalt and lined with buildings. The river's floodwater has inundated parts of modern Orange County at least five times in the 20th century alone, destroying the homes, lives, and livelihoods of residents. Yet, for much of every year, it is a narrow, shallow stream that simply disappears into its riverbed about mid-county. As it disappears, however, its waters sink into a groundwater reservoir that is capable of holding some 2.5 to 3 million acre-feet of water (Bailey 1929, 5). OCWD hydrogeologists have since mapped and modeled the basin and estimate its total capacity to be 10-40 million-acre-feet (Herndon 1999). California Department of Water Resources 1997 estimates place the usable capacity of this underground reservoir at about 1.25 million acre-feet (Van Haun 1997).

At first, the basin's supply seemed unlimited. By the 1930s, however, the groundwater level had dropped precipitously, indicating the basin was already overdrawn. If Orange County were to continue its economic expansion, the basin supply would have to be replenished and protected. To study the problem, the Farm Bureau and County Chamber of Commerce established a committee of agribusiness and civic leaders. The committee proposed legislation to establish a unique basin-wide management and conservation district for the valley. As

stated in the original 1933 Orange County Water District Act, the new district would monitor and conserve underground supplies in the Santa Ana Valley basin, and protect local water rights against outside users. While this basic purpose has remained in place, modern technology and science have made OCWD's operation much more complex.

The first directors supervised day-to-day maintenance themselves, hiring engineers as needed or retaining attorneys to pursue litigation over water rights against upstream users of the Santa Ana River. But, by 2002, OCWD's operation had grown to a staff of 186, including scientists, engineers, technicians, accountants, and attorneys. It owned more than 3,600 acres of land for groundwater recharge and had more than $70 million in annual operational funds. Groundwater management policies had expanded from clearing weeds in the river bottom to championing internationally acclaimed wastewater reclamation projects. Now in 2014, supported by a staff of 216 and annual operational funds that total $112.6 million, the District remains at the forefront of groundwater management and protection.

Orange County Water Agencies

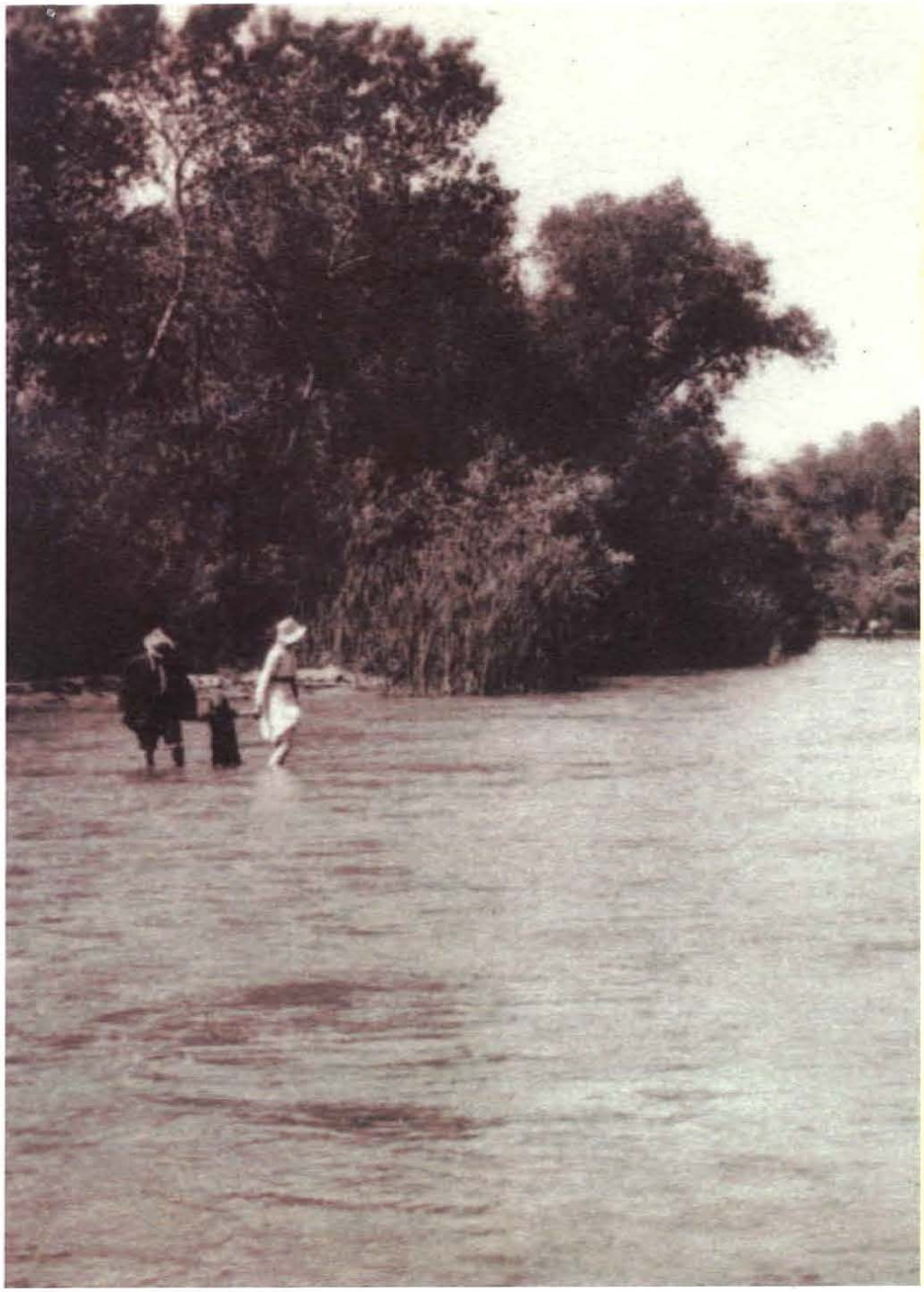
Several different kinds of water districts serve Orange County and have similar names, but often different responsibilities. Only one—OCWD—manages the groundwater basin of the north and central part of the county. With the exception of treated wastewater for irrigation in the Green Acres Project, OCWD does not directly provide water to anyone. Its mission is to provide local water retailers with a reliable, adequate, and high-quality supply of water procured in an environmentally responsible manner at the lowest reasonable cost.

The Metropolitan Water District of Southern California (MWD) provides water from the Colorado River and the State Water Project to Southern California. It wholesales this imported water to its Orange County member agencies, including three independent cities, Anaheim, Fullerton, and Santa Ana, and the Municipal Water District of Orange County (MWDOC). MWDOC represents all of Orange County (excluding the independent city members of MWD), acting as a pass-through agency for MWD water sold to its constituent members, and sells additional untreated water to OCWD for groundwater recharge.

Special districts, including Irvine Ranch Water District, Mesa Water District, Yorba Linda Water District, East Orange County Water District, and Serrano Water District, which until recent decades were primarily agricultural water producers, also draw groundwater from the basin. In addition to these districts, private individuals and water companies also produce water independently from the groundwater basin. Directly or indirectly, they are tied to the Santa Ana River. Without Santa Ana River flows, north and central Orange County would be dependent on the Colorado River or northern California for most, if not all, of their water. Ultimately, the economy of north and central Orange County depends upon maintaining the Santa Ana River and its watershed basins to support an ever-growing population.

Although a skeptic would challenge its influence on the coastal areas of Orange County in the middle of a dry summer, the Santa Ana River is the largest coastal stream in Southern California. Flowing west from the San Bernardino Mountains, the river winds through San Bernardino and Riverside Counties before reaching Orange County and ultimately the Pacific Ocean. Its drainage area encompasses about 2,470 square miles, including a portion of Los Angeles County, and its total length is about 80 miles (Blomquist 1988, 3). Two of its main tributaries, Mill Creek and Bear Creek, originate in the San

Bernardino Mountains; a third, Lytle Creek, originates in the San Gabriel Mountains (M. B. Scott 1976, 7). Together these flow southwesterly through the upper river valley, where other smaller tributary streams meet them, finally entering Orange County through a 12-mile gorge—the Santa Ana Canyon. Once on the coastal plain, the river is joined by Santiago Creek and flows to the ocean between Huntington Beach and Newport Beach.



THE RIVER UNTAMED

Santa Ana River, circa 1899. *Photo courtesy of Anaheim Public Library.*

Freshwater Supplies and the Serrano and Tongva

The Serrano and Tongva lived along the banks of the Santa Ana River for thousands of years, drawn there by the vegetation and wildlife associated with each ecological region of the river's watershed. For many, the Santa Ana River remains a part of cultural traditions today. In the upper San Bernardino Valley regions, villages of the Serrano Indians were tucked into the canyons. There they found shelter from winter storms, as well as abundant water and game. Village sites in the lower woodlands offered a steady supply of acorns, other plant foods, and game, as well as grasses and reeds that yielded fibers for basket making and home building. Encampments in lower reaches of the river—open grassland areas and riparian edges—enabled both the Serrano and the Tongva to take advantage of deer and smaller animals that came to the river to drink. Fresh water also meant a steady supply of fish, fibers, and plant foods to sustain their lives and livelihoods. A number of communities thrived in the Santa Ana Valley along the Coyote Creek and the Santa Ana River. When the Portolá expedition crossed the Santa Ana River in 1769, its journalist, Father Crespí, noted a friendly village on the riverbanks (McCawley 1996, 60). He mentioned the Indians offered the travelers antelope, hares and seeds from their larder—typical resources derived from the grassland ecosystem.

Other archeological evidence presented by author and historian William McCawley suggests that the Indians had temporary camps in the marshy regions at the mouth of the river. Since the coastal marshes flooded in winter storms, inland bands likely used the camps for seasonal hunting, shellfish gathering, and fishing bases. Several probable locations on the bluffs of Huntington Beach and Costa Mesa above the river's flood plain have been identified. They include the Newland House, Banning Estate, and Fairview and Griset sites (McCawley 1996, 71-72).

Water Works and the Spanish Period

Life on the coastal plain changed with the coming of the missionaries. Mission San Gabriel had jurisdiction over a wide area of the Los Angeles basin, including the Santa Ana Valley. In the late 1700s the Spanish padres attempted to convert the Serrano and Tongva Indian population to Christianity and teach them European ways of living. In

Early Spanish missionaries

the process, they were exposed to disease and threatened with punishment. Forced to abandon traditional beliefs and practices meant changing the world of the Serrano and Tongva forever.

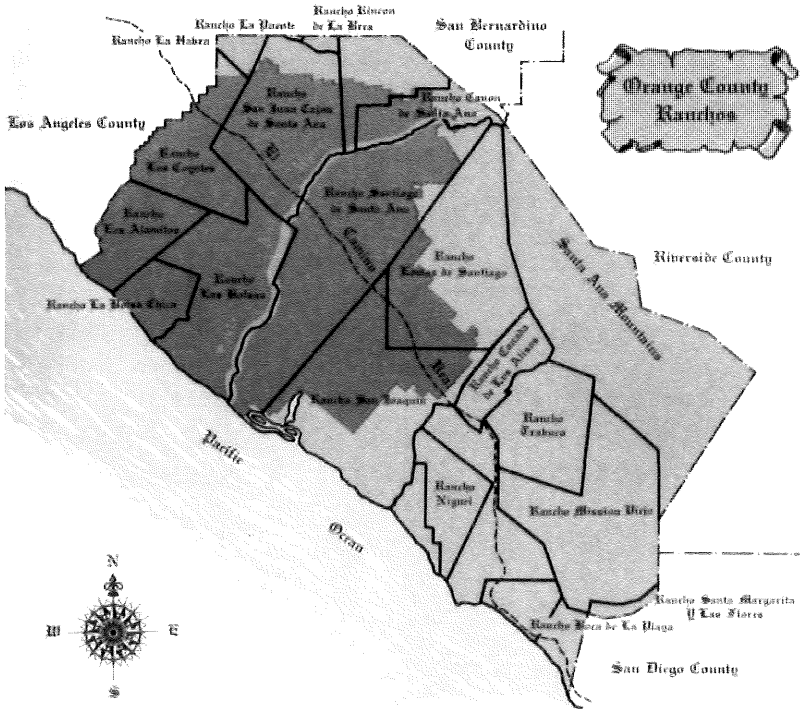
Mission San Gabriel drew its irrigation water from nearby groundwater springs and *cienegas* (marshlands) for the fields at the mission

and other areas along the rivers of the valley. Eventually the Mission had some 6,000 acres of land under irrigation, including tracts at Santa Ana (Cleland 1941, 22; Blomquist 1992, 44). In about 1819, Indians from San Bernardino visited Mission San Gabriel. Seeing the irrigation works, they requested help in establishing similar structures on Mill Creek. Their resulting construction of the Mill Creek Zanja became the first such development in the upper basin (M. B. Scott 1976, 9). It remains in place nearly 200 years later.

Beginning in the late 18th century, Europeans introduced their concept of community control of irrigation and water management to Southern California as their colonies developed. What was once the land of Spanish clergy became the land of Mexican rancheros, Mormon colonists, and finally—in Orange County—German vineyard owners.

According to Spanish law, no individual could claim the right to a stream flow. The right to use water was held in common within a community for the benefit of all, and did not supersede the similar right of downstream users. A watermaster, or *zanjero*, was charged with the responsibility of allocating water in proportion to the needs of the people and the quantity available. The *pueblo* (municipality) or irrigation district was responsible for division of the water, development of water works, and protection of water quality for the stream as it passed by. Thus, formal concepts of communal sharing of water were applied to the river.

In 1810, the Spanish government granted a concession for grazing rights on the 62,500-acre Rancho Santiago de Santa Ana to retired soldier José Antonio Yorba and his nephew, Juan Pablo Peralta. Following the custom of the Spanish government, the land was not granted to the men, but rather, the rights to graze cattle on it. Because of its location, the rancho claimed riparian rights to the river flow, confirmed by the United



Orange County Ranchos

States land commission in 1860. A rancho's rights were subordinate to those of a pueblo. Generally limited to domestic use or watering of livestock, the rancho's water usage could be expanded for crop irrigation or to operate a mill, as long as the use did not injure other downstream users. If, however, a rancher turned water onto his land to irrigate and no one complained, his use could be confirmed after a period of time. In the first recorded use of Santa Ana River water for irrigation, Yorba and Peralta diverted water to irrigate their crops and pasture land on the rancho (OCWD Annual Report 1983, 6).

Water Works and the Rancho Period

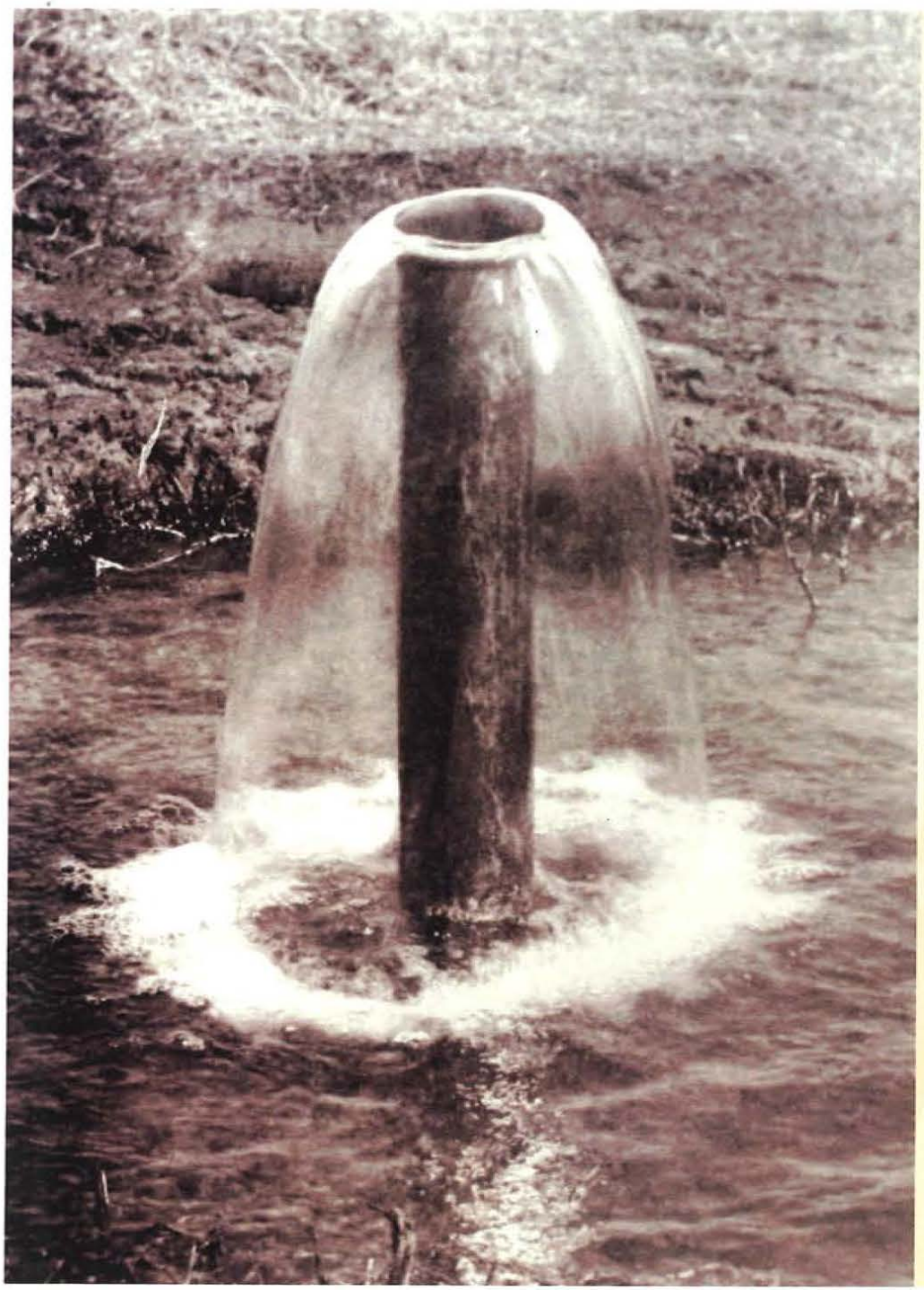
When Mexico became independent from Spain in 1821, the influence of the missions began to decline in California. The newly independent nation secularized mission lands in the early 1830s and granted them to settlers. Under the secularization decree, Don Bernardo Yorba, son of José Antonio, received a Mexican land grant to the Rancho Cajon de Santa Ana on the north side of the river. In 1835, Bernardo Yorba built several irrigation ditches on the river in the vicinity of Bedrock Canyon, the narrowest point in the Santa Ana Canyon (Hall 1983, 634). Within a year, he was irrigating between 1,000 to 2,000 acres of cropland, vineyards, and orchards (M. B. Scott 1976, 211).

Despite the transfer of land ownership from the missions to the settlers, the economy changed little. Yankee traders came into the region in the late 1820s and early 1830s to trade household goods for hides, which they shipped by ocean-going vessels to the eastern United States. Isolated on the West Coast, the Anglos intermarried with the Mexican ranch families and continued traditional cattle operations on the plains. Because it was so difficult and time-consuming to carry freight beyond the Los Angeles area, there was no outside market for perishables such as meat nor incentive to irrigate more land than needed for food to sustain the local population.

Southwest view of the Bernardo Yorba adobe and shed, on Rancho Santiago de Santa Ana, circa 1910. *Photo courtesy of Santa Ana Public Library.*

Water Works and the American Period

In 1848, the Treaty of Guadalupe Hidalgo concluded the war with Mexico and made California part of the United States. James Wilson Marshall, a sawmill operator on the American River, discovered gold at virtually the same time, and the rush to California was on. Farmers came into Southern California and purchased rancho land to grow grain and other food crops for hungry miners. Ranchers began to graze cattle for their meat, not just the hides, because it was finally profitable to drive a herd north across the San Joaquin Valley to Sacramento.



DRAWING DOWN THE BASIN

Artesian well in the late 1890s. *Photo courtesy of Santa Ana Public Library.*

Mormon Settlement and the Zanja

After the gold rush began, Mormon leader Brigham Young envisioned converts coming to Salt Lake City via the Pacific Coast, and also establishing a colony in the milder California climate. He planned a series of farming communities as stopping points between San Diego and Salt Lake City. His followers founded a community at San Bernardino in 1851, purchasing land and water rights on Mill Creek. Just as they had in the arid Salt Lake region, the Mormon colonists realized that irrigation was necessary in the San Bernardino Valley. No one knows today exactly how the irrigation water was divided among the colonists, but a community commission administered the irrigation operations, and the labor to build the ditches was provided by the settlers in proportion to the acreage they farmed (Pisano 1984, 81-83). The colony of San Bernardino flourished until 1857 when Young called his settlers back to Utah to meet a crisis there, and the farmland was sold to newcomers or abandoned.

Mallory's vineyard, 1898. *Photo courtesy of Santa Ana Public Library.*

The Anaheim Colony and the Anaheim Water Company

As the Mormon effort fell apart, another cooperative colony began on the lower reaches of the river. The missions had successfully grown grapes in the coastal region before the Mexican period, but the vines had died out. Once gold seekers reached San Francisco in the early 1850s, however, the city's demand for wine increased. Western frontier trapper and tracker-turned-settler William Wolfskill and others began to grow grapes for that market and soon developed extensive vineyards near Los Angeles. In an effort to expand their production still further, San Francisco wine merchant John Frohling and his Los Angeles partner, Charles Kohler, looked for people in San Francisco who would be willing to come to the Los Angeles region to grow grapes. At his urging, a group of 50 German immigrants agreed to establish a vineyard colony near the Santa Ana River. The Germans formed a stock company to purchase part of the Rancho San Juan Cajon de Santa Ana, on the north side of the river. Their agent, George Hansen, also secured a right of way across the remaining part of the rancho to the river and the right to fill their ditch from the river with a certain volume of water for irrigation of the 1,165-acre tract. Hansen supervised laying out the individual plots for vineyards and households in what became known as Anaheim, a home (*heim*) by the river (*Ana*). Hansen also directed Indian labor construction of the irrigation ditch to carry water to the vineyards from the river.

Irrigation ditch used by the Anaheim Union Water Co., located on Albert Yorba's property; view shows dry irrigation ditch in the foreground, and ruins of a one-story wood-frame house in the background. *Photo courtesy of Anaheim Public Library.*

Once the vineyards were established, the colonists took possession of the individual plots of land and established a mutual water company—the Anaheim Water Company—to continue to administer the irrigation works. Each landowner owned one share in the company. This was a pioneering effort to develop a private water company, distinct from later municipal and district operations funded by taxes and bonds (Hundley 1992, 103).

Birth of Santa Ana, Orange, and Tustin

While the colonists on the Rancho San Juan Cajon de Santa Ana had purchased the right to a certain amount of water to irrigate their acreage, there was no volume limit on the riparian rights of the Rancho Santiago de Santa Ana. The original grant stated that Rancho Santiago de Santa Ana had the right to half of the waters of the river that came to it. When Rancho Santiago de Santa Ana was partitioned in 1868, the water rights went with each parcel—along with a right of way for a ditch to the river if the parcel did not border the river. Instead of joining together as the Anaheim colonists did to form a mutual water company to supervise irrigation, the landowners on this rancho dug small individual ditches, which were gradually abandoned.

By the mid-1870s, land developers were already establishing the new communities of Santa Ana, Orange, and Tustin on the Rancho Santiago de Santa Ana. Two of the men who purchased rancho land or took it in payment for services were attorneys A.B. Chapman and Andrew Glassell. Andrew Glassell's brother, William, supervised the creation of Richland (now the city of Orange) some distance from the river. Since this had been rancho land, the development was entitled to water from the Santa Ana River. In order to bring water to the fledgling town, William Glassell widened and lengthened one of the abandoned ditches, constructed a small reservoir, and laid iron pipes to hydrants in the town site (Brigandi 19). Residents hauled water to their homes and orchards from them, including one at the Orange Plaza at Chapman and Glassell.

Two years later, the brothers formed the Semi-Tropical Water Company and transferred the ditch, now known as the A.B. Chapman Ditch, to it. The company then extended its lines to Tustin and Santa Ana (Hall 1888, 633).

Anaheim Water Company v. Semi-Tropical Water Company

As people moved into the Riverside area and developed orchards, they used more of the river upstream from the ranchos for irrigation, allowing less to flow down to the coastal plain. While it appeared to Anaheim colonists on the north side of the river that the Semi-Tropical Water Company was taking more of their water, the upper basin diverters were the real culprits. The diminished flow would not have been a problem in wet years, but 1877 was a dry year and the river ran nearly dry at the ditch intake for Anaheim. Farmers in Anaheim, accustomed to using as much water as they needed, had to haul water to save their vineyards. As a result, the Anaheim Water Company sued the Semi-Tropical Water Company to regain its volume share of river water.

Open canal of the Anaheim Union Water Company. *Photo courtesy of Santa Ana Public Library.*

Litigation of the river began with the lawsuit of Anaheim Water Company v. Semi-Tropical Water Company. A lower court decision stated that Anaheim was entitled to a supply of water to fill its main ditch. That decision was appealed to the California Supreme Court, which reversed the lower court's decision and upheld the Semi-Tropical Water Company's riparian rights to the river. The court, however, also recognized riparian rights invested in the Anaheim Water Company, stating that it had equal rights to use the water. Justices remanded the case to the lower court for a final decision, but suggested that instead of continuing litigation, the parties agree to an equitable division of the water, and devote their money to "proper development and use of it" (Hall 1888, 632). By the time the case was finally settled in 1883, the Anaheim Water Company had joined with other small ditch owners on the north side of the river to form the Anaheim Union Water Company. Meanwhile, the Semi-Tropical Water Company had been purchased by the Santa Ana Valley Irrigation Company, which was formed to irrigate all the river land on the south side. As a result of these consolidations, two private water delivery companies commanded the flow of the river in the Santa Ana Valley. They continued to supply water to their customers until the 1960s when OCWD purchased the jointly held land, the water rights of the Santa Ana Irrigation District, and the works of the Anaheim Union Water Company to prevent their purchase by upstream users (Pearson 1968).

The Irvine Legacy

The James Irvine family holds a prominent place in the county's history as well as its water resources. Lured by the Gold Rush, James Irvine I arrived in California in 1848 and worked as a merchant and miner. His success as a business person enabled him to invest in real estate, both in San Francisco and what would become Orange County. Timing was everything. The Mexican land grant system dissolved once California entered the Union in 1850. The dons who once held title to vast ranchos found themselves owing property taxes they could not pay. While debt began eroding their wealth, severe drought began decimating their cattle herds. Many had no choice but to arrange for quick sale of their holdings. James Irvine I became a silent partner in Flint, Bixby, and Company, a sheep raising venture based on Orange County land comprised of Rancho San Joaquín and Rancho Lomas de Santiago, and later, Rancho Santiago de Santa Ana. In 1876, Irvine bought out his partners, becoming sole owner of the Irvine Ranch, nearly one-third of present-day Orange County.

His son, James Irvine II, or "J.I.," assumed control of the Irvine Ranch in 1892 and founded The Irvine Company two years later. Aiming to maximize yield without losing control of the land, he established a program of tenant farming on the property. Sheep and cattle ranching gave way to the production of lima beans, citrus, sugar beets, barley, and other crops. The arrival of the railroad enabled The Irvine Company to tap a national market, while the construction of wells enabled it to tap into groundwater. Water was not perceived to be an issue on such a marsh-dominant landscape. However, within 10 years, the water table dropped significantly and water conservation and management soon became a company priority. Dams and reservoirs, including Irvine Lake, were built on the Irvine Ranch, and water supplies were closely monitored.

Early artesian well, circa late 1880s. *Photo courtesy of Kern County Local History Photograph Collection. Kern County Library, Bakersfield, California.*

James Irvine III continued the Irvine legacy, setting the way for his wife, Athalie R. Clarke, and daughter, Joan Irvine Smith, to carry forth the family vision. Members of The Irvine Company's board of trustees and founders of both the Joan Irvine Smith & Athalie R Clarke Foundation and the National Water Research Institute, they have been driving forces in the support of water science research and technology.

Tapping Artesian Groundwater

The presence of groundwater in both the upper and lower river basins made it possible for growers to irrigate off-stream farms with wells. In the upper river basin, rich, porous soil caused small tributary streams to sink into it before they reach the river. Groundwater basins were filled as a result. The lower river basin was fed primarily by the river that ran across the upper basin, which was reduced by upstream irrigation use. Later estimates showed that less than half the mountain runoff ever reached the river, so great was the use in the upper valley (Bailey 1946, 3). In later years the disparity would create conflict among growers in the three counties, but in the beginning, there was enough water for all.

Where the river enters modern Orange County, water is also absorbed into the Orange County groundwater basin, underlying rich farmlands. Citrus ranchers and farmers irrigated from shallow wells sunk as little as 15 feet into the valley below the foothills. Closer to the coast, artesian springs flowed freely across peat lands.

Called "the Delta of the American Nile" by enthusiastic boosters, the Fountain Valley area was filled with an almost impenetrable tangle of scrub trees, peat bog, and vines (Talbert 1982, 37). Between 300 and 400 flowing artesian wells flooded this lowland area. Springs were fed by the seasonal Santa Ana River runoff and augmented by the flow of Santiago Creek. Although a few hardy individuals farmed the swamp's edges at Westminster, its rich bottom land soil was too moist for cultivation.

Determined farmers had to channel the artesian spring runoff before they could cultivate these swampy coastal regions. Since any drainage channel would have to go all the way to the ocean to be effective, landowners formed a municipal irrigation or drainage district to clear large sections of swamp. They assessed themselves to pay construction costs, and built a network of large ditches—fed by underground tile drains—to carry excess water to the ocean (Talbert 1982, 60-61; Osborne 1998). By 1900, they had successfully drained the swamp to raise sugar beets, barley, lima beans, and other crops.

Arrival of the Railroad

In 1887 the Santa Fe Railroad arrived at Santa Ana to break the monopoly of the Southern Pacific Railroad and connect the valley cities directly with the eastern produce markets of Chicago. Valley agribusinessmen joined other Southern California growers to establish the California Fruit Growers Exchange (now Sunkist), further improving market access and increasing their profits as the citrus industry expanded in the 1890s. These economic changes brought substantial population growth to the riverbanks and correspondingly, more demand for water, both from the river and the groundwater basin. The changes also meant that the Santa Ana Valley was finally strong enough politically to separate from parent Los Angeles County. In 1889 county lines were drawn along the Coyote Creek and San Gabriel River, carving Orange County out of the southern section of Los Angeles County.

Tri Counties Reforestation Committee

In 1888 there were about 23,500 irrigated acres in Orange County. By 1904 there were 30,000 acres, and by 1912 50,000 acres. The water level in county wells started to drop and farmers wondered about their future supply of water. A federal study concluded in 1905 that the underground supply was being drawn out faster than it was being refilled, and urged conservation (Works Progress Administration 1936, Addendum 1).

In response, citrus ranchers in Orange, Riverside, and San Bernardino Counties formed the Tri Counties Reforestation Committee to improve groundwater conditions (*Anaheim Gazette* 13 December 1906). The committee's members were among the successful elite of each county. Conservationists and progressive businessmen at the same time, they wanted to protect and preserve nature to utilize its resources efficiently and expand their own fortunes. They realized that forest cover slowed the flow of the river and allowed more water to sink into the groundwater basin. If they were to increase or even maintain the groundwater supply, they had to protect the forest above the watershed. They began to lobby for federal funds to purchase more forestlands and reforest burned and lumbered areas in the San Bernardino Mountains.

Water Conservation Association

Two years later, in 1909, the committee organized and incorporated the Water Conservation Association to manage water conservation projects in the upper river basin (Baker 1983, 2).

Under the direction of Francis Cuttle of Riverside, the association began to spread—or percolate—water in the porous debris beds at the base of the San Bernardino Mountains. Earlier experiments showed that spreading water over permeable soil and gravel beds could increase the quantity of available groundwater in the underground basins. In theory the water would percolate underground from the upper basin to the lower one or drain by the river from one to the other. The spreading was funded largely at private expense. County governments, reluctant to pay for spreading efforts outside their own boundaries, nevertheless jointly funded studies of the flow. By 1930 engineers in the lower basin questioned the value and the quantity of water produced in this manner for Orange County. Eventually they recommended that funding for the projects stop because it was perceived as not being to the county's advantage.

Metropolitan Water District

The entire Los Angeles basin population exploded in the 1920s. Orange County's population nearly doubled during that decade to 118,674 people. In the past, most Orange County communities had enough well water to furnish domestic water without endangering the irrigation supply. Now, however, there was doubt that the water supply could be expanded to serve both. In 1925 water engineer J.B. Lippincott reported to the Orange County Board of Supervisors that the overdraft was about 39,449 acre-feet, that the artesian area had shrunk from 315 square miles in 1888 to 52 square miles in 1923, and that the water table level was dropping 2.5 feet per year (Lippincott 1925, 2). Lippincott also discovered several breaches in the coastal geologic barrier between the ocean and the groundwater basin. When the level of water dropped below the breaches, seawater contaminated coastal water wells and could ultimately affect the interior groundwater basins. He recommended that the county seek domestic water from outside the groundwater basin and encouraged building a flood control and conservation dam at Santa Ana Canyon to control the flow of the river.

Neighboring Los Angeles, undergoing the same kinds of urban pressures, had already built the Los Angeles Aqueduct to bring fresh water from the Owens Valley, over 400 miles away. It was not enough. William Mulholland, director of the Los Angeles Water and Power Department, proposed that the urban region import additional water from the Boulder Dam project, a flood control, irrigation, and hydropower project in proposal before Congress. He envisioned an aqueduct

from the Colorado River to Southern California that would bring river water to the thirsty region. The cost, however, would be enormous, so he encouraged other regional cities to join the planning and development process.

In 1924 the Boulder Dam Association—citizens lobbying for the hydropower, irrigation and flood project—proposed the affected cities form a new water district to build an aqueduct from the river to the Los Angeles general area, and distribute water to its member municipalities. It authorized another lobbying organization, the California Aqueduct Association, to draft and support state legislation to form the proposed Metropolitan Water District.

Orange County political leaders helped draft the final provisions for the enabling act so the City of Los Angeles would not overwhelm the smaller municipalities in the district. The Orange County leaders insisted on a uniform rate for each class of water. In this way, they hoped to preclude increased rates for the Orange County cities to cover the cost of a trunkline extension into Orange County. Instead, OCWD as a whole paid for the pipeline as a part of the overall project cost.

While farm interests were suspicious of the motives of Los Angeles and were concerned that the potentially powerful district might try to condemn local groundwater for domestic use, they were pragmatic. Influential growers realized that if domestic water could be brought from outside, there would be more groundwater for irrigation purposes. The enabling legislation for the Metropolitan Water District (MWD) passed in 1927.

Cities that had their own municipal domestic water supply were eligible to join the new district. Anaheim and Santa Ana joined at once. Fullerton joined in 1931 when its city government realized its water supply was inadequate for economic expansion. Orange, the other eligible city in the county, chose not to join at the time, but eventually joined in 1951 as part of the Municipal Water District of Orange County. It was a decade before the Colorado River Aqueduct was finished and began providing water to the cities. Meanwhile, the civic leaders planned for expansion based on the availability of sufficient imported water. This optimistic view temporarily relieved concern about the future of the groundwater supply.

Orange County Flood Control District

The immediate problem along the river, however, was flooding. Ironically, Orange County faced both a water deficit due to overdrafting of groundwater supplies and a dangerous surplus due to out-of-control flooding during winter storms. The great flood of 1862 virtually marked the end of the ranching period in Southern California because it and the subsequent drought decimated an already weakened cattle economy. The river flooded again in 1916, causing damage to crops and orchards in Orange County. It flooded once again in 1927. Although this flood was smaller than the one in 1916, the damage was greater because the population had doubled and the cultivated acreage in the flood plain had increased.

Demographic changes in Orange County—reflecting those of the rest of Southern California in the 1920s—created new wealth. Men who had come to California during World War I returned with their families to establish small farms and orchards or to work in the new industries of the postwar economy. New residential districts were built on the flood plain. Farmers began to plant in the overflow land of the old Santa Ana River channel in the Anaheim area and in the outwash at the base of the mountains. The value of citrus and ground crops increased as more

acreage was cultivated. In 1911, for example, the entire citrus crop was valued at about $2.7 million; by 1927 its value increased to over $28 million (Orange County Department of Agriculture 1911 and 1927). Discovery of oil in Huntington Beach attracted additional capital and industry to the county in the 1920s. The value of oil production in the county had increased from $6.5 million (1915) to more than $56 million (1927) in less than 15 years due to these major new petroleum strikes (California State Senate 1927, 60). No wonder the 1939 Army Corps of Engineers' report on the potential need for Prado Dam prepared under Major Theodore Wyman, Jr., stated that "Orange County has been said to have the highest per capita wealth of any corresponding area in the country."

The Orange County Flood Control District (OCFCD) was created by the state legislature in 1927 at the request of the county's mayors. It was designed to provide for control of the flood and storm waters that have their source outside the district, to conserve such water for beneficial use by spreading, and to protect property within the district from flood damage. The district boundaries were to be the county lines, and its directors the County Board of Supervisors. The first proposal to fund flood control works on the river was narrowly defeated in 1929, largely because of the opposition of James Irvine and Susana Bixby, influential ranchers who opposed the location of a dam on the Santa Ana River. Two more proposals were defeated or withdrawn in the early 1930s due to the impact of the Great Depression. Finally, after the great flood of 1938 took 34 lives and caused some $14 million in damage to properties in the county, the Army Corps of Engineers built the dam as a federal facility (M. B. Scott 1976, 227).

Santa Ana Basin Water Rights Protective Association

Santa Ana Basin Water Rights Protective Association Water engineer Paul Bailey's 1929 report on the diminishing groundwater supply in the county was a wake-up call to agricultural interests. Southern California was in the middle of a multi-year drought despite occasional flooding of its major streams. No longer could growers be sure that imported domestic water alone would ease future shortages; they needed additional irrigation water to continue expansion. Even in depression times, citrus production continued to increase. In 1929 there were almost 44,000 acres devoted to orange orchards. That acreage rose to 48,000 in 1931 and to nearly 54,000 acres by 1935 (Orange County Department of Agriculture 1931, 1935).

The Farm Bureau formed the Santa Ana Basin Water Rights Protective Association to study the political problem of groundwater recovery and come up with a solution. Like the earlier water committees, this one was composed of prominent farmers and political figures from throughout the valley, including R.J. McFadden, L.J. Bushard, John Pope, R.A. Chaffee, W.C. Mauerhan, and J.J. Dwyer. H.C. Head and A.W. Rutan were retained as legal counsel. Edson Abel, of the California Farm Bureau Federation, a powerful lobbying group, assisted them on the state level in Sacramento (Lenain, *Orange County Water District*, 1983). The committee had two major challenges: to improve the condition of the groundwater basin and to prevent "outsiders" from taking water directly from the basin.

The Board of Supervisors of Orange County had given the water-spreading project tacit support since they could not fund the experiments directly, and had contributed to tri-county studies to improve the river flow. As early as 1925, however, J.B. Lippincott

warned that the benefits to Orange County had not yet been demonstrated. Upper basin orchards were drawing their water upstream from Orange County, near the mountains. They were using water that might have percolated into the groundwater basin and finally come to Orange County in the normal stream flow. As a result, the anticipated supply was not reaching the lower basin. Bailey demonstrated in 1929 that, despite several years of above-normal precipitation, the river stream had declined in the Prado area and, correspondingly, in north Orange County's groundwater basin. He theorized the reduction was because of the increased pumping in upper basin wells, and warned that pumping would further increase because there was still land to be put under cultivation in the Riverside and San Bernardino area (Bailey 1929, 24).

Nevertheless, Francis Cuttle continued the Water Conservation Association's efforts to spread water. Both Riverside and San Bernardino Counties began construction of new water spreading facilities near the mountains as the Great Depression began to affect Southern California's economy (*Anaheim Gazette* 19 October 1933). While Cuttle saw the new construction primarily as a means to provide jobs for the unemployed, the completed diversion works could have spread most of the flood flow that Orange County relied upon to replenish its own groundwater basin. As a result of these warnings, G.A. Elliott, a consulting engineer to the OCFCD, recommended that the county interests discontinue support of the upper basin spreading program (Bailey 1955, 3). Subsequently, the Irvine Company entered into a suit against upper basin users to protect its own rights to a portion of the river flow.

Upper basin users were not the only sources of threats to northern Orange County's water interests. Soon after the Santa Ana Basin Water Rights Protective Association was formed, it rallied against an attempt by the City of Long Beach to buy water-bearing land in the Orange County basin. The association made a formal legal protest to the Long Beach City Council and threatened further legal action if its plans continued (*Anaheim Gazette* 12 March 1931). Apparently the threat of litigation plus the support of the Board of Supervisors deterred the city. Still seeking outside water, Long Beach joined MWD.

Laguna Beach lay outside the basin, but owned land and water wells on the flood plain between Newport Beach and Huntington Beach. The city was piping water through Newport Beach and Corona del Mar to its residents because it had virtually no other source of domestic water. Basin landowners resented Laguna Beach's use of the local water and considered the city an outsider. Ultimately, Laguna Beach's wells in the basin failed because of encroaching seawater, and the city was forced to import water.

Orange County Title Company

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Santa Ana, California

Amount $600.00

Number 148028
6045-1

Orange County Title Company

a corporation, of Santa Ana, California, herein called the Company, for a valuable consideration, paid for this Policy of Title Insurance,

Does Hereby Insure

ORANGE COUNTY WATER DISTRICT,

together with any other person or corporation included in the term the Insured as defined in this

against loss or damage not exceeding Six Hundred

dollars, which any Insured shall sustain

by reason of title to the land described in Schedule A being vested at the date hereof otherwise therein stated,

or by reason of unmarketability of the title of any vestee to or in said land on account of liens, encumbrances and other matters not shown in Schedule B,

or by reason of any defect in, or lien or encumbrance on said title, at the date hereof, otl defects, liens, encumbrances and other matters shown in Schedule B,

or by reason of any defect in the execution of any mortgage or deed of trust securing an inde the owner of which is insured by this Policy,

or by reason of priority thereto of any lien or encumbrance at the date hereof except as sl Schedule B,

all subject, however, to the exceptions and conditions hereto annexed, which exceptions and co together with Schedules A and B are hereby made a part of this Policy.

In Witness Whereof, *Orange County Title Company has caused its corporate name and se hereunto affixed by its duly authorized officers, this* 16th day of October, 1936 at

A. M.

ORANGE COUNTY TITLE COMP

By H. A. Gardner P.

MANAGING THE COMMONS

OCWD's first land acquisition, 1936.

The Santa Ana Basin Water Rights Protective Association developed a series of proposals to protect the basin supply from outsiders and to encourage basin-wide conservation. These proposals led to the legislation that created the Orange County Water District (OCWD). The first attempts in 1931 to create a water district stalled in the legislature because of opposition from Orange County cities (Anaheim, Fullerton, and Santa Ana) that belonged to MWD. These cities expected to have MWD water deliveries in the future. Since they were already being taxed to pay for that outside water, they did not want to pay additional taxes for water they might not use. In the 1933 legislative session, the Association tried again. This time, the proposal eliminated MWD cities from the district and made several other changes to satisfy objections of the urban residents. Senator Nelson T. Edwards carried the bill, SB 1201, which was signed into law on June 14, 1933.

Orange County Water District

The bill as passed formed a district within Orange County of about 156,000 acres, excluding MWD cities and part of the Irvine holdings. The new district had broad powers to protect the basin water supply. It was expected to provide:

- Management of the groundwater basin,
- Conservation of the groundwater supplies, including both quantity and quality of the water, and
- Protection of Orange County's water rights to the natural flows of the Santa Ana River (Wesner 1973, 1).

These obligations meant that the new district was to act as litigator for basin water rights, to import water from outside the watershed for basin replenishment and to control, conserve and reclaim flood and storm water for beneficial use in the basin (OCWD Annual Report 1983, 16). Its activities would be funded by an ad valorem tax on real property within the district. Unlike the flood control district, which was directed by the County Board of Supervisors, this new district had a board of seven directors, each representing a subregion within the district. The directors were elected within each division on the principle of one vote per each $100 of assessed valuation of property owned, so that each property owner would have a voice in proportion to his financial interest in the district. Nothing like that had been tried before (*Anaheim Gazette* 14 September 1933). Undoubtedly to forestall hostile challenges, OCWD supporters instituted a friendly suit against its levy

Original OCWD Board of Directors, circa 1933.

and taxation provisions, and the legislation was upheld in court (*Los Angeles Times* 1 September 1934).

The first directors of the new district were Roy Browning, Frank B. Champion, William Schumacher, William C. Mauerhan, William Wallop, C.A. Palmer, and Willis Warner. Warner, later a multi-term member of the Orange County Board of Supervisors, was elected president of the board.

Almost immediately the directors discovered that they needed to amend the enabling act if they were ever to seek outside water. In the haste to pass the original bill, a section had been inadvertently dropped which would allow them to get water from outside the basin. They discovered that in order to get the bill amended, they had to agree not to take water from the Mojave Valley, located on the eastern side of the San Bernardino Mountains. The water was plentiful there, and the region had not developed as fast as had been expected. As a result, Mojave Valley did not use all of its water for crops. Water specialists in the Los Angeles region had already considered condemning water rights in this valley as well as for the Colorado River in their search for imported water, so the political interests were alert to the possibility of a takeover. Mojave legislators threatened to block the bill unless it specifically stated that OCWD would not file for water rights on the valley's water. The bill was amended so that Mojave water rights could not be affected, and it passed, to the relief of the OCWD directors.

Irvine Company v. Water Conservation Association

It took a couple of years for OCWD to organize itself and prepare to take on litigation responsibilities for the basin. Finally in 1937 OCWD directors intervened in the Irvine suit against water spreading by the upper basin water users. James Irvine II, as the largest landowner in the county, had initiated the suit to protect his own water interests. It was obvious, however, that if his interests were protected, those of the rest of the basin would be as well. Farm Bureau leaders thought that the suit was the proper responsibility of the entire basin, not just James Irvine, and that James Irvine should be reimbursed for his court costs. In 1936, both sides agreed to a five-year study of the river flow to be conducted by a three-man panel of experts. This study was to be the basis for a decision on the amounts of water to be allocated to each of the parties involved. OCWD, wary of litigation, sought arbitration of the issues as the preparations for court continued. In a 1940 letter, James Irvine argued for arbitration. "I know of nothing more indefinite, intangible, with definite undiscernible, excessive costs than a nice, juicy water law suit," he wrote to Dian Gardiner, secretary of OCWD. "In my opinion no opportunity should be lost at any time to come to any reasonable compromise settlement in any water issue." The agreement, reached in 1942, reduced the amount of water that could be spread in the Santa Ana River, Mill Creek, and Lytle Creek basins upstream to ensure that Orange County would have water from the Santa Ana River (M.B. Scott 1976, 224). It also placed monitoring and administrative responsibilities on the defendants (Blomquist 1992, 250). Although this was not the final litigation on the river, it set the limits and conditions for future spreading and secured Orange County's rights to the stream flow.

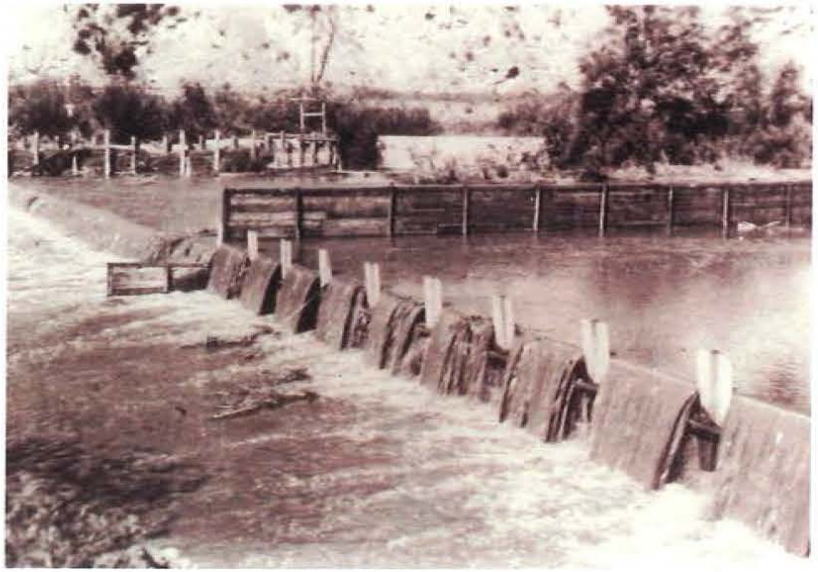
During the study period, there were several years of above-average rainfall, resulting in an increased river flow and percolation into the groundwater basin. Experiments suggested that management of the spreading areas could increase the percolation, and OCWD continued to buy river land for that purpose. Flood control was the primary

Water passing through Prado Dam on its way to Orange County.

purpose of Prado Dam when it was completed in 1941. The holding back of water increased the amount available for percolation into lands below the dam owned by OCWD. The dam, however, was constructed with ungated openings to avoid involving the federal government in local water rights issues; consequently, for many years it was impossible to hold back water for seasonal storage (Osborne 1998).

Conservation and Replenishment

In addition, to increase the recharge capability of the riverbed, the OCWD directors began conservation projects along the river in conjunction with the flood control district and private landowners. As property became available in the riverbed, OCWD purchased it to use for replenishment experiments. OCWD added heavy tractors and trucks to its fleet to sculpt the riverbanks and clear brush as strategies to improve percolation in the gravel beds. OCWD also built a double-row iron fence along the riverbank, planting willows between the rows to prevent soil erosion on the riverbanks. These small-scale experiments gave OCWD engineers the confidence to begin spreading operations on a large scale in the late 1940s and 1950s.



Upper Santa Ana River headgate

World War II and Military Bases

Even before the Irvine suit was settled, a potentially more serious problem developed. When war engulfed Europe, the United States began preparations to support the Allies. In 1940, the Army began

construction of Camp Haan, an anti-aircraft camp outside Riverside, near March Field. Riverside proposed to supply the new camp with water from its wells, which were in the upper river basin. This basin supplied the rising stream of the river into Orange County, and, according to a 1940 memorandum of protest from Paul Bailey, about two-thirds of the water that reached the county. Since upper basin use, still under adjudication, was already imperiling the Orange County supply, this new demand appeared to further threaten the county's orchards and field crops. Although OCWD was supportive of the efforts of the military to meet the crisis, it was cognizant of the intra-basin water shortage and determined to protect its water rights for local irrigation. Bailey suggested bringing Colorado River water to the base via MWD pipelines instead of pumping precious groundwater. He and OCWD's attorney, A.W. Rutan, lobbied strenuously in Washington to convince the Army to use MWD water as soon as the pipeline connection could be constructed.

According to the exchange of letters between Bailey, Rutan, and the Army, the final agreement between the Army and the City of Riverside allowed the use of a maximum amount of basin water for a short time until MWD could deliver Colorado River water. It specifically said that this was an emergency allotment for the wartime effort, not an entitlement to the future use of basin water. Since MWD rules required an entity to be a member of the district to receive water service, MWD directors also had to declare a wartime emergency to permit delivery of Colorado River water to the Army (Oshio 1992, 117). Instead of becoming a problem for OCWD because of its use of groundwater, Camp Haan became an early opportunity for MWD to sell its surplus water and demonstrate to a skeptical population that Colorado River water was fit for domestic use.

At the beginning of World War II, Orange County was still a sparsely settled agricultural region. War brought county land to the attention of the military seeking new bases along the coast. The Marines chose El Toro as an air base. "It was perfect—few and far away neighbors, close to the ocean so pilots could practice carrier landings, within range of desert bombing ranges and near Camp Pendleton" (Soja 1992, 116). Orange County people were caught up in the effort to supply water for the war effort. Editors of the *Laguna Beach South Coast News* were

El Toro air base (1962). *Photo courtesy of Great Park Design Studio.*

only too aware of the increasing burden of the military bases nearby in the thirsty region. A September 22, 1942 editorial spoke of the necessity of furnishing water to the military and concluded: "A shortage of water here would immediately curtail the war effort at one of its vital centers" (Oshio 1992, 118). In 1942, cities along the Orange County coastline formed the Coastal Municipal Water District and annexed to MWD to ensure their domestic supply and thereby reduce the burden on the valley's groundwater basin. Once again, OCWD supported MWD with lobbying efforts. When the federal government first rejected MWD's plea for a pipeline to reach the new coastal district, pragmatic OCWD spokesmen intervened and convinced skeptics that the pipeline was critical. Rationed materials were then made available for construction of the pipeline from Santa Ana to the coast.

First Report on Water Supply in the Lower Santa Ana Basin

By the end of the war, the cities of Anaheim, Fullerton, and Santa Ana, and the Coastal Municipal Water District all had connected to the MWD system and were receiving domestic water. Nevertheless, a new study (Gleason 1945) showed that approximately 123,500 acre-feet per year were still being pumped from the groundwater basin. After figuring the normal natural replacement, the groundwater basin was still being overdrawn by about 12,000 acre-feet per year. Just as Bailey had predicted, when groundwater was drawn down below sea level by the overdraft, seawater filtered into the coastal areas and threatened to pollute the entire groundwater basin. Several coastal wells had already been contaminated and abandoned, so the fear of contamination was warranted. It was imperative that OCWD act to replenish the groundwater basin, just to maintain the status quo.

Even more discouraging than the current overdraft situation was the realization that Orange County might not have water available for industrial expansion. Without adequate water supplies, the county was limited in its ability to attract new industries first drawn to the county by the prospect of less expensive acreage. OCWD directors threatened that if the overdraft was not corrected, they would have to oppose postwar expansion and industrialization to protect the current water users (OCWD Directors 1945). George Gleason, who prepared a report for OCWD and the California Department of Water Resources, made several recommendations in his study for improvement, which he described as "akin to 'scraping the bottom of the barrel.'" Nevertheless, he suggested that OCWD might be able to salvage the 12,000 acre-feet per year through wastewater conservation behind Prado Dam, improvement of the percolation basins below the dam, increased efficiency in the use of irrigation water, and reclamation of sewage water.

Under a seven-point program, OCWD directors began to implement Gleason's recommendations to improve the quantity and quality of the groundwater. Among the study programs were agreements with the California Department of Water Resources to sample and analyze the quality of water in the basin and to study evaporation and transpiration below the dam. Other studies involved reclamation of wastewater and better irrigation techniques. On a proactive note, OCWD maintenance crews constructed barriers in the river to prevent channelization, thus allowing the percolation of water over a broader area of the river. Finally, OCWD encouraged other cities in the county to take more of their water directly from MWD and formed a committee to figure out how to increase the supply of imported water (Poland 1947).

Still, this was not enough. Postwar growth was greater and demanded even more water than engineers had anticipated. In little more than a decade, the population of Orange County doubled to 270,000. Significantly, crop acreage dropped and industrial development increased. By 1952, of the total estimated need for 250,000 acre-feet of water per year, 80 percent was for industrial and domestic use, while 20 percent was for irrigation purposes—exactly the opposite of the pattern in the 1920s (Crooke 1965, 3). If the overdraft was not halted, accumulated water might be used up in the foreseeable future. To make matters worse for water planners, the county entered a long drought period in 1945, and water levels, which had been high in 1944, began to drop once again. Predictably, during the next decade water levels in the district's 3,500 pumping wells dropped an average of 38.5 feet, and ocean water intruded three to four miles into the Fountain Valley area (Crooke 1967, 5).

OCWD Board of Directors, circa 1965.

Reducing Overdraft

OCWD directors had hoped that natural replenishment would fill the basin, but clearly they had to obtain outside water and limit production from the basin by adjudication or other means. MWD was finally delivering water to Orange County through its new pipeline, but only members regularly received it. OCWD was not a member agency, and because it did not retail imported water, did not qualify to become one. Even if OCWD could obtain emergency supplies to halt the overdraft, it did not have enough money from its property tax funds to purchase the needed quantities.

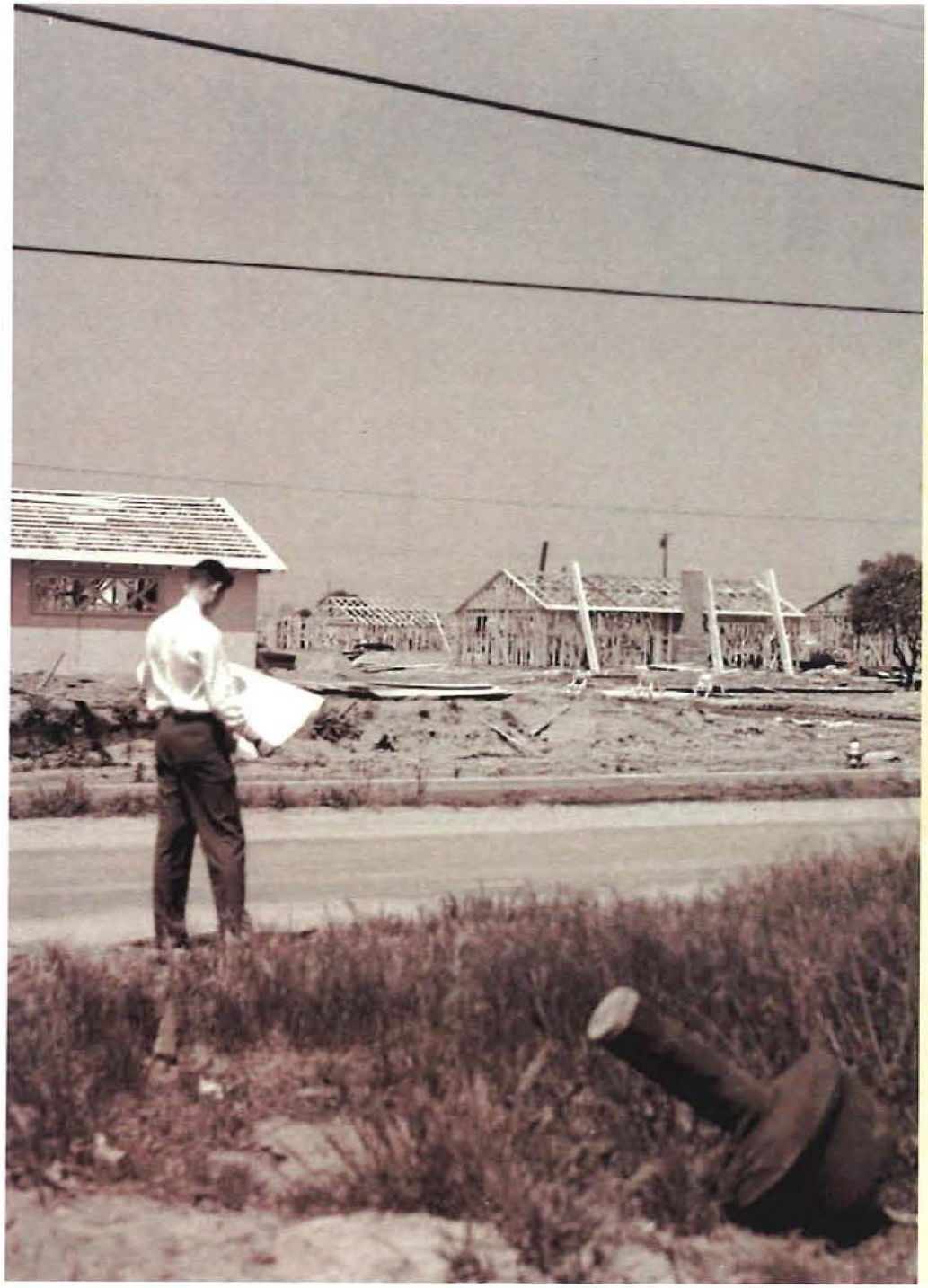
Legally the directors could put a special assessment for replenishment before the voters and hope they would allow it, but a special assessment was a temporary levy, and replenishment was a long-term endeavor. Not only were the directors unsure of approval, they knew that the assessment would not be temporary. Property owners within the district who were also within MWD's area would, conceivably, be paying for the Colorado River water twice—through their taxes for the MWD system, and for replenishment through OCWD. And finally, because all property owners within the district paid the ad valorem tax whether or not they produced groundwater, use of the tax to purchase water appeared to subsidize groundwater pumpers at the expense of nonpumping property owners (Blomquist 1988, 27).

Other means of financing the replenishment had to be located for the long term. The alternative was to lose the groundwater, suffer

possible subsidence, and fund an extensive and expensive above-ground pipeline feeder system for imported water (Blomquist 1988, 26). In the immediate water emergency, however, MWD agreed to sell some water for replenishment. The County Board of Supervisors paid for the deliveries from OCFCD funds in 1948-1949, 1950-1951 and 1951-1952 while OCWD sought other ways to fund its imports.

At the time imported water was readily available from MWD. MWD was eager to perfect its right to Colorado River water in anticipation of a future legal challenge, so it was able to secure and deliver surplus water to Orange County (Blomquist 1988, 26). The delivery actually met one of MWD's goals, to use surface water to replenish groundwater supplies in the general region (Oshio 1992, 155).

George Osborne, who was manager of the OCFCD at the time, vividly recalled the first deliveries of MWD water. "This water was introduced upriver at Arlington where the transmission line from Lake Matthews crosses the river. They opened the valve and the water sprayed out several hundred feet, and fell into the river. That was the initial delivery of water to Orange County" (Osborne 1997). The water, however, was not actually used for replenishment. Anaheim Union Water Company and the Santa Ana Valley Irrigation Company diverted it to serve their customers. In turn, the two water companies refrained from pumping an equivalent amount of water from the basin (Osborne 1997).



RESPONDING TO GROWTH

Orange groves give way to housing tracts in Orange County, 1960s. *Photo courtesy of Orange County Archives.*

From Croplands top Housing Tracts

Orange County of the 1950s was a different place from Orange County of the 1920s and 1930s. Until the war years, the rural landscape was mostly farmland and oil fields dotted by independent towns. In the north citrus was king. Citrus ranchers made comfortable lives from a few acres of lemon or orange trees. In the plains prosperous truck farmers planted a variety of crops for market. Petroleum fields in the Huntington Beach and Fullerton areas brought transient wealth to those communities.

After the war, though, the pace quickened. A few housing tracts were built in northern Orange County for workers commuting to Los Angeles. More housing followed the new freeways into the orchards and open countryside. Los Angeles' economy was booming from the wartime aircraft industry. The city was already congested. Land costs within the central industrial and commercial areas had begun to spiral upward. By the mid-1950s, the aerospace industry began to take shape throughout Southern California. To compete in the new industry, major aircraft companies established large branch plants outside the urban center, many of them among the remaining orange groves of northern Orange County. Land was less expensive than in Los Angeles, and there was plenty of it for industrial uses (A. Scott 1986, 9). The land only lacked sufficient water to attract these new industries.

Although Orange County leadership was politically cautious, it was profit-minded. Farmers saw that the days of agriculture were drawing to a close. The "quick decline" disease had begun to attack a few citrus orchards, and they were becoming less profitable. Groundwater in other orchards had fallen below the level of their pumps. In Irvine, for example, it dropped to 60 feet below sea level (Owen 1997). While the pumpers could set their pumps even lower into the basin, the pumping process took more energy and was more expensive at the lower levels. Raw land values were increasing rapidly and, as it had been in the 1920s, water was still a critical part of land values. If owners wanted to be able to get top dollar for their property, they would have to ensure that there was a constant supply of water for urban and industrial uses. There was strong talk of adjudicating the basin to determine each pumper's rights, or of stopping new pumpers from taking water out of the basin (Owen 1997). The groundwater basin had to be stabilized or economic expansion would be sharply limited.

Committee of Twelve

In the spring of 1952, the Farm Bureau and the Associated Chambers of Commerce recognized that OCWD had to be able to replenish the groundwater basin with imported water if the county were to reach its maximum growth potential. The Orange County Water Basin Conservation Committee was created in June 1952 to investigate the possibility of recommending a procedure for raising funds for the purchase of outside water to replenish the underground basin. All users of the common supply were to be included in any formula offered (OCWD Minutes 9 July 1952). Their objective was threefold: to protect the groundwater from salt water intrusion, to replenish both the annual and long-term overdraft with imported water, if necessary, and to find a way to pay for it (OCWD Minutes 8 October 1952). The committee became known by its informal name: the Committee of Twelve. Some of the most influential agribusiness and businessmen in the county took time to be involved.

The membership list read like a county business and political "who's who": Glen Allen, prominent in MWD and OCWD policy making; Courtney Chandler, mayor of Santa Ana, the county seat; J.W. Crill,

president of the OCWD board; W.B. Hellis, representing the Irvine Company; John Murdy, incoming state senator; Walter Knott of Buena Park, owner of Knott's Berry Farm; industrialist H.H. Kohlenberger of Fullerton; Charles Pearson, mayor of Anaheim; Walter Schmid, representing the still-powerful Farm Bureau; Ross Shafer, prominent water and land consultant; E.T. Watson, representing the Santa Ana Valley Development Company, owner of the conservation lands behind Prado; and Roy Seabridge, mayor of Huntington Beach and member of the OCWD Board of Directors (OCWD Minutes 9 July 1952).

The members of the Committee of Twelve were not developers; for the most part they were farmers who wanted to be able to sell their land for the highest return (Owen 1997). They believed a common pool of water in the basin was worth more to the land than a limited, individually adjudicated share of the current groundwater supply. That meant they had to handle the water rights differently than other districts in the region which had gone to court to adjudicate individual rights.

Over a period of four months, the committee arrived at a proposal. According to Howard Crooke, who soon would become the first OCWD secretary-manager, the committee reached two conclusions in its deliberations. One was that they did not want to adjudicate the basin's water because the action would lead to a "philosophy of scarcity." The process of adjudication was long and involved litigation of the quantity of water each producer was entitled to receive. Langdon (Don) Owen, who became the second secretary-manager of OCWD, recalled that the thinking at the time was that if each producer took the rights to a certain quantity of water as an individual, he would get only about 25 percent of the water he needed. If, however, the producers did not establish individual rights, but acted as a group, they would be able to manage and replenish the basin so that *all* had more water (Owen 1997). The second conclusion was that equitable financing for importing water to replenish the groundwater basin was the most practical solution to having adequate water for landholders and inhabitants alike (Crooke 1965, 3).

These politically conservative men made a number of socialistic recommendations that were incorporated into a revision of the OCWD Act. In doing so, they set a new course for OCWD. They set aside their individual property rights concept in favor of a basin-wide use policy in which they would share the surplus in wet years and the shortage in drought. According to Don Owen, Howard Crooke called it a policy of surplus rather than shortage. He said that every producer in the future would have an equal right to pump as much water as he could beneficially use, but that each would also have the obligation to pay the costs of replacing his yearly extractions to continue making the basin as productive as possible (Owen 1997). Crooke and the others who promoted the new concept knew that everyone could not get all they needed from the basin, regardless of how much additional water they could produce in common action. They expected to purchase MWD or other imported water to make up the difference.

This was a difficult concept to implement, further complicated by opposition from all sides. Traditionally, groundwater basins were adjudicated among the users. The idea of a non-adjudicated common pool basin was difficult to reconcile. Farmers feared they would lose agricultural water to the cities if they did not establish rights to it, and cities feared they might not obtain any legal right to the groundwater without adjudication. Nevertheless, the committee recommended the common pool approach without adjudication, a policy that has continued for over 60 years.

Up to this point, the three MWD member cities from Orange County had been excluded from OCWD. These cities, however, were pumping about 50 percent groundwater. If they remained outside the district, they could not be required to pay for the replenishment water. On the other hand, the three cities did not want to pay OCWD for replenishment water through ad valorem taxes because they were already paying for MWD water in their property tax rate. A method of assessment had to be developed to include the cities without double taxation.

Since the district had been primarily an agricultural entity, voting was on the basis of property value. An early proposal from the committee had suggested a popular vote for the directors. If that happened, the agricultural interests could be outvoted easily by urban interests. OCWD counsel, A.W. Rutan, expressed the property owners' viewpoint in a letter to the Board of Directors on December 29, 1952: "Personally, I do not like a popular vote in Districts of this kind. Persons owning no property are too willing to vote large bond issues and assessments which the property owners have to pay." As a result of his influence, the voting policy remained unchanged for the time being.

The committee members proposed changes to the law that addressed most of the general legislative concerns. Membership was extended to cover MWD cities as individual units within the district. Each city's governing board was permitted to name a director who would serve the same length term as the elected directors from the different geographic subregions. Voting outside the cities would continue to be by property value, but there would be no direct vote within the cities. Technically, while city residents had no direct vote on their choice of director, they did elect the city officials who appointed them. By the middle of the 1960s, however, large parcels of agricultural land had been purchased by outside interests intent on developing them commercially, and there were many more homeowners within the district subregions. Voting by property value was no longer a protection for agriculture or other local small property owners, but instead reflected different outside interests. The method of electing directors was modified by amendments to the Act in 1967, which put the vote in compliance with the general election voting laws (California Codes). After this, directors were elected in the geographic regions on the basis of one vote per registered voter. The cities of Anaheim, Fullerton, and Santa Ana, however, continued to appoint their representatives.

Water level gauge at Warner Basin.

To meet the three cities' objections to double taxation and to put the burden of payment on those who used the groundwater, the committee proposed a gross pump tax on future water production. Under this concept, everyone paid alike, on the basis of the amount of water they produced, regardless of when they began to pump from the basin. There would be no special protection for those who had been in the basin for a long time, nor special reservations on newcomers. The committee rejected an ad valorem tax to pay for imported water to meet future overdrafts, but agreed that the current landowners, whose land had appreciated greatly in the past decade, could be taxed to add enough water to the basin to replenish the current overdraft (Owen 1997).

The proposed amendments set up a two-tier tax system: an ad valorem tax to cover OCWD's expenses in setting up the new system and to pay for enough water to slow the seawater intrusion, and a "pump tax," called a replenishment assessment (RA), based on each pumper's yearly extraction to pay for water to replace the estimated future annual overdraft (Weschler 1968, 16-17). Beginning in 1954, each pumper, or producer, was required to register the city's well(s) with OCWD, maintain records of the amount withdrawn during the year, report that figure, and pay a tax (the RA) in proportion to the amount of water used. The tax would be established after completion of an engineer's report that indicated how much water had been used in the previous year, estimated the amount that could be extracted safely, and calculated how much water would have to be imported to maintain the groundwater at a safe level. For the first time, the entire basin supply was placed under the management of a single water entity. Although each of the producers was free to use the water needed, each producer was now responsible to a governmental agency for documenting all extractions. Because a producer would pay a tax on what it removed, based on the condition of the entire basin, the producer was forced to consider how its efforts affected the groundwater supply.

State Senator John Murdy, a member of the committee, introduced the bill amending the OCWD Act in the 1953 legislative session, and it became law in June 1953, to be effective in 1954.

Replenishment Assessment and Registration

Until this time there had been little need for either a permanent office staff or an administrator. The board met regularly and handled its business by committee. Secretarial support was often provided by someone in a member's personal office, and expert advice was provided by consultants. By 1952 conditions had changed and District responsibilities had multiplied. Permanent staff was needed. The OCWD Board of Directors hired its first full-time administrator and secretary in 1952-1953. Thelma Willoughby became a full-time office manager/secretary in 1952, and Howard Crooke became secretary-manager in 1953. Both, according to a later manager, Neil Cline, were critical to the early success of the new structure. Crooke was the "rough and ready" personality who implemented the amendments, convincing producers to support the concept of pooled resources. Willoughby was the gentle diplomat and organizer who often dealt with disgruntled producers in the district office and helped them understand the new regulations. Although the board had received applications from several qualified engineers for the position of secretary-manager, its members decided against hiring a technical expert to manage OCWD. They looked instead for someone with administrative ability, diplomatic skills, and a close familiarity with the local condi-

tions. The board's general feeling was that they could hire an engineer when they needed that expertise (OCWD Minutes 22 July 1953).

Crooke was from Garden Grove and had managed a Sunkist citrus warehouse. He had no engineering training, but was a farmer, with a farmer's instinct on how to manage water. Neil Cline characterized him as a gruff person, a deep thinker. "He could be quite charming," he said, "but was very businesslike, very goal-oriented, and a genius" (Cline 1997). Crooke had the persuasive ability to convince the ranchers that their land was of limited value with a water scarcity problem, but with an adequate water supply had limitless value. If they would sacrifice their individual rights for the good of all, they would all benefit. He made them realize that this was a good business decision, and a good farming decision (Cline 1997). Apparently, no one really believed Crooke when he started out to promote the program, but by the force of his personality, he succeeded. His successor, Don Owen, said that Crooke convinced the skeptics that the pump tax would be used for the purchase of water only. "I can buy neither the pencil nor the eraser to audit this account out of the pump tax," Crooke would say "I can only buy water." Even after the amendments passed, there was disagreement over the mechanics of a pump tax. Charles Pearson tried to smooth feelings after a particularly heated meeting. "It [the amendments] is a new theory, sort of a trial and error proposition, and that is the way we have to accept it..." (OCWD Minutes 9 June 1954). As Crooke and the Committee of Twelve had hoped, the efforts to increase production were successful and instrumental in promoting Orange County's urban development. In about 1964, Crooke made the following comments about the cost of importing MWD water for replenishment in the basin and alternate use:

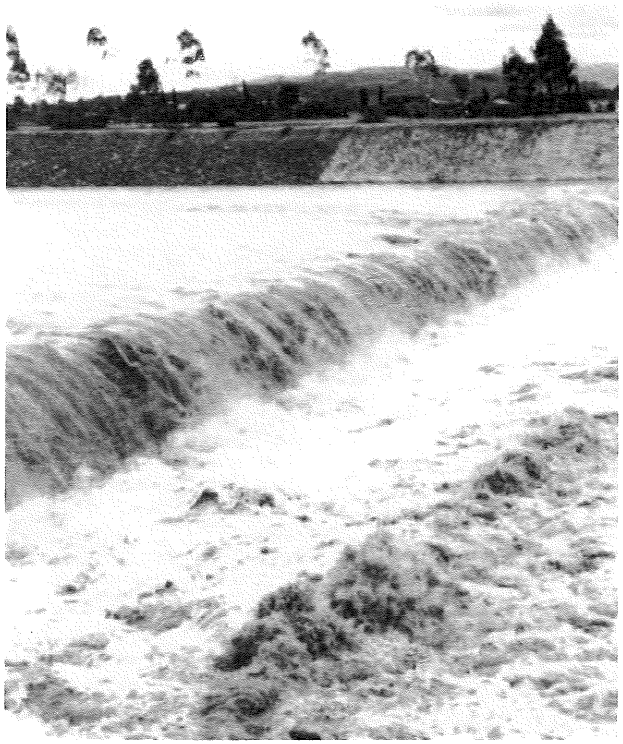
Payments made by the people of Orange County to The Metropolitan Water District of Southern California in the form of water charges and taxes for the entire period from the formation of MWD in November 1928 to July 1, 1963 total $61.5 million. In the eleven-year period from 1954-55 to 1964-65, the taxable assessed valuation of the area of the Orange County Water District increased by $1.1 billion. Actual values of these properties in this same period increased more than $3.8 billion. The $61.5 million in payments to MWD are but 1.6% of the increase in actual values of these properties that have taken place. This is cheap insurance, indeed, for the development of an area that could not have occurred without a water management program that guaranteed a firm and adequate water supply (Crooke 1965).

Municipal Water District of Orange County

In 1951 several more Orange County cities—Huntington Beach, La Habra, Orange, Placentia, Seal Beach, and Tustin (Oshio 1992, 186 fn. 59)—realized that they, too, would have to join MWD and purchase domestic water to serve their expanded populations. MWD's policy was that cities could join as geographic groups, which included the surrounding rural areas. The cities, therefore, formed the Orange County Municipal Water District, soon renamed the Municipal Water District of Orange County (MWDOC). MWDOC promptly joined MWD, representing the cities and most of the underrepresented portions of the county as a pass-through agency to obtain MWD imported water. Once MWDOC became a member, OCWD purchased imported water indirectly from MWD through MWDOC.

OCWD's policy for the period from 1954 to 1964 was to fill the groundwater basin in an attempt to keep out the seawater and ensure

an adequate supply of fresh water. Crooke acted swiftly because there were already out-of-state challenges to California's entitlement to Colorado River water, and no one was certain how long MWD would have a surplus to share. After the first replenishment assessment (RA) was collected in 1954, OCWD began to purchase MWD water in large quantities for replenishment. In 1954 OCWD purchased 50,000 acre-feet of water from MWD at a cost of $500,000. OCWD spent $3,247,136 to purchase 234,789 acre-feet in 1963 at the peak of the program (Blomquist 1992, 258).



Storm flow spilling over drop structure en route to ocean.

The Politics of Spreading Basins

It took several years of spreading to make a difference in the water levels. In 1956 the water dropped to its lowest point, as much as 40 feet below sea level, and seawater intruded 3-1/2 miles inland (Blomquist 1992, 257). Then the basin began to recover. By 1964 the overall water level had reached 1944 levels; however, the aquifer had shifted as a result of subsidence and pumping patterns. While the water level in the forebay (the area where spreading took place) was some 50 to 80 feet above the 1944 level, seawater was able to intrude into some of the coastal areas where the level was still below sea level (Blomquist 1988, 42; Weschler 1968, 33-34). Worse, if OCWD continued to add water in an attempt to block the intrusion, it would recreate the swampy conditions that gave the Fountain Valley area the appellation of "Gospel Swamp." Like the rest of the valley, that area had been extensively developed with homes and businesses. OCWD did not want to be seen as responsible for a long-abandoned artesian well bubbling up in someone's backyard because the basin overfilled. The OCWD engineer's report said that the basin was probably as full as it could be, and recommended that spreading be reduced even though seawater intrusion continued (Weschler 1968, 34). Subsequently, the basin equity assessment (BEA) and basin production percentage (BPP) programs were established to control the quantities of groundwater throughout the basin.

In the mid-1950s, when OCWD began to prepare its recharge basins to capture as much imported water and natural flow as possible, no one realized the consequences of massive water spreading to properties near the spreading grounds. The plan was simply to prepare percolation basins to handle the additional water. Because of the strong economic climate, there was a demand for the sand and gravel that would be removed to create these basins.

Two freeways were being built through the county at that time, in addition to other major construction projects in the region. They all required enormous amounts of fill materials. Commercial sand and gravel companies excavated pits 40 to 50 feet deep in the porous

ground adjacent to the river to provide base materials for the heavy construction. As OCWD began to add water in the river spreading grounds in Anaheim, water would seep into the gravel pits and hamper operations. The result was conflict with the owners. Owen recalled that "these people played very rough. Howard [Crooke]," he said, "could stand like a bulldog if he had to." Crooke fought desperately to establish the rights of OCWD to spread water in the forebay and resisted the opposition of the sand and gravel people to any spreading. In addition, he and Owen worked closely with George Osborne, then manager of the flood control district, to improve flood control works, permit wider spreading operations, and improve public safety (Owen 1997).

Reconstructed sand levee in river

When they first began to improve the spreading beds in the Anaheim forebay, Crooke planned to have sand and gravel pits dug by district personnel and their extracted material sold. That would have put OCWD in competition with the private companies. The potential competitors protested, stopping Crooke's original approach. Instead, the sand and gravel operators removed the sand and paid OCWD 10 to 15 cents per ton for the material. As OCWD continued to spread water, it purchased additional sand and gravel property in the forebay area and excavated additional spreading basins. Crill Basin, purchased in 1957, was one of the first. Later named Anaheim Lake, it became a popular fishing spot.

With this purchase, Crooke began a new policy. He treated the sand and gravel removal as a public works contract, setting conditions and specifications for the operation. Everything was done under a bid contract. This way he could enforce performance, and most importantly, was able to increase the price of the material to $1.42 per ton. OCWD purchased the land for $20,000 an acre and received $45,000 in revenues from the sand and gravel contract revenues. With this kind of return, OCWD could afford to purchase even more gravel land for percolation and continue the spreading operations (Owen 1997).

At the same time OCWD began spreading MWD water to recharge the basin, it also began another suit against the upstream users to protect its rights to the Santa Ana River flow. This suit, filed in 1951, was against the four major upstream cities—Riverside, San Bernardino, Colton and Redlands—to limit their water production and protect the river's flow into Orange County (Blomquist 1992, 255). Like Orange County's cities, these cities had grown during the war years

because of the military bases nearby. As they expanded their use of groundwater increased, in part because none had joined MWD to get outside water. OCWD sued to force a declaration of the rights of these cities to water, and to ensure that they take only the amount stipulated. The case finally reached court in 1957. It was determined that the cities had a right to the amount of water they used in 1946 at the start of the five-year period before the initial suit was filed. Their water use was scaled back, and OCWD's share of the water increased. The case was last appealed in 1961, but the basic judgment held (Blomquist 1992, 257).

Sand and gravel mining at Burris Pit, 1974.

Orange County Water District v. City of Chino, et al.

Two years later the inflow of water at Prado from the Santa Ana River decreased due to the upstream users (Blomquist 1992, 261). This necessitated a new and larger-scale suit. In 1963 OCWD filed suit again, this time to require an adjudication of the entire upper basin and ensure a minimum level of water for Orange County, regardless of the use and needs of upper basin pumpers. The case, OCWD v. City of Chino, et al., was really aimed at all water producers above Prado Dam. Crooke, according to Owen, had run out of patience with negotiations over the water rights of the upper basin. The two basins had been the subject of litigation for 30 years, but the problem of assuring a specified quantity of water for Orange County remained. As Crooke's assistant, it was Owen's job to bring the dispute to a satisfactory conclusion. Owen, with his Sacramento lobbying experience, knew the principal figures involved with the upper basin and was able to negotiate an agreement (Owen 1997). The final settlement came in 1968.

The stipulations generally allocated the natural supply of water between the basins and left individual rights within the basin for users of the water basins to determine internally. OCWD was given the rights to conserve and store storm water behind Prado Dam in Riverside County, and all parties agreed that water which passed through their treatment facilities and into the river must meet the water quality standards of the Santa Ana Regional Water Quality Control Board. The settlement stated that pumpers on the upper basin had to ensure that an average of 42,000 acre-feet of base flow reached Prado Dam annually. Further, it stipulated that the volume required would be adjusted for quality using a formula based on the quantity of

total dissolved solids in the water. The new rules were to be administered by a joint Watermaster Committee made up of representatives of each of the major districts above Prado and OCWD. This committee would compile a yearly report of the water flow and quality (Superior Court of the State of California 1969).

OCWD needed more land for spreading operations by the close of the Chino suit. It already owned Anaheim Lake and six miles of riverbed stretching from Imperial Boulevard to Ball Road, managing it in conjunction with the Orange County Flood Control District (OCFCD) for spreading and flood control. However, additional spreading grounds did not come without conflict.

Construction continued throughout the north county at a steadily increasing rate. Manufacturing had become the county's major industry, eclipsing agriculture. Many of the major aerospace and aircraft employers had built plants in the Fullerton and Anaheim areas. Land prices in the best percolating areas of the river were escalating because the properties were ideally suited to small businesses that served major industries. This land, although ideal for manufacturing, was also ideal for water spreading. If OCWD were unable to acquire enough open acreage before industry developed, the spreading program would be constrained. To be successful, OCWD had to contend with landowners who might give their land away just to have construction that would bring more business into the area.

OCWD directors purchased 95 acres on the north side of the river for a percolation basin, now Warner Basin, in 1966. Ten years later, in 1976, they purchased a portion of the Kraemer property near Anaheim Lake and the flood control district's Miller storm retarding basin to complete a series of interrelated storage basins. At the same time, they purchased the Burris Pit, near Ball Road, and enlarged it as a recharge and conservation basin (Blomquist 1988, 49). In 1983, OCWD purchased two sand and gravel pits along Santiago Creek for additional recharge capacity. These were joined to the Burris Pit by a pipeline so that additional river water could be transferred from Burris to the Santiago Creek recharge basin.

As OCWD accumulated land along the river, it came in conflict with county residents. Anaheim citizens did not want to see the river changed or turned into a gravel pit. They wanted the area to remain undeveloped for recreation. People in other areas were disgruntled that OCWD was spending all of its money in the forebay area without seeming to benefit them. Owen realized that the protests could lead to the stoppage of all spreading programs. To forestall this and provide something for the entire district population, OCWD directors dedicated 10 percent of the sand and gravel gross revenue to recreational activities along the river (Owen 1997). Several years after the purchase and filling of Burris Pit, a creative concessionaire developed a golf driving range over it, complete with distance markers set on islands, and floating golf balls. These recreational facilities, developed with the financial assistance of OCWD, are open to the public. In addition to the water-oriented recreation sites, Owen and Cline worked with OCFCD to build trails along the river banks as part of the countywide equestrian, hiking and biking trail system (Cline 1997). Today, these trails remain an important, well-traveled feature in the river landscape.

The newly acquired basins gave OCWD added recharge capability, but did not address the problem of how to balance the use of water throughout the district. Producers could draw as much water as they needed, regardless of location, since there were no restrictions on pumping. That meant a pumper in the coastal area could pump the groundwater below sea level, allowing seawater to reach the basin,

while in another area, a producer might not pump enough to permit adequate recharging.

Basin Equity Assessment

According to George Osborne, Owen came up with a plan to regulate the pumping (Osborne 1997). Owen thought the groundwater basin should be used in conjunction with MWD supply. If customers would purchase MWD water during the year, and use groundwater primarily for peak-need periods, the groundwater basin could be used to store water for emergency drought periods when imported water was scarce. He described the outcome of his scheme as a bathtub in which you could raise and lower the water level at will. In a period when water was plentiful, OCWD could add to the basin supply, conserving additional water against a dry period when producers would draw heavily on it and lower the level. All the persuasive powers that Crooke and Owen could muster were needed to convince the cities to cooperate in a conjunctive use program by taking at least 50 percent of their water from MWD, since it was more expensive than groundwater (Owen 1997).

The OCWD Act was amended in 1969 to implement Owen's proposals. He envisioned that each year engineers would determine how much water could be safely pumped from the basin to meet the estimated total needs of the district. In most years this figure had been less than the total estimated need, which must be made up with imported water. The estimate of water to be pumped from underground versus that to be imported is expressed as a percentage figure, the basin production percentage (BPP). While producers are theoretically obligated to take water in that ratio, OCWD does not necessarily expect them all to do so. In some cases, as in the coastal area, OCWD may want one producer to pump less than the stated percentage. In other cases, a producer may not be able to obtain MWD water and therefore has to pump all groundwater.

Historically imported water costs much more than groundwater, so providers were reluctant to purchase more than they required to meet their obligations. If the BPP were to work, the cost of imported water had to be subsidized so producers would use it instead of groundwater. In order to make the cost equitable for those who take imported water, OCWD assessed producers who pump more than the BPP based on the difference between the cost of the additional groundwater pumped and the cost of an equivalent amount of MWD water purchased. This assessment is known as the basin equity assessment (BEA). Then OCWD determines which water retailers cannot pump the maximum groundwater percentage—or which ones it wants to produce less from groundwater—and pays them the difference in cost from the fund established by overproducers' assessments. Theoretically, the total cost for every water retailer in the district is based on the same ratio of groundwater and MWD water (Owen 1997).

This program came about not only because of Owen's vision, but also because of the flexibility of the District Act. The legislature could amend it when it was necessary to make adjustments or devise new management programs. This program, as well as others that changed district operations, was a result of a management decision, not users' decisions. If, according to Owen, you left the choice up to individual producers to limit production or pay district assessments, you might not get their cooperation.

Owen's metaphor of a bathtub had a flaw that he recognized. The sides of a tub are all the same level. The "bathtub" of the Santa Ana Valley groundwater basin had breeches along its coastal front. Even

when OCWD engineers could theoretically raise and lower the level, they had to "patch" the hole in the coastal walls before they could actually control the basin. There was a geological barrier at the coastal edge of the basin that had openings in at least two places, the Alamitos Gap, near the mouth of the San Gabriel River, and the Talbert Gap, in Fountain Valley. Seawater could seep into the basin through them, if the fresh water level was not maintained above sea level.

Salt Water Barriers

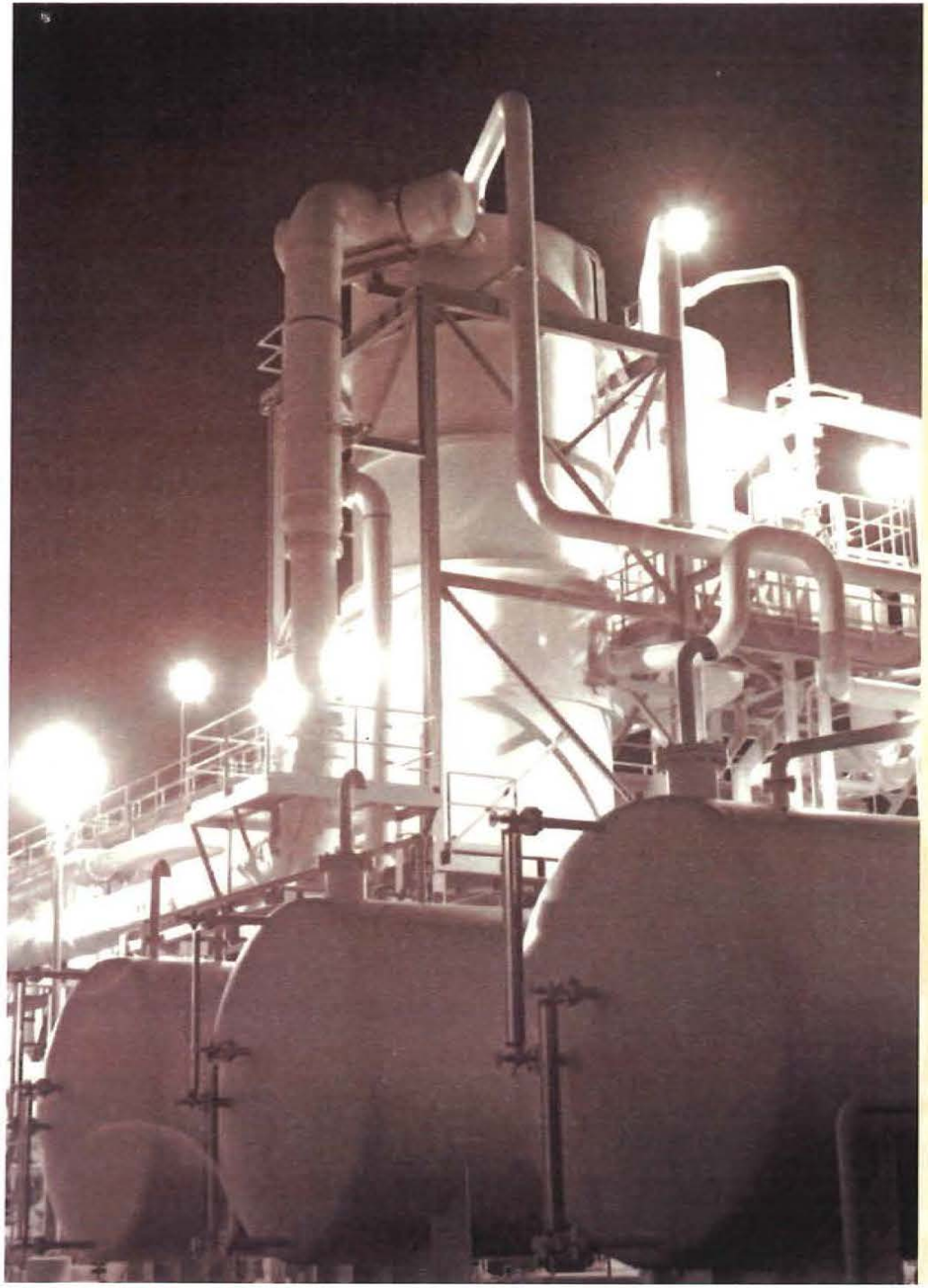
OCWD began a joint program with the Los Angeles County Flood Control District to maintain a fresh water barrier at Alamitos in 1965. The seawater intrusion at this gap affected both Orange County and the central basin of Los Angeles County, including the Long Beach area. As a barrier against the sea at the mouth of the San Gabriel River, OWCD placed 26 injection wells in the area to force fresh water into the basin. Water for these injection wells originally was secured jointly through Los Angeles County Flood Control District and OCWD from MWD (Blomquist 1992, 151).

Talbert Gap required a different solution. Studies began in 1965 to plan for protecting this barrier area (Wesner 1973). It would have required nearly six times the quantity of water to create an adequate barrier similar to the one at Alamitos. Supplies of that magnitude were uncertain, and, if available, would probably cause the water table to rise unacceptably again in Fountain Valley (Blomquist 1992, 266).

Several outside forces influenced the planning of a barrier at Talbert Gap. A 1963 Supreme Court decision (Arizona v. California) limited the amount of water California was guaranteed from the Colorado River, giving Arizona a larger share than California had anticipated. Since California had been using the additional water, it was necessary to reduce consumption. MWD, which had a lower priority for water than some agricultural areas, would stand to lose 70 percent of the total quantity lost, or about 662,000 acre-feet per year. Thus the surplus that OCWD counted on could disappear (Hundley 1992, 323).

Pursuit of Local Water Supplies (Extraction and Injection Wells)

OCWD management hoped to get additional water from the State Water Project, designed to deliver surplus northern California water to the water-short south. It had been approved earlier, but controversy began over the damming of northern rivers to capture the excess water for transport. During the social upheaval of the 1960s, some people took a look at their environment and began to question whether they were really improving the quality of life by making substantial and irreversible changes to the natural environment. The political consensus moved away from and challenged traditional attitudes that did not consider the impact of new developments on the environment. Water projects were subject to intense scrutiny. In particular, the 1963 dam at Glen Canyon created ill feeling among environmentalists and a resolve to limit future development of several wild rivers that had been planned as part of the State Water Project. In 1971, this resolve hardened into the Wild and Scenic Rivers Act (Hundley 1992, 306). It was no longer certain that the project would be completed in order to deliver the anticipated amount of water for district operations.



REFINING THE VISION

Development of Water Factory 21

In the 1960s the shared sentiment of most water planners was that there might not be surplus water for Southern California beyond the next 20 years. Mindful of the possibility, Owen urged the development of additional local water, knowing it would take 20 to 30 years to perfect the technological processes (Environmental Coalition of Orange County 1974; Owen 1997). To do so, however, he had to develop a program that would be politically acceptable throughout the basin and still provide extensive protection for the coastal barrier. He conceptualized the plan as a program that would add storage capacity to the basin because it gave the flexibility of raising or lowering the water level at will without the danger of seawater breaching the gap. This approach was acceptable because it emphasized that the entire basin was to benefit from the cost of stopping seawater intrusion in the coastal areas (Owen 1997).

Owen's plan consisted of two sets of wells, one for injection, and the other for extraction. Extraction wells were placed about two miles inland, to pull the seawater out of the aquifer. This caused a depression in the groundwater basin level. At the same time, injection wells, placed four miles inland, added water to the basin. Because of the depression, the fresh water tended to flow toward the ocean, forming a mound of water as a barrier to seawater intrusion. By careful monitoring, the engineers would be able to determine how much water to inject to maintain the slope of the basin.

Don Owen was a brilliant engineer, according to Neil Cline, who succeeded Owen as manager. He never worried about money to fund an idea; if a project was worthwhile, he thought the money would be there (Cline 1997). Although OCWD could have purchased expensive MWD water at least for the time being, Owen decided to develop a multimillion-dollar treatment plant to provide wastewater that had been brought to drinking water standards for injection. This was still expensive water, but he thought it was cheaper than building a pipeline from MWD connections to Fountain Valley, where it was needed (Owen 1997).

Aerial view of Water Factory 21, circa 1971.

There had been talk as early as 1929 about trying to process wastewater for replenishment, but the technology had not been developed. Finally, in the mid-1960s, district engineers decided to consider treating wastewater for injection along the coast at Talbert Gap. The directors purchased land next to the sewage treatment plant for a pilot plant to conduct experiments in tertiary treatment of the wastewater

before it was injected and to monitor the experimental injection wells. Meanwhile, Howard Crooke retired from OCWD and Don Owen, his assistant, became secretary-manager. Owen hired Neil Cline, a geologist he had known when both were working for the California Department of Water Resources, as assistant to oversee the injection experiments. Owen and Cline thought they would be able to inject treated wastewater into the barrier where it would mingle with the other waters and be diluted. The first experiments found that the treated water was too saline and did not dilute, but stayed in a mass (Cline 1997). Experiments continued for several years under the supervision of the State Department of Health. Finally by 1971, both OCWD and the health department were satisfied with the advanced treatment's capacity to remove organics and, together with deep well fresh water or desalinized seawater, form the barrier mound of fresh water.

STATEMENT BEFORE THE SUBCOMMITTEE ON
WATER AND POWER RESOURCES
HOUSE INTERIOR AND INSULAR AFFAIRS COMMITTEE

MARCH, 20, 1973

BY

HENRY T. SEGERSTROM, PRESIDENT
BOARD OF DIRECTORS, ORANGE COUNTY WATER DISTRICT

CONGRESSMAN JOHNSON, GENTLEMEN OF THE COMMITTEE:

IT IS A PRIVILEGE FOR ME TO ONCE AGAIN HAVE THE OPPORTUNITY TO APPEAR BEFORE YOUR COMMITTEE ON BEHALF OF THE ORANGE COUNTY WATER DISTRICT. MY NAME IS HENRY SEGERSTROM, AND I AM PRESENTLY SERVING AS PRESIDENT OF THE BOARD OF DIRECTORS OF THE DISTRICT.

ON APRIL 23, 1971, THE ORANGE COUNTY WATER DISTRICT SIGNED A COOPERATIVE AGREEMENT WITH THE FEDERAL GOVERNMENT'S OFFICE OF SALINE WATER, FOR THE CONSTRUCTION OF A LARGE-SCALE DESALINATION MODULE. SINCE THAT SIGNING, LESS THAN TWO YEARS AGO, RAPID PROGRESS HAS BEEN MADE IN THE ASSEMBLY OF THE ADVANCED DESIGN PLANT

Excerpt from Director Segerstrom 1973 testimony.

The timing of the pilot plant was auspicious. The Department of the Interior's Office of Saline Water (later the Office of Water Resources and Technology) was interested in developing a joint desalinization project in Southern California, and had talked to MWD about building a desalter plant. MWD showed less interest than OCWD at the time because of the costs. OCWD was interested since the experimental plant would be one more way to develop water for the barrier project, and offered the potential of additional potable water for the future. Jointly funded by the federal government and OCWD, the project began in 1971 with construction of an advanced recycled water treatment plant and desalter. The technical operation process was almost too much for a general audience to comprehend, although most welcomed the potential for more fresh water. In a 1975 article, Owen recalled how the project got its name, "Water Factory 21."

According to Owen he had been invited to discuss his brainchild at a League of Women Voters meeting in Newport Beach. He began by saying something like, "The plant consists of a seawater desalting module that will combine two flash distillation methods, vertical tube evaporation and multi-stage flash, and a wastewater reclamation plant using lime coagulation, clarification and solids settling, ammonia stripping, recarbonation, mixed/media filtration,

carbon adsorption, and chlorination." One woman in the front said, "What?" Owen repeated his description, which was no more enlightening the second time through. The woman said, "But what does it do?" Owen replied that it cleaned up sewage and made fresh water out of ocean water. "Oh," the woman said. "It's a water factory." Owen liked that, and though he says he met with some initial opposition, that did become its name. The "21" was added to connote the plant's futuristic technology and implications (Environmental Coalition of Orange County 1975).

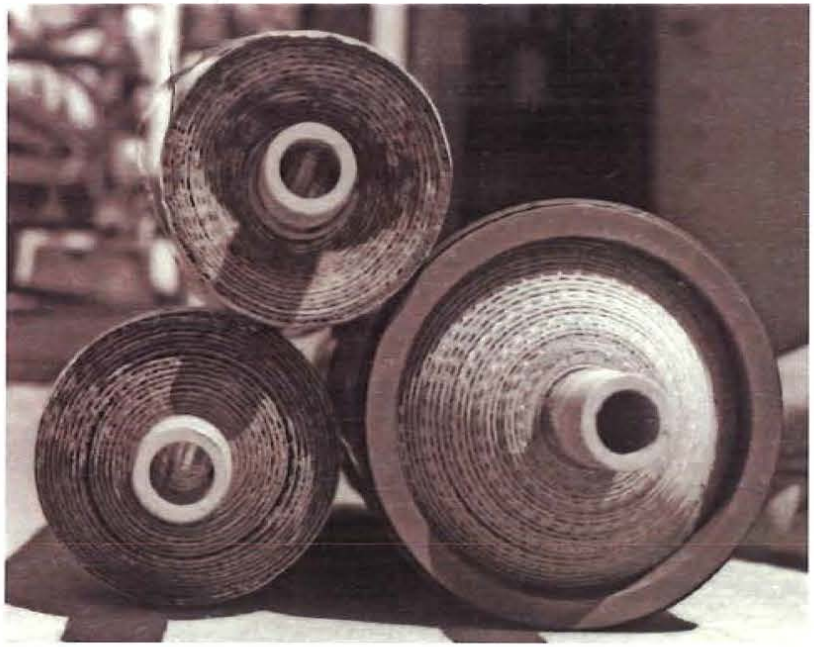
Since he did not think a manager could be effective for more than five years at a time, Owen left OCWD in 1973 to go into private consulting practice. Neil Cline succeeded him and followed through, bringing Water Factory 21 on line.

The prototype wastewater treatment plant went into operation in April 1975. In June the desalter unit was completed and put into operation by the federal government. Although designed for a five-year pilot study, it operated for less than a year before the project was canceled (*Los Angeles Times* 23 April 1976). Cline recalled that almost from the beginning, the directors knew the joint project was doomed for several reasons. The first was an increase in operation costs. The desalter was designed to clean 15 million gallons per day (mgd), but even though it was only producing 3 million gallons per day in the demonstration phase, it used the same amount of fuel as if the plant were in full production. Overall fuel costs had gone up dramatically as a result of the 1973 Oil Embargo, making the demonstration concept less practical. The economy was faltering and federal programs were reduced or phased out, as funds became difficult to secure. Of the eight federal desalinization projects testing different methods of operation, five were canceled, including this one (OCWD's) (*Huntington Beach Independent Review* 25 October 1975). As of April 30, 1976, the Fountain Valley plant's operation was halted, and the plant placed in standby condition.

Withdrawal of support by the federal government left OCWD in a difficult position. The directors had committed funds not only for the desalting plant, but also for the wastewater treatment plant, which was now operating. Confident in the availability of demineralized seawater, OCWD had planned on having 30 mgd of reclaimed water, including the desalted seawater, for injection in the barrier. Now, OCWD had to find another way to get higher quality water to blend with the wastewater. Cline remembered the political battle he fought to get federal funding to continue the desalter. He recalled wryly that he was unsuccessful in getting the administration to continue the project even though millions had been spent on it. "It came down to an advisor to President Ford saying 'We regret the local inconvenience.'" (Cline, 1997). Although he was able to get some Congressional support and a little more funding, the seawater plant was obviously dead.

Pursuit of New Projects

Resilient district engineers settled on a method of improving the quality of wastewater for injection. They turned to reverse osmosis (RO), a process not used before in wastewater treatment. In this process, water is passed over a series of membranes that filter out salts and other impurities, leaving water that meets drinking water standards. OCWD engineers believed that they could blend the treated water with water drawn from deep wells to produce a blend suitable for injection into the water table. The pilot operation, however, produced only 5mgd of the water required for injection, and an activated carbon adsorption process was used to purify the remainder of the wastewater component.

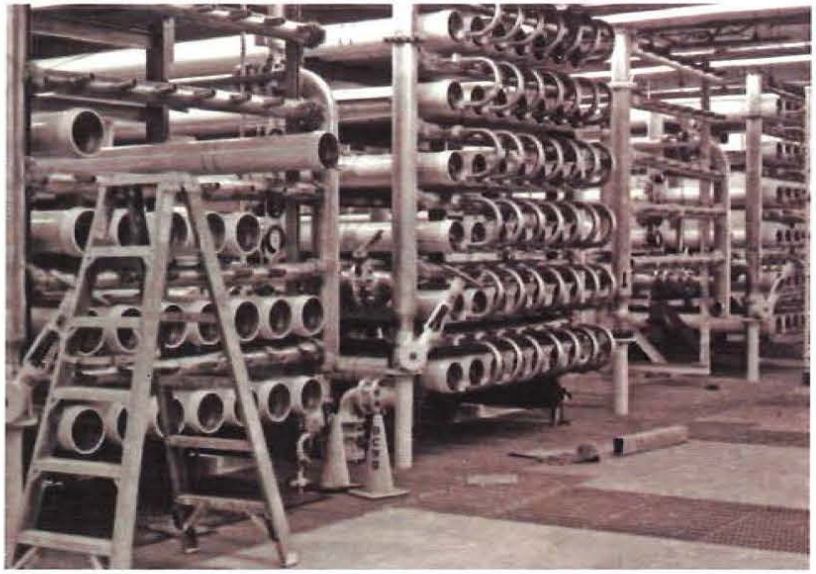


Reverse osmosis (RO) membranes.

In an interview, Bill Dunivin, Water Factory 21 plant manager, remembered the years of research that perfected the operations. "This was an entirely new concept," he said. Visitors came from around the world to examine the new plant and learn about the technology OCWD was developing. At first the cost was high (over $1,000 per acre-foot), but by 1996, it had come down to within a few dollars of the cost of imported water. The initial cost of reclaimed water was a concern, but the planners expected it to be high in the beginning and anticipated that it would decrease as new technology became available.

Dunivin noted that the plant had provided the freedom to research a variety of technologies and that the cooperation of the water industry manufacturers who supplied experimental materials for testing was outstanding.

Water Factory 21 has become the success its proponents anticipated. After five years (1976-1981) of experimentation, a Stanford study stated that "no evidence was found that would indicate that this reclaimed municipal wastewater would pose a significant health risk if used as a source of municipal water supply" (OCWD Annual Report 1983, 33). In 1991 OCWD reached its ultimate goal when it received a permit to inject undiluted product water from Water Factory 21 into the groundwater basin. These endorsements were important to the future of the project. Both Fountain Valley and Huntington Beach drew their domestic water from the basin in the vicinity of the injection wells.



Reverse osmosis plant inside Water Factory 21, circa 1990.

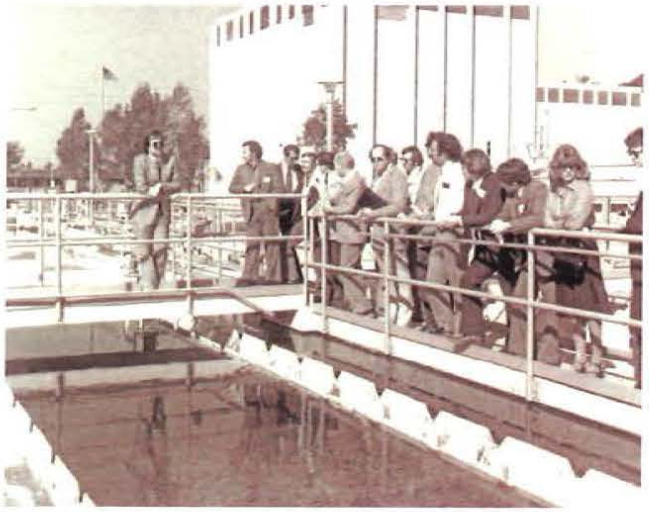
The treated wastewater had to meet municipal standards because it was likely to mingle with groundwater in the cities' wells.

In 1978 when the California State Ballot Proposition 13 passed, restricting the rate of increase of property tax and rolling the level backwards, many public agencies were devastated. OCWD funding, however, came from the replenishment assessment (RA), as well as the ad valorem tax, so OCWD had an untouched source of money to continue operation. The District Act was amended to permit use of the RA for *all* purposes instead of just the purchase of imported water. Under the old method of assessing the ad valorem tax, OCWD had estimated its yearly needs and set a rate accordingly. After Prop 13 the rate was set as a portion of the one percent tax rate allowed on real property in the county, regardless of what the anticipated expenditure was.

Serving punch with reclaimed water, circa 1980.

During this wet period, OCWD did not spend as much for imported water as it had projected. The current projects had been built, and there was a lull in new construction. As a result of these factors, OCWD accumulated reserve funds. In the mid-1980s, the county Grand Jury noted that OCWD had a surplus of public money and faulted it for continuing to collect more (Osborne 1997). There was even a recommendation that OCWD return the money to its constituents if it was not used. Clearly, OCWD had to invest in new projects if it were to protect its resources.

Looking back in 1997, Cline characterized his 12 years as secretary-manager (1973-1986) as a period of general operation following OCWD's expansion into wastewater recycling. Additional projects were proposed to use the reserve funds, but all efforts were concentrated on the development and operation of Water Factory 21. Cline later accepted the position of general manager at Santa Ana Watershed Project Authority, and ultimately retired in 1998.


Guests touring Water Factory 21.

PREPARING FOR THE NEW MILLENIUM

Modernizing Orange County Water District

William Mills, a private consultant and former employee of the California Department of Water Resources, was the board's ultimate choice to succeed Cline in 1987. Mills recognized that OCWD needed a long-term improvement plan to continue the programs that had been started under both Owen and Cline. He made a number of changes to modernize OCWD's operations, including changing his title from secretary-manager to general manager, creating a finance department, and integrating a complex computer system for data management. Under his direction, OCWD developed an eight-point plan for groundwater management. The plan provided for: "water quality monitoring, contaminant cleanup, regulatory agency support, toxic residuals removal, hazardous waste management, technical information, public disclosure, and periodic evaluation of overall policy effectiveness" (OCWD 1994, 17). Slightly modified, these points have continued to guide district planning.

To carry out his goals, Mills developed a capital improvement plan that identified "a couple hundred million dollars" worth of facilities to be built within the next five or six years to increase the amount of groundwater that could be pumped. His financial plan increased the revenue base of OCWD by raising the RA. "With the stability of a higher revenue base, OCWD secured additional outside funding for the planned improvements" (Mills 1997). The ultimate benefit of this capital improvement plan was the capacity of OCWD to slow down increases in water costs for retail water agencies.

Green Acres Project

Having proved it was possible to treat wastewater for injection, OCWD staff began another program to develop tertiary treated wastewater for urban irrigation use. Until this time, county golf courses, public parks and landscaping were watered with drinking water because the treated effluent—or outflow—from the sanitation district did not meet water quality standards for reuse. The Green Acres Project was designed in the mid-1980s to provide this reclaimed water for use within five miles of the plant. Operational in 1991, the plant initially provided water for nearby Mile Square Park. Secondary treated wastewater was piped from the Orange County Sanitation District (OCSD) to the adjacent OCWD reclamation plant in Fountain Valley, treated to a tertiary level and piped out for use. Since this time, additional reaches of pipe have been installed to serve Santa Ana and other cities beyond the five-mile range (OCWD Annual Report 1991, A-6). Since 2002, the Green Acres Project has provided nearly 7,000 acre-feet of water a year to customers in Fountain Valley, Huntington Beach, Costa Mesa, Newport Beach, and Santa Ana.

Analytical Water Quality Laboratory

The permits that allowed OCWD to build Water Factory 21 required an increase in the sophistication of staff to meet the challenges of developing and monitoring the new project. The proposal called for "a highly qualified operation and maintenance staff of about 14 persons including one superintendent, eight operators, one chemist and four maintenance men" (Wesner 1987, A-13) Laboratory services—initiated in response to the needs of Water Factory 21—continued to expand, monitoring water quality at wells throughout the district.

Dr. Yvonne Shen, a research chemist trained at the University of Massachusetts, established the first of the two labs—the water quality lab—in 1973. This lab was planned to monitor the water quality of Santa Ana River water and the demonstration injection wells of

Water Factory 21. When the EPA rules for water quality became more stringent, requiring extensive testing for more chemical contaminants, OCWD took over that responsibility from the Orange County Health Department and added it to the work of Shen's lab. The workload increased dramatically and other technicians were hired to assist. In 1991 the lab processed 176,900 analyses for a network of over 400 monitoring and production wells. The water quality lab's responsibilities continued to increase, as did its size and level of sophistication of its testing equipment. It earned a high level of accreditation by the State of California for complete chemical, physical, and microbiological analysis of groundwater and wastewater. As a result of this approval and recognition, the lab's technicians conducted testing not only for OCWD and its producers, but also for OCSD facilities as well (Shen 1997). To meet this growing demand, OCWD expanded the laboratory by adding 1,000 square feet of space and acquiring new equipment, including four new high-performance water-testing instruments. OCWD chemists use these and other instruments to test for new contaminants to very low detection levels (e.g., parts per trillion).

Advanced Water Quality Assurance Laboratory

OCWD's Advanced Water Quality Assurance Laboratory opened in 2009. Housing additional chemists, lab technicians, and water quality monitoring personnel, the laboratory handles over 400,000 analyses of approximately 20,000 water samples each year. The new laboratory also supports the water quality testing requirements for the innovative Groundwater Replenishment System (GWRS).

Reflecting "green design," the new laboratory building was constructed with locally manufactured materials with recycled components and low emissions of volatile organic compounds. Further, recycled water is used for onsite landscape irrigation. Key design strategies from the federal government program, Laboratories for the 21st Century (Labs21) have been incorporated into the design.

The work in the water quality laboratory involves meticulous record-keeping and careful, constant monitoring of water quality parameters, an understated contribution vital to the health of OCWD and the groundwater producers.

Research and Development Laboratory

OCWD's research laboratory is another dynamic contributor to the future of water technology. Like the water quality lab, it grew out of the need for research for Water Factory 21. David Argo, former district engineer, recruited Harry Ridgway, a post-doctoral research scientist at the University of California, Irvine, to study the problem of a fouling layer (slime) on RO membranes. Argo and Cline decided that district management needed to set up a research lab. At first OCWD directors were skeptical, but they agreed to establish an annuity to fund the lab, and Ridgway was hired to continue research on RO membranes (Cline 1997). Since then the research laboratory has expanded to include other scientists and state-of-the-art equipment. Its projects have included continued RO membrane studies and other bacteria-related research such as percolation enhancement in the recharge basins and biological treatment of groundwater contaminants (OCWD Annual Report 1995-1996). Current research focuses on advanced oxidation processes (AOP) like the ultraviolet/hydrogen peroxide process used with GWRS, sediment removal by prefiltration before percolation of river water, fouling of both microfiltration and reverse osmosis membranes by nanoparticles, and factors affecting the mobilization

of metals in aquifer materials by low ionic strength waters such as RO product water.

Improved Recharge Capabilities in the Basin

When the Orange County Water District v. City of Chino, et al. decision was handed down in 1969, it was a mixed blessing. Orange County was assured of a water supply for recharging and production. OCWD facilities, however, had to be improved to take advantage of the additional base flow and storm flow that would come downriver from Prado Dam.

A major project envisioned by OCWD engineers was to develop storage basins at Santiago Creek and construct a pump station and pipeline to connect them to Burris Pit so that additional water could be transferred there. Former forebay operations manager Alan Flowers recalled that the project cost about $25 million, but paid for itself in water saved—water that OCWD did not have to purchase for recharge (Flowers 1997). When finished in 1991, the system added another 25,000 acre-feet of capacity to the basin, bringing OCWD's total recharge capability to between 300,000 and 400,000 acre-feet per year.

The Santiago Creek project had an unexpected natural bonus for nearby residents, despite additional cost and frustration for OCWD management. Since the new basins would inundate small, isolated wetlands within the basin, engineers had to include a mitigation project. OCWD directors authorized nearly $200,000 to pay for planting, irrigation and other measures to create a wildlife habitat on a 16-acre island between the two basins (Fonley 1997).

Over the years OCWD's research has included work with the recharge basins themselves. Initially, in each of the percolation basins, beginning with Anaheim Lake in 1962, water infiltrated quickly. Gradually, however, the silt from the Santa Ana River flow collected in the basins, retarding infiltration. Cleaning became a yearly chore as the managers emptied the basins to scrape the accumulated solids that were preventing infiltration. Since the process was time consuming, it could not be done easily during the winter months when the operators expected a storm flow. As a result, water infiltration declined when it was needed most to capture the heavy flow. Precious water was also lost during the process because once a basin was emptied for cleaning, there was no way to hold the water or transfer it from one basin to another.

A first step to correct the problem was to build a maze of pipes linking the different basins in the forebay area. As one basin required cleaning, its contents could be shifted to another. High- powered submersible pumps were also installed in each basin to empty it quickly. Soon operators could empty, clean, and refill the recharge basins during the winter as well as the summer to increase infiltration by as much as 40 percent. The recharge capacity was further increased by the addition of two inflatable rubber dams across the river channel in the early 1990s. Previously, earthen levees were built to capture normal runoff and direct it into the recharge basins. When the storm flow was high, however, these levees washed out. They could not be replaced until the water level went down enough to get heavy equipment back into the riverbed. Valuable replenishment water, of course, was lost in the interim. The rubber dams, however, will deflate during storms and can be raised again in 30 minutes to capture runoff once the flow has decreased.

Conservation Programs at Prado Basin

Prado Dam was originally conceived as a flood control dam, with water conservation being an incidental secondary purpose. Although it is still a critical point in the defense from storms in the lower Santa Ana

basin, its importance for conservation has increased. For many years the two private water companies, Anaheim Union Water Company and Santa Ana Valley Irrigation Company, owned land behind Prado Dam (in Riverside County) for conservation. Ditches dug in the overflow lands helped relieve waterlogged conditions by increasing the flow through the dam's ungated opening (Osborne 1998). During the 1960s, as the need for agricultural water declined, these companies shifted their focus from water sales to Orange County land development and sold their Riverside County property to OCWD (OCWD Minutes 14 June 1967).

As a result of that purchase, OCWD owns about 2,150 acres of bottomland behind Prado Dam that can be flooded for conservation purposes. During the 1970s and early 1980s, OCWD began working toward a proactive water conservation program. The basic concern was that flood control and water conservation require opposite management techniques. Flood control managers want to keep the flood land behind a dam as free of water as possible, to prepare for an unexpected heavy runoff. Water conservation managers, on the other hand, want to store as much water as possible behind the dam, releasing it slowly so that it can be infiltrated in spreading grounds and saved as groundwater. OCWD directors authorized $600,000 in 1986 to study the feasibility of conservation consistent with flood control at Prado.

Endangered songbird, the least Bell's vireo. *Photo by Benjamin Smith.*

The study, completed by the Army Corps of Engineers in 1988, indicated that seasonal storage would not jeopardize flood control at the dam (OCWD Annual Report 1991). Conservation could take place between March 1 and September 1, while flood control efforts would take precedence between November 1 and February 28 (Van Haun 1997). Environmental studies followed to determine the impact on wildlife in the proposed storage area. Finally, in 1991, an agreement was reached by OCWD, the Army Corps of Engineers, the U.S. Fish and Wildlife Service (USFWS), and The Nature Conservancy to allow storage and to mitigate and alleviate anticipated damage to the wildlife habitat. Under the agreement, OCWD set aside land for habitat for an endangered songbird, the least Bell's vireo, and contributed $900,000 for habitat management and other land conservation projects. In spring 1991 alone, some 40,000 acre-feet of high quality water were saved from runoff by storage behind the dam (OCWD Annual Report 1991). Had OCWD needed to purchase that amount of water to replenish the basin, the total cost would have been far greater than the cost of the conservation project.

Jim Van Haun, former associate general manager, remembered that OCWD had seriously considered giving up on the conservation project in 1986 when the least Bell's vireo was listed as a Federal and state endangered species. Prado Basin had the second largest population of these small songbirds and its population had dropped to 19 nesting pairs. Since their migration period from Mexico to Prado, where they nested, was mid-March, these few pairs would be directly affected by the proposed conservation plan. OCWD directors finally decided to try to "live with the Endangered Species Act" and continued the study. According to Van Haun, biologists discovered that the bird population decline was due more to an incursion of brown-headed cowbirds, not necessarily to loss of habitat alone. Cowbirds lay their eggs in the nests of other birds, like the least Bell's vireo, and leave. The diminutive vireo parents are left raising a large and aggressive cowbird nestling that literally starves and crowds out the vireo nestlings. Cowbird nest parasitism nearly decimated the least Bell's vireo population.

The immediate solution was to build and install Australian cowbird traps. "A crazy deal," Van Haun remarked. OCWD spent $35,000 to $40,000 each year for several years trapping cowbirds. Dick Zembal, OCWD natural resources director, who at the time served as USFWS Deputy Field Supervisor, and Martin Rigby, former assistant general manager of OCWD, collaborated to develop a recovery plan. By setting cowbird traps and changing mowing patterns of fields behind Prado Dam, the least Bell's vireo population rebounded. Since first being listed as an endangered species in 1977, the population of vireos at Prado Basin grew from 12 to 561 territories in 2013. As a result OCWD has been allowed to expand the area it seasonally floods for conservation. In the long run, the good results from trapping, while costly, saved millions of dollars' worth of water and provided the basis for a permanent water conservation agreement (Van Haun 1997).

Subsequent to the decision to trap cowbirds, researchers found that giant cane had overrun the birds' habitat. OCWD, USFWS, and the Army Corps of Engineers entered a cooperative agreement to remove this invasive plant from the upper watershed. OCWD's share of the cost was $1 million. In March 1995, just a few days after the environmental impact statements were completed and approved to allow additional storage behind the dam, a storm came up and the dam filled, saving $3.2 million worth of water for use in Orange County (Van Haun 1997).

OCWD provided the leadership to form a team with seven other agencies to develop the Santa Ana River Conservation Trust Fund. Its unique concept of depositing funds into a trust that is dedicated to solving a regional problem provides the opportunity for broader solutions with more lasting results. By 2002 the Trust Fund had funded the removal of 600 acres of giant cane from the watershed. More than 10 years later, over 5,000 acres have been removed.

Water Quality behind Prado Dam

Through its water quality research program, OCWD scientists and engineers had discovered other benefits of the Prado conservation program. The runoff water that reaches Prado Dam is degraded because of both dairy and urban usage. Under terms of the Chino decision, it had to meet certain water quality standards when it reached Prado Dam. Even before the conclusion of the lawsuit, the water agencies realized that the water quality of the river was continuing to deteriorate in the watershed.

In 1967 representatives of the three major water agencies upstream met with Don Owen to develop a joint program for improvement of the

water quality (OCWD Minutes 25 October 1967). Subsequently, the OCWD board authorized a joint powers agreement between OCWD, Chino Basin Municipal Water District, Western Municipal Water District (Riverside area), and San Bernardino Valley Municipal Water District to "create a self-help agency which will conduct a water quality management program study for the Santa Ana River watershed" (OCWD Minutes 13 December 1967). The Santa Ana Watershed Planning Authority obtained start-up grants and initial funding from the four districts in 1968 to plan a basin-wide program that addressed buildup of total dissolved solids. The study recommended treatment plants, desalters and a brine line to the ocean to carry off residual wastewater. Since no district was willing to embark on a project of this size alone, the authority was recast as the Santa Ana Watershed Project Authority (SAWPA. In 1972 it began building the pipeline that now stretches from San Bernardino to Fountain Valley (Cline 1997). Its projects continue today with desalting plants and other water quality facilities.

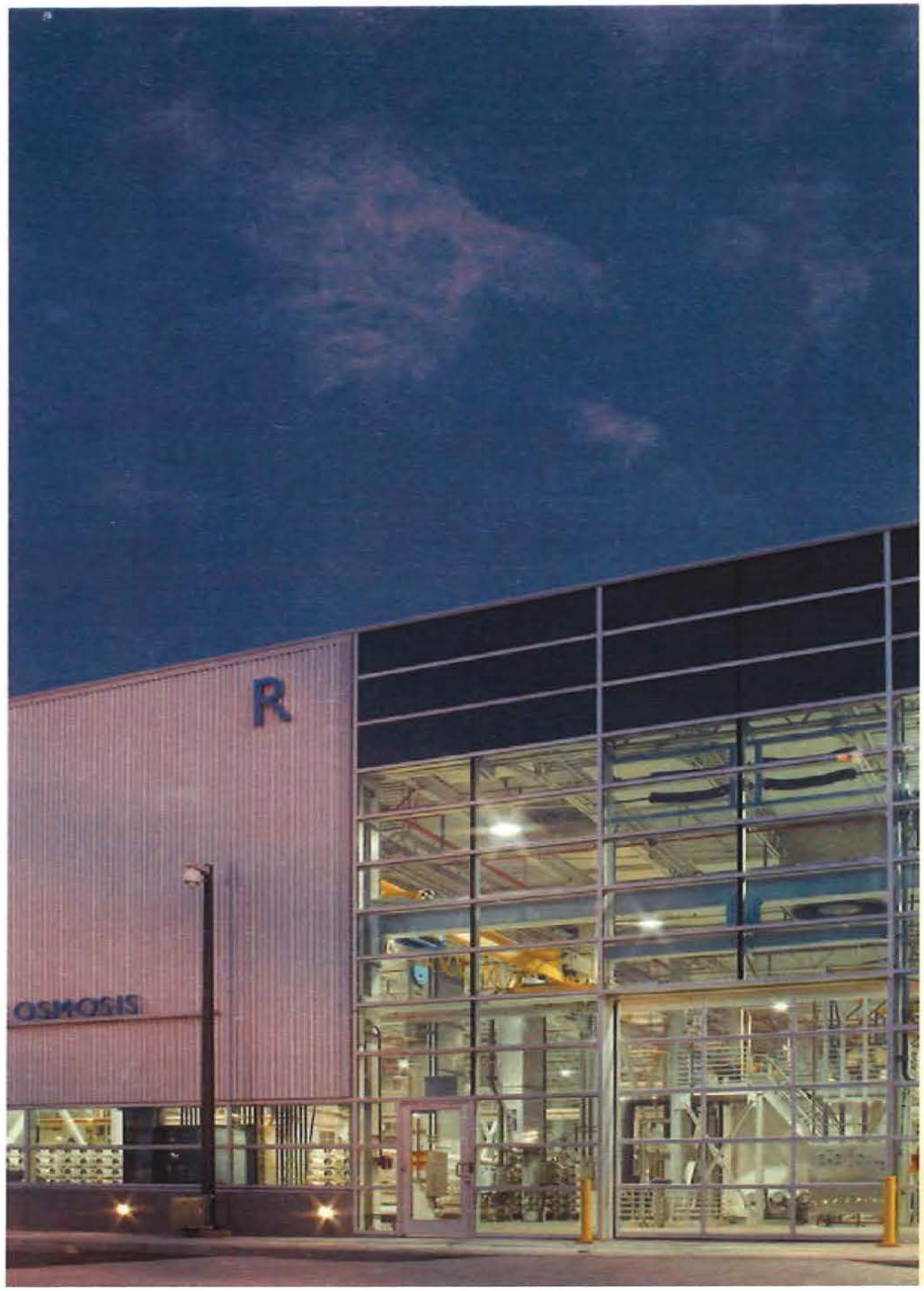
As a result of the testing program scientists discovered still another means to improve the water quality at the dam site. Behind the dam was a 450-acre constructed wetlands consisting of 50 linked pools through which nearly half of the baseline flow of the river passed. This was originally operated by a concessionaire as a waterfowl hunting area. Water quality engineers discovered that the water passing through these ponds was of a higher quality than other water reaching Prado, indicating that the series of ponds naturally removed some of the nitrate and other compounds accumulating in the urban flow. As a result of these studies, OCWD modified the pond system to increase the flow in and out of each pond. It deepened individual ponds, widened and deepened the main diversion channel to the pond system, and improved the conveyance system between ponds. With these modifications, OCWD increased the rate of flow from 60 cubic feet per second (cfs) to 200 cfs, thus allowing more river water to flow through the ponds (OCWD Annual Report 1995). The wetlands have proven to be very effective at removing nitrate from the river water. In fact they remove up to 2,000 tons of nitrate per year.

National Water Research Institute

The need for collaborative research to address water supply and quantity issues was the driver behind OCWD partnering with other forward-thinking Southern California water agencies and the Joan Irvine Smith and Athalie R. Clarke Foundation to establish the National Water Research Institute (NWRI), a 501c3 nonprofit. Since 1991, NWRI has served as an independent industry expert in water science, technology, and public policy. NWRI's many leading-edge projects and activities have advanced the worldwide understanding in areas such as treatment technologies, potable reuse, salinity management, and other factors that influence the quality and availability of water supplies and resources. This prestigious institute is housed on OCWD's campus.

Among its services NWRI specializes in organizing and facilitating Independent Advisory Panels to help public agencies with developing and implementing a challenging water project or program. These panels consist of water and wastewater professionals who are nationally renowned experts in their fields. Recent examples of NWRI panels include reviewing the City of Los Angeles' proposed projects to replenish groundwater using advanced treated recycled water, reviewing the City of San Diego's pioneering efforts to augment a drinking water reservoir with recycled water, evaluating the City of Tucson's plans to fully utilize all the treated wastewater within its

service area, and addressing questions about the impacts of the infiltration of reclaimed water on groundwater and other water resources in the Olympia, Washington area. The overall goal of these panels is to provide the guidance and credibility needed to make appropriate project decisions and develop good public policy.



ENTERING THE NEW MILLENIUM

GRWS reverse osmosis building. *Photo courtesy of Larry Mack, CDM.*

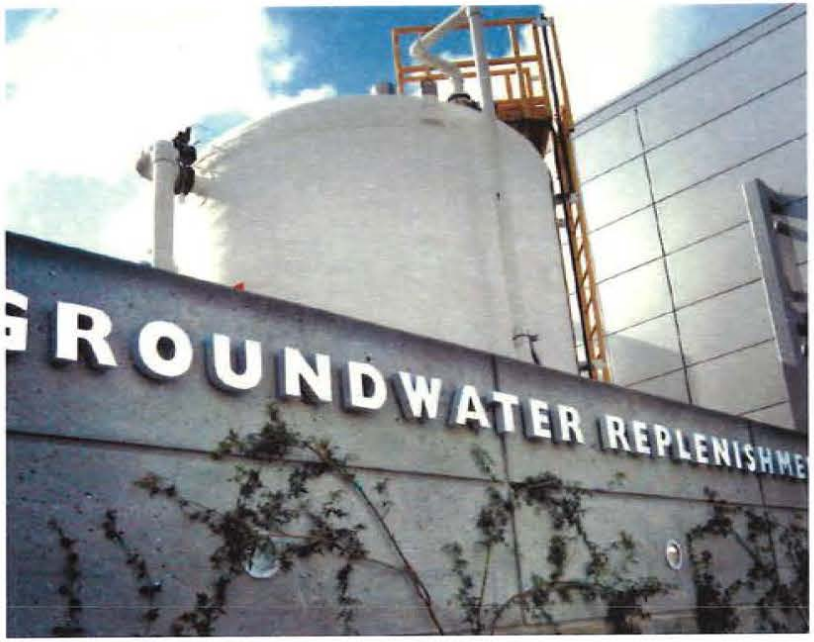
Groundwater Replenishment Program

OCWD's tradition of innovation is nowhere more evident than in the cutting-edge Groundwater Replenishment System (GWRS) project. The GWRS is the world's largest advanced water purification system for potable reuse. It takes treated wastewater that otherwise would be sent to the Pacific Ocean and purifies it using a three-step advanced treatment process. Consisting of microfiltration, reverse osmosis, and ultraviolet light with hydrogen peroxide, this innovative process produces high-quality water that exceeds all state and federal drinking water standards. This water is injected into a seawater barrier and pumped to recharge basins where it naturally percolates into the groundwater basin.

OCWD Board of Directors at the GWRS Initial Expansion groundbreaking ceremony.

The Groundwater Replenishment System was launched in 1999 when the Boards of Directors of both OCWD and OCSD unanimously certified the project's Environmental Impact Report. Following certification, a team of three engineering firms began the project development phase of the project. The OCSD Board unanimously approved its own Strategic Plan, which incorporated OCSD's participation in the GWRS project. In 2001 both Boards overwhelmingly voted to move forward and begin detailed design of the first phase of GWRS with a target goal of producing 72,000 acre-feet per year of purified water.

The project has received significant attention from outside agencies that recognize the applicability of this technology to many other communities. Funding was authorized by the Bureau of Reclamation through its Title XVI program for $20 million, the State Water Resources Control Board for $5 million, the U.S. Environmental Protection Agency for $500,000, and the California Energy Commission for $700,000. GWRS was also awarded $67 million in grants through the 2000 California State Water Bond. In addition, the Metropolitan Water District of Southern California also awarded a $3.8 million annual operating subsidy for a 21 year period through its Local Resources Program (LRP).



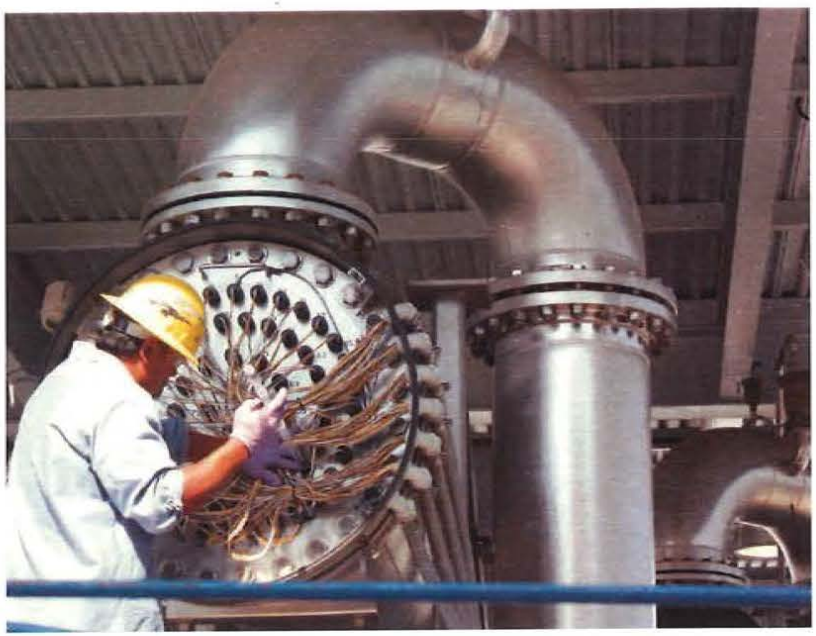
Groundwater Replenishment System building

Construction of GWRS began in 2002. Operational since January 2008, the GWRS has the capacity to produce 70 million gallons of high-purity water every day. By 2015 these figures are projected to increase to 100 million gallons when purification facilities are expanded and excess flow stored during the day is run through the GWRS at night. Ultimate capacity for the GWRS is projected at 130 MGD after facilities are expanded further and more flows are rerouted from ocean discharge for reuse.

GWRS has garnered over 42 awards, including the prestigious 2014 U.S. Water Prize, 2014 Lee Kuan Yew Prize, American Society of Civil Engineers (ASCE) 2009 Outstanding Civil Engineering Achievement Award for the year's most outstanding national engineering project, and the Stockholm 2008 Industry Water Award for the year's most outstanding international water project.

Advanced Water Purification Facility

Part of developing GWRS involved construction of the $300 million Advanced Water Purification Facility. It is here that 70 million gallons of secondary-treated wastewater are transformed each day to near distilled water quality. After undergoing microfiltration, reverse osmosis, and ultraviolet light with hydrogen peroxide, the purified water is then put back into the groundwater basin.



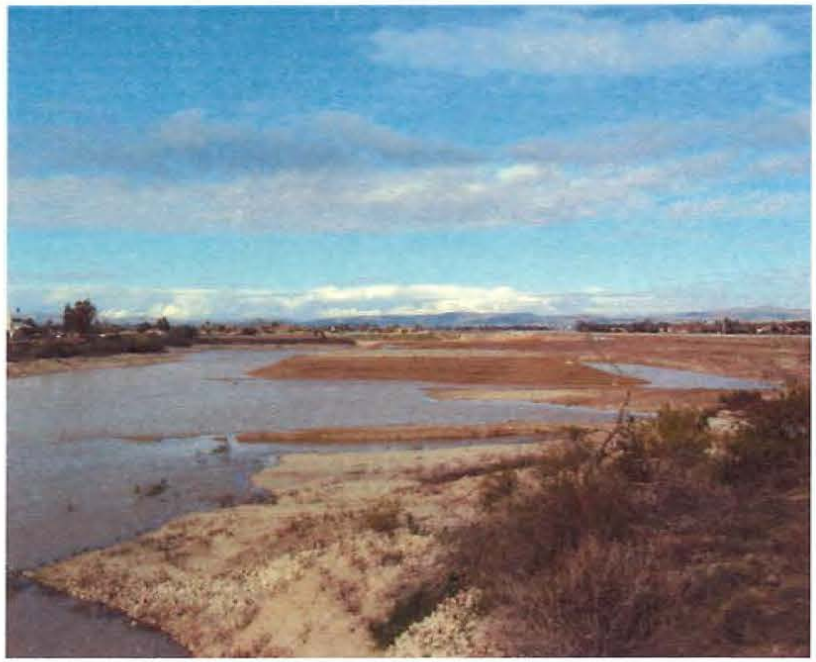
Treating wastewater with ultraviolet light with hydrogen peroxide and lime.

From Ocean to Foothills—the Seawater Intrusion Barrier and Inland Spreading Basins

Seawater Intrusion Barrier

Beginning in 1999 improvements were made to OCWD's Talbert Seawater Intrusion Barrier in the cities of Fountain Valley and Huntington Beach. OCWD constructed two new injection well sites in 1999, one in 2000, two in 2003, and eight more in 2004-05. This latter installation is part of GWRS. The addition of four new well sites at the west end of the barrier and four to the southeast helps prevent seawater from going around the existing Talbert Seawater Intrusion Barrier. Further, they have more than doubled the annual injection of 100% purified recycled water. As a result, coastal water utilities are able to pump up to 75 percent of their water demand without damaging the groundwater basin. The Talbert Barrier provides enormous value to local water utilities—without it, seawater would intrude several more miles into the basin, contaminating production wells, reducing the freshwater capacity of the basin, and limiting the amount of water that could be produced from the basin each year.

In addition nine injection wells were constructed in 2000 to increase seawater protection at the center and eastern end of the Alamitos Seawater Intrusion Barrier located along the Orange/Los Angeles County line near the ocean. OCWD is currently planning to construct eight additional injection well sites during 2013-15 along the central portion of the barrier to prevent intermittent pulses of salinity from breaching through the barrier into Orange County. The Alamitos Barrier is currently supplied by approximately 50% imported water and 50% purified recycled water, and supplies are sufficient to support the planned improvements.



Inland spreading and percolation basins.

Inland Spreading Basins

One of the principal methods for recharging groundwater involves supplying source water to the District's spreading basins, Kraemer, Miller, and Miraloma Basins in Anaheim. Water sources include GWRS recycled water, imported water from the State Water Project and Colorado River, and both base flow and captured storm water in the Santa Ana River. Kraemer Basin consists of 31 acres and has a maximum storage capacity of 1,170 AF (381 million) with a maximum recharge capacity of approximately 300 AF (97 million gallons) per day. Due to the need to reserve space for storm water capture, the

average recharge capacity in this basin is 19,000 acre-feet per year (AFY), (6 billion gallons per year). The District's newest basin, Miraloma Basin, has a maximum storage capacity of 63 AF (20 million gallons) and a projected annual recharge capacity of 20,000 AFY (6.5 billion gallons) per year. Percolation rates with cleaner sources of water, such as GWRS and imported water, are more than double the rates achieved with Santa Ana River water. This is because Santa Ana River water contains suspended solids, typically comprised of inorganic silts and clays that clog the basin surface.

GWRS water is conveyed to these basins through a 13-mile (20 kilometers) long transmission pipeline that travels along the west levee of the Santa Ana River through the cities of Fountain Valley, Santa Ana, Orange, and Anaheim, and along the Carbon Canyon Diversion Channel. Five feet in diameter at its end point, this pipeline is capable of delivering over 80 million gallons of purified water to the basins each day.

Continuing the Tradition of Innovation

Driven by its tradition of innovation, OCWD continues to be a worldwide leader in the water industry. Thanks to visionary leaders, and dedicated and talented staff, OCWD has earned its outstanding reputation in groundwater management, water reuse, and water conservation. It also strives to exceed it.

In 2002 William R. Mills retired after nearly 15 years of service to Orange County Water District (OCWD). Virginia Grebbien was appointed as the new general manager of OCWD. Grebbien's extensive involvement in the water community and previous work on landmark water supply development projects helped her advance OCWD's mission.

In 2007 Michael R. Markus was named general manager—only the sixth in the District's lengthy history that began in 1933. He continues to hold this position today. In his previous position as construction manager, he was given the responsibility to manage implementation of GWRS, an undertaking that involved construction of seven individual projects, including the Advanced Water Purification Facility. Markus was named one of the Top 25 Newsmakers of 2007 by the Engineering News-Record and received the highly coveted international 2009 Säid Khoury Award for Engineering Construction Excellence.

AFTERWORD

By Michael R. Markus, P.E., D.WRE, General Manager, Orange County Water District

This book has detailed the tremendous achievements that have been garnered by the District over the past 80 years, which has made it a worldwide leader in groundwater management and recycled water. These accomplishments would never have happened without the vision and leadership of the past and present Boards of Directors. These leaders have shaped the policies and made the decisions that have made the District what it is today. They understood the need for investment in water infrastructure and the impact that has had on the economic engine of Orange County.

The District has faced challenges in the past and met them head-on with innovation and foresight. This same spirit will need to continue because future challenges loom on the immediate horizon. These challenges will include: decreased flow in the Santa Ana River due to recycling and groundwater extractions in the Upper Santa Ana Watershed, decreased stormflow due to reoccurring drought, and potential shortages of imported water. All of these issues affect the supply of water into the groundwater basin and could eventually lead to a decrease in the amount of pumping out of the basin.

Even though the challenges will be great, I am confident that the District staff will rise to the occasion and come up with creative solutions in finding additional ways in which to maximize the potential of the groundwater basin. The District has always been recognized for its "tradition of innovation" and its high caliber staff. With the combination of the leadership of the Board of Directors and the ingenuity of the staff, the Orange County Water District will continue its preeminent reputation well into the future.

CONCLUSION

Orange County's population has grown at a dizzying speed since the end of World War II. The county's population soared from 130,760 in 1940 to over three million in 2012. Its urban regions have become the dominant water users as houses and light industry replace agriculture in the local economy. In contrast to earlier urban areas which developed and expanded into suburbia from a central city, Orange County has no one central city. Rather, it has many. One city is the civic center, another the cultural center, another the technology/science center, and still another the sports and entertainment center. Since no single city really dominates, the cities cooperate to provide basic urban services. Although operated independently, the cities of Orange County are interdependent in many ways. Nowhere is this interdependency so obvious as in the management of the Santa Ana River and the County's groundwater basin.

OCWD was created by independent members of the business and agricultural community. These individuals recognized that they had to work together to provide enough water for a growing economy. While users of Orange County water could have demanded to remain completely independent of one another and adjudicated the basin's water, they chose a pool arrangement in which rights are shared in common. By sharing such rights and choosing to operate from a philosophy of plenty, Orange County water users have empowered OCWD to establish a management policy that recharges the groundwater basin and protects it from careless overdraft. From pumping reclaimed water to a recharge basin to restoring riparian habitat in Riverside County, the basic goal of Orange County's water management plan has not changed. It remains the protection of the quantity and quality of water in the Orange County groundwater basin.

Historical Timeline—Orange County Water Progress 1769-1960

1769	Father Serra camps in Santa Ana Valley
1776	Mission San Juan Capistrano established
1848–1850	Gold Rush, Alta California ceded to U.S., California Statehood
1860s	Irvine Ranch established 1862—Historic flood
1870s	Major cities established
1889	Orange County established
1916	Historic flood. Santa Ana River rerouted to present location
1927	Historic flood
1928	Historic flood. Metropolitan Water District of Southern California (MWD) established. Cities of Santa Ana and Anaheim represent Orange County as founding member cities.
1931	City of Fullerton joins MWD as the third member city from Orange County
1932	Construction of Colorado River Aqueduct begins
1933	Orange County Water District (OCWD) established to manage the groundwater basin
1938	Historic flood
1941	Construction of Prado Dam completed by U.S. Army Corps of Engineers
1941	Colorado River Water Aqueduct completed
1941	Coastal Municipal Water District established, annexed to MWD as a member agency the following year
1949–1950	OCWD's first purchases of imported water from MWD
1951	Orange County Municipal Water District (OCMWD) formed and annexed to Metropolitan as a member agency. OCMWD later changes name to Municipal Water District of Orange County (MWDOC) in 1969.
1952	Orange County Water Basin Committee established new water management policies
1954	Cities of Anaheim, Fullerton, and Santa Ana annexed into the Orange County Water District
1954	OCWD establishes replenishment assessment (RA) to bring in revenue to purchase imported water to fill the groundwater basin.
1960	Fairview Farms Water Company merges with Mesa Consolidated Water District
1960	San Juan Water Company becomes Capistrano Beach Water District
1961	Irvine Ranch Water District formed

Historical Timeline—Orange County Water Progress 1965-Present

1965	Alamitos Barrier becomes operational
1969	Stipulated judgment resolves Santa Ana River water disputes.
1969	Historic flood
1969	Basin Equity Assessment (BEA) and Basin Production Percentage (BPP) are created to assist OCWD in managing the groundwater basin
1972	Santa Ana Watershed Project Authority (SAWPA) formed
1975	First Northern California water deliveries to Orange County
1976	Water Factory 21 becomes operational
1977	Water Factory 21 adds reverse osmosis
1978	Proposition 13 enacted restricting use of ad Valorem tax
1983	Water Advisory Committee of Orange County (WACO) established
1991	Green Acres Project becomes operational
1991	Arlington Desalter becomes operational
1995	OCWD reaches historic agreement with the U.S. Army Corps of Engineers to store Santa Ana River flows behind Prado Dam
1995	Expansion of Prado Wetlands completed
1996	Proposition 204 Water Bond passed
2000	Proposition 13 Water Bond passed
2001	Coastal Municipal Water District becomes part of MWDOC
2001	Chino Desalter becomes operational
2001	OCWD and Orange County Sanitation District approve design and construction of the Groundwater Replenishment System
2001	Coastal Municipal Water District merges with MWDOC.
2006	Water Factory 21 ceases operations
2006	New Interim Water Factory 21 becomes operational
2008	Groundwater Replenishment System becomes operational
2009	Advanced Water Quality Assurance Laboratory opens
2011	OCWD breaks ground on initial expansion of the Groundwater Replenishment System
2012	Miraloma Basin is completed, becoming OCWD's 21st groundwater recharge basin.
2012	Advanced Water Quality Assurance Laboratory earns full certification from the Environmental Protection Agency to monitor unregulated contaminants of concern
2013	OCWD celebrates 80th anniversary and 5th anniversary of the Groundwater Replenishment System

Locations of District Headquarters

1933–1935, Garden Grove Chamber of Commerce office
1935–1941, Medical Building, 622 N. Main St., Santa Ana
1941–1947, Ramona Building, 118 W. 5th St., Santa Ana
1947–1957, 1104 W. 8th St., Santa Ana
1957–1960, 941 E. 1st. St., Santa Ana
1960–1974, 1629 W. 17th St., Santa Ana
1974–present, 10500 Ellis Ave., Fountain Valley
(New Administration Building completed, 1991)
1988–present, Field Headquarters, 4060 E. La Palma Ave., Anaheim
2007–present, Ward St., Fountain Valley

Fountain Valley headquarters. *Photo courtesy of Larny Mack, CDM.*

Property Boundary/Annexation History

(as of 29 September 2013)[1]

Action	Date	Description	Acres	Square Miles
SB 1201	10 April 1933	Establishes OCWD Boundaries	162,676.700	254.182
OCWD Bd. Minutes	25 March 1942	Adds 5 Parcels	576.000	0.900
SB 509	8 July 1949	Eliminates 14 Parcels	-9,920.000	-15.500
OCWD Bd. Minutes	29 July 1949	Resultant Boundary Per SB 509	153,332.710	239.582
OCWD Bd. Minutes	11 Jan 1950	Adds 1 Parcel	2.650	0.004
SB 91	21 May 1953	Adds Cities of Anaheim, Fullerton, and Santa Ana	20,672.000	32.300
SB 117	July 1957	Adds Nohl Ranch	6,299.470	9.843
SB 1257	1959	Adds portions of Buena Park, Fullerton, Carlton & M. Yorba Allot.	9,184.510	14.351
Reso. 545	12 Aug 1959	Includes area southerly of Chapman Ave., Easterly of Newport Ave.	183.650	0.287
Reso. 599	12 Nov 1960	Includes area between Northerly Line Sec. 6-4-8 and Santa Ana Canyon Rd.	77.050	0.120
SB 1026	Sept 1961	D-2 Includes areas of Costa Mesa, Northerly of 15th St. and portion of Irvine Sub. Easterly and Northerly of Costa Mesa	11,244.890	17.570
Reso. 960[1]	15 Sept 1965	East Yorba Linda (Fairmont Annex.)	426.400	0.666
Annex 68-1	15 Jan 1969	East Yorba Linda (Horseshoe Bend)	350.000	0.547
Annex 70-1[2]	15 April 1970	East Yorba Linda	54.000	0.084
Annex 70-2[3]	17 June 1970	East Yorba Linda	151.700	0.237
Annex 72-1	18 June 1975	East Orange	5.250	0.008
Annex 75-2	23 July 1975	East Yorba Linda	41.000	0.064
Annex 75-5	23 July 1975	East Yorba Linda	23.216	0.036
Annex 74-1	23 July 1975	East Orange	81.170	0.127
Annex 75-4	23 July 1975	East Orange	74.200	0.116
Annex 75-3	20 Aug 1975	East Yorba Linda	1.493	0.002
Annex 75-7	15 Oct 1975	East Yorba Linda	36.600	0.057
Annex 75-9	17 Mar 1976	D-3 East Yorba Linda	5.586	0.009
Annex 75-1	21 April 1976	East Yorba Linda	64.000	0.100

Action	Date	Description	Acres	Square Miles
Annex 75-10	21 July 1976	East Orange	1.640	0.003
Annex 75-8	18 Aug 1976	East Orange	102.260	0.160
Annex 76-1	18 Aug 1976	East Orange	10.740	0.017
Annex 76-5	17 Nov 1976	East Orange	17.330	0.027
Annex 76-2	19 Jan 1977	East Orange	1.040	0.002
Annex 76-4	19 Jan 1977	East Orange	111.330	0.174
Annex 76-8	16 Mar 1977	East Orange	13.150	0.021
Annex 76-7	17 Aug 1977	East Orange	0.998	0.002
Annex 76-6	21 Sept 1977	East Orange	425.030	0.664
Annex 77-1	15 Feb 1978	East Orange	0.460	0.001
Annex 76-3	30 Oct 1978	East Yorba Linda	1,700.000	2.656
Annex 78-1	1 May 1980	East Orange (8 Islands)	109.700	0.171
Annex 81-1	4 Aug 1981	Northerly portion of Fullerton	2,014.900	3.148
Annex 86-1[4]	1 Jan 1988	D-4 Remaining portion of City of Newport Beach	8,863.000	13.848
Annex 87-1[5]	1 Jan 1988	Anaheim/Wallace, Bauer, Oak Hills Ranch	1,250.000	1.953
Reorg 105	16 Sept 1987	Cypress (Forest Lawn)	1.900	0.003
Annex 88-1	2 Nov 1989	Santiago County Water District	9,434.000	14.741
Annex 88-2	6 Mar 1990	East Orange	384.710	0.601
Annex 95-1 Reorg 94-9	13 July 1995	Irvine Regional Park	477.100	0.745
Annex 95-2[6]	14 Aug 1996	Featherly Regional Park	64.52	0.101
Annex 96-1[7]	3 Nov 1997	Eastern Transportation Corridor	356	0.556
Annex 98-1[8]	Oct 1998	Shell Yorba Linda Master Planned Community	855	1.336
Total			228,506.353	357.041

[1] Fairmont Annex $25/ac. Fee (426.4ac.@$25/ac.=$10,860) and agreement with water purveyor, Southern California Water Co., stipulating that not less than 50% of water served shall be imported from outside Santa Ana River Watershed.

[2] Annex 70-1 $100/ac. Fee (54 ac.@$100/ac.=$5,400).

[3] Annex 70-2 $25/ac. Fee (151.7 ac., minus 15.4 ac. of Greenbelt and Corners = 136.3 ac.@$25/ac.=$3,407.50).

[4] Annex 86-1 Per annexation agreement utilizing new annexation charge formula

[5] Annex 87-1 Per annexation agreement utilizing new annexation charge formula

[6] Annex 95-2 Area rounded from 0.1008125

[7] Annex 96-1 Area rounded from 0.55625

[8] LAFCO designation: "Shell Reorganization" – Annexation to the Orange County Water District (RO 94-01b), completed Oct. 20, 1998. Annex 98-1 Area rounded from 1.3359375

Current Board of Directors

Division Number	Director	Since	Current Term Expires
1	**Kathryn L. Barr**	09/79	12/05/14
2	**Denis Bilodeau**	12/00	12/02/16
3	**Roger Yoh**	12/04	12/02/16
4	**Philip L. Anthony**	02/81	12/02/16
5	**Stephen Sheldon**	05/05	12/05/14
6	**Cathy Green**	12/10	12/02/16
7	**Shawn Dewane**	12/10	12/05/14
8	**Vincent Sarmiento**	01/13	12/02/16
9	**Harry Sidhu**	02/12	12/02/16
10	**Bruce Whitaker**	08/12	12/02/16

as of 9/2013

Terms expire on the first Friday in December

December 5

December 2

2018 December 7

SECRETARY MANAGER/GENERAL MANAGER

C.A. Palmer *(Director)*	1933-1939
Wm. C. Mauerhan *(Director)*	1939-1942
W. W. Hoy *(Staff)*	1942-1945
Dion R. Gardner *(Hired as Secretary-Engineer)*	1945-1949
W. D. Miller *(Staff)*	1949-1953
Howard W. Crooke *(Secretary Manager)*	1953-1968
Langdon W. Owen *(Secretary Manager)*	1968-1973
Neil M. Cline *(Secretary Manager)*	1973-1986
William R. Mills Jr. *(Secretary Manager)*	1987-1988
William R. Mills Jr. *(General Manager)*	1988-2002
Virginia Grebbien *(General Manager)*	2002-2007
Michael P. Wehner *(Acting General Manager)*	2007-2007
Michael R. Markus *(General Manager)*	2007-present

DISTRICT SECRETARY

Mary E. Johnson	1988-1995
Barbara White	1995-1999
Janice Durant	1999-present

ASSISTANT SECRETARY

Thelma G. Willoughby	1952-1972
Mary E. Johnson	1972-1988
Barbara A. White	1988-1995
Janice Durant	1995-1999
Judy-Rae Karlsen	2000-present

History of Board of Directors

Division 1

		Term of Appointment
William C. Mauerhan		1933-1937
William C. Mauerhan resigned 11/8/44		1937-1941
		1941-1945
John W. Crill		1944-1945
		1945-1949
President	1951-1955	1953-1957
Vice President	1945-1951	1949-1953
Walter R. Schmid		1955-1957
		1957-1961
H. Louis Lake		1961-1965
		1965-1969
1st Vice President	1973-1974	1973-1977
2nd Vice President	1965-1973	1969-1973
Thomas T. Lacy		1974-1977
Thomas T. Lacy resigned 6/20/79		1977-1981

		Term of Appointment
Kathryn L. Barr		1979-1981
Appointed by OC Board of Supervisors 8/28/79		1981-1985
(sworn in on 9/26/79) and ran for election 11/79		
President	1995, 2010	1994-1998
1st Vice President	1988-1995, 2000-2002	2000-2002
2nd Vice President	1985-1988, 2005-2007	2005-2007

Division 2

		Term of Appointment
C. A. Palmer		1933-1935
Secretary	1933-1939	1935-1939
Dion R. Gardner		1939-1943
President	1939-1943	
Errol Trafford (E. T.) Watson		1943-1947
E. T. Watson resigned 11/7/75		1947-1951
President	1955-1961	1955-1959
		1959-1963
		1963-1967
		1967-1971
		1971-1975
Vice President	1951-1955	1951-1955
John V. Fonley		1975-1979
President	1985-1988	1988-1992
		1992-1996
		1996-2000
1st Vice President	1983-1985	1983-1988
2nd Vice President	1981-1983, 1998-2000	1979-1983
Denis R. Bilodeau		
President	2002-2003	2000-2004
		2004-2008
2nd Vice President	2008-2009	2008-2012
		2012-2016

Division 3

		Term of Appointment
William Wallop		1933-1935
William Wallop resigned 12/7/38		1935-1939
Ralph J. McFadden		1938-1939
Ralph J. McFadden resigned 12/48		1939-1943
		1943-1947
		1947-1951
Lewis Lemke		1948-1951
		1951-1955
Merwin Wagner		1951-1955
Merwin Wagner resigned 2/78		1955-1959
President	1961-1967	1963-1967
		1967-1971
		1971-1975
		1975-1979
Vice President	1959-1961	1959-1963
Lawrence P. Kraemer Jr.		1978-1979
retired at end of term		1979-1983
2nd Vice President	1983-1985	1983-1988
1st Vice President	1985-1988	1988-1992
President	1988-1990	1992-1996
1st Vice President	1998-2000	1996-2000
2nd Vice President	2000-2002	2000-2004
Roger Yoh		2004-2008
2nd Vice President	2013	2008-2012
		2012-2016

Division 4

		Term of Appointment
William Schumacher		1933-1935
		1935-1939
Job J. Denni Sr.		1939-1943
Job J. Denni Sr. resigned 9/62		1943-1947
		1947-1951
		1951-1955
		1955-1959
		1959-1963
Jake Van Dyke		1963-1967
Jake Van Dyke resigned 2/17/65		
Preston K. Allen		1965-1967
Preston K. Allen resigned 12/17/80		1967-1971
President	1975-1979	1979-1983
1st Vice President	1974-1975	1975-1979
2nd Vice President	1973-1974	1971-1975

		Term of Appointment
Philip L. Anthony		1981-1981
		1981-1983
		1983-1988
President	1992-1995, 2005-2007	1992-1996
		1996-2000
1st Vice President	2009, 2010-2012	2000-2004
2nd Vice President	1990-1992, 2004	1998-1992

Division 5

	Term of Appointment
C. Roy Browning	1933-1937
C. Roy Browning resigned 3/8/39	1937-1941
Charles E. Smith	1939-1941
Charles E. Smith resigned 4/8/42	1941-1945
C. Roy Browning	1942-1945
C. Roy Browning resigned 2/16/55	1945-1949
	1949-1953
	1953-1957
Wayne Eaton	1955-1957
Disqualified by boundary realignment 9/7/55	
W. F. Mitchell	1955-1957
W. F. Mitchell resigned 9/23/64	1957-1961
	1961-1965
Minor Warne	1964-1965
Minor Warne resigned 1/21/70	1965-1969
	1969-1973
Paul H. Cleary	1970-1973
Paul H. Cleary resigned 6/74	1973-1977
E. Ray Quigley Jr.	1974-1977
E. Ray Quigley Jr. resigned 10/15/80	1977-1981

		Term of Appointment
Langdon W. Owen		1980-1981
Langdon W. Owen did not run for re-election in November 1998		1981-1985
		1985-1990
President	1990-1992	1994-1998
2nd Vice President	1988-1990	1990-1994
Jerry A. King		1998-2002
President	2000-2002	2000-2002
Paul Cook		2002-2006
Paul Cook resigned 4/7/05		
Stephen Sheldon		2005-2006
President	2008-2009	2006-2010
		2010-2014

Division 6

		Term of Appointment
Willis H. Warner		
Willis H. Warner resigned 12/14/38		1933-1935
President	1933-1938	1935-1939
Vernon C. Heil		1938-1939
Vernon C. Heil died 1951		1939-1943
President	1943-1951	1943-1947
		1947-1951
Gerald E. Price		
appointed to fill term, never qualified because of election		
Roy Seabridge		1951-1955
Roy Seabridge resigned 4/8/70		1955-1959
President	1959-1961	1963-1967
		1967-1971
Vice President	1955-1959	1959-1963
Noble J. Waite		1970-1971
Noble J. Waite resigned 11/13/91		1971-1975
President	1981-1983	1983-1988
		1988-1992
1st Vice President	1979-1981	1979-1983
2nd Vice President	1975-1979	1975-1979

		Term of Appointment
Wesley M. Bannister		
Wesley M. Bannister died 12/10/09		
President	1996-1997	2000-2004
1st Vice President	1995-1996	1996-2000
1st Vice President	2008-2009	2004-2008
		2008-2012
2nd Vice President	1995-1995	1992-1996
Noble J. Waite		2010-2010
Appointed to fill term		
Cathy Green		2010-2012
Elected to a short term through 2012		2012-2016
1st Vice President	2013	

Division 7

		Term of Appointment
Frank B. Champion		1933-1937
Frank B. Champion resigned 3/45		1937-1941
Acting President	1942-1943	1945-1949
Vice President	1935-1945	1941-1945
Donald J. Dodge		1945-1949
Donald J. Dodge disqualified by boundary survey 7/49		
Stephen Griset		1949-1953
		1953-1957
Henry T. Segerstrom		1957-1961
Henry T. Segerstrom resigned 3/21/84		1961-1965
President	1967-1983	1969-1973
		1973-1977
		1977-1981
		1981-1985
1st Vice President	1962-1967	1965-1969

		Term of Appointment
Donn Hall		1984-1985
		1985-1990
2nd Vice President	1993-1994	1990-1994
Arnt G. "Bud" Quist		1994-1998
1st Vice President	1997-1998	
2nd Vice President	1996-1997	
Kelly E. Rowe		1998-2002
Kelly E. Rowe resigned 12/23/00		
Jan Debay		2001-2002
Filled remaining term, then re-elected in 2002		2002-2006
1st Vice President	2005-2007	2006-2010
2nd Vice President	2010	
Shawn Dewane		
President	2013	2010-2014

Division 8 – City of Santa Ana

		Term of Appointment
Courtney R. Chandler		1953-1977
Courtney R. Chandler resigned in 1977		
John Garthe		1977-1992
John Garthe resigned 7/1/92		
President	1983-1985	
1st Vice President	1981-1983	
2nd Vice President	1979-1981	
Daniel E. Griset		1992-1998
President	1997-1998	
1st Vice President	1996-1997	
2nd Vice President	1995-1996	
Miguel A. Pulido		1999-1999
Miguel A. Pulido resigned 10/4/99		
Thomas A. Lutz		1999-2000
Brett Franklin		2000-2004
1st Vice President	2002-2003	
Jose Solorio		2004-2006
Jose Solorio resigned 12/06		
Claudia Alvarez		2007-2012
President	2010-2012	
Vincent Sarmiento		2013-Present

Division 9 – City of Anaheim

		Term of Appointment
Charles H. Pearson		1953-1972
Charles H. Pearson died 5/72		
August F. Lenain		1972-1991
August F. Lenain resigned 4/1/91		
William D. Ehrle		1991-1992
William D. Ehrle resigned 11/92		
Irv Pickler		1992-1995
Irv Pickler resigned 5/19/95		
Bob Zemel		1995-1996
Irv Pickler		1996-2002
President	1998-2000	
2nd Vice President	1997-1998	
Richard Chavez		2002-2007
Appointed by City of Anaheim to fill remaining term		2004-2008
Irv Pickler		2007-2012
Harry S. Sidhu		2012-Present

Division 10 – City of Fullerton

		Term of Appointment
Cecil Crew		1953-1961
Cecil Crew resigned 3/61		
Howard M. CornwalL		1961-1968
Howard M. Cornwall resigned 4/68		
Robert L. Clark		1968-1988
Robert L. Clark resigned 6/88		
President	1979-1981	
1st Vice President	1975-1979	
2nd Vice President	1974-1975	
H. George Osborne		1988-1999
H. George Osborne died 1/12/99		
President	1995-1996	
1st Vice President	1995-1995	
2nd Vice President	1994-1995	

		Term of Appointment
Jan Flory		1999-2002
Shawn Nelson		2002-2008
Don Bankhead		2008-2012
Don Bankhead resigned 7/21/12		
2nd Vice President	2011-2012	
Bruce Whitaker		2012-2014
Jan M. Flory, Esq.		2014

Current OCWD employees

Ray Abrahamson
Alexander Adams
Crystal Albert
Chris Alvarez
Jesse Aragon
Glen Arrieta
Gina Ayala
Talula Barbee
Pedro Barrera
Ashley Barton
Menu Bhatia-Leddy
David Bolin
John Bonsangue
Dan Bott
Paula Bouyounes
Michelle Boyd
Bill Bradberry
Scott Brandon
Don Brown
John Bruns
Tam Bui
Matt Buis
Ramon Camacho
Adrienne Campbell
Tony Carreira
Andre Casasola
Manuel Castro
Jim Caver
Mike Centro
Alex Cervantes
Flora Chang
Frank Chavez
Darla Cirillo
Steve Clark
Dan Cohen
Julie Combs
Jason Dadakis
Scott Davidson
Jeremy Davis
Julio De La Cruz
Rodger Denecochea
Pete Doplito
Stephanie Dosier
Bruce Dosier
Frank Duarte
Marta Dudek
Bill Dunivin
Janice Durant
Kim Dusky
Melany Economakos
Randy English
Robert Ennis
Michael Ewing
Ruben Felix
Joaquin Ferreyra
Randy Fick
David Field
Joe Flint
Betty Freeman
Chris Friberg
Christina Fuller
Jaime Garcia
Eric Gautier
Stephanie Giraud
Joanne Goco
Kevin Greene
Mark Greening
Don Haffke
Jim Hammersmith
Phil Harrington
Jimmy Hawkins
Wes Haydock
David Henry
Josue Hernandez
Roy Herndon
Andrew Higgins
Melissa Hill
Rita Hintlian
Scott Hollender
Patrick Hollinden
Don Houlihan

Bonnie Howard
William Hunt
Adam Hutchinson
Brent Ida
Ken Ishida
Lorenzo Jackson
Don Jackson
Jeremy Jenkins
Bonnie Johnson
Jay Kalinowski
Judy-Rae Karlsen
John Kennedy
Quan Kha
Jeff Kind
Jeff Kirkwood
Tom Knoell
Linda Koki
Janice Kovacevic
Rae Krause
Jim Kutzle
Elizabeth Kwan
Phuong Lam
Troy Lane
Julio Langarica
Anny Lau
Anh-Tu Le
Patrick Lewis
Li Li
Linda Liang
Laura Liang
Darlene Lipinski-Fagan
Ben Lockhart
Joshua Long
Erin Lucero
Steven Lusk
Cindy Luu
Bruce Macomber
Mario Manriquez
Derrick Mansell
David Mark
Michael Markus
Kyle McCarty
Chris McConaughy
Lynn McConnell
Justin McKeever
David McMichael
Rebecca Mudd
Kaukaba Naggar
Tyson Neely
Nicole Nguyen
Tam Nguyen
Thong Nguyen
Vickie Nguyen
Tom Nicholson
Ernest Nunez
Scott Nygren
Michael Ochoa
Brian Okey
Chris Olsen
Mike Olson
Ted O'Rourke
Kevin O'Toole
Chindamony Pak
Prem Parmar
Mehul Patel
Craig Patterson
Renee Patterson
Riki Paulson
Jimmy Pennella
Audrey Perry
Mark Petty
Christine Pham
John Pham
Bob Phillips
Don Phipps
Donna Pike
Robert Raley
Juan Ramirez
Octavio Reynoso
Mick Riopka
Grisel Rodriguez
Ben Rodriquez
Heinz Roehler
Enrique Romo
Mike Ross
Jana Safarik
Mike Samples

Lily Sanchez
Curtis Sanders
Mike Saunders
Nate Scheevel
John Schifano
Sandy Scott-Roberts
Vishav Sharma
Gwen Sharp
Matthew Sieg
Danny Simala
Frank Simone
Cathy Skousen
Ben Smith
Jim Smith
John Souza
Tim Sovich
Chuck Spade
Tim Stevens
Tom Stevens
Stephen Strand
Don Supernaw
Rusty Sutton
Dianne Swanson
Art Tabata
Lo Tan
Kevin Thai
Eleanor Torres
Luis Torres
Vu Truong
Karen Underhill
Esmer Uribe
Noe Valdez
Ritchie Valdez
Francisco Valencia
Sterling Vamvas
John Vandenbergh
Patrick Versluis
Monica Villalvazo
Leticia Villarreal
Chris Vu
Alex Vue
Jeff Waller
Karen Warren
Marc Wedge
Sumedha Weeratunga
Michael Wehner
Marsha Westropp
Greg Wietki
Rose Wilke
Chiris Wilson
Patti Wimmerstedt
Lisa Wirtz
Greg Woodside
Wei Xu
Nira Yamachika
Mark Yamamoto
Lee Yoo
Gary Yoshiba
Jeannie Young
Richard Zembal

Glossary

A

Accumulated overdraft. The amount of water necessary to be replaced into the groundwater basin to prevent the landward movement of ocean water into the fresh groundwater body.

AF. Acre-foot. The amount of water needed to cover an acre (approximate a football field) one foot deep, or 325,900 gallons. One acre-foot can support the annual indoor and outdoor needs of between one and two households per year, and, on average, three acre-feet are needed to irrigate one acre of farmland.

AFY. Acre-foot per year.

Alamitos Barrier. Joint project between OCWD, Los Angeles County Dept. of Public Works, and the Water Replenishment District of Southern California (WRDSC) for injection of imported water into a geologic gap at the Orange County-Los Angeles County boundaries subject to seawater intrusion.

Alluvium. A stratified bed of sand, gravel, silt, and clay deposited by flowing water.

AMP. Allen McColloch pipeline, operated by the Metropolitan Water District of Southern California to transport imported water within Orange County.

Annexation. The inclusion of land within a government agency's jurisdiction.

Annual overdraft. The quantity by which the production of water from the groundwater supplies during the water year exceeds the natural replenishment of such groundwater supplies during the same water year.

Aqueduct. A structure for transporting water form one place to another by means of a pipeline, canal, conduit, tunnel or a combination of these things.

Aquifer. A geologic formation of sand, rock and gravel through which water can pass and which can store, transmit and yield significant quantities of water to wells and springs.

Artesian. An aquifer in which the water is under sufficient pressure to cause it to rise above the bottom of the overlying confining bed, if opportunity to do so should be provided.

Artificial recharge. The addition of surface water to a groundwater reservoir by human activity, such as putting surface water into recharge basins. (See also: *groundwater recharge and recharge basin.*)

B

Base flow. River surface flow, not counting storm flow and/or purchased imported water.

Basin cleaning device (BCD). A continuous clean-out system for removing the clogging layer that accumulates on the bottoms and sides of deep recharge basins and inhibits percolation; the BCV has been patented by OCWD.

Basin equity assessment (BEA). The additional fee charged by OCWD on water pumped that exceeds the BPP, which makes the cost of that water equal to the cost of imported water.

Basin production percentage (BPP). The percentage of an OCWD member agency's total potable water demand that can be produced from the basin without subjecting that member agency to the BEA.

Biofouling. The formation of bacterial film (biofilm) on fragile reverse osmosis membrane surfaces.

BMP. Best Management Practice. An urban water conservation measure that the California Urban Practice Water Conservation Coalition agrees to implement among member agencies.

Brackish water. Water containing dissolved minerals in amounts that exceed normally acceptable standards for municipal, domestic, and irrigation uses. Considerably less saline than seawater.

Brown Act. Ralph M. Brown Act enacted by the State legislature governing all meetings of legislative bodies. Also know as the Open Meeting requirements.

C

CEQA. California Environmental Quality Act.

cfs. Cubic feet per second.

Chloramines. A mixture of ammonia and chlorine used to disinfect water.

Closed basin. A groundwater basin whose topography and geology prevent subsurface outflow of water.

Colored water. Groundwater that is unsuitable for domestic use without treatment due to high color and odor exceeding drinking water standards.

Confined aquifer. A water-bearing subsurface stratum that is bounded above and below by formations of impermeable, or relatively impermeable soil or rock.

Conjunctive use. The planned use of groundwater in conjunction with surface water in overall management to optimize total water resources.

D

Deep percolation. The percolation of surface water through the ground beyond the lower limit of the root zone of plants into a groundwater aquifer.

Degraded water. Water within the groundwater basin that, in one characteristic or another, does not meet primary drinking water standards.

Denitrification. The physical process of removing nitrate from water through reverse osmosis or other means.

Desalting (or desalination). Specific treatment processes, such as reverse osmosis or multi-stage flash distillation, to demineralize seawater or brackish (saline) waters for reuse. Also sometimes used in wastewater treatment to remove salts other pollutants.

Desilting. The physical process of removing suspended particles from water.

Direct Potable Reuse. The injection of recycled water directly into the potable water supply distribution system downstream of the water treatment plant, or into the raw water supply immediately upstream of the water treatment plant. Injection could either be into a service reservoir or directly into a water pipeline. The water used by consumers could be therefore either undiluted, or slightly diluted recycled water. In this definition, the key distinction with indirect potable reuse is that there is no temporal or spatial separation between the recycled water introduction and its distribution to consumers.

Disinfection. Water treatment which destroys potentially harmful bacteria.

Drainage basin. The area of land from which water drains into a river, for example, the Santa Ana River Basin, in which all land area drains into the Santa Ana River. Also called catchment area, watershed, or river basin.

E

East Side Reservoir Project. A Metropolitan Water District project in Riverside County for the storage of imported water.

Effluent. Wastewater or other liquid, partially or completely treated or in its natural state, flowing from a treatment plant.

Evapotransporation. The quantity of water transpired (given off), retained in plant tissues, and evaporated from plant tissues and surrounding soil surface. Quantitatively, it is expressed in terms of depth of water per unit area during a specified period of time.

F

Flocculation. A chemical process involving addition of a coagulant to assist in the removal of turbidity in water.

Forebay. A portion of a groundwater basin where large quantities of surface water can recharge the basin through infiltration; also a reservoir or pond situated at the intake of a pumping plant or power plant to stabilize water level.

G

Gray water reuse. Reuse, generally without treatment, of domestic type wastewater for toilet flushing, garden irrigation and other nonpotable uses. Excludes water from toilets, kitchen sinks, dishwashers, or water used for washing diapers.

Green Acres Project (GAP). A 7.5 million gallons per day (Mgd) water reclamation project that serves tertiary treated recycled water to irrigation and industrial users in Costa Mesa, Fountain Valley, Huntington Beach, Newport Beach, and Santa Ana.

Groundwater. Water that occurs beneath the land surface and fills partially or wholly pore spaces of the alluvium, soil or rock formation in which it is situated. Does not include water which is being produced with oil in the production of oil and gas or in a bona fide mining operation.

Groundwater basin. A groundwater reservoir defined by all the overlying land surface and the underlying aquifers that contain water stored in the reservoir. Boundaries of successively deeper aquifers may differ and make it difficult to define the limits of the basin.

Groundwater mining. The withdrawal of water from an aquifer in excess of recharge over a period of time. If continued, the underground supply would eventually be exhausted or the water table could drop below economically feasible pumping lifts.

Groundwater overdraft. The condition of a groundwater basin in which the amount of water withdrawn by pumping exceeds the amount of water that recharges the basin over a period of years during which water supply conditions approximate average.

Groundwater recharge. The action of increasing groundwater storage by natural conditions or by human activity. See also: Artificial recharge.

Groundwater Replenishment System. An OCWD/OCSD joint project being developed to provide up to 100,000 acre-feet of reclaimed water annually for groundwater replenishment. Treated wastewater will undergo further treatment at OCWD-using the same technology as bottled water companies-before it is piped northward along the Santa Ana River to replenish the groundwater basin in the inland part of the county. Visit the GWR System website (http://www.gwrsystem.com).

Groundwater table. The upper surface of the zone of saturation (all pores of subsoil filled with water), except where the surface if formed by an impermeable body.

gpm. Gallons per minute.

H

Hydrologic balance. An accounting of all water inflow to, water outflow from, and changes in water storage within a hydrologic unit over a specified period.

Hydrologic cycle. The process by which water constantly circulates from the ocean, to the atmosphere, falling to the earth in some form of precipitation, and finally returning to the ocean.

I

Imported water. Water that has originated from one hydrologic region and is transferred to another hydrologic region. Metropolitan Water District (MWD) of Southern California imports water from the Colorado River and Northern California. MWD's agency in Orange County is the Municipal Water District of Orange County (MWDOC).

Indirect Potable Reuse (Planned). The reclamation and treatment of water from wastewater (usually sewage effluent) and the eventual returning of it into the current/natural water cycle well upstream of the drinking water treatment plant. Planned reuse indicates that there is an intent to reuse the water for potable use. The point of return could either be into a major water supply reservoir, a stream feeding a reservoir, or into a water supply aquifer where natural processes of filtration, and dilution of the water with natural flows aim to reduce any real or perceived risks associated with eventual potable reuse.

Indirect Potable Reuse (Unplanned). Unplanned (or Incidental) indirect potable reuse is wastewater entering the natural water system

(creeks, rivers, lakes, aquifers), which is eventually extracted from the natural system for drinking water

Inflatable rubber dams. Designed to replace temporary sand levees that wash out during heavy storm flow, OCWD's rubber dams hold back high-volume river flows and divert the water into the off-river system for percolation.

In-lieu program. A program offered by OCWD in conjunction with the MWD seasonal storage program that financially encourages groundwater producers to turn off their pumping facilities and use MWD imported water to meet their demands, thereby indirectly replenishing the groundwater basin.

Interruptible water. Water from MWD that is subject to being shut off at any time, thus avilable at a discounted rate.

L

LIMS. Laboratory Information Management System allows water samples to be logged into the computer and the analytical results automatically posted to the WRMS database.

M

Maf. Million acre feet.

MCL. Maximum contaminant level. Set by EPA for a regulated substance in drinking water.

Mgd. Million gallons per day.

Microfiltration. A physical separation process where tiny, hollow straw-like membranes separate particles from water. It is used very effectively as a pre-treatment for reverse osmosis.

mg/L. Milligrams per liter.

N

NPDES. National Pollutant Discharge Elimination System. A federal permit authorized by the Clean Water Act, Title IV, which is required for discharge of pollutants to navigable waters of the United States, which includes any discharge to surface waters-lakes, streams, rivers, bays, the ocean, wetlands, storm sewer, or tributary to any surface water body.

Natural flows. Flows, typically in the Santa Ana River, that are not placed into the system by man-made activities.

Non-interruptible. Water from MWD that is not subject to any interruption.

Non-point source. Wastewater discharge other than from point sources. See also: point source.

O

OCCP. Orange County Coastal Project. The original name of the seawater barrier project at the Fountain Valley site, now known as Water Factory 21.

Operator or owner. Any public or private group or any individual to whom a water producing facility (well) is assessed by the county

assessor, or the person who owns the land upon which a water producing facility is located.

OCWD Annual Engineer's Report. An annual report on the groundwater conditions, water supply, and basin utilization to be delivered in writing to the Secretary of OCWD on the second Wednesday in February of each year.

Overdraft. See: *groundwater overdraft.*

P

Perched groundwater. Groundwater supported by a zone of material of low permeability located above an underlying main body of groundwater with which it is not hydrostatically connected.

Percolation. The downward movement of water through the soil or alluvium to the groundwater table.

Permeability. The capability of soil or other geologic formations to transmit water.

Point source. A specific site from which waste or polluted water is discharged into a water body, the source of which is identified. See also: non-point source.

Potable water. Suitable and safe for drinking.

pb. Parts per billion. Used interchangeably with ug/L (micrograms per liter.)

ppm. Parts per million. Used interchangeably with mg/L (milligrams per liter.)

ppt. Parts per trillion.Used interchangeably with ng/L (nanograms per liter.)

Primary treated water. First major treatment in a wastewater treatment facility, usually sedimentation but not biological oxidation.

Prior appropriation doctrine. Allocates water rights to the first party who diverts water from its natural source and applies the water to beneficial use. If at some point the first appropriator fails to use the water beneficially, another person may appropriate the water and gain rights to the water. The central principle is beneficial use, not land ownership.

Production, producing. The act of extracting groundwater by pumping or otherwise.

psi. Pounds per square inch.

Purveyor. Another name for groundwater producer or pumper.

R

RA. Replenishment assessment, a fee to pump groundwater. A charge on each acre-foot of groundwater extracted from the basin. Income from the RA finances the replenishment of the basin and projects for water recycling and water quality improvements.

Recharge. The physical process where water naturally percolates or sinks into a groundwater basin.

Recharge basin. A surface facility, often a large pond, used to increase the infiltration of surface water into a groundwater basin.

Reclaimed wastewater. Wastewater that becomes suitable for a specific beneficial use as a result of treatment. See also: wastewater reclamation.

Reclamation project. A project where water obtained from a sanitary district or system undergoes additional treatment for a variety of uses, including landscape irrigation, industrial uses, and groundwater recharge.

Recycling. A type of reuse, usually involving running a supply of water through a closed system again and again. Legislation in 1991 legally equates the term "recycled water" to reclaimed water.

Riparian. Of or on the banks of a stream, river, or other body of water.

RO. Reverse osmosis. A method of removing salts or other ions from water by forcing water through a semi-permeable membrane.

S

Safe yield. The maximum quantity of water that can be withdrawn from a groundwater basin over a long period of time without developing a condition of overdraft. Sometimes referred to as sustained yield.

Salinity. Generally, the concentration of mineral salts dissolved in water. Salinity may be measured by weight (total dissolved solids - TDS), electrical conductivity, or osmotic pressure. Where seawater is known to be the major source of salt, salinity is often used to refer to the concentration of chlorides in the water.

SARI. Santa Ana Regional Interceptor. A used water discharge line that runs from the Inland Empire to the Orange County Sanitation District.

SARWQH. Santa Ana River Water Quality and Health Study. An OCWD study to verify the safety of existing recharge operations using Santa Ana River water and to satisfy regulatory concerns with the developing Groundwater Replenishment System.

Seasonal storage. A three-part program offered by MWD.

Seawater intrusion. The movement of salt water into a body of fresh water. It can occur in either surface water or groundwater basins.

Seawater barrier. A physical facility or method of operation designed to prevent the intrusion of salt water into a body of freshwater, such as OCWD's Talbert Barrier or Alamitos Barrier.

SB 1201. Senate Bill 1201 passed in June, 1933. Authorized the formation of the Orange County Water District as a political sub-division of the State of California.

Secondary treatment. Generally, a level of treatment that produces 85 percent removal efficiencies for biological oxygen demand and suspended solids. Usually carried out through the use of trickling filters or by the activated sludge process.

Spreading basin; spreading grounds. See: *recharge basin.*

Storm flow. Surface flow originating from precipitation and run-off which has not percolated to an underground basin.

SWP. State Water Project. An aqueduct system that delivers water from northern California to central and southern California.

Subsidence. Sinking of the land surface due to a number of factors, of which groundwater extraction is one.

Supplemental sources. Sources of water outside the watershed of the Santa Ana River purchased for the replenishment of the groundwater basin or used by an OCWD member agency to meet water demands.

Sustained yield. See safe yield.

T

Talbert Barrier. A series of multipoint injection wells through which OCWD injects water to maintain a seawater barrier. Water from this project is obtained from Water Factory 21 and deep-aquifer wells.

TDS. Total dissolved solids. A quantitative measure of the residual minerals dissolved in water that remain after evaporation of a solution. Usually expressed in milligrams per liter.

Tertiary treatment. The treatment of wastewater beyond the secondary or biological stage. Normally implies the removal of nutrients, such as phosphorous and nitrogen, and a high percentage of suspended solids.

THM. Trihalomethanes. Any of several synthetic organic compounds formed when chlorine or bromine combine with organic materials in water.

Transpiration. The process in which plant tissues give off water vapor to the atmosphere as an essential physiological process.

Turbidity. Thick or opaque with matter in suspension; muddy water.

U

Ultraviolet light disinfection. A disinfection method for water that has received either secondary or tertiary treatment, used as an alternative to chlorination.

V

VOC. Volatile organic compound. A chemical compound which evaporates readily at room temperature and contains carbon.

W

Wastewater. Water that has been previously used by a municipality, industry or agriculture and has suffered a loss of quality as a result of use.

Wastewater reclamation. Treatment and management of municipal, industrial or agricultural wastewater to produce water of suitable quality for additional beneficial uses.

Water Factory 21 (WF-21). Orange County Water District's advanced wastewater purification plant.

Water rights. A legally protected right to take possession of water occurring in a natural waterway and to divert that water for beneficial use.

Water year (OCWD). The period between July 1 of one calendar year to June 30 of the following calendar year.

Water year (USGS). The period between October 1 of one calendar year to September 30 of the following calendar year

Watermaster. A court appointed person(s) that has specific responsibilities to carry out court decisions pertaining to a river system or watershed.

Watershed. The total land area that from which water drains or flows to a river, stream, lake or other body of water.

Weir box. A device to measure and/or control surface water flows in streams or between a series of ponds.

Wellhead treatment. Water quality treatment of water being produced at the well site.

WPF. Water producing facility. Any device or method, mechanical or otherwise, used for the production of water from the groundwater supplies within the District; a water well.

WRMS. Water Resources Management System. Custom computer application, which began development in 1990 to assist District staff with the management and analysis of water resources data. This data includes well information, water quality, water levels, production, and recharge. The system is based on a set of integrated software programs consisting of a relational database (Oracle), computer-aided design (AutoCAD), geographic information system (GIS), and groundwater flow model (MODFLOW)

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Mesa Consolidated Water District

District Mission: Dedicated to Satisfying our Community's Water Needs

February 18, 2010

Mr. Michael Markus, P.E.
General Manager
Orange County Water District
P.O. Box 8300
Fountain Valley, CA 92728-8300

Subject: Orange County Water District Groundwater Basin Equity Assessment (BEA) Exemption Program

Dear Mr. Markus:

Mesa Consolidated Water District (Mesa) and Irvine Ranch Water District (IRWD) appreciate the Orange County Water District (OCWD) efforts in reviewing the Basin Equity Assessment Exemption Program. We encourage OCWD to continue the program and make adjustments to it to make it fair, equitable and consistent between the program participants.

The Basin Production Percentage (BPP) and BEA were established and incorporated into the OCWD District Act in 1969. The BPP and BEA allow OCWD and the producers to control basin pumping and help ensure that the producers have similar overall water supply costs. By maintaining water supply cost equity for all of the producers, no agency is disadvantaged.

The BEA Exemption Program was adopted by the OCWD Board of Directors in 1989 to encourage the production and treatment of impaired quality groundwater. The long term vision of the Board was that removal of poor quality groundwater from the basin would eventually increase the usefulness and productivity of the portions of the groundwater basin suffering from impaired quality. The program utilizes the ability of OCWD to adjust the Basin Equity Assessment (BEA) for the exemption of poor quality groundwater in order to offset the additional treatment costs that are necessary to beneficially use the water. The Board recognized that the exemptions must be sufficient to offset the additional costs and provide a financial incentive to encourage individual producers to participate in the program.

We encourage the Board to consider changes to the current program to make it fair, equitable and consistent between participants of the program. We believe these changes would also better align the program with its original goals. We suggest the following adjustments to update and improve the program: (1) the BEA used for the program should be based on the actual cost participating producers pay for imported water, (2) the incentive amount should be adjusted for inflation, and (3) past accounting procedures should be reviewed and reconciled.

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The BEA is currently established based upon the MWD Tier II rate plus readiness to serve and capacity charges. For agencies that purchase imported water from Municipal Water District of Orange County (MWDOC), an additional component of the rate is the MWDOC charge. The MWDOC producers pay a melded rate that is significantly less than the MWD Tier II rate for imported water. The three cities of Anaheim, Fullerton and Santa Ana typically pay the Tier I rate but potentially could pay the Tier II rate. Prior to 2003, the BEA was established based upon the actual cost producers paid for MWD water. Since 2003, the BEA has been based on the higher MWD Tier II rate. This creates a financial penalty for producers who pump above the BPP that conflicts with the original intent of the BEA exemption program. The BEA exemption program was designed to provide a financial incentive to construct and operate groundwater treatment plants. The formula for the BEA exemption should be modified based on the producers actual cost of MWD water.

The Basin Equity Assessment Exemption Program adopted in 1989 provided a $20/af incentive to produce and treat poor quality groundwater. This amount has not been adjusted as the cost of imported water has increased significantly over time. At the time of the adoption of the program in 1989, the MWD non-interruptible rate was $230/af. The incentive was approximately ten percent of the MWD rate. We suggest that the incentive be adjusted from a flat $20/af to a percentage of the MWD Tier I treated water rate to provide adequate incentive for producers to undertake the increased risk of constructing and operating groundwater treatment facilities.

We support a program review committee for the Basin Equity Assessment Exemption Program comprised of representatives from OCWD and the participating agencies. This committee can suggest changes to the current accounting procedures to reflect adjustments made to make the program fair, equitable and consistent for all program participants. Changes that should be incorporated include: (1) factoring in grants and subsidies when calculating the exemption amount, (2) limiting the program to approximately ten percent of total water demands within OCWD, and (3) allowing modification or replacement costs to be included as additional capital costs provided the additional costs are based on new conditions and/or regulatory requirements impacting the project and cost to replace necessary equipment that has reached the end of its useful life.

Thank you for your consideration on this matter. We look forward to future discussions with OCWD staff and other producers to continue this valuable program in a manner that is fair, equitable and consistent among the program participants.

Sincerely,

Paul Shoenberger
General Manager, Mesa Consolidated Water District

Paul Jones II
General Manager, Irvine Ranch Water District

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cc: Greg Heiertz, IRWD

State Water Resources Control Board

Policy for Water Quality Control for Recycled Water (Recycled Water Policy)

Revised January 22, 2013
Effective April 25, 2013

STATE WATER RESOURCES CONTROL BOARD
RESOLUTION NO. 2013-0003

ADOPTION OF AN AMENDMENT TO THE POLICY FOR WATER QUALITY CONTROL FOR RECYCLED WATER CONCERNING MONITORING REQUIREMENTS FOR CONSTITUTENTS OF EMERGING CONCERN

WHEREAS:

1. Provisions of the Policy for Water Quality Control for Recycled Water (Recycled Water Policy), adopted under Resolution No. 2009-0011, directed the State Water Resources Control Board (State Water Board) to convene a "blue-ribbon" advisory panel (Panel) to provide guidance on future actions related to monitoring constituents of emerging concern (CECs) in recycled water.

2. In June 2010, the Panel submitted a report titled "Monitoring Strategies for Chemicals of Emerging Concern (CECs) in Recycled Water – Recommendations of a Science Advisory Panel" (Report), which presented recommendations for monitoring CECs in municipal recycled water used for groundwater recharge.

3. In December 2010, the State Water Board held a public hearing regarding the Panel's Report and received public comments.

4. In May 2012, staff circulated a draft amendment to the Recycled Water Policy that: (1) proposed, in accordance with the Panel's recommendations, monitoring requirements for CECs and surrogates in recycled water used for groundwater recharge; and (2) proposed a reduction of priority pollutant monitoring of recycled water used for landscape irrigation.

5. In July 2012, a scientific peer review of the draft amendment and the Panel's Report was conducted.

6. Staff reviewed comments received on the draft amendment from the public and peer reviewers and issued a revised draft amendment on September 14, 2012. Written comments were received on this draft prior to an October 9, 2012, due date.

7. The State Water Board held a public hearing on October 16, 2012, to consider adoption of the draft amendment. At the hearing, the adoption was postponed to refine the responses to comments and allow additional time for public review.

8. The Natural Resources Agency has approved the State Water Board's and the Regional Water Quality Control Boards' water quality control planning process as a "certified regulatory program" that adequately satisfies the California Environmental Quality Act requirements for preparing environmental documents. The amendment concerns monitoring requirements for priority pollutants and constituents of emerging concern. It is not a "project" as defined by title 14, California Code of Regulations chapter 3, Guidelines for Implementation of the California Environmental Quality Act. Hence, approval of an environmental document is not required to adopt the amendment.

THEREFORE BE IT RESOLVED THAT:

The State Water Board

1. Adopts the amendment to the Recycled Water Policy.

2. Directs State Water Board Staff to submit the amended Recycled Water Policy to the Office of Administrative Law (OAL) for final approval.

3. Directs the Executive Director or designee to make minor, non-substantive modifications to the language of the amendment, if OAL determines during its approval process that such changes are needed; and directs the Executive Director to inform the State Water Board of any such changes.

CERTIFICATION

The undersigned Clerk to the Board does hereby certify that the foregoing is a full, true, and correct copy of a resolution duly and regularly adopted at a meeting of the State Water Resources Control Board held on January 22, 2013.

AYE:	Vice Chair Frances Spivy-Weber Board Member Tam M. Doduc Board Member Steven Moore
NAY:	None
ABSENT:	Chairman Charles R. Hoppin Board Member Felicia Marcus
ABSTAIN:	None

Jeanine Townsend

Jeanine Townsend
Clerk to the Board

Recycled Water Policy

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Recycled Water Policy

1. *Preamble*

California is facing an unprecedented water crisis.

The collapse of the Bay-Delta ecosystem, climate change, and continuing population growth have combined with a severe drought on the Colorado River and failing levees in the Delta to create a new reality that challenges California's ability to provide the clean water needed for a healthy environment, a healthy population and a healthy economy, both now and in the future.

These challenges also present an unparalleled opportunity for California to move aggressively towards a sustainable water future. The State Water Resources Control Board (State Water Board) declares that we will achieve our mission to "preserve, enhance and restore the quality of California's water resources to the benefit of present and future generations." To achieve that mission, we support and encourage every region in California to develop a salt/nutrient management plan by 2014 that is sustainable on a long-term basis and that provides California with clean, abundant water. These plans shall be consistent with the Department of Water Resources' Bulletin 160, as appropriate, and shall be locally developed, locally controlled and recognize the variability of California's water supplies and the diversity of its waterways. We strongly encourage local and regional water agencies to move toward clean, abundant, local water for California by emphasizing appropriate water recycling, water conservation, and maintenance of supply infrastructure and the use of stormwater (including dry-weather urban runoff) in these plans; these sources of supply are drought-proof, reliable, and minimize our carbon footprint and can be sustained over the long-term.

We declare our independence from relying on the vagaries of annual precipitation and move towards sustainable management of surface waters and groundwater, together with enhanced water conservation, water reuse and the use of stormwater. To this end, we adopt the following goals for California:

- Increase the use of recycled water over 2002 levels by at least one million acre-feet per year (afy) by 2020 and by at least two million afy by 2030.
- Increase the use of stormwater over use in 2007 by at least 500,000 afy by 2020 and by at least one million afy by 2030.
- Increase the amount of water conserved in urban and industrial uses by comparison to 2007 by at least 20 percent by 2020.
- Included in these goals is the substitution of as much recycled water for potable water as possible by 2030.

As modified by
State Water Board Resolution 2013-0003
(January 22, 2013)

The purpose of this Policy is to increase the use of recycled water from municipal wastewater sources that meets the definition in Water Code section 13050(n), in a manner that implements state and federal water quality laws. The State Water Board expects to develop additional policies to encourage the use of stormwater, encourage water conservation, encourage the conjunctive use of surface and groundwater, and improve the use of local water supplies.

When used in compliance with this Policy, Title 22 and all applicable state and federal water quality laws, the State Water Board finds that recycled water is safe for approved uses, and strongly supports recycled water as a safe alternative to potable water for such approved uses.

2. *Purpose of the Policy*

a. The purpose of this Policy is to provide direction to the Regional Water Quality Control Boards (Regional Water Boards), proponents of recycled water projects, and the public regarding the appropriate criteria to be used by the State Water Board and the Regional Water Boards in issuing permits for recycled water projects.

b. It is the intent of the State Water Board that all elements of this Policy are to be interpreted in a manner that fully implements state and federal water quality laws and regulations in order to enhance the environment and put the waters of the state to the fullest use of which they are capable.

c. This Policy describes permitting criteria that are intended to streamline the permitting of the vast majority of recycled water projects. The intent of this streamlined permit process is to expedite the implementation of recycled water projects in a manner that implements state and federal water quality laws while allowing the Regional Water Boards to focus their limited resources on projects that require substantial regulatory review due to unique site-specific conditions.

d. By prescribing permitting criteria that apply to the vast majority of recycled water projects, it is the State Water Board's intent to maximize consistency in the permitting of recycled water projects in California while also reserving to the Regional Water Boards sufficient authority and flexibility to address site-specific conditions.

e. The State Water Board will establish additional policies that are intended to assist the State of California in meeting the goals established in the preamble to this Policy for water conservation and the use of stormwater.

f. For purposes of this Policy, the term “permit” means an order adopted by a Regional Water Board or the State Water Board prescribing requirements for a recycled water project, including but not limited to water recycling requirements, master reclamation permits, and waste discharge requirements.

3. *Benefits of Recycled Water*

The State Water Board finds that the use of recycled water in accordance with this Policy, that is, which supports the sustainable use of groundwater and/or surface water, which is sufficiently treated so as not to adversely impact public health or the environment and which ideally substitutes for use of potable water, is presumed to have a beneficial impact. Other public agencies are encouraged to use this presumption in evaluating the impacts of recycled water projects on the environment as required by the California Environmental Quality Act (CEQA).

4. *Mandate for the Use of Recycled Water*

a. The State Water Board and Regional Water Boards will exercise the authority granted to them by the Legislature to the fullest extent possible to encourage the use of recycled water, consistent with state and federal water quality laws.

(1) The State Water Board hereby establishes a mandate to increase the use of recycled water in California by 200,000 afy by 2020 and by an additional 300,000 afy by 2030. These mandates shall be achieved through the cooperation and collaboration of the State Water Board, the Regional Water Boards, the environmental community, water purveyors and the operators of publicly owned treatment works. The State Water Board will evaluate progress toward these mandates biennially and review and revise as necessary the implementation provisions of this Policy in 2012 and 2016.

(2) Agencies producing recycled water that is available for reuse and not being put to beneficial use shall make that recycled water available to water purveyors for reuse on reasonable terms and conditions. Such terms and conditions may include payment by the water purveyor of a fair and reasonable share of the cost of the recycled water supply and facilities.

(3) The State Water Board hereby declares that, pursuant to Water Code sections 13550 *et seq*., it is a waste and unreasonable use of water for water agencies not to use recycled water when recycled water of adequate quality is available and is not being put to beneficial use, subject to the conditions established in sections 13550 *et seq*. The State Water Board shall exercise its authority pursuant to Water Code section 275 to the fullest extent possible to enforce the mandates of this subparagraph.

b. These mandates are contingent on the availability of sufficient capital funding for the construction of recycled water projects from private, local, state, and federal sources and assume that the Regional Water Boards will effectively implement regulatory streamlining in accordance with this Policy.

c. The water industry and the environmental community have agreed jointly to advocate for $1 billion in state and federal funds over the next five years to fund projects needed to meet the goals and mandates for the use of recycled water established in this Policy.

d. The State Water Board requests the California Department of Public Health (CDPH), the California Public Utilities Commission (CPUC), and the California Department of Water Resources (CDWR) to use their respective authorities to the fullest extent practicable to assist the State Water Board and the Regional Water Boards in increasing the use of recycled water in California.

5. *Roles of the State Water Board, Regional Water Boards, CDPH and CDWR*

The State Water Board recognizes that it shares jurisdiction over the use of recycled water with the Regional Water Boards and with CDPH. In addition, the State Water Board recognizes that CDWR and the CPUC have important roles to play in encouraging the use of recycled water. The State Water Board believes that it is important to clarify the respective roles of each of these agencies in connection with recycled water projects, as follows:

a. The State Water Board establishes general policies governing the permitting of recycled water projects consistent with its role of protecting water quality and sustaining water supplies. The State Water Board exercises general oversight over recycled water projects, including review of Regional Water Board permitting practices, and shall lead the effort to meet the recycled water use goals set forth in the Preamble to this Policy. The State Water Board is also charged by statute with developing a general permit for irrigation uses of recycled water.

b. The CDPH is charged with protection of public health and drinking water supplies and with the development of uniform water recycling criteria appropriate to particular uses of water. Regional Water Boards shall appropriately rely on the expertise of CDPH for the establishment of permit conditions needed to protect human health.

c. The Regional Water Boards are charged with protection of surface and groundwater resources and with the issuance of permits that implement CDPH recommendations, this Policy, and applicable law and will, pursuant to paragraph 4 of this Policy, use their authority to the fullest extent possible to encourage the use of recycled water.

d. CDWR is charged with reviewing and, every five years, updating the California Water Plan, including evaluating the quantity of recycled water presently being used and planning for the potential for future uses of recycled water. In undertaking these tasks, CDWR may appropriately rely on urban water management plans and may share the data from those plans with the State Water Board and the Regional Water Boards. CDWR also shares with the State Water Board the authority to allocate and distribute bond funding, which can provide incentives for the use of recycled water.

e. The CPUC is charged with approving rates and terms of service for the use of recycled water by investor-owned utilities.

6. *Salt/Nutrient Management Plans*

a. Introduction.

(1) Some groundwater basins in the state contain salts and nutrients that exceed or threaten to exceed water quality objectives established in the applicable Water Quality Control Plans (Basin Plans), and not all Basin Plans include adequate implementation procedures for achieving or ensuring compliance with the water quality objectives for salt or nutrients. These conditions can be caused by natural soils/conditions, discharges of waste, irrigation using surface water, groundwater or recycled water and water supply augmentation using surface or recycled water. Regulation of recycled water alone will not address these conditions.

(2) It is the intent of this Policy that salts and nutrients from all sources be managed on a basin-wide or watershed-wide basis in a manner that ensures attainment of water quality objectives and protection of beneficial uses. The State Water Board finds that the appropriate way to address salt and nutrient issues is through the development of regional or subregional salt and nutrient management plans

rather than through imposing requirements solely on individual recycled water projects.

b. Adoption of Salt/ Nutrient Management Plans.

(1) The State Water Board recognizes that, pursuant to the letter dated December 19, 2008 and attached to the Resolution adopting this Policy, the local water and wastewater entities, together with local salt/nutrient contributing stakeholders, will fund locally driven and controlled, collaborative processes open to all stakeholders that will prepare salt and nutrient management plans for each basin/sub-basin in California, including compliance with CEQA and participation by Regional Water Board staff.

(a) It is the intent of this Policy for every groundwater basin/sub-basin in California to have a consistent salt/nutrient management plan. The degree of specificity within these plans and the length of these plans will be dependent on a variety of site-specific factors, including but not limited to size and complexity of a basin, source water quality, stormwater recharge, hydrogeology, and aquifer water quality. It is also the intent of the State Water Board that because stormwater is typically lower in nutrients and salts and can augment local water supplies, inclusion of a significant stormwater use and recharge component within the salt/nutrient management plans is critical to the long-term sustainable use of water in California. Inclusion of stormwater recharge is consistent with State Water Board Resolution No. 2005-0006, which establishes sustainability as a core value for State Water Board programs and also assists in implementing Resolution No. 2008-0030, which requires sustainable water resources management and is consistent with Objective 3.2 of the State Water Board Strategic Plan Update dated September 2, 2008.

(b) Salt and nutrient plans shall be tailored to address the water quality concerns in each basin/sub-basin and may include constituents other than salt and nutrients that impact water quality in the basin/sub-basin. Such plans shall address and implement provisions, as appropriate, for all sources of salt and/or nutrients to groundwater basins, including recycled water irrigation projects and groundwater recharge reuse projects.

(c) Such plans may be developed or funded pursuant to the provisions of Water Code sections 10750 *et seq.* or other appropriate authority.

(d) Salt and nutrient plans shall be completed and proposed to the Regional Water Board within five years from the date of this Policy unless a Regional Water Board finds that the stakeholders are making substantial progress towards completion of a plan. In no case shall the period for the completion of a plan exceed seven years.

(e) The requirements of this paragraph shall not apply to areas that have already completed a Regional Water Board approved salt and nutrient plan for a basin, sub-basin, or other regional planning area that is functionally equivalent to paragraph 6(b)3.

(f) The plans may, depending upon the local situation, address constituents other than salt and nutrients that adversely affect groundwater quality.

(2) Within one year of the receipt of a proposed salt and nutrient management plan, the Regional Water Boards shall consider for adoption revised implementation plans, consistent with Water Code section 13242, for those groundwater basins within their regions where water quality objectives for salts or nutrients are being, or are threatening to be, exceeded. The implementation plans shall be based on the salt and nutrient plans required by this Policy.

(3) Each salt and nutrient management plan shall include the following components:

(a) A basin/sub-basin wide monitoring plan that includes an appropriate network of monitoring locations. The scale of the basin/sub-basin monitoring plan is dependent upon the site-specific conditions and shall be adequate to provide a reasonable, cost-effective means of determining whether the concentrations of salt, nutrients, and other constituents of concern as identified in the salt and nutrient plans are consistent with applicable water quality objectives. Salts, nutrients, and the constituents identified in paragraph 6(b)(1)(f) shall be monitored. The frequency of monitoring shall be determined in the salt/nutrient management plan and approved by the Regional Water Board pursuant to paragraph 6(b)(2).

(i) The monitoring plan must be designed to determine water quality in the basin. The plan must focus on basin water quality near water supply wells and areas proximate to large water recycling projects, particularly groundwater recharge projects. Also, monitoring locations shall, where appropriate, target groundwater and surface waters where groundwater has connectivity with adjacent surface waters.

(ii) The preferred approach to monitoring plan development is to collect samples from existing wells if feasible as long as the existing wells are located appropriately to determine water quality throughout the most critical areas of the basin.

(iii) The monitoring plan shall identify those stakeholders responsible for conducting, compiling, and reporting the monitoring data. The data shall be reported to the Regional Water Board at least every three years.

(b) A provision for annual monitoring of Constituents of Emerging Concern (e.g., endocrine disrupters, personal care products or pharmaceuticals) (CECs) consistent with recommendations by CDPH and consistent with any actions by the State Water Board taken pursuant to paragraph 10(b) of this Policy.

(c) Water recycling and stormwater recharge/use goals and objectives.

(d) Salt and nutrient source identification, basin/sub-basin assimilative capacity and loading estimates, together with fate and transport of salts and nutrients.

(e) Implementation measures to manage salt and nutrient loading in the basin on a sustainable basis.

(f) An antidegradation analysis demonstrating that the projects included within the plan will, collectively, satisfy the requirements of Resolution No. 68-16.

(4) Nothing in this Policy shall prevent stakeholders from developing a plan that is more protective of water quality than applicable standards in the Basin Plan. No Regional Water Board, however, shall seek to modify Basin Plan objectives without full compliance

with the process for such modification as established by existing law.

7. *Landscape Irrigation Projects*[1]

a. *Control of incidental runoff.* Incidental runoff is defined as unintended small amounts (volume) of runoff from recycled water use areas, such as unintended, minimal over-spray from sprinklers that escapes the recycled water use area. Water leaving a recycled water use area is not considered incidental if it is part of the facility design, if it is due to excessive application, if it is due to intentional overflow or application, or if it is due to negligence. Incidental runoff may be regulated by waste discharge requirements or, where necessary, waste discharge requirements that serve as a National Pollutant Discharge Elimination System (NPDES) permit, including municipal separate storm water system permits, but regardless of the regulatory instrument, the project shall include, but is not limited to, the following practices:

(1) Implementation of an operations and management plan that may apply to multiple sites and provides for detection of leaks, (for example, from broken sprinkler heads), and correction either within 72 hours of learning of the runoff, or prior to the release of 1,000 gallons, whichever occurs first,

(2) Proper design and aim of sprinkler heads,

(3) Refraining from application during precipitation events, and

(4) Management of any ponds containing recycled water such that no discharge occurs unless the discharge is a result of a 25-year, 24-hour storm event or greater, and there is notification of the appropriate Regional Water Board Executive Officer of the discharge.

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[1] Specified uses of recycled water considered "landscape irrigation" projects include any of the following:
i. Parks, greenbelts, and playgrounds;
ii. School yards;
iii. Athletic fields;
iv. Golf courses;
v. Cemeteries;
vi. Residential landscaping, common areas;
vii. Commercial landscaping, except eating areas;
viii. Industrial landscaping, except eating areas; and
ix. Freeway, highway, and street landscaping.

b. *Streamlined Permitting.*

(1) The Regional Water Boards shall, absent unusual circumstances (i.e., unique, site-specific conditions such as where recycled water is proposed to be used for irrigation over high transmissivity soils over a shallow (5' or less) high quality groundwater aquifer), permit recycled water projects that meet the criteria set forth in this Policy, consistent with the provisions of this paragraph.

(2) If the Regional Water Board determines that unusual circumstances apply, the Regional Water Board shall make a finding of unusual circumstances based on substantial evidence in the record, after public notice and hearing.

(3) Projects meeting the criteria set forth below and eligible for enrollment under requirements established in a general order shall be enrolled by the State or Regional Water Board within 60 days from the date on which an application is deemed complete by the State or Regional Water Board. For projects that are not enrolled in a general order, the Regional Water Board shall consider permit adoption within 120 days from the date on which the application is deemed complete by the Regional Water Board.

(4) Landscape irrigation projects that qualify for streamlined permitting shall not be required to include a project specific receiving water and groundwater monitoring component unless such project specific monitoring is required under the adopted salt/nutrient management plan. During the interim while the salt management plan is under development, a landscape irrigation project proponent can either perform project specific monitoring, or actively participate in the development and implementation of a salt/nutrient management plan, including basin/sub-basin monitoring. Permits or requirements for landscape irrigation projects shall include, in addition to any other appropriate recycled water monitoring requirements, monitoring for priority pollutants in the recycled water at the recycled water production facility once per year, except when the recycled water production facility has a design production flow for the entire water reuse system of one million gallons per day or less. For these smaller facilities, the recycled water shall be monitored for priority pollutants once every five years.

(5) It is the intent of the State Water Board that the general permit for landscape irrigation projects be consistent with the terms of this Policy.

c. *Criteria for streamlined permitting*. Irrigation projects using recycled water that meet the following criteria are eligible for streamlined permitting, and, if otherwise in compliance with applicable laws, shall be approved absent unusual circumstances:

(1) Compliance with the requirements for recycled water established in Title 22 of the California Code of Regulations, including the requirements for treatment and use area restrictions, together with any other recommendations by CDPH pursuant to Water Code section 13523.

(2) Application in amounts and at rates as needed for the landscape (i.e., at agronomic rates and not when the soil is saturated). Each irrigation project shall be subject to an operations and management plan, that may apply to multiple sites, provided to the Regional Water Board that specifies the agronomic rate(s) and describes a set of reasonably practicable measures to ensure compliance with this requirement, which may include the development of water budgets for use areas, site supervisor training, periodic inspections, tiered rate structures, the use of smart controllers, or other appropriate measures.

(3) Compliance with any applicable salt and nutrient management plan.

(4) Appropriate use of fertilizers that takes into account the nutrient levels in the recycled water. Recycled water producers shall monitor and communicate to the users the nutrient levels in their recycled water.

8. *Recycled Water Groundwater Recharge Projects*

a. The State Water Board acknowledges that all recycled water groundwater recharge projects must be reviewed and permitted on a site-specific basis, and so such projects will require project-by-project review.

b. Approved groundwater recharge projects will meet the following criteria:

(1) Compliance with regulations adopted by CDPH for groundwater recharge projects or, in the interim until such regulations are approved, CDPH's recommendations pursuant to Water Code section 13523 for the project (e.g., level of treatment, retention time, setback distance, source control, monitoring program, etc.).

(2) Implementation of a monitoring program for CECs that is consistent with Attachment A and any recommendations from CDPH.

Groundwater recharge projects shall include monitoring of recycled water for priority pollutants twice per year.

c. Nothing in this paragraph shall be construed to limit the authority of a Regional Water Board to protect designated beneficial uses, *provided* that any proposed limitations for the protection of public health may only be imposed following regular consultation by the Regional Water Board with CDPH, consistent with State Water Board Orders WQ 2005-0007 and 2006-0001.

d. Nothing in this Policy shall be construed to prevent a Regional Water Board from imposing additional requirements for a proposed recharge project that has a substantial adverse effect on the fate and transport of a contaminant plume or changes the geochemistry of an aquifer thereby causing the dissolution of constituents, such as arsenic, from the geologic formation into groundwater.

e. Projects that utilize surface spreading to recharge groundwater with recycled water treated by reverse osmosis shall be permitted by a Regional Water Board within one year of receipt of recommendations from CDPH. Furthermore, the Regional Water Board shall give a high priority to review and approval of such projects.

9. *Antidegradation*

a. The State Water Board adopted Resolution No. 68-16 as a policy statement to implement the Legislature's intent that waters of the state shall be regulated to achieve the highest water quality consistent with the maximum benefit to the people of the state.

b. Activities involving the disposal of waste that could impact high quality waters are required to implement best practicable treatment or control of the discharge necessary to ensure that pollution or nuisance will not occur, and the highest water quality consistent with the maximum benefit to the people of the state will be maintained.

c. Groundwater recharge with recycled water for later extraction and use in accordance with this Policy and state and federal water quality law is to the benefit of the people of the state of California. Nonetheless, the State Water Board finds that groundwater recharge projects using recycled water have the potential to lower water quality within a basin. The proponent of a groundwater recharge project must demonstrate compliance with Resolution No. 68-16. Until such time as a salt/nutrient management plan is in effect, such compliance may be demonstrated as follows:

(1) A project that utilizes less than 10 percent of the available assimilative capacity in a basin/sub-basin (or multiple projects utilizing less than 20 percent of the available assimilative capacity in a basin/sub-basin) need only conduct an antidegradation analysis verifying the use of the assimilative capacity. For those basins/sub-basins where the Regional Water Boards have not determined the baseline assimilative capacity, the baseline assimilative capacity shall be calculated by the initial project proponent, with review and approval by the Regional Water Board, until such time as the salt/nutrient plan is approved by the Regional Water Board and is in effect. For compliance with this subparagraph, the available assimilative capacity shall be calculated by comparing the mineral water quality objective with the average concentration of the basin/sub-basin, either over the most recent five years of data available or using a data set approved by the Regional Water Board Executive Officer. In determining whether the available assimilative capacity will be exceeded by the project or projects, the Regional Water Board shall calculate the impacts of the project or projects over at least a ten year time frame.

(2) In the event a project or multiple projects utilize more than the fraction of the assimilative capacity designated in subparagraph (1), then a Regional Water Board-deemed acceptable antidegradation analysis shall be performed to comply with Resolution No. 68-16. The project proponent shall provide sufficient information for the Regional Water Board to make this determination. An example of an approved method is the method used by the State Water Board in connection with Resolution No. 2004-0060 and the Regional Water Board in connection with Resolution No. R8-2004-0001. An integrated approach (using surface water, groundwater, recycled water, stormwater, pollution prevention, water conservation, etc.) to the implementation of Resolution No. 68-16 is encouraged.

d. Landscape irrigation with recycled water in accordance with this Policy is to the benefit of the people of the State of California. Nonetheless, the State Water Board finds that the use of water for irrigation may, regardless of its source, collectively affect groundwater quality over time. The State Water Board intends to address these impacts in part through the development of salt/nutrient management plans described in paragraph 6.

(1) A project that meets the criteria for a streamlined irrigation permit and is within a basin where a salt/nutrient management plan satisfying the provisions of paragraph 6(b) is in place may be

approved without further antidegradation analysis, provided that the project is consistent with that plan.

(2) A project that meets the criteria for a streamlined irrigation permit and is within a basin where a salt/nutrient management plan satisfying the provisions of paragraph 6(b) is being prepared may be approved by the Regional Water Board by demonstrating through a salt/nutrient mass balance or similar analysis that the project uses less than 10 percent of the available assimilative capacity as estimated by the project proponent in a basin/sub-basin (or multiple projects using less than 20 percent of the available assimilative capacity as estimated by the project proponent in a basin/sub-basin).

10. *Constituents of Emerging Concern*

a. General Provisions

(1) Regulatory requirements for recycled water shall be based on the best available peer-reviewed science. In addition, all uses of recycled water must meet conditions set by CDPH.

(2) Knowledge of risks will change over time and recycled water projects must meet legally applicable criteria. However, when standards change, projects should be allowed time to comply through a compliance schedule.

(3) The state of knowledge regarding CECs is incomplete. There needs to be additional research and development of analytical methods and surrogates to determine potential environmental and public health impacts. Agencies should minimize the likelihood of CECs impacting human health and the environment by means of source control and/or pollution prevention programs.

(4) Regulating most CECs will require significant work to develop test methods and more specific determinations as to how and at what level CECs impact public health or our environment.

b. Research Program

(1) The State Water Board, in consultation with CDPH, convened a “blue-ribbon” advisory panel to guide future actions relating to CECs.

(a) The panel was actively managed by the State Water Board and was composed of the following: one human health toxicologist, one environmental toxicologist, one epidemiologist, one biochemist, one civil engineer familiar with the design and construction of recycled water treatment facilities, and one chemist familiar with the design and operation of advanced laboratory methods for the detection of emerging constituents. Each of these panelists had extensive experience as a principal investigator in their respective areas of expertise.

(b) The panel reviewed the scientific literature and submitted a report to the State Water Board and CDPH that described the current state of scientific knowledge regarding the risks of CECs to public health and the environment. In December 2010, the State Water Board, in coordination with CDPH, held a public hearing to hear a presentation on the report and to receive comments from stakeholders.

(c) The State Water Board considered the panel report and the comments received and adopted an amendment to the Policy establishing monitoring requirements for CECs in recycled water. These monitoring requirements are prescribed in Attachment A.

(2) The panel or a similarly constituted panel shall update the report every five years. The next update is due in June 2015.

(a) Each updated report shall recommend actions that the State of California should take to improve our understanding of CECs and, as may be appropriate, to protect public health and the environment.

(b) The updated reports shall answer the following questions: What are the appropriate constituents to be monitored in recycled water, including analytical methods and method detection limits? What is the known toxicological information for the above constituents? Would the above lists change based on level of treatment and use? If so, how? What are possible indicators that represent a suite of CECs? What levels of CEC's should trigger enhanced monitoring of CEC's in recycled water, groundwater and/or surface waters?

(c) Within six months from receipt of an updated report, the State Water Board shall hold a hearing to consider recommendations from staff and shall endorse the

recommendations, as appropriate, after making any necessary modifications.

c. Permit Provisions

Permits for recycled water projects shall be consistent with any CDPH recommendations to protect public health and the monitoring requirements prescribed in Attachment A.

11. *Incentives for the Use of Recycled Water*

a. Funding

The State Water Board will request CDWR to provide priority funding for projects that have major recycling components; particularly those that decrease demand on potable water supplies. The State Water Board will also request priority funding for stormwater recharge projects that augment local water supplies. The State Water Board shall promote the use of the State Revolving Fund (SRF) for water purveyor, stormwater agencies, and water recyclers to use for water reuse and stormwater use and recharge projects.

b. Stormwater

The State Water Board strongly encourages all water purveyors to provide financial incentives for water recycling and stormwater recharge and reuse projects. The State Water Board also encourages the Regional Water Boards to require less stringent monitoring and regulatory requirements for stormwater treatment and use projects than for projects involving untreated stormwater discharges.

c. TMDLs

Water recycling reduces mass loadings from municipal wastewater sources to impaired waters. As such, waste load allocations shall be assigned as appropriate by the Regional Water Boards in a manner that provides an incentive for greater water recycling.

ATTACHMENT A

Requirements for Monitoring Constituents of Emerging Concern in Recycled Water

As modified by
State Water Board Resolution 2013-0003
(January 22, 2013)

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As modified by
State Water Board Resolution 2013-0003
(January 22, 2013)

ATTACHMENT A

REQUIREMENTS FOR MONITORING CONSTITUENTS OF EMERGING CONCERN FOR RECYCLED WATER

The purpose of this attachment to the Recycled Water Policy (Policy) is to provide direction to the Regional Water Quality Control Boards (Regional Water Boards) on monitoring requirements for constituents of emerging concern[2] (CECs) in recycled municipal wastewater, herein referred to as "recycled water." The monitoring requirements and criteria for evaluating monitoring results in the Policy are based on recommendations from a Science Advisory Panel[3]. The monitoring requirements pertain to the production and use of recycled water for groundwater recharge reuse[4] by surface and subsurface application methods. The monitoring requirements apply to recycled water producers, including entities that further treat or enhance the quality of recycled water supplied by municipal wastewater treatment facilities, and groundwater recharge reuse facilities.

Groundwater recharge by surface application is the controlled application of water to a spreading area for infiltration resulting in the recharge of a groundwater basin. Subsurface application is the controlled application of water to a groundwater basin or aquifer by a means other than surface application, such as direct injection through a well.

The California Department of Public Health (CDPH) shall be consulted for any additional monitoring requirements for recycled water use found necessary by CDPH to protect human health.

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[2] For this Policy, CECs are defined to be chemicals in personal care products, pharmaceuticals including antibiotics, antimicrobials; industrial, agricultural, and household chemicals; hormones; food additives; transformation products, inorganic constituents; and nanomaterials.

[3] The Science Advisory Panel was convened in accordance with provision 10.b. of the Policy. The panel's recommendations were presented in the report; *Monitoring Strategies for Chemicals of Emerging Concern (CECs) in Recycled Water – Recommendations of a Science Advisory Panel*, dated June 25, 2010.

[4] As used in this attachment, use of recycled water for groundwater recharge reuse has the same meaning as indirect potable reuse for groundwater recharge as defined in Water Code section 13561(c), where it is defined as the planned use of recycled water for replenishment of a groundwater basin or an aquifer that has been designated as a source of water supply for a public water system.

As modified by
State Water Board Resolution 2013-0003
(January 22, 2013)

1. CECS AND SURROGATES

Within this Policy, CECs of toxicological relevance to human health are referred to as "health-based CECs."[5] CECs determined not to have human health relevance, but useful for monitoring treatment process effectiveness, are referred to as "performance indicator CECs." A performance indicator CEC is an individual CEC used for evaluating a family of CECs with similar physicochemical or biodegradable characteristics. The removal of a performance indicator CEC through a treatment process provides an indication of removal of CECs with similar properties. A health-based CEC may also serve as a performance indicator CEC.

A surrogate is a measurable physical or chemical property, such as chlorine residual or electrical conductivity, that can be used to measure the effectiveness of trace organic compound removal by treatment process and/or provide an indication of a treatment process failure. A reverse osmosis (RO) treatment process, for example, is expected to substantially reduce the electrical conductivity of the recycled water being treated. This reduction in the level of the surrogate also provides an indication that inorganic and organic compounds, including CECs, are being removed.

Recycled water monitoring programs used for groundwater recharge reuse shall include monitoring for: (1) human health-based CECs; (2) performance indicator CECs; and (3) surrogates. The purpose of monitoring performance indicator CECs and surrogates is to assess the effectiveness of unit processes to remove CECs. For this policy for groundwater recharge reuse, unit processes that remove CECs include RO, advanced oxidation processes (AOPs), and soil aquifer treatment.[6] AOPs are treatment processes involving the use of oxidizing agents, such as hydrogen peroxide and ozone, combined with ultraviolet light irradiation. Soil aquifer treatment is a natural treatment process that removes CECs as water passes through soil, the vadose zone, and within an aquifer.

This Policy provides CEC monitoring requirements for recycled water which undergoes additional treatment by soil aquifer treatment or by RO followed by AOPs. CEC monitoring requirements for groundwater recharge reuse projects implementing treatment processes that provide control of CECs by processes other than soil aquifer treatment or RO/AOPs shall be established on a case-by-case basis by the State Water Board in consultation with CDPH.

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[5] Heath-based CECs were determined through a screening process that was developed and conducted by the CEC Science Advisory Panel; *Monitoring Strategies for Chemicals of Emerging Concern (CECs) in Recycled Water – Recommendations of a Science Advisory Panel*, dated June 25, 2010.

[6] For evaluating removal of CECs, the treatment zone for soil aquifer treatment is from the surface of the application area through the unsaturated zone to groundwater, including groundwater within a 30-day travel time distance through the aquifer downgradient of the surface application area.

Monitoring of health-based CECs or performance indicator CECs is not required for recycled water used for landscape irrigation due to the low risk for ingestion of the water.[7]

1.1. CECs for Monitoring Programs

This Policy provides requirements for monitoring CECs in recycled water used for groundwater recharge reuse. The Regional Water Boards shall not issue requirements for monitoring of additional CECs in recycled water beyond the requirements provided in this Policy except when recommended by CDPH or requested by the project proponent.

Table 1 provides the health-based CECs and performance indicator CECs to be monitored along with their respective reporting limits. All CECs listed for a recycled water application shall be monitored during an initial assessment monitoring phase, as described in Section 3.1. Based on monitoring results and findings, the list of performance indicator CECs required for monitoring may be refined for subsequent monitoring phases. The health-based CECs listed in Table 1 shall be monitored during the entirety of the initial assessment and baseline monitoring phases (Sections 3.1 and 3.2). Based on the results of the baseline monitoring phase and/or subsequent monitoring, the list of health-based CECs required for monitoring may be revised. The method for evaluation of monitoring results for health-based CECs is provided in Section 4.2.

Quality assurance and quality control measures shall be used for both collection of samples and laboratory analysis work. The project proponent shall develop a quality assurance project plan that includes the appropriate number of field blanks, laboratory blanks, replicate samples, and matrix spikes.

[7] "For monitoring programs to assess CEC threats for urban irrigation reuse, none of the chemicals for which measurement methods and exposure data are available exceeded the threshold for monitoring priority. This is largely attributable to higher Monitoring Trigger Levels (MTLs), because of reduced water ingestion in a landscape irrigation setting compared to drinking water." MTLs are health-based screening level values for CECs for a particular water reuse scenario. MTLs were established in, *Monitoring Strategies for Chemicals of Emerging Concern (CECs) in Recycled Water – Recommendations of a Science Advisory Panel*, dated June 25, 2010.

Table 1 – CECs to be Monitored

Constituent	Constituent Group	Relevance/Indicator Type	Reporting Limit (µg/L)
GROUNDWATER RECHARGE REUSE - SURFACE APPLICATION			
17β-estradiol	Steroid hormones	Health	0.001
Caffeine	Stimulant	Health & Performance	0.05
N-Nitrosodimethylamine (NDMA)	Disinfection byproduct	Health	0.002
Triclosan	Antimicrobial	Health	0.05
Gemfibrozil	Pharmaceutical	Performance	0.01
Iopromide	Pharmaceutical	Performance	0.05
N,N-Diethyl-meta-toluamide (DEET)	Personal care product	Performance	0.05
Sucralose	Food additive	Performance	0.1
GROUNDWATER RECHARGE REUSE - SUBSURFACE APPLICATION			
17β-estradiol	Steroid hormones	Health	0.001
Caffeine	Stimulant	Health & Performance	0.05
NDMA	Disinfection byproduct	Health & Performance	0.002
Triclosan	Antimicrobial	Health	0.05
DEET	Personal care product	Performance	0.05
Sucralose	Food additive	Performance	0.1

µg/L – Micrograms per liter

Analytical methods for laboratory analysis of CECs shall be selected to achieve the reporting limits presented in Table 1. The analytical methods shall be based on methods published by the United States Environmental Protection Agency, methods certified by CDPH, or peer reviewed and published methods that have been reviewed by CDPH, including those published by voluntary consensus standards bodies such as the Standards Methods Committee and the American Society for Testing and Materials International. Any modifications to the published or certified methods shall be reviewed by CDPH and subsequently submitted to the Regional Water Board in an updated quality assurance project plan.

1.2. Surrogates for Monitoring Programs

Table 2 presents a list of surrogates that shall be considered for monitoring treatment of recycled water used for groundwater recharge reuse. Other surrogates not listed in Table 2 may also be considered.

Table 2: Surrogates

GROUNDWATER RECHARGE REUSE - SURFACE APPLICATION
Ammonia
Total Organic Carbon (TOC)
Nitrate
Ultraviolet (UV) Light Absorption
GROUNDWATER RECHARGE REUSE - SUBSURFACE APPLICATION
Electrical Conductivity
TOC

The project proponent shall propose surrogates to monitor on a case-by-case basis appropriate for the treatment process or processes. The Regional Water Board shall review and approve the selected surrogates in consultation with CDPH.

Where applicable, surrogates may be measured using on-line or hand-held instruments provided that instrument calibration procedures are implemented in accordance with the manufacturer's specifications and that calibration is documented.

2. MONITORING LOCATIONS

Monitoring locations for CECs and surrogates are described in this section.

2.1. Health-Based CEC Monitoring Locations

2.1.1. Groundwater Recharge Reuse - Surface Application

For groundwater recharge reuse projects implementing surface application of recycled water, health-based CECs shall be monitored at these locations:

(1) Following tertiary treatment[8] prior to application to the surface spreading area; and

(2) At monitoring well locations designated in consultation with CDPH within the distance groundwater travels downgradient from the application site in 30 days.

Monitoring locations for health-based CECs for the phases of monitoring are presented in Tables 3 through 5.

2.1.2. Groundwater Recharge Reuse - Subsurface Application

For groundwater recharge reuse projects implementing subsurface application of recycled water, health-based CECs shall be monitored at a location following treatment prior to release into an aquifer.

2.2. Performance Indicator CEC and Surrogate Monitoring Locations

To allow evaluation of individual unit processes or a combination of unit processes that provide removal of CECs, performance indicator CECs and surrogates shall be monitored at the locations described below and presented in Tables 3 through 5.

2.2.1. Groundwater Recharge Reuse - Surface Application

For groundwater recharge reuse projects using surface application of recycled water, performance indicator CECs and surrogates shall be monitored at these locations:

(1) Following tertiary treatment prior to application to the surface spreading area; and

(2) At monitoring well locations designated in consultation with CDPH within the distance groundwater travels downgradient from the application site in 30 days.

Monitoring locations for performance indicator CECs and surrogates for the phases of monitoring are presented in Tables 3 through 5.

2.2.2. Groundwater Recharge Reuse - Subsurface Application

For groundwater recharge reuse projects using subsurface application of recycled water, performance indicator CECs shall be monitored in recycled water at these locations:

(1) Prior to treatment by RO; and

[8] Standards for disinfected tertiary recycled water presented in California Code of Regulations, Title 22, section 60301.230 and 60301.320.

(2) Following treatment prior to release to the aquifer.

If the project proponent can demonstrate that the RO unit will not substantially remove a CEC, the Regional Water Board may allow monitoring for that CEC prior to the AOPs, instead of prior to the RO unit.

For groundwater recharge reuse projects using subsurface application of recycled water, surrogates shall be monitored at locations proposed by the project proponent and approved by the Regional Water Board in consultation with CDPH.

3. PHASED MONITORING REQUIREMENTS

The Regional Water Board shall phase the monitoring requirements for CECs and surrogates for groundwater recharge reuse projects. The purpose of phased monitoring is to allow monitoring requirements for health-based CECs, performance indicator CECs and surrogates to be refined based on the monitoring results and findings of the previous phase. An initial assessment monitoring phase, followed by a baseline monitoring phase, shall be conducted to determine the project-specific monitoring requirements for standard operations. The initial assessment and baseline monitoring phases shall be conducted after CDPH approval for groundwater recharge reuse project operation.

3.1. Initial Assessment Monitoring Phase

The purposes of the initial assessment phase are to: (1) identify the occurrence of health-based CECs, performance indicator CECs, and surrogates in recycled water and groundwater;[9] (2) determine treatment effectiveness; (3) define the project-specific performance indicator CECs and surrogates to monitor during the baseline phase; and (4) specify the expected removal percentages for performance indicator CECs and surrogates. The monitoring requirements for the initial assessment monitoring phase shall apply to the start-up of new facilities, piloting of new unit processes at existing facilities, and existing facilities where CECs and surrogates have not been assessed equivalent to the requirements of this Policy. Data from prior assessment need not replicate the exact frequency and duration of the initial assessment phase requirements specified in Table 3, if the overall robustness and size of the data are sufficient to adequately characterize the CECs, surrogates, and treatment performance. The initial assessment monitoring phase shall be conducted for a period of one year.

During the initial assessment monitoring phase for the applicable recycled water application method, each of the health-based CECs and performance indicator CECs

[9] The identification of the occurrence of health-based CECs, performance indicator CECs, and surrogates in groundwater only applies to groundwater recharge reuse by surface application.

listed in Table 1 and appropriate surrogates (see Section 1.2) shall be monitored. Surrogates shall be selected to monitor individual unit processes or combinations of unit processes that remove CECs. Performance indicator CEC and surrogate monitoring results that demonstrate measurable removal for a given unit process shall be candidates for use in the monitoring programs for the baseline and standard operation phases. Monitoring requirements for the initial assessment phase are summarized in Table 3.

For existing groundwater recharge reuse projects, historic monitoring data may be used to assess the occurrence and removal of CECs and surrogates. Existing projects demonstrating prior assessment of CECs and surrogates equivalent to the initial assessment phase requirements of this Policy may skip the initial monitoring phase and initiate the baseline monitoring phase requirements in Section 3.2.
Monitoring results shall be evaluated following each sampling event to allow timely implementation of any response actions. If evaluation of monitoring results indicates a concern, such as finding a concentration of a health-based CEC above the thresholds described in Table 7, more frequent monitoring may be required to further evaluate the effectiveness of the treatment process. Additional actions may also be warranted, which may include, but not be limited to, resampling to confirm a result, additional monitoring, implementation of a source identification program, toxicological studies, engineering removal studies, and/or modification of facility operations. If additional monitoring is required, the Regional Water Board shall consult with CDPH and revise the Monitoring and Reporting Program as appropriate. Evaluation of monitoring results and determination of appropriate response actions based on the monitoring results are presented in Section 4.

Following completion of the initial assessment monitoring phase, monitoring requirements shall be re-evaluated and subsequent requirements for the baseline monitoring phase shall be determined on a project-specific basis.

3.2. Baseline Monitoring Phase

Based on the findings of the initial assessment monitoring phase, project-specific performance indicator CECs and surrogates shall be selected for monitoring during the baseline monitoring phase. The purpose of the baseline monitoring phase is to assess and refine which health-based CECs, performance indicator CECs and surrogates are appropriate to monitor the removal of CECs and treatment system performance for the standard operation of a facility. Performance indicator CECs and surrogates that exhibited reduction by unit processes and/or provided an indication of operational performance shall be selected for monitoring during the baseline monitoring phase. Surrogates not reduced through a unit process are not good indicators of the unit's intended performance. For example, soil aquifer treatment may not effectively lower electrical conductivity. Therefore, electrical conductivity may not be a good surrogate for soil aquifer treatment. The baseline monitoring phase shall be conducted for a period

of three years following the initial assessment monitoring phase. Monitoring requirements for the baseline phase are summarized in Table 4. If a performance indicator CEC listed in Table 1 is found not to be a good indicator, the project proponent shall propose an alternative performance indicator CEC representative of the constituent group to monitor. This performance indicator CEC shall be subject to approval by the Regional Water Board in consultation with CDPH.

For existing groundwater recharge reuse projects, historic monitoring data may be used to assess removal of health-based CECs, performance indicator CECs and surrogates. Existing projects that can demonstrate prior assessment of CECs and surrogates equivalent to the initial assessment phase and baseline phase requirements of this Policy may be eligible for the standard operation monitoring requirements.

Monitoring results shall be evaluated following each sampling event to allow timely implementation of any response actions. If evaluation of monitoring results indicates a concern, such as finding a concentration of a health-based CEC above the thresholds described in Table 7, more frequent monitoring may be required to further evaluate the effectiveness of the treatment process. Additional actions may also be warranted, which may include, but not be limited to, resampling to confirm a result, additional monitoring, implementation of a source identification program, toxicological studies, engineering removal studies, and/or modification of facility operation. If additional monitoring is required, the Regional Water Board shall consult with CDPH and revise the Monitoring and Reporting Program as appropriate. Evaluation of monitoring results and determination of appropriate response actions based on the monitoring results are presented in Section 4.

Following the baseline operation monitoring phase, monitoring requirements shall be re-evaluated and subsequent requirements for the standard operation of a project shall be determined on a project-specific basis.

Table 3: Initial Assessment Phase Monitoring Requirements

Recycled Water Use	Constituent	Frequency	Monitoring Point
Groundwater Recharge Reuse- Surface Application	Health-Based CECs and Performance Indicator CECs: All listed in Table 1.	Quarterly[1]	- Following tertiary treatment prior to application to surface spreading area. - At monitoring well locations designated in consultation with CDPH.[2]
	Surrogates: To be selected on a project-specific basis.[5]	1st 3 months: To be determined on a project-specific basis.[3]	- Following tertiary treatment prior to application to the surface spreading area. - At monitoring well locations designated in consultation with CDPH.[2]
		3-12 months: To be determined on a project-specific basis.[3]	- Following tertiary treatment prior to application to the surface spreading area. - At monitoring well locations designated in consultation with CDPH.[2]
Groundwater Recharge Reuse -Subsurface Application	Health-Based CECs: All listed in Table 1.	Quarterly[1]	Following treatment prior to release to the aquifer.
	Performance Indicator CECs: All listed in Table 1.	Quarterly[1]	- Prior to RO treatment.[4] - Following treatment prior to release to the aquifer.
	Surrogates: To be selected on a project-specific basis.[5]	To be determined on a project-specific basis.	- At locations approved by the Regional Water Board.[6]

1 – This is the initial monitoring frequency for the monitoring and reporting program. The Regional Water Board may require additional monitoring to respond to a concern as stated in Section 3.1.
2 – Groundwater within the distance groundwater travels downgradient from the application site in 30-days.
3 – The monitoring frequency shall be determined by the Regional Water Board in consultation with CDPH. The intent is to have an increased monitoring frequency during the first three months and a decreased monitoring frequency after three months.
4 – If the project proponent can demonstrate that the RO unit will not substantially remove a CEC, the Regional Water Board may allow monitoring for that CEC prior to the AOP, instead of prior to the RO unit.
5 – See Section 1.2 for guidance on selection of surrogates.
6 – See Section 2.2.2 for information on surrogate monitoring locations for subsurface application.

Table 4: Baseline Phase Monitoring Requirements

Recycled Water Use	Constituent	Frequency	Monitoring Point
Groundwater Recharge Reuse – Surface Application	Health-Based CECs: All listed in Table 1. Performance Indicator CECs: Selected based on the findings of the initial assessment phase.	Semi-Annually[1]	- Following tertiary treatment prior to application to the surface spreading area. - At monitoring well locations designated in consultation with CDPH.[2]
	Surrogates: Selected based on the findings of the initial assessment phase.	Based on findings of the initial assessment phase. .	- Following tertiary treatment prior to application to the surface spreading area. - At monitoring well locations designated in consultation with CDPH.[2]
Groundwater Recharge Reuse – Subsurface Application	Health-Based CECs: All listed in Table 1.	Semi-Annually[1]	Following treatment prior to release to the aquifer.
	Performance Indicator CECs: Selected based on the findings of the initial assessment phase.	Semi-Annually[1]	- Prior to RO treatment.[3] - Following treatment prior to release to the aquifer.
	Surrogates: Selected based on the findings of the initial assessment phase.	Based on findings of the initial assessment phase.	- At locations approved by the Regional Water Board.[4]

1 – More frequent monitoring may be required to respond to a concern as stated in Section 3.2.
2 – Groundwater within the distance groundwater travels downgradient from the application site in 30-days.
3 – If the project proponent can demonstrate that the RO unit will not substantially remove a CEC, the Regional Water Board may allow monitoring for that CEC prior to the AOP, instead of prior to the RO unit.
4 – See Section 2.2.2 for information on surrogate monitoring locations for subsurface application.

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3.3. Standard Operation Monitoring

Based on the findings of the baseline monitoring phase, monitoring requirements for health-based CECs, performance indicator CECs and surrogates may be refined to establish project-specific requirements for monitoring the standard operating conditions of a groundwater recharge reuse project. Monitoring requirements for the standard operation phase are summarized in Table 5. The list of health-based CECs may be revised to remove a health-based CEC from the list if monitoring results meet the conditions of the minimum threshold level presented in Table 7. Performance indicator CECs and surrogates that exhibited reduction by a unit process and/or provided an indication of operational performance shall be selected for monitoring of standard operations. If a performance indicator CEC is found to be a poor indicator, the project proponent shall propose an alternative performance indicator CEC representative of the constituent group to monitor. This performance indicator CEC shall be subject to approval by the Regional Water Board in consultation with CDPH.

Monitoring locations for the standard operation phase shall be the same as the locations used for the baseline monitoring phase.

Monitoring for health-based CECs and performance indicator CECs shall be conducted on a semi-annual basis, unless the project demonstrates consistency in treatment effectiveness in removal of CECs, treatment operational performance, and appropriate recycled water quality. These projects may be monitored for CECs on an annual basis. Monitoring frequencies for CECs and surrogates for standard operation monitoring are presented in Table 5.

Monitoring results shall be evaluated following each sampling event to allow timely implementation of any response actions. If evaluation of monitoring results indicates a concern, such as finding a health-based CEC above the thresholds described in Table 7 or a decline in removal of a performance indicator CEC from the performance levels established during the initial and baseline monitoring phases, more frequent monitoring may be required to further evaluate the effectiveness of the treatment process. Additional actions may also be warranted, which may include, but not be limited to, resampling to confirm a result, additional monitoring, implementation of a source identification program, toxicological studies, engineering removal studies, and/or modification of facility operation. If additional monitoring is required, the Regional Water Board shall consult with CDPH and revise the Monitoring and Reporting Program as appropriate. Evaluation of monitoring results and determination of appropriate response actions based on the monitoring results are presented in Section 4.

Table 5: Standard Operation Monitoring Requirement

Recycled Water Use	Constituent	Frequency	Monitoring Point
Groundwater Recharge Reuse - Surface Application	Health-Based CECs: Selected based on the findings of the baseline phase.	Semi-Annually or Annually[1]	- Following tertiary treatment prior to application to the surface spreading area. - At monitoring well locations designated in consultation with CDPH.[2]
	Performance Indicator CECs: Selected based on the findings of the baseline phase.		
	Surrogates: Selected based on the findings of the baseline phase.	Based on findings of the baseline assessment phase.	- Following tertiary treatment prior to application to the surface spreading area. - At monitoring well locations designated in consultation with CDPH.[2]
Groundwater Recharge Reuse - Subsurface Application	Health-Based CECs: Selected based on the findings of the baseline phase	Semi-Annually or Annually[1]	-Following ~~RO/AOPs~~ treatment prior to release to the aquifer.
	Performance Indicator CECs: Selected based on the findings of the baseline phase.	Semi-Annually or Annually[1]	- Prior to RO treatment.[3] - Following treatment prior to release to the aquifer.
	Surrogates: Selected based on the findings of the baseline phase,	Based on findings of the baseline assessment phase.	At locations approved by the Regional Water Board.[4]

1 – More frequent monitoring may be required to respond to a concern as stated in Section 3.3.
2 – Groundwater within the distance groundwater travels downgradient from the application site in 30-days.
3 – If the project proponent can demonstrate that the RO unit will not substantially remove a CEC, the Regional Water Board may allow monitoring for that CEC prior to the AOP, instead of prior to the RO unit.
4 – See Section 2.2.2 for information on surrogate monitoring locations for subsurface application.

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4. EVALUATION OF CEC AND SURROGATE MONITORING RESULTS

This section presents the approaches for evaluating treatment process performance and health-based CEC monitoring results. Monitoring results for performance indicator CECs and surrogates shall be used to evaluate the operational performance of a treatment process and the effectiveness of a treatment process in removing CECs. For evaluation of health-based CEC monitoring results, a multi-tiered approach of thresholds and corresponding response actions is presented in Section 4.2. The evaluation of monitoring results shall be included in monitoring reports submitted to the Regional Water Board and CDPH.

4.1 Evaluation of Performance Indicator CEC and Surrogate Results

The effectiveness of a treatment process to remove CECs shall be evaluated by determining the removal percentages for performance indicator CECs and surrogates. The removal percentage is the difference in the concentration of a compound in recycled water prior to and after a treatment process (e.g., soil aquifer treatment or RO followed by AOPs), divided by the concentration prior to the treatment process and multiplied by 100.

$$\text{Removal Percentage} = ([X_{in} - X_{out}]/X_{in})\ (100)$$

X_{in} - Concentration in recycled water prior to a treatment process
X_{out} - Concentration in recycled water after a treatment process

During the initial assessment, the recycled water project proponent shall monitor performance to determine removal percentages for performance indicator CECs and surrogates. The removal percentages shall be confirmed during the baseline monitoring phase. One example of removal percentages from Drews et. al. (2008) for each application scenario and their associated processes (i.e. soil aquifer treatment or RO/AOPs) is presented in Table 6. The established removal percentages for each project shall be used to evaluate treatment effectiveness and operational performance.

4.1.1. Groundwater Recharge Reuse – Surface Application

For groundwater recharge reuse by surface application, the removal percentage shall be determined by comparing the quality of the recycled water applied to a surface spreading area to the quality of groundwater at monitoring wells. The distance between the application site and the monitoring wells shall be no more than the distance the groundwater travels in 30 days downgradient from the application site. The location of the monitoring wells shall be designated in consultation with CDPH. The removal percentage shall be adjusted to account for dilution from potable water applied to the application site, storm water applied to the application site, and native groundwater.

As modified by
State Water Board Resolution 2013-0003
(January 22, 2013)

The removal percentage shall also be adjusted to account for CECs in these waters. The project proponent shall submit a proposal to the Regional Water Board and CDPH as part of its operation plan on how it will perform this accounting.

4.1.2. Groundwater Recharge Reuse – Subsurface Application

For groundwater recharge reuse using subsurface application, the removal percentage shall be determined by comparing recycled water quality before treatment by RO/AOPs and after treatment prior to release to the aquifer.

Table 6: Monitoring Trigger Levels and Removal Percentages

Constituent/ Parameter	Relevance/Indicator Type/Surrogate	Monitoring Trigger Level (micrograms/liter)[1]	Removal Percentages (%)[2]
GROUNDWATER RECHARGE REUSE - SURFACE APPLICATION[3]			
17β-estradiol	Health	0.0009	--[4]
Caffeine	Health & Performance	0.35	>90
NDMA	Health	0.01	--
Triclosan	Health	0.35	--
Gemfibrozil	Performance	--	>90
Iopromide	Performance	--	>90
DEET	Performance	--	>90
Sucralose	Performance	--	<25[5]
Ammonia	Surrogate	--	>90
TOC	Surrogate	--	>30
Nitrate	Surrogate	--	>30
UV Absorption	Surrogate	--	>30
GROUNDWATER RECHARGE REUSE - SUBSURFACE APPLICATION[6]			
17β-estradiol	Health	0.0009	--
Caffeine	Health & Performance	0.35	>90
NDMA	Health & Performance	0.01	25-50, >80[7]
Triclosan	Health	0.35	--
DEET	Performance	--	>90
Sucralose	Performance	--	>90
Electrical Conductivity	Surrogate	--	>90
TOC	Surrogate	--	>90

1 – Monitoring trigger levels for groundwater recharge reuse and landscape irrigation applications were established in *Monitoring Strategies for Chemicals of Emerging Concern (CECs) in Recycled Water – Recommendations of a Science Advisory Panel*, dated June 25, 2010.
2 –The removal percentages presented in this table are from work by Drewes et.al. (2008) and provide an example of performance for that specific research. Project specific removal percentages will be developed for each groundwater recharge reuse project during the initial and baseline monitoring phases.
3 – Treatment process: Soil aquifer treatment. The stated removal percentages are examples and need to be finalized during the initial and baseline monitoring phases for a given site.
4 – Not applicable
5 – Sucralose degrades poorly during soil aquifer treatment. It is included here mainly as a tracer.
6 – Treatment process: Reverse osmosis and advanced oxidation process.
7 – For treatment using reverse osmosis, removal percentage is between 25 and 50 percent. For treatment using reverse osmosis and advanced oxidation processes, removal percentage is greater than 80 percent.

4.2. Evaluation of Health-Based CEC Results

The project proponent shall evaluate health-based CEC monitoring results. To determine the appropriate response actions, the project proponent shall compare measured environmental concentrations (MECs) to their respective monitoring trigger levels[10] (MTLs) listed in Table 6 to determine MEC/MTL ratios. The project proponent shall compare the calculated MEC/MTL ratios to the thresholds presented in Table 7 and shall implement the response actions corresponding to the threshold.

For surface application, the results shall be evaluated for groundwater collected from the monitoring wells. For subsurface application projects, results shall be evaluated for the recycled water released to the aquifer.

Table 7: MEC/MTL Thresholds and Response Actions

MC/MTL Threshold	Response Action
If greater than 75 percent of the MEC/MTL ratio results for a CEC are less than or equal to 0.1 during the baseline monitoring phase and/or subsequent monitoring -	A) After completion of the baseline monitoring phase, consider requesting removal of the CEC from the monitoring program.
If MEC/MTL ratio is greater than 0.1 and less than or equal to 1 -	B) Continue to monitor.
If MEC/MTL ratio is greater than 1 and less than or equal to 10 -	C) Check the data. Continue to monitor.
If MEC/MLT ratio is greater than 10 and less than or equal to 100 -	D) Resample immediately and analyze to confirm CEC result. Continue to monitor.
If MEC/MLT ratio is greater than 100 -	E) Resample immediately and analyze to confirm result. Continue to monitor. Contact the Regional Water Board and CDPH to discuss additional actions. (Additional actions may include, but are not limited to, additional monitoring, toxicological studies, engineering removal studies, modification of facility operation, implementation of a source identification program, and monitoring at additional locations.)

[10] Monitoring Trigger Level (MTL): Health-based screening level value for a CEC for a particular water reuse scenario. MTLs were established in, *Monitoring Strategies for Chemicals of Emerging Concern (CECs) in Recycled Water – Recommendations of a Science Advisory Panel*, dated June 25, 2010.

August 21, 2014

Glenda Sanders
Presiding Judge of the Superior Court
700 Civic Center Drive West
Santa Ana, CA 92701

and

Orange County Grand Jury
700 Civic Center Drive West
Santa Ana, CA 92701

SUBJECT: MAY 28, 2014 GRAND JURY REPORT "SUSTAINABLE AND RELIABLE ORANGE COUNTY WATER SUPPLY: ANOTHER ENDANGERED SPECIES?"

Dear Judge Sanders:

As required by the May 28, 2014 Grand Jury letter the Orange County Water District (District or OCWD) has reviewed the report "Sustainable and Reliable Orange County Water Supply: Another Endangered Species?"

OCWD applauds and supports the Grand Jury's efforts to investigate and report on water supply and reliability issues. Unfortunately too many of our residents and businesses do not appreciate or understand the complicated issues the water community must manage and address on a daily basis to ensure sufficient water supplies are always available. This report will help inform the community of those issues and some of the choices that lay before us.

The Grand Jury has requested that the District respond to Findings F.2, F.3, F.5, F.7 and F.9, and Recommendations R.1 – R.5. The original Findings and Recommendations are provided below, along with the District's response in **bold** type.

FINDINGS (2,3,5,7 and 9)

As to each Grand Jury finding, the responding person or entity shall indicate one of the following:

WITNESS MARKOS
EXHIBIT 31
DATE 10-11-17 RPTR NH
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(1) The respondent agrees with the finding.

(2) The respondent disagrees wholly or partially with the finding, in which case the response shall specify the portion of the finding that is disputed and shall include an explanation of the reasons therefore.

F.2. The BDCP is an expensive, long-term, ($25 billion in capital and operations over 50 years) plan yet to be approved or funded project to restore the Bay Delta and improve exported water source reliability. The future effects of climate change on water allocations and the vulnerability of the dual, under delta tunnels have not been well defined and should be developed further before MWDOC allocates significant resources to its implementation.

OCWD disagrees partially with Finding F.2. OCWD agrees that the BDCP is an expensive project and that issues such as climate change and the vulnerability of the delta tunnels should be fully vetted before the project is considered for construction. However over 25% of the water supplies Southern California relies upon comes from Northern California. And these supplies have been reduced in recent years due to environmental issues and concerns regarding the general health of the Sacramento delta ecosystem. The general goal of the BDCP, which the District supports, is to restore and secure the water supplies Southern California has relied upon while improving the local delta environment.

F.3. Most of the local and County water sources have been developed and optimized. Some additional capture of ground water and recycling of municipal waste water is in various stages of planning and execution, but these options are progressively more expensive to execute and, by themselves, are not game changers.

OCWD disagrees with Finding F.3. The Groundwater Replenishment System (GWRS) is currently being expanded from 70 million gallons per day (mgd) to 100 mgd which will add another 31,000 acre-feet per year of local water supply. This additional amount of water would meet the entire needs of the City of Huntington Beach. OCWD has also started preparing documents to consider expanding the GWRS project from 100 mgd to 130 mgd which would add another 31,000 acre-feet per year of local water supply.

Additionally the Orange County Sanitation District recently established a policy to attempt to recycle all wastewater that it receives and treats. After accounting for the wastewater that would be used to expand the GWRS as

previously described, approximately another 30,000 acre-feet per year of wastewater would be available to recycle and put to beneficial use.

OCWD also understands that South Orange County agencies that are outside of the District's service territory are considering recycling projects that could generate significant amounts of new water supplies.

Recycled water facilities, especially indirect potable reuse projects, are less expensive than either imported water or seawater desalination. These projects are game changers because they result in giving the region a reliable source of water supply at the lowest cost. Maximizing the recycled water supply in any region should be the first priority for sustainable water resource management.

F.5. The largest, yet to be developed source of local water is the Pacific ocean. Two OC desalination projects are being evaluated by regulatory agencies and OC water districts, [redacted] 50 Mgd Huntington Beach project and the MWDOC's Doheny Coastal Ocean Desalination Project rated at 15 Mgd potable/15 Mgd barrier injection at Doheny Beach.

OCWD disagrees partially with Finding F.5. As mentioned in the District's response to Finding F.3., there still exists a large opportunity to implement additional recycled water projects in Orange County. OCWD currently is evaluating potentially purchasing the 56,000 acre-feet of water from the proposed Huntington Beach project. The District believes that the Doheny project's capacity may have been overstated.

F.7. The local OC water supply is less vulnerable to major events because of a number of innovative retail water supplier and OCWD efforts. The primary focus has been on large waste or surface run-off water reclamation, increased winter and emergency storage, conservation and rate pricing strategies, preventative maintenance, back-up and redundant equipment, and a large number of interconnections between district distribution pipelines.

OCWD agrees with Finding F.7.

F.9. Permitting large water infrastructure construction projects consumes many years, and cuts across many agencies and jurisdictions. Permitting issues are frequently used by stakeholder special interests to manipulate outcomes that are not always consistent with the public's greater good.

OCWD partially disagrees with Finding F.9. The District concurs that

navigating the California environmental laws and the various regulatory agencies' permitting processes can be time consuming and expensive. However OCWD does not completely agree that permitting issues are "frequently" used by special interest to manipulate outcomes.

RECOMMENDATIONS (1-5)

As to each Grand Jury recommendation, the responding person or entity shall report one of the following actions:

(1) The recommendation has been implemented, with a summary regarding the implemented action.

(2) The recommendation has not yet been implemented, but will be implemented in the future, with a time frame for implementation.

(3) The recommendation requires further analysis, with an explanation and the scope and parameters of an analysis or study, and a time frame for the matter to be prepared for discussion by the officer or head of the agency or department being investigated or reviewed, including the governing body of the public agency when applicable. This time frame shall not exceed six months from the date of publication of the Grand Jury report.

Based on its investigation of water reliability and sustainability in Orange County, the 2013-2014 Orange County Grand Jury makes the following five recommendations:

R.1. MWDOC and OCWD should assemble and finance a strong inter-agency (OCWD, MWDOC, and select retailers) advocacy group to drive the final permitting and construction of several large scale seawater desalination plants with the objective of significantly accelerating the process and shortening project schedules. (F.1. through F.6.), (F.10.)

Implementation of Recommendation R.1 requires further analysis. MWDOC and OCWD can continue efforts regarding clarification and streamlining of permitting issues related to seawater desalination, but advocacy groups such as CalDesal should be the primary sources to effect that change. Each water agency statewide needs to assess its own needs and make a determination if seawater desalination is appropriately a part of its water supply portfolio.

OCWD and other local water agencies are routinely meeting to consider the proposed Huntington Beach project. Determining if and when the project

should be constructed is very complicated. Additionally MWDOC may take the lead in preparing an Orange County Water Reliability Study this fiscal year which would provide additional analysis on the project.

OCWD has also hired a consultant to assist in evaluating funding options and financial issues with the project. This work is expected to be completed within three months.

R.2. MWDOC and OCWD should work with legislators, contractors, other stakeholders, and the regulatory agencies to streamline and accelerate the large infrastructure permitting process. The goal should be the development of a one-stop agency capable of representing and adjudicating conflicting or overlapping agency permit requirements. (F.9.), (F.10.)

Implementation of Recommendation R.2 requires further analysis. OCWD agrees with the spirit of the recommendation. However there are several state agencies that must approve a project such as an ocean desalination plant. The effort the Grand Jury is recommending would require the commitment of significant resources and a sustained effort over several years. Numerous groups, political leaders and agencies from around the state would need to be involved with a small likelihood of success in the District's opinion given current state-wide policies.

R.3. MWDOC and OCWD should develop an interconnection process flow network diagram connecting all relevant OC agencies (City, County, and MET) and use it to investigate the impact of "what if" scenarios (various emergency outages due to failed wells and pumping stations, damaged piping, etc.) which could impact local district water supplies. Close coordination of resources and plans is necessary to integrate the local OC water infrastructure. (F.7.)

Implementation of Recommendation R.3 requires further analysis. OCWD agrees with this recommendation however it will require further analysis as the recommendation directly impacts and requires the participation of the local retail water agencies. To some extent this recommendation has already been implemented. Many retail water agencies in the county have already constructed interconnections with their neighboring agencies for emergency scenarios. Additionally agreements have been executed to allow groundwater to be transported to South Orange County agencies during emergency events. This issue will also be included as part of the previously mentioned Orange County Water Reliability Study that will be completed this fiscal year.

R.4. MWDOC should continue to monitor and support the BDCP, but a favorable resolution of water supply allocations and tunnel vulnerability issues is required before significant resources should be expended. (F.2.), (F.8.)

Recommendation R.4 is specific to MWDOC, and does not seek any action from OCWD. OCWD has no response.

R.5. MWDOC and OCWD should consider merging into a single wholesale agency to better evaluate, coordinate, and integrate more complex strategies involving the allocation and distribution of ground and imported water under emergency and climate change impacts. This merger would facilitate the implementation of Recommendations 1-4. (F.1.), (F.4.), (F.6.)

Recommendation R.5 has been implemented. OCWD and MWDOC are having on-going discussions to consider merging. OCWD agrees that a merger could improve the coordination and integration of groundwater and imported water supplies in the region.

We trust and hope that the Grand Jury has found our responses informative and adequate. As the Grand Jury has learned with the preparation of this report, water supply and reliability issues are complicated. The District's board of directors, general manager and staff are always available to meet with the Grand Jury to discuss and analyze water issues. Please call our General Manager Mr. Mike Markus at (714) 378-3201 to arrange any further meetings.

Shawn Dewane
Orange County Water District
Board President

cc. OCWD Directors
MWDOC General Manager

SINCE 1933

Compilation of Orange County Water District Policy Principles

July 2015

WITNESS Markus
EXHIBIT 32
DATE 11-17 RPTR MH
eLitigation Services Inc.

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SEAWATER INTRUSION PREVENTION POLICY

The Orange County groundwater basin is a valuable natural resource that must be protected for future generations. Seawater intrusion represents a significant water quality threat to the groundwater basin. The control and prevention of seawater intrusion will continue to be one of the Orange County Water District's (OCWD) key basin management responsibilities. The District will take actions necessary to:

- Prevent degradation of the quality of the groundwater basin from seawater intrusion.
- Effectively operate and evaluate the performance of OCWD's seawater barrier facilities.
- Adequately identify and track trends in seawater intrusion in susceptible coastal areas and evaluate and act upon this information, as needed, to protect the groundwater basin.

SANTA ANA RIVER WATERSHED WATER RESOURCES POLICY PRINCIPLES

The Orange County Water District (OCWD) and other agencies in the Santa Ana River (SAR) watershed have discussed developing water resources policy principles that encourage a coordinated response and a comprehensive SAR watershed approach to protect water resources in an environmentally responsible manner and that support the development of additional water supplies in the watershed.

- OCWD supports collaboration among all stakeholders in the Santa Ana River (SAR) Watershed.
- Because of the large population in the watershed, natural resource values, and the inter-related nature of activities in watershed, it is vitally important that stakeholders work together to maximize water resources in an environmentally responsible manner.
- OCWD supports placing a high priority on developing additional water supplies for the watershed and collaboration among agencies in the watershed to maximize efficient use of water resources throughout the watershed.
- For proposed water resource projects that may affect the rate of flow in the Santa Ana River or its tributaries, OCWD supports evaluating the net impact of the project at the scale of the entire SAR Watershed.
- The goal should be to fund projects that increase the net water supplies of the watershed.

POLICY FOR DIRECT USE OF GWRS WATER SUPPLIES BY GROUNDWATER PRODUCERS AND INDUSTRIAL USERS

The Orange County Water District (OCWD) began operating the Groundwater Replenishment System (GWRS) in January 2008. The project includes a 13.6 mile pipeline traveling up the west levy of the Santa Ana River to OCWD's recharge facilities in the City of Anaheim. Interested Groundwater Producers can apply to OCWD to directly utilize GWRS water supplies. OCWD will evaluate each application individually however the general conditions below will apply to all request.

- Applicant is responsible for all cost and maintenance of necessary pipelines, pumps, meters and connections and the permitting there of;
- OCWD must approve all construction documents of necessary pipelines and connections;
- The price of the water needs to be determined on a case-by-case basis;
- OCWD can temporarily discontinue providing water to Applicant at any time for any reason. Applicant will need to provide a back-up source of water;
- The project water quality shall only conform to the regulatory requirements necessary to percolate the water at OCWD's Anaheim recharge facilities;
- Applicant will provide the appropriate indemnification to OCWD;
- OCWD will sell water to local retail water agencies as a wholesaler similar to the existing Green Acres Project arrangements;
- GWRS water will be treated as neutral water regarding the Producers annual Basin Production Percentage calculation just as is Green Acres Project water supplies;
- OCWD will prepare an agreement with applicant.

WATER RESOURCES POLICY

The Orange County Water District (OCWD) was formed to sustainably manage the Orange County groundwater basin and protect the area's rights to flows in the Santa Ana River. Due to reoccurring droughts, uncertainties in imported water supplies and lower Santa Ana River flows, supplies into the groundwater basin have diminished. Without the development of additional new local water supplies the local multi-billion dollar economy will be severely impacted. The OCWD Board of Directors is committed to maximizing the use of the groundwater basin to the benefit of the Groundwater Producers, but will also look to help develop projects that benefit the entire County.

- OCWD will evaluate and undertake economical and sustainable projects and programs to work towards the goal of ensuring adequate water supplies are always available to its service territory and explore opportunities of enhancing County wide water reliability.
- The types of projects to evaluated shall include: (1) Maximizing Santa Ana River base flow, (2) Increasing storm flow capture, (3) Increasing water use efficiency, (4) Additional water recycling, (5) Additional colored water treatment, (6) Conjunctive use, (7) Groundwater banking and exchange programs, (8) Brackish water desalination, and (9) Seawater desalination.

BASIN PRODUCTION PERCENTAGE GOAL

The Orange County Water District (OCWD) was formed to sustainably manage the Orange County groundwater basin and protect the area's rights to flows in the Santa Ana River. Maximizing the utility and annual production from the groundwater basin provides economic and water reliability benefits to the region and the Groundwater Producers. The Basin Production Percentage (BPP) is established each April as required by Section 31.5 of the District Act.

- The District will evaluate and undertake economical projects and programs to work toward the goal of achieving and maintaining a 75% BPP.
- The District will create, acquire and/or purchase economical water supplies to annually recharge the groundwater basin to support a 75% BPP.
- If additional economical projects and programs can be implemented that support a BPP above 75%, the District will undertake such projects and programs.
- The District reserves the option to deviate from this policy when conditions warrant and will reduce the BPP when necessary to protect the groundwater basin from an excessive accumulated overdraft and against seawater intrusion.

BASIN EQUITY ASSESSMENT EXEMPTION PROGRAM

It is the objective of the Orange County Water District to encourage the production and subsequent beneficial use of groundwater that does not meet drinking water standards. The extraction of such waters from the groundwater basin provides for an increase in the usable storage space in the basin and prevents the further spread of poor quality groundwater and the subsequent degradation of nearby good quality groundwater.

- The District shall utilize its ability to adjust the Basin Equity Assessment for the exemption of the poor quality groundwater produced by a water production facility, in order to offset the additional treatment, including, blending, and distribution costs that are necessary to beneficially use the groundwater.
- This Board recognizes that such exemptions must be sufficient to offset the additional treatment and distribution costs and to provide a financial incentive to encourage such production.
- Criteria for Future Projects. Applications for the BEA exemption program will need to demonstrate to the District's satisfaction that the proposed project is of value to the management of the groundwater basin and that the treatment process selected is appropriate, efficient, effective and necessary to meet drinking water standards. All potential clean-up options should be evaluated to determine the most cost effective method. The project should demonstrate regional value including the protection of other nearby groundwater production wells versus simply providing treatment for an isolated well. Only groundwater that is unsuitable for potable use (not meeting primary and secondary drinking water standards) will be eligible for the BEA exemption. OCWD will verify water quality for individual wells by minimum semiannual sampling and laboratory chemical analysis. Only direct marginal cost necessary to treat the groundwater should be included in the project cost. The typical costs a Producer would incur to construct a groundwater extraction well not requiring treatment are unallowable. Additionally transmission pipelines from the treatment facility would generally be excluded from the project cost. A methodology and criteria to annually assess the project's effectiveness after it has been constructed and is operating should also be established. Approval for a BEA exemption should be obtained prior to the start of design drawings for the proposed facility. In order for a proposed project to be eligible for a BEA exemption, the newly constructed project production wells must be located within the project applicant's service

area, unless otherwise approved by the producer serving the area where the project production wells are to be located.

- Financial Incentives. Previously a $20/af financial incentive was provided by the District in the annual O&M cost calculations. This incentive will not be offered to future projects.
- Grants and Subsidies. All outside funding such as capital grants or operational subsidies need to be factored into the program's accounting.
- Program Review Committee. An internal OCWD "Program Review Committee" to annually review the accounting and performance of all active BEA-exempt projects shall be established. The Chief Financial Officer will chair this committee. The committee will be tasked with maintaining consistency with regard to evaluating project capital and O&M cost eligibility for the BEA calculations. Any disputed committee decisions can be appealed to the OCWD Board. The attached document "Method for Determining Amount of Exemption of BEA" shall be used to determine appropriate project cost.
- Annual Reporting. Each participating Producer will be required to submit an annual letter on the treatment operations which would be included with its annual BEA submittal. The letter will certify that the facility is operating as intended; that the wells are removing contaminants as originally intended; and that the treatment process is still effective and necessary. Water quality data will be included showing before and after treatment contaminant concentrations. The Producer shall be annually responsible to prove and verify to the District that the treatment process continues to be necessary to protect down gradient wells or otherwise provide sufficient benefit to basin quality. District staff will evaluate the information to determine if any production wells should be eliminated from the program.
- Program Term Limit. A time limit of either 20 years or when the project's capital cost is repaid via the accumulation of annual BEA exemptions, which ever comes first, will be established for the project. With the time limit the District will have the discretion to cease providing the BEA exemption if it is determined the project is no longer providing the basin management benefits originally intended. If the project is working as planned and still operating effectively, the BEA exemption could be extended at OCWD's sole discretion.
- Establish Project Caps. A specific acre-foot per year production limit for the project shall be established.

- Program Financial Risk. Although there is no obligation to participate in the BEA exemption program, there are inherent risks for a Producer to construct and operate facilities to pump and treat poor-quality groundwater, whose extent and concentration may not be well defined. It is possible that the groundwater could "clean up" or migrate away from the well(s) such that it no longer qualifies for a BEA exemption. New contaminants, changing basin conditions, or regulations could arise that require significant upgrades or overhaul of treatment facilities. In addition, increases in the BPP or problems with the Producer's other wells could result in some or all of a Producer's production of poor-quality groundwater to fall below the BPP such that there is no BEA to exempt. In this situation the Producer is simply pumping and treating impaired groundwater with no financial offset from reduced imported water cost. All of these risks pose significant cost implications to participating Producers' water supply costs. These risks shall remain with the Producer.
- Basin Equity Assessment – The BEA used for this program will be based upon the actual cost of imported water to the participating Producer.
- Accounting for Interest. Interest cost is an allowable program cost. Staff recommends flexibility in the methodology for calculating allowable interest cost as this cost can vary for each Producer depending upon their borrowing and financing methods. Interest costs, less any interest earned on temporary investments during construction, should be capitalized. Interest costs incurred after construction is completed should be expensed annually.
- Facilities Modification or Replacement. The following general guidelines will be used to assist when a Producer claims additional capital cost by modifying its treatment plant and/or replacing equipment beyond normal repairs and refurbishments.
- Any new allowable cost should be based upon new conditions and/or regulatory requirements impacting the project.
- Expenses due to poor and inadequate treatment plant maintenance and/or design and construction will not be allowed.
- Cost to replace necessary equipment that has reached its useful life will be allowable.
- The OCWD Board must approve any capital cost changes.

Method for Determining Amount of BEA Exemption

OCWD's policy has been to use a partial or total exemption of the BEA as a means of compensating the qualified participating agency for its costs for treating the poor-quality groundwater. These costs typically include capital, interest, and operation and maintenance (O&M) costs for the treatment facilities. Treatment costs and the BEA exemption will be calculated annually as follows:

The Total project capital cost shall be initially determined and transmitted to the District via a formal letter and accepted by the District. Any changes to the capital cost should be formally requested by the Producer and accepted by OCWD. Only direct marginal project cost necessary to treat the groundwater should be included in the costs. The typical costs a Producer would incur to construct a groundwater extraction well not requiring treatment are unallowable. General and administrative costs are not eligible. OCWD shall solely determine allowable costs. Examples of allowable capital costs which shall be supported by detailed accounting documents provided by the Producer include: contractor expenses, consultants, CEQA compliance, permitting, design, direct labor and direct benefits only, and interest incurred net of interest earned on investments prior to construction completion. Outside grants for capital costs shall be subtracted from the capital cost. Fee title land cost shall be excluded.

Capital amortization and annual payment schedules will be developed for the project.

Applicant will track and report to OCWD by September 30 each year the following: (1) actual O&M treatment costs for each water year with supporting accounting details and statements, (2) actual untreated groundwater production for each well, and (3) the delivered product water.

O&M treatment costs may include items such as direct labor and direct benefits only, supplies, energy (excluding energy to pump groundwater up to the treatment plant), outside lab analyses, outside consultants, permitting compliance, meter maintenance, chemicals, brine disposal, color monitoring supplies, and building maintenance.

OCWD staff will calculate the annualized unit O&M and capital costs as follows:

$$Tr(O\&M) = \frac{O\&M}{GW} = \$/af$$

where: Tr(O&M) = unit O&M treatment cost ($/af)
O&M = annual O&M treatment costs ($)
GW = annual untreated groundwater pumped from all wells supplying the project, provided that water quality from each well remains unsuitable for potable use based on lab analyses (af)

A BEA exemption, up to the full BEA, will be granted to cover the unit O&M treatment costs.

Any remaining BEA after subtracting the annualized unit O&M treatment costs will be exempted to offset the capital costs, including capitalized interest costs net of interest earned prior to completion of construction. The annual BEA exemption for capital costs ("Ex(Cap)") will continue until such time as the cumulative amount of the Ex(Cap) is equal to the total capital costs of the project facilities, or until such time as the BEA exemption terminates, whichever comes first, as follows:

$$Ex(Cap) = BEA - [Tr(O\&M) + Interest - Subsidies], \text{ and}$$

$$\sum_{i = \text{year } 1}^{i = \text{year } N} Ex(Cap)_i = \text{total capital costs less Subsidies}$$

where: Interest = annual interest costs incurred after construction
Subsidies = funding provided by third parties for operating or capital project costs

ANNEXATION POLICY
FEBRUARY 19, 1986, SEPTEMBER 1, 1999 and October 2, 2013

It shall be the policy of the Orange County Water District (OCWD) to accommodate the long-term Producers within the District's groundwater management programs and provide uniformity of cost of and access to groundwater throughout the District by consenting to requests for annexation of areas within the Orange County portion of the Santa Ana River watershed, provided that the annexing territory is within the boundaries of The Metropolitan Water District of Southern California.

- Prior to annexation, an agreement shall be entered into between OCWD and the applicable water purveying agency providing for payment to OCWD of an annual annexation charge.
- An annual fee as provided by Resolution 86-2-15 shall be paid by the annexing Producer.
- All future annexation requests must follow the eight-step process described below:

  Step 1. Applicant applies to annex into OCWD
  Step 2. OCWD and Applicant approve CEQA Memorandum of Understanding
  Step 3. OCWD prepares Annexation Agreement
  Step 4. Applicant complies with CEQA
  Step 5. Applicant defends CEQA actions
  Step 6. OCWD and Applicant approve Annexation Agreement; OCWD prepares resolution and applies to LAFCO
  Step 7. LAFCO considers request and holds a public hearing
  Step 8. OCWD adopts final resolution approving annexation

- OCWD shall be the lead CEQA Agency.
- OCWD shall work with the Groundwater Producers to develop a new Annexation Policy by the year 2023.

DISTRICT RESERVE POLICY

A key element of prudent financial planning is to ensure that sufficient funding is available for current operating, capital, and debt service needs. Additionally, fiscal responsibility requires anticipating the likelihood of, and preparing for, unforeseen events. The District will at all times strive to have sufficient funding available to meet its operating, capital, and debt service obligations. To preserve its strong credit ratings of AAA/AAA/Aa1, in every fiscal year the District will strive to maintain unrestricted cash and investment balances totaling a minimum of 625 days of budgeted operating expenses comprised of annual budgeted General Fund appropriations and annual budgeted Debt Service.

- **Operating Reserve Fund** - Established by the District Act and allocated from the general fund to be used to meet the cash flow needs of the District before the proceeds of taxes or replenishment assessment collections are available to meet emergency expenditures for operations, maintenance and the debt service payments of the District. The level of this general operating reserve as established in the District Act shall not exceed 15% of the total current annual general and water reserve fund operating budget.
- **Toxic Cleanup Reserve Fund** - Established for toxic spill emergencies and cleanup. The target level is $ 4 million and is to be replenished annually after the adoption of the annual OCWD budget.
- **Contingency Reserve Fund** - Established by the District Act to provide for expenditures that have not been anticipated or provided for in the District's annual budget. The money for this fund is to be allocated from the Operating Fund and the Water Reserve Fund at the beginning of each fiscal year. The level of this fund as established by the District Act is not to exceed $ 3 million.
- **Water Replenishment Fund (to be known as the "Operating Fund")** - Established for funds collected and received from the levy of the District's replenishment assessment. These monies shall be sufficient to enable the District to carry on any of the projects or purposes of the District as deemed by the Board of Directors. It can also include the expenditures necessary for the maintenance, operation and repairs of works and projects of the District as authorized by the Board of Directors. The funds can also be used for the purchase of supplemental water, and the replenishment of ground water supplies within the District. **The District shall maintain a minimum balance equal to fifty percent of the sum of the (i) current annual budgeted General Fund appropriations, plus (ii) current annual budgeted debt service appropriations.**
- **Basin Equity Assessment Fund** - established for funds received from the levy of the District's Basin Equity Assessment. These funds are to be used only for the

purchase of water for the purpose of groundwater replenishment and/or to reimburse Producers assigned pumping limitations per the District Act.

- **Water Reserve Fund** - established by the District Act to accumulate any excess general assessment, or unexpended funds, other than funds allocated to the operating reserve or operating contingencies by the Board of Directors. These funds can be used for the purchase of supplemental water for groundwater replenishment, acquiring, constructing or developing any groundwater intrusion prevention projects, pipelines, wells or other works necessary for the purposes of the district. Going forward, under the new Reserve Policy, this fund shall be designated only for purchases of supplemental water in order to have funds set aside and available. This will provide accountability and transparency to the Board and Groundwater Producers on funds collected and spent on water purchases. **The maximum upper limit is set at enough funds to purchase 50% of water needed to have an accumulated basin overdraft of 125,000 acre-feet.**
- **Repair and Replacement Fund** - established for replacement or refurbishment of District facilities, to be equal to thirty years of projected Replacement and Refurbishment (R&R) costs as defined in the District's R&R model.
- **Capital Fund** – established for proceeds from bond issuances or any other debt financing, and are used for the District's capital projects and capital improvements. These funds are restricted to specific capital projects which are authorized and approved by the Board of Directors.
- **Debt Reserve Fund** - established for various bond issues. These funds are not available for the general needs of the District and must be maintained at specific levels, and are restricted by certain bond covenants.
- **Debt Service Fund ("Bond Fund" per District Act)** - established to meet the annual debt payments of principal and interest for the Certificates of Participation (COPs). These funds are allocated from property tax revenues and the fiscal replenishment assessment collections. In 1992 and 1993 the Board dedicated the District's ad valorem taxes to the payment of the bond debt. The District funds the annual debt payments from the property taxes received (first priority) and then from replenishment assessments (second priority). Under this policy, this fund shall cease to exist and funds included in this fund shall be incorporated into the Operating Fund.

DISTRICT INVESTMENT POLICY

The purpose of this Investment Policy is to formalize the investment activities of the Orange County Water District (District). This Investment Policy is intended to be broad enough to allow the investment officer to function properly within the parameter of responsibility and authority, yet specific enough to adequately safeguard the investment assets. The Investment Policy broadly defines the scope, objectives, authority, standards of prudence, authorized institutions, investments type, collateralization, and diversification customized to the specific characteristics of the District.

- This Investment Policy applies to the investment of operating funds. Investments of employees' retirement funds and proceeds from certain bond issues are covered by a separate policy.
- In accordance with State law (Government Code Section 53600.3 and 53600.5), the objectives of the District Treasurer in making such investments in order of importance, shall be safety, liquidity, and yield.
- Investments made by the District Treasurer in the name of the District shall be made with judgment, intelligence and care, acting as a trustee of the District funds placed for investment to the benefit of the District stakeholders.
- The District's investment policy shall be reviewed annually.
- The California Government Code Section 53601 and 53601.6 governs the District's Investments
- The treasurer shall prepare an investment report at least quarterly, including a management summary that provides an analysis of the status of the current investment portfolio and transactions made over the last quarter.

WATER BOND PRINCIPLES

The state government periodically evaluates and has developed water bonds to be considered by the residents of California. The development of water bonds is influenced by numerous political groups and special interest throughout the state. Orange County Water District has developed these principles to guide staff and the board in evaluating proposed water bonds.

- Funding for any Delta restoration shall support the co-equal goals of water supply reliability and ecosystem restoration.
- Support adequate funding to expand statewide and/or regional above ground and/or below ground water storage. Any proposed water bond shall provide funding for above ground surface storage and below ground groundwater storage to capture excess storm flows.
- Support adequate funding for newly created water supplies through water recycling/reuse, brackish water desalination and seawater desalination.
- Support regional projects through the Integrated Regional Water Management Planning (IRWMP) process.
- Support adequate funding for remediation of groundwater contamination.
- Bond proceeds should be distributed to beneficial projects throughout the State in an equitable, balance and reasonable manner.
- Any proposed water bond or water infrastructure financing measure should include specific criteria which must be met before a project obtains funding. The specific criteria should include cost-effectiveness, a project proponent's ability to implement the project, specific timelines for project implementation and a high level of measureable benefit.
- Bond proceeds should be leveraged to the maximum extent possible utilizing local or federal matching funds. Projects funded with a higher percentage of non-state funds should be given priority.
- The allocation of bond funds should be handled within existing State resources to minimize bond administration costs.
- State water bonds should fund projects and programs that increase water supplies for California.
- State water bonds should include funds that develop programs to reduce the operating cost to provide water supplies to California residents.

LEGISLATIVE GUIDING PRINCIPLES

The OCWD Communications/Legislative Committee of the OCWD Board has adopted legislative guiding principles to streamline the Board's approach to legislative decision making and provide staff with proper direction to aid in preparing legislative proposals for Board review.

- Oppose Legislating Water Quality
- Protect Special District Funding
- Oppose Legislating Local Problems
- Support the Association of California Water Agencies (ACWA) Blueprint
- Support Good Governance Efforts

GROUNDWATER MANAGEMENT LEGISLATION POLICY PRINCIPLES

The Orange County Water District (District) has managed the groundwater basin in north and central Orange County since 1933. The California legislature provided sufficient authority to the District to allow it to sustainably manage the groundwater resources of the basin. As the state of California considers new legislation to change the way groundwater is managed in the state, it is important that the District, which serves as a model of sustainable groundwater management, be engaged to ensure that new legislation results in meaningful change and does not interfere with the District's ability to continue managing the basin. In order to guide the District's advocacy related to groundwater management legislation, the following policy principles have been adopted by the District.

Groundwater legislation adopted by the Legislature should be guided by the following principles:

- Legislation should not interfere with the authority or governance of adjudicated and special act basins.
- Existing laws and court/agency decisions that effectively govern groundwater production and recharge should not be disturbed. The rights of parties to take water pursuant to prior court decisions, decisions of the State Water Resources Control Board, or inter-agency agreements must be protected, and existing legal obligations imposed on parties should remain enforceable.
- Existing groundwater basin management boundaries created through statute or court decision should not be modified, and new groundwater management areas should not be carved out of existing groundwater management plan areas without the approval of the affected groundwater management agency(ies). Similarly, where a statute or a court decree has authorized an entity to manage a groundwater basin, legislation should not create or empower other local entities with duplicative or overlapping authority.
- Local agencies are in the best position to implement sustainable groundwater management. Groundwater management can best be accomplished at the local level - by agencies that have the technical expertise and existing or newly-granted authority to ensure aquifer health is maintained and competing uses balanced.
- Any definition of sustainable groundwater management should allow groundwater managers, including the District, sufficient flexibility to manage groundwater, recognizing the following:

a. Sustainability varies as a function of local hydrogeologic conditions, water supply availability, and historic groundwater utilization.

b. Sustainable groundwater management can include periods when groundwater withdrawals exceed recharge as long as it causes no long-term negative impacts and there is a commitment to balance pumping over time with natural or artificial replenishment.

- Managed aquifer recharge is a key tool that allows for sustainable groundwater management. As such, groundwater recharge should be recognized as a beneficial use of the water supplies of the state.

GROUNDWATER QUALITY PROTECTION POLICY

Consistent with the District's mission and authority granted under the Orange County Water District Act and other provisions of law, it is the objective of this policy (the "Policy") to provide guidance to the District in taking actions to protect groundwater from discharges or releases of Hazardous Materials or contamination that damage or threaten water quality in the aquifers and facilities that serve the District.

It is the policy of the District to:

1. Maintain a groundwater supply of suitable quality for all existing and potential beneficial uses.
2. Prevent degradation of the quality of the groundwater supply and protect groundwater from Hazardous Materials and contamination.
3. Provide notice to, confer, and cooperate with applicable regulatory agencies to identify sources of contamination and threats to surface water and groundwater caused by releases of Hazardous Materials, to characterize the extent of such contamination, and develop and implement effective emergency, removal, and remedial measures as shall be appropriate, in accordance with applicable standards and requirements.
4. Support regulatory enforcement of investigation and cleanup requirements on responsible parties in accordance with law.
5. Undertake investigation and cleanup projects as necessary to protect the groundwater supplies of the basin from contamination and Hazardous Materials.
6. In matters in which the District is seeking recovery of its investigation and response costs, to be consistent with requirements of the National Oil and Hazardous Substances Pollution Contingency Plan (National Contingency Plan), 40 Code of Federal Regulations Parts 300-399, and other applicable provisions of law.
7. In instances in which releases of Hazardous Materials have been detected, except as otherwise may be necessary or appropriate in the event prompt emergency action is needed to prevent, abate, or contain any threatened or existing contamination of or pollution to surface water or groundwater, the District will propose to meet and confer with any owner or operator responsible for such contamination or pollution, and any administering agency with oversight responsibility thereof, and to cooperate on exchanges of information and data, appropriate protective measures, and the containment and remediation of such contamination or pollution.
8. Prior to initiating legal action for cleanup and abatement of contamination or pollution or to recover the District's costs for investigation, response, and remediation of surface water or groundwater contamination, the District will propose to any owner or operator responsible for such contamination that the parties enter into an agreement to mediate in good faith to attempt to resolve the

matter without litigation. The proposed agreement would include the following elements:

- That the District and the responsible party agree upon a suitable and qualified third party mediator such as JAMS or other appropriate party experienced in environmental contamination matters, with the cost of the mediation to be equally shared.
- That the District and responsible party exchange all relevant, and reasonably requested information regarding the dispute; and the responsible party provide the District with access to defendant's records relating to the dispute for review and copying, provide information regarding the defendant's insurance, and allow the District to conduct soil and groundwater test on the property.
- That all statements, offers, demands, negotiations, and other communications made or exchanged in the mediation process shall be treated as confidential and shall not be admissible in any litigation involving any of the parties, in accordance with applicable California and Federal law; such confidentiality shall not be applicable to facts obtained by the parties in discovery or from third party sources outside of the mediation.
- That the parties toll all applicable statues of limitations for up to 180 days to allow the mediation process to go forward. This time period may be extended by agreement if progress is being shown and additional time is reasonably required to complete the mediation process.
- Provided the responsible party enters into an agreement to mediate on the terms outlined herein, the Board of Directors shall appoint a subcommittee or member of the Board to participate in the mediation and report to the full Board. Any settlement offers made by the responsible party shall be presented to the full Board in closed session.

  If the responsible party declines to enter into an agreement to mediate on the terms outlined herein, or enters into such agreement but the matter is not resolved during the mediation period, the District may initiate litigation against the responsible party.

9. The District shall establish improvement funds ("Groundwater Contamination Cleanup Fund") pursuant to Section 20 of the District Act to hold and invest any and all proceeds that the District receives from the trial or settlement of lawsuits to recover the District's costs to abate, remediate, and clean up threatened or actual groundwater contamination. A separate restricted Groundwater Contamination Cleanup Fund shall be established for each groundwater contamination case for which the District receives such moneys. The monies in the Groundwater Contamination Cleanup Funds shall be invested in accordance with the California Government Code and, net of litigation expenses, shall be used only for the current or future projects and activities to abate, remediate, or clean up the groundwater contamination for which the Groundwater Cleanup Fund was established.

10. Maintain the District's surface water and groundwater quality monitoring program and monitoring well network, the purposes of which are to:

- Assess ambient water quality conditions and determine trends in water quality, including surface water supplies used for recharge into the groundwater basin.
- Identify areas where groundwater used for public supply is vulnerable to or threatened by contamination.
- Evaluate the effectiveness of programs, projects, and regulations intended to protect groundwater quality, and recommend additional measures as appropriate.
- Provide water quality information to water purveyors and applicable regulatory agencies.

11. Maintain the District's Water Resources Management System, including databases, geographic information system, and computer models, to support efficient storage, accessibility, analysis, presentation, and reporting of water quality and water resources information.

12. Maintain an Emergency Response Fund (formerly known as the Toxic Reserve Account) in order to ensure adequate funds are available to contain and clean up catastrophic releases of chemicals or other substances that may contaminate the surface water or groundwater of the basin.

13. Coordinate with groundwater producer(s) impacted or threatened by any groundwater contamination in their service territory and work with affected producer(s) in the development of an appropriate monitoring and remediation plan if necessary.

14. Encourage the beneficial use and appropriate treatment of poor-quality groundwater where the use of such groundwater will reduce the risk of impact to additional production wells, increase the operational yield of the basin, and/or provide additional water quality improvements to the basin. The overall merit of each potential project will be evaluated individually based on estimated benefits and costs.

15. This Policy shall not be interpreted to impose any new or additional requirements on claims or legal actions pending at the time of adoption of this policy.

AGENDA ITEM SUBMITTAL

Meeting Date: November 2, 2017

To: Communications/Leg. Liaison Cte.
Board of Directors

From: Mike Markus

Staff Contact: E. Torres/A. Dunkin

Budgeted: N/A
Budgeted Amount: N/A
Cost Estimate: N/A
Funding Source: N/A
Program/Line Item No.: N/A
General Counsel Approval: N/A
Engineers/Feasibility Report: N/A
CEQA Compliance: N/A

POLICY ISSUE: STATE LEGISLATIVE UPDATE

SUMMARY

The Orange County Water District (OCWD; the District) state legislative consultants will provide a report on the current legislative calendar, updates to legislation of interest to the District and funding opportunities.

Attachment(s)

- Joe A. Gonsalves & Son, Edelstein Gilbert Robson & Smith End of Session Report
- SB 606 Hertzberg Fact Sheet

RECOMMENDATION

Agendize for November 8 Board meeting: Take action as appropriate

BACKGROUND

OCWD's state legislative consultants, Edelstein, Gilbert, Robson, and Smith and Joe A. Gonsalves and Son will provide a verbal update on the state legislative calendar, legislation of interest to the District, and their monthly activities on behalf of the District.

Water Conservation Legislation

Current law requires the state, through local water districts, to achieve a 20% reduction in urban per capita water use by December 31, 2020. Early in 2017, the Administration made it known that it sought legislation to mandate post-2020 conservation requirements on local water districts. This caused a flurry of activity in the Legislature and the Governor's Office including the introduction of several bills in the Assembly on various approaches to conservation, the formation of an Assembly Working Group on the issue, and the introduction of very problematic Trailer Bill Language (TBL) by the Administration leading to negotiations in the Governor's Office.

OCWD joined the coalition opposing the TBL and several Assembly bills that would have given inordinate power to the State Water Resources Control Board. In addition, a priority

for OCWD was to advocate for full credit for recycled water. Consequently, on behalf of OCWD, staff and consultants advocated consistently all year for full credit for recycled water. This advocacy included several meetings in the Governor's Office and meetings with Assembly Member Eduardo Garcia, the Chair of the Assembly Water, Parks and Wildlife Committee, as well as a private meeting our consultants had with Senator Hertzberg on August 28, 2017. As Chair of the Senate Natural Resources and Water Committee, Senator Hertzberg is leading the Senate's water conservation negotiations. Our consultant's meeting was solely focused on credit for recycled water and during the meeting it became clear that Senator Hertzberg was attempting to balance his strong support for OCWD's position with his ability to secure the votes necessary for a water conservation agreement. At the time of the meeting the various conservation proposals contained a 10 percent credit that was reduced by 1 percent each year and ultimately 0 percent after 10 years. The water conservation coalition was successful in pushing back on the 10 to zero percent proposal and believe the 10 percent floor in the final proposals was set in response to our meeting with Senator Hertzberg and out of recognition that OCWD and other stakeholders want a percentage much higher than 10 percent.

Recognizing the Legislature adjourned on September 15th and will not reconvene until January 3, 2018, there are two bills awaiting their return in January: SB 606 (Hertzberg) and AB 1668 (Freidman). During the closing week of session it is important to note, both WateReuse and the Municipal Water District of Orange County (MWDOC) agreed to accept 10 percent credit for recycled water. In addition, several water districts backed out of the opposition coalition and supported the bills. Nonetheless, our consultants continued to oppose the bills and lobby for full credit on behalf of OCWD along with other agencies from around the state.

On the last night of the session (September 15th) the authors of SB 606 and AB 1668 determined that they did not have the support/votes necessary to pass the bills in both houses. Consequently, SB 606 and AB 1668 are now two-year bills and will be revisited in 2018.

CERTIFIED TRANSCRIPT

REGULAR MEETING BOARD OF DIRECTORS
ORANGE COUNTY WATER DISTRICT

AUGUST 3, 2016 – 5:30 P.M.

DATE: November 1, 2017

Court Reporting • Video • Trial

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Governor John Doe
Lieutenant Governor Mark Hutchison
Director Rudy Gonzalez

Green: I bring to order the Wednesday, August 3rd, 5:30 OCWD board meeting.

Unknown: Please place your hand on your heart and repeat with me. I pledge allegiance to the flag of the United States of America, and to the Republic for which it stands, one nation under God, indivisible, with liberty and justice for all.

Green: Roll call, please.

Unknown: Director Anthony?

Anthony: Yes.

Unknown: Director Bilodeau?

Bilodeau: Present.

Unknown: Director Brandon?

Brandon: Here.

Unknown: Director Dewane?

Dewane: Here.

Unknown: Director Ford?

Ford: Here.

Unknown: Director Green?

Green: Yes.

Unknown: Director Nguyen?

Nguyen: Yes.

Unknown: Director Reyna?

Reyna: Here.

Unknown: Director Sheldon?

Sheldon: Here.

Unknown: Director Yoh? We have a quorum.

Green: Okay. Next, do we have any items too late to be agendized?

Unknown: There are none.

Green: All right. Time for visitor participation. Our first speaker is Arthur Darras. And thank you for that. That was very nice of you.

Darras: Madam Chair, members of the board, during the past two months you've had some people from LULAC representing their favored [inaudible] Poseidon. I just wanted to point out that LULAC is a well-known, probably the oldest Hispanic group in the United States, but it's a civil rights organization. It's not an environmental group.

And when they say they're in favor for signing, it's because, as most people do, when you say to them that salt water is going to be turned into fresh water, they say, "Well, that's great. We need that," without knowing what it entails, the details of what's going to happen to the whole environment, the Pacific Ocean, Huntington Beach. Because I'm sure that they don't know about the fiasco that happened in Tampa Bay when the desalination plant [inaudible] there went millions of dollars in debt, and they filed for bankruptcy.

They probably do not even know about the process that it takes to desalinate water. The fact that water is going to be sucked in from [inaudible] the decided [inaudible] sucked in and [inaudible] process killing all the small vertebrae, and fish, and fish larva. And that's not all. Because then they will dump the grime and the salt water extracted back into the ocean, killing more sea life. I'm sure they don't know all these facts.

And one more thing. The LULAC does not speak for all Hispanic people. It's a very limited group. It's, like I said, civil rights. And that's what you should understand when you're listening to a group that apparently has been -- has received monies and contributions to be able to participate [inaudible]. Thank you very much.

Green: Thank you. Next, Clem Dominguez.

Dominguez: Good evening, everyone. My name is Clem Dominguez, from Huntington Beach. And I -- tonight I just want to get a clarification from the board. On the July 6th meeting the presentation showed what the additional -- once

they decided on Option 1 and whether it was bona fide, Option 1, I think it was going to be an additional $437 per acre foot, something like that. But one of the things that came up, I think John Kennedy mentioned that the average water bill was about $50 a month, and the additional cost was anywhere from $6 to $8 a month.

Now, I asked him recently, "What did you divide that number by?" And he said the number of 2.4 million residents. And to me, that is meaning that that's $6 to $8 per resident. So if you have four people, you would have $32 a month. So I would think that the board, and everybody, would want to see the average water bill for a residency, and the average water bill for a business, and see what the average cost increase would be to the number of customers, not the number of residents. So I might have it wrong, but I just would like to see that clarification.

And the other thing, I wanted to announce that I am running for the board. It looks like so much fun up there. So I'm happy to meet you. And I just thought that it would be time that -- it would be a good idea for Huntington Beach to have a surfer on the board. So thank you very much.

Green: Okay. Moving on to our public hearing to consider modifying the 2015, 2016, 2017 Basin Equity Assessments for producers participating in the fiscal year 2016/2017 Coastal Pumping Transfer Program.

Unknown: John Kennedy will give a short presentation on this item.

Kennedy: Judy or Ray, can you hit the screen for me? Okay. Thank you. This is a public hearing to implement a Coastal Pumping Transfer Program for the current fiscal year.

We discussed this issue at the July Water Issues Committee meeting. We have implemented Coastal Pumping Transfer Programs in the past, 5 times over the last 16 years, most recently in fiscal years 2013/2014 and 2014/2015. What we do with this program is we have inland producers pump above the basin production percentage. And then when you do that, you pay a basin equity assessment that we'll modify. And I'll describe that later. And then we have coastal agencies pump below the basin production percentage, and they receive a basin equity assessment from the water district.

So this figure just kind of shows how it works. We're recommending decrease in pumping along the coast. We will increase pumping inland. The inland producers who are pumping above the BPP pay an additional BEA,

basin equity assessment, to the district. We turn around and give that money to the coastal producers who are decreasing their production and buying more MET water.

The program goal is we're trying to reduce seawater intrusion, and I'll show you specifically where we're worried in levels, and the target for this program. The program is cost neutral to the producers who participate, and we try to make the program cost neutral and pumping neutral to the water district.

We are limited by how much we can do in this program. You need inland producers who have excess pumping capacity, who can pump above the basin production percentage to participate. In implementing the program, for the inland producers who are pumping above the BPP, we are recommending to give them a small $50 [inaudible] BEA reduction to compensate them for the expense and trouble that they're going through to pump additional water. And we work with the coastal producers to determine which wells to turn off. MODOC helps us a lot with the implementing and administrating the program.

This is the area we're targeting. We mentioned before we have an issue in the Sunset GAP. We potentially have seawater coming in from three different areas, potentially doing an end-around. This is the Alamitos Barrier, and we could have seawater coming in on the southerly side of that. We may have seawater coming in in this area, and then potentially have seawater coming in from this area.

I'm showing Huntington Beach well here. This well has been shut down because of seawater intrusion. And we have other Huntington Beach wells in the area, and Westminster has wells, Golden State has a well. So we would be working with Huntington Beach specifically to reduce pumping from these three wells to reduce the gradient for seawater to come in.

Ultimately we hope to have a permanent solution that we can recommend with the board. [Inaudible] group has built some monitoring wells in the area. He's hired a modeler to help model this area, and we're hoping in a year to 18 months we'll come back to the board with a permanent solution to stop the seawater intrusion. But in the meantime, we're recommending to implement this Coastal Pumping Transfer Program just to reduce pumping in the area.

Getting into some of the details, this chart is a summary of the producers who would participate. For the over pumping producers, these are the producers inland, we're asking Orange, Buena Park, Fountain Valley, Garden Grove, Golden State and La Palma to all pump a little bit above the BPP. And we're working with these agencies right now to figure out exactly how much they can over pump. We're thinking it will be in the area of 5,000 to 6,000 acre feet. Primarily we'll work with Huntington Beach, to get Huntington Beach to reduce their pumping in those wells I showed earlier.

This column here shows the original basin equity assessment that we set in April. These are the BEAs for all of the participating producers. And then we would modify the BEA. We're modifying the BEA in two ways. For the producers who are over pumping, I mentioned we would give them a $50 discount on BEA, so we're reducing their BEA by $50.

And then the other thing we're doing, and we're getting into the weeds here, but the BEA -- when we set the BEA, it's based on the cost of MET water. And the cost of MET water, we also include what's called the "readiness to serve charge" when we set the BEA. So this program will impact what these producers pay for the readiness to serve charge.

So we've been working with MODOC, and MODOC is going to take this program and back out how it impacts the readiness to serve charge that these producers pay. So what that means is the readiness to serve charge adds about $65 an acre foot to the cost of MET water. We're going to also reduce the BEA by $65, in addition to the $50 I previously mentioned. So these BEAs are all being reduced by $115 an acre foot.

I'm really getting into the weeds of the accounting here, but I just wanted to show you why we came up with these adjusted BEA numbers for the participating producers.

So with that, we're recommending to modify BEAs, as the table has showed, and to begin doing the Coastal Pumping Transfer Program in this fiscal year. If I can answer any questions.

Green: Director Yoh?

Yoh: He had a request to speak.

Green: Hmm? Oh, okay. Did anybody?

Unknown: Yes, I [inaudible].

Green: Okay. Director Anthony?

Anthony: Yes. John, could you clarify how much total water would be pumped or not pumped per year? Is that the 5,000 acre feet?

Kennedy: About 5,000 will be transferred inland, yes.

Anthony: Per year?

Kennedy: Per year.

Anthony: And that's all that can be done, or is that enough to do the job you think?

Kennedy: Well, you know, it will help Huntington. Huntington has those three wells, and that's a pretty big decrease for those three wells in pumping. So it's a good start. I'd always like to do more, but you have to get, you know, inland producers to over pump. And that's the hard part, getting people to agree to over pump. So we're kind of limited by who will over pump for us.

Anthony: You mean some producers refuse to over pump, or they're just not able to?

Kennedy: Both. Both. And some -- yeah. I had a producer say, "The $50 incentive is not enough. I would like more than a $50 incentive."

Unknown: I think as John mentioned though, we feel that the wells that we're taking in the program, 5,000 acre foot is about the right target. Certainly if we see that there is an issue, and that's not enough, we can approach others to shut down. Some on the map that John had, I think he showed some [inaudible] and the Golden State well that are in that proximity. And this is really the only GAP where we're having issues, the Sunset GAP. [Inaudible] Talbert. Of course Talbert, well protected, not an issue also. So we're monitoring this very carefully, and we think it's the right number.

Anthony: Okay. Thank you.

Unknown: I'd like to ask a quick question. Why isn't Westminster wells in this mix of decreasing?

Kennedy: You know, if we had a lot more people over pumping, we could include Westminster to under pump. Go back to your map.

Unknown: That's it?

Unknown: I think if you look at the chloride line, certainly the three wells that are clustered there, the Huntington Beach wells are the closest in proximity. The

next two probably would be just north of that, above where the one and the two, the 12. And I -- do you know whose those are, John?

Kennedy: That's Westminster. Westminster, yes.

Unknown: I think that's from Westminster.

Kennedy: Yeah.

Unknown: Those are the ones I was asking about.

Unknown: Yeah, those would be the next ones we would target if we felt that we needed additional under pumping in this area.

Green: Any other questions? I'd like to open the public hearing. Do we have any speakers? No? Close the public hearing. Okay. We have a recommended action.

Unknown: With separate [inaudible].

Unknown: I'll second.

Unknown: Okay. Please vote. The motion passes unanimously with directors Anthony, Bilodeau, Brandon, Dewane, Ford, Green, Nguyen, Director Reyna, Director Sheldon, and Director Yoh all voting yes. Okay. Moving to the Consent Calendar.

Unknown: So moved.

Unknown: Second.

Brandon: [Inaudible].

Green: Yes?

Brandon: Thank you. On the Consent Calendar I need to declare an abstention on Item 75643 and 756760 from environmental advisors, and for Item 75829 for Council on Public Affairs for [inaudible] purposes as previously stated. Thank you.

Green: Anybody else? Okay. Please vote.

Unknown: Director Ford, Director Reyna, Sheldon.

Unknown: The buttons are getting sticky.

Green: The vote passes unanimously with Director Anthony, Bilodeau, Director Brandon, Dewane, Ford, Green, Nguyen, Reyna, Sheldon and Yoh voting yes, with the stated abstention from Director Brandon. Okay. Moving on to our informational items. Our first one is classification of reclaimed water.

Unknown: Yes. General counsel Joel Kuperberg will be presenting this item this evening.

Kuperberg: Thank you, President Green, and to the board. I know it's a slow summer evening. We have here a presentation from general counsel. The board asked me to present an overview of the issues that are raised in the recent lawsuit filed by Irvine Ranch Managed Water District against Orange County Water District dealing with [inaudible] mixed with [inaudible]. And so I'm going to cover it at a fairly high level. Obviously I'm not going to talk to you about strategic issues or things like that that would involve litigation decisions, but more just to provide the public and the producers with a snapshot idea of what the case is about and what the issues were about.

So Irvine Ranch Managed Water District filed its complaint in late June. Its complaint is different than most of the types of lawsuits we see, in that one of the causes of action, one of the claims in the lawsuit, it's called "reverse validation action." And this is an action in which the summons isn't served to all of the parties, but rather, it's published. And anyone who thinks that they might be affected by the lawsuit can file an answer, and then participate in the lawsuit. So it's unusual in that respect. Any producer can join the lawsuit just by saying they want to participate. Normally you have to get court permission to join a lawsuit and to file.

OCW was served in late June, and our answer is due actually around the end of this week. We'll be filing one. The case has been assigned to Orange County Superior Court to Judge James Di Cesare, and he's a regular Orange County Superior Court judge who hears civil trials.

There are three main claims that are raised in the lawsuit. The first claim deals with the calculation with the basin production percentage under provision of the District Act, Section 31.5 of the District Act. The second issue is an issue relating to language in the act under which OCWD can sue to prevent what's called "unlawful exportations of water" from a district. And the third issue is a bit of a hybrid between the two, which is a claim that relates to how OCWD determines, based upon the basin production percentage, whether water has been unlawfully exported from a district. And I'll explain all of these in a little bit greater detail.

But by way of background, just to that people understand what the basin production percentage is, it is a formula that is set forth in the District Act that is a ratio of groundwater to the aggregate quantity of groundwater and what's called "supplemental sources" of water, which for our purposes means imported water. And this formula yields a number, which is the maximum proportion of groundwater that any producer can produce without having to pay the basin equity assessment. So for example, if the BPP is 70 percent, and a producer's total water needs are 100, the producer can pump up to 70 acre feet of water without paying basin equity assessment. If the producer pumps 75 acre feet of water, for this example, they would pay the basin equity assessment on 5 acre feet of water.

And it's a calculation that the district does annually. It's done at the same time the district does the replenishment assessments and the additional replenishment assessments. And it's based upon the condition of the basin, a projection of what the aggregate amount of producers' water needs are for the coming year, and what proportion the district thinks should be achieved from groundwater. So at times when the groundwater basin is relatively full, then the BPP may be higher. At times when the groundwater basin is very strained, BPP may be lower. Yes?

Unknown: Joel, when did that definition of BPP first appear in the District Act?

Kuperberg: I believe it first appeared in the late 1950s, early 1960s, and it's been modified a little bit since then.

Unknown: So it first appeared about 1960 or so?

Kuperberg: Correct. The basin production percentage was not part of the original District Act in 1933.

Unknown: Thank you.

Kuperberg: So this is a real good graphic that John Kennedy prepared. He was showing the water issues to me a while back, of the effect of the basin production percentage insofar as it relates to reclaimed water. Irvine Ranch Water District argues that reclaimed water ought to be included in the calculation for the basin production percentage. Orange County Water District's position is that the District Act doesn't allow that.

Irvine Ranch Water District would say that if OCWD allowed reclaimed water to be included in the calculation, then Irvine Ranch Water District would be allowed to pump additional water without paying the BPP, and

hence, they say, because they're not being allowed to do that, they are essentially being, and in terms of the complaint, they say they're being penalized.

And so what this shows is that if someone had 3,000 acre feet of groundwater, and this is the far right column, they might only be able to -- let's see. How does this work here? I'm sorry. That the effect of 3,000 acre feet of reclaimed water reduces the amount of groundwater that they might be able to pump, because of the way the formula works. John, maybe you can explain this a little better. I'm sorry. I've never been good with graphs.

Kennedy: But, yeah, the reclaimed water is not considered supplemental water. So in the eyes of the water district, reclaimed water does not exist. In the eyes of the water district, this producer only has total water produced of 27,000 acre feet, and it reduces their allowable pumping.

Kuperberg: So by not counting reclaimed water, they can only pump 18,900. If we counted the reclaimed water as part of the supplemental sources, and we'll hit that in a second, they could pump to 21,000, which would be the same as if they didn't use reclaimed water to begin with.

Now, all of this relates to the definition of supplemental sources, which is water from sources outside the watershed of the Santa Ana River. This is a map that shows the Santa Ana River Watershed, and the boundaries of Irvine Ranch Water District, and then OCWD and a little bit outside. And Irvine Ranch Water District is almost entirely within the watershed of the Santa Ana River. Irvine Ranch Water District's water reclamation plant, Michelson Plant, is within the watershed of the Santa Ana River. Based upon this, we look at this and say that the reclaimed water that IRWD produces is sourced within the watershed of the Santa Ana River. Hence, it can't be part of supplemental sources.

And here's the language from the act itself. So again, the definition for the basin production percentage is it is groundwater over groundwater plus supplemental sources. Supplemental sources means sources of water outside the watershed of the Santa Ana River. There's a carve-out for Santiago Creek water, and that was because those were water rights that were established before the district was created in 1933. And for all intents and purposes, we interpret this to mean imported water from Metropolitan Water District. But if, for example, a producer within OCWD found a way to purchase state contract water from one of the state contractors other than

OWD, that would also be a supplemental source of water, because it's a source of water from outside the watershed of the Santa Ana River.

Ford: And Joel, how is GWRS water treated? That should be easy.

Kuperberg: Well, it's complicated, because GWRS water doesn't really figure into it in most cases, even though it would seem like it, since we're talking about reclaimed water. And that's because this is a formula that applies to producers that are pumping water. Our GWRS water isn't generally delivered directly to producers. And the only exceptions we have really, I think, we have a contract with the City of Anaheim to provide a very small quantity of GWRS water, basically as a favor to Anaheim for purposes of being able to get certain approvals that Anaheim needed for an energy plant. And that water, I believe, is counted the same way as we count IRWD's reclaimed water. It's excluded from the definition of supplemental sources, and hence, doesn't fall within the formula for the basin production percentage.

Now, for Anaheim the quantity or the volume of that GWRS water is so small that it probably doesn't really matter. But a similar example would be Green Acres Project water, where the numbers are a little bit higher. Again, relatively small compared to what most of the production is. But Santa Ana, Mesa, Fountain Valley, and I'm not sure who else, retails Green Acres Project water. They sell that water that we produce as sub-potable reclaimed water. It goes to golf courses. It goes to other uses. That water also, because it's sourced within the Santa Ana River Watershed, does not count as part of supplemental sources of water, and hence, it's not a credit towards the BPP.

So for example, for Santa Ana, for Mesa, for Fountain Valley, when they sell 1,000 acre feet of Green Acres Project water, if they sell that much, they can't include that in part of their formula, and thereby produce a little bit more groundwater. That's just so we're being consistent in how we treat that.

But the reason I was a little bit hesitant, Director Ford, is that most of the GWRS water is used to go into the groundwater basin, and it becomes groundwater, and it's really no different. We treat it the same way that we treat MWD water that's been put into the ground, the same way that we treat Santa Ana River water that we put into the ground.

So in the case of IRWD, they have reclaimed water. If they sell the water directly to their customers for golf courses or whatever, it doesn't count as part of supplemental source water under this definition, and hence, doesn't

help them on the BPP. If IRWD sold their reclaimed water to Orange County Water District for the purposes of putting that reclaimed water in the ground, if we could legally do so, you know, if it met the water quality standards, they would be able to derive the financial benefit from it. And we would treat it the same way that we treat buying water from MET or the GWRS water, as part of our total groundwater supplies.

But, again, what we're talking about is basin production percentage, is not the effect on OCWD, but the effect that each producer feels when it calculates how much groundwater each producer can pump without hitting the basin equity assessment. I hope that answered the question.

Ford: Well, kind of. Going back to the slide that defines that BPP equals groundwater over groundwater plus supplemental sources, correct?

Kuperberg: Correct.

Ford: And so the simple explanation is if IRWD is allowed to include reclaimed water in this formula, then it increases the denominator.

Kuperberg: Correct.

Ford: Okay. So GWRS water, which is piped up to the aquifer and adds to the groundwater, correct?

Kuperberg: Correct. But it doesn't fall within this formula.

Ford: Okay. And that's what's confusing to me.

Kuperberg: Okay. This is a formula that's based upon individual -- that affects individual producers use of water. 99 percent of the GWRS water that is produced is water that OCWD uses to convert to groundwater, so that's water that's available to all producers to pump out. Once we put it in a pump and we put it into a spreading basin, it's no different than the MWD water we buy or the Santa Ana River water that we capture naturally. And so it's not part…

Ford: I think that's what's confusing is that this formula relates to production, and I'm thinking of it in terms of supply.

Kuperberg: Correct.

Ford: So it does get a little confusing.

Kuperberg: Yeah, the GWRS, if we were selling GWRS water directly to customers, as we do the small amount to Anaheim, then it applies. This formula would apply, because it's being used directly. The producer is getting it directly, and is then using it directly or selling it directly to a retailer. Most of the GWRS water is water that we use to help manage the basin, to help fill the basin, and so it doesn't fit within the formula.

Ford: Got it.

Kuperberg: And nobody said this stuff was easy. I mean, that's not it. This language is kind of archaic. So, again, the position that Orange County Water District has taken over several days now has been it's not a matter of what OCWD wants to do or doesn't want to do. But we believe that the language of the OCWD Act compels us to interpret supplemental sources as excluding reclaimed water that is generated from within OCWD.

If a producer goes out and buys reclaimed water from San Diego, that would be reclaimed water from outside the watershed, and hence, it would count as supplemental sources. But, again, it's just this definition, this definition that the legislature enacted. And, again, the OCWD, again, this is just so you understand, the OCWD Act is state legislation. It's no different than a provision of the Government Code or the Business and Professions Code. It's a law that two houses and the governor approved, and it is our government statute.

Now, one of the things that we believe confirms -- well, before I say that, Irvine Ranch Water District has taken the position in their lawsuit that when you see this definition of supplemental sources, it really should be interpreted as water that doesn't naturally replenish the groundwater basin. And that what the legislature meant when it said "sources of water outside the watershed" was sources of water that do not naturally replenish the groundwater basin watershed of the Santa Ana River.

We look at that and say, "Well, that could be a plausible way the legislature could approach it, but we don't see that language in the act." We think that the act is clear as written, and we think that to read those words into the act isn't appropriate. If the legislature wants to say that that's what supplemental sources mean, the legislature would then change the definition by amending this piece of the District Act.

The district also believes that its position is the appropriate interpretation, because the legislative history of this piece of the District Act shows that at

one time, back in 1991, the words reclaimed water were intentionally, expressly, put into this provision. In 1991 the district sponsored -- Orange County Water District sponsored a bill in Sacramento that we enacted to add the words reclaimed water to the definition of those supplemental sources [inaudible]. And it appears the reason for doing so had to do with the price in Green Acres Project water. It's kind of a complicated story, so unless you have questions, I don't even want to bore you with it. But once this change to the act occurred, the district started calculating supplemental sources by including reclaimed water the way Irvine Ranch Water District is now saying we should. And the reason that OCWD did so is because the language now said, "Supplemental sources means reclaimed water and water from outside the watershed."

But then in 1995, just four years later, the legislature again amended this provision of the District Act, again at the request of Orange County Water District, to take those very words out. So the words were put in in 1991, and then taken out in 1995. And looking at it through normal rules of how you interpret statutes, we believe that expressly adding those words in, and then taking them out, confirms that when they're not there, we don't count them as part of the definition of supplemental sources. So that's the basic debate, if you will, or the issues in the litigation regarding basin production percentage as it relates to reclaimed water.

The second issue that's raised by Irvine Ranch Water District is a provision that, to my knowledge, has actually never been exercised by the district, and it's a portion of Section 2, which is sort of the general summary of the district's powers. And in sub paragraph 9 of Section 2, it's a listing of the different types of things that OCWD can file a lawsuit about. And OCW can file a lawsuit about water quality and contamination, about somebody stealing water, and then there's a line, "OCWD can file a lawsuit to prevent the unlawful exportation of water from the district."

Irvine Ranch Water District says OCWD has been preventing IRWD from moving water outside of the district. It doesn't have the authority to do so. And they claim that OCWD cannot define what unlawful exportation is. Well, OCWD, to my knowledge, has never, you know, taken a formal position, because it's never been asked to file a lawsuit. It's never considered filing a lawsuit, to my knowledge, on unlawful exportation. It's been the inclusive policy of the district that this language means that any exportation of water from within the district outside the district is unlawful, unless it's

either expressly allowed by legislation, or approved by the board of directors of the Orange County Water District.

And that would be generally consistent with how water agencies in other parts of the state treat what's called "area of origin" issues, here in other parts of the state there are rules that say you cannot have water leave the area of origin, normally defined as a county, not a district boundary. But there's never been a lawsuit over this language specifically, so it does raise, you know, a question. We think that the district's interpretation is correct, but IRWD takes a different interpretation.

Ford: What is the bad act that OCWD is being accused of? What is the act?

Kuperberg: The act is, and it's not explained as clearly as perhaps it should be in the complaint, but that's not our problem. It seems to me that we are using this language to prevent IRWD from moving water to areas within IRWD that are outside of OCWD. And I don't know that IRWD has ever come and said, "Can we do this?" and you said, "No." I mean, I know that the district staff has worked with IRWD in calculating the amount of groundwater production and the amount of imported water used within IRWD, so that IRWD could move water through its pipelines, and feel assured that it was not violating the statute.

But that's been a cooperative measure that the district staff has taken with IRWD to make sure it works based upon the calculation of basin production percentage on water used within the portion of IRWD that's also within OCWD. But to my knowledge IRWD has never said, "We just moved 500 acre feet of groundwater from within OCW to outside OCW. What are you going to do about it?" I mean, it's not been a challenge like that.

Ford: But this is a provision in the District Act which empowers the water district, OCWD, to take actions to prevent the unlawful exportation of water from the district. So is IRWD saying they're not taking action that we should be taking?

Kuperberg: No, quite the contrary. What they're saying is, and again, I don't want to read too much into the complaint. It's not as fleshed out as it might be nice for us to better understand. But it seems that the argument is that OCWD has used this language to deter IRWD from water transfers that it might otherwise do, even though we've never formally taken an action. To my knowledge, the issue has never come in front of the OCW before. So it's almost as if district staff is somehow intimidating IRWD regarding the transfer of water.

Ford: But this provision I think is an enabling provision that allows the water district to act, commence, maintain, intervene, defend, et cetera. So how would that be some sort of a violation?

Kuperberg: IRWD is saying that since the legislature hasn't said what an unlawful exportation is, any exportation is lawful, but OCWD won't allow an exportation. Maybe that's a better to say it. That'd be another way of understanding what their complaint is. But, again, this is a lawsuit that has to do with OCWD either filing or pending a lawsuit. You're correct on that. So it's an argument that doesn't seem to fit any current facts, I guess, is one way to say it.

Markus: President Green?

Green: Yes.

Markus: This is Mike Markus. Does the Irvine Ranch Water District have production facilities within the Orange County Water District service area?

Kuperberg: Production facilities?

Dewane: Water extraction wells.

Kuperberg: Oh, wells, yes.

Markus: They have a lot of them, right?

Kuperberg: Yes, and they're all in the City of Santa Ana.

Dewane: And the service area of the Irvine Ranch Water District straddles between the Orange County Water District service area, and that is how the service area -- well, the Irvine Ranch Water District service area straddles our service area, the Orange County Water District service area, and a portion of their service area is outside of our service area.

Kuperberg: Yes.

Markus: So the fact that the last slide there, Joel, the exportation of water from the service area, is what's generally referred to there, wouldn't you agree?

Kuperberg: Yes. I think what this mainly pertains to, and, you know, I don't want to get into the legal aspects, because I'm not a lawyer, but what we do is we read the water meters that are in IRWD's service area that are within the district. So we know what the total water readings are from IRWD within the district. So we take currently 70 percent, because that's what their BPP is

constrained to, of those demands within the district, and that's the amount of water that they're allowed to pump out of the ground.

Now, because as Director Dewane points out, their piping probably goes both inside and outside of the district, we can't trace exactly where those water molecules are going. But we would suspect that some of those water molecules are probably going outside of the district.

How that plays into what their lawsuit is, I'm not sure. But I guess if you took the letter of the law, or the District Act, we could say that they would have to build their system to deliver water to those pumps within the district service area to be within the district service area. And then they'd have to have a separate system for anything outside the district. That's not the case. They have a system within their service area, which is partially in and partially out.

Markus: And then finally -- thank you for that. That's very helpful. And then finally, the recycled water that they refer to in their system is different than the GWRS water, because the GWRS water is returned to the groundwater basin. Recycled water is not returned to the groundwater basin. It is used for irrigation, correct?

Kuperberg: Yeah, correct. GWRS is considered indirect [inaudible], whereas theirs is not.

Markus: And so for the purpose of the discussion, their groundwater is for the beneficial use of all of the producers in the Orange County Water District service area, where the recycled water that the Irvine Ranch Water District is claiming here is not for the beneficial use of all of the producers, because it's only spread as landscaping water, and does not replenish the groundwater basin. It's therefore not available for extraction by other producers. Am I correct?

Kuperberg: Correct. Correct statement.

Unknown: Director Anthony.

Anthony: Mike, you've just more or less said that they're probably unlawfully exporting water. Did you take any action to stop them?

Markus: Have I?

Anthony: Yeah, you're the executive here.

Markus: Yes.

Anthony: So you've taken no action?

Markus: Well, I think…

Anthony: They're afraid you might someday, is why this all started?

Markus: I don't know what the…

Anthony: Please don't answer that.

Markus: …what their intent is.

Anthony: Please don't answer that.

Markus: But again, what…

Anthony: Let's just move on, Joel, and get this thing over with.

Kuperberg: Okay. But I counter all the claims that are raised. Procedurally OCW, as I said…

Green: Director Sheldon had a question.

Kuperberg: I'm sorry, Director Sheldon.

Sheldon: Thank you, Madam President. Does the complaint ask for a definition of unlawful exportation?

Kuperberg: No. The complaint states the contention of IRWD that the only entity that can determine whether it's unlawful is the legislature, and that the legislature has not stated that any exportation is unlawful.

Sheldon: And it's our position that whether it's -- that there could be lawful exportation if we approved it, and if our board disallowed it, it would then be unlawful exportation.

Kuperberg: The position that I understand, as has been the implicit policy of the board, because I don't think there's anything explicit on it, is that any exportation of groundwater, that is a net exportation of groundwater, that's why I focus on the general managers explaining, they're asking net exportation, would be unlawful if those were not directors authorized.

And so one example of the board directors authorizing a net exportation of groundwater, several years ago the district entered into an understanding

with other agencies in the county, including South County agencies, regarding transfers of water in case of water emergencies, earthquakes and such. And OCWD agreed that if there were an emergency that deprived South County of water, because they are largely in the line of [inaudible] one or two pipelines, that OCWD would move groundwater through IRWD down to South County. And then South County could repay OCWD at some future time when the systems were restored.

So that's, to my mind, one example where OCWD said, "We will authorize an exportation of water from the district under those circumstances."

Sheldon: That's the only example?

Kuperberg: That's the one which I'm…

Sheldon: [Inaudible].

Unknown: Yes.

Unknown: Jim, is this portion of the act, is this original from 1933?

Unknown: Oh, no, no.

Kuperberg: You know, that I don't know. It's been hard to trace this one down. I know that portions of this have been changed, but I don't know if the unlawful exportation comes from 1933 or comes from one of the other major amendments between the early to mid 1950s or in the 1960s. But it's been there for several decades.

Unknown: I think you made a statement, and maybe this is a [inaudible] question. But the GW available to all producers, is that from a hydrology point of view correct that that water would reach producers in Huntington Beach?

Unknown: The actual molecule does not, but because of the GWRS water going into the groundwater basin, it raises the basin threshold.

Unknown: But the molecules that we produce from GWR, are they not available to Huntington Beach?

Unknown: It would take decades.

Unknown: It's part of the barrier.

Unknown: Yeah, it would take a long time.

Unknown: It is a barrier [inaudible].

Unknown: So there -- I don't want to…

Unknown: The injection wells that we inject [inaudible] water intrusion, that water does reach Huntington Beach, as an example.

Unknown: I mean, I understand the process, and how it helps the entire system, but technically speaking it's not available to all producers that are within that hydrologic area.

Unknown: I think actually over time, and that could be centuries, but it would be spread out throughout the basin.

Unknown: It's not available today.

Unknown: Well, it is. [Inaudible] some of the water that we inject into the barrier actually does go into Fountain Valley and Huntington Beach.

Unknown: Okay. That's…

Unknown: A portion of that goes to the…

Unknown: I was thinking Anaheim.

Unknown: And then the Anaheim water goes into Fullerton, and down into Orange. You know, eventually it will get to a little bit more westerly in the county.

Kuperberg: If I may too, the District Act talks in terms of benefit to the lands and district, not availability. So for example, you know, if the district buys MWD water that's released up near [inaudible], and is percolated in the replenishment basins in Anaheim, it's sort of the same thing. It adds to the general supply. It may not be immediately available to Westminster or Fountain Valley, but it's part of the overall supply that lasts all producers [inaudible].

Unknown: What do you do with…

Unknown: [Inaudible] it's the pressure of our recharge of all different kinds, including GWRS, is what allows all of the groundwater production throughout the basin to occur. So COB, for example, is about as remote as you can get from the [inaudible]. It seems [inaudible] from the pressure of the recharge in the [inaudible].

Unknown: Actually, in Anaheim.

Unknown: That's just one idea.

Unknown: And then back on the [inaudible] slide [inaudible], do we have the 1991 legislation and 1995? Have we looked at any of the assembly or Senate Committee staff force members? They may have described the reason for the legislation.

Kuperberg: Yes, we have. And again, the -- it's not really reflected so much in the staff analyses of the bills. It's more reflected in documents that OCWD prepared contemporaneously when requesting legislators to introduce and push the bills. [Inaudible] in 1991 the change had to do with increasing the value of reclaimed water, which then would affect the pricing of reclaimed water by OCWD to retailers, and retailers to the end users. It's not clear, based on the documentation that I've seen, why the language was taken out. Maybe that pricing mechanism didn't work. Whatever.

There is a [inaudible] letter requesting a number of changes in 1995 that's characterized as housekeeping. And this is one of maybe four, five, or six changes to the District Act that are part of that, that are included in that letter requesting the legislative amendment. So the 1995 change, it's much -- we've not yet found any clear reason why that change occurred. But what is clear is that the change did occur.

Unknown: So in my thinking of the -- my last question is when GWR recycles water that's sent to Anaheim, that's to the benefit of all the producers. When IRWD, when they recycle water and release it for irrigation, that's only for their benefit, and that's the difference?

Kuperberg: That may be a policy reason. From my perspective this isn't a policy case. This is a case of what does the District Act allow OCWD to do? What does the District Act prohibit OCWD from doing? I look at the language on supplemental sources that says to be a supplemental source and be part of that denominator in the formula, it has to be water from outside the watershed. I look at, and I think district staff, and, again, there's history of documentation within the district, wastewater generated from houses within IRWD, within the watershed of the Santa Ana River, that are wastewater that is recycled in a plant that is within the watershed of the Santa Ana River, that can't be said to be water that originates from outside the watershed of the Santa Ana River.

The sewage was generated within the watershed. The sewage was reclaimed within the watershed. Nothing occurs outside the watershed. And so it's that, plus this language, that compels the conclusion that reclaimed water doesn't fit within supplemental sources. If the district or directors thought that it was

good public policy to include reclaimed water within supplemental sources, it would be my advice to the district that that policy determination need to be implemented by a change in legislation to return the language to this.

Unknown: Well, the [inaudible] is within the watershed.

Kuperberg: That's my understanding.

Unknown: Yeah, but you can verify it's within the watershed?

Kuperberg: Correct. But again, the GWR plan, when we sell GWR water directly to the City of Anaheim, we treat that the same as we treat IRWD water. But for the most part we don't sell GWR water to anyone. We just use it to augment the groundwater supplies.

Unknown: Thank you.

Kuperberg: So that's pretty much the…

Green: Wait a minute. We've got two more questions. Director Ford?

Ford: I did read the lawsuit, and I had a tough time wading through that, because I wasn't understanding what the bad act was, and what the district was being accused of. Going back to your slide that has the three principal challenges, when you look at the first claim that OCWD improperly excludes reclaimed water from supplemental sources, I think that IRWD's best argument would be that to the extent that they use reclaimed water to water their golf courses, et cetera, to the extent that they do that, then they're not pumping from the groundwater. And they're looking for credit for that. That's what my take is, because that's the only thing that makes any sense to me.

The second claim, having to do with OCWD cannot define unlawful exportation of groundwater, that's probably a true statement, because OCWD doesn't have the power to make that definition. If the District Act is a child of state legislative action, then it is the state legislature that can only define unlawful exportation, I think. Would you agree with that or no?

Kuperberg: Well, you know, it's a statutory construction sheet.

Anthony: You know, why are we talking about an existing lawsuit in this kind of detail in a public meeting? Because we're going to help somebody. Well, maybe we'll help the judge to decide, or he may not pursue it.

Kuperberg: I…

Ford: Well, I think we're trying to do is understand.

Anthony: I think it's improper.

Ford: We actually had this discussion, and it was decided by the board that we wanted a public hearing. And all I'm trying to do is understand what the lawsuit means. Anyhow, going back to the third point, OCWD cannot exclude reclaimed water from calculation of unlawful exportation of groundwater. If we were to do that, then it seems to me that that would be the tool that we would use to go after IRWD for unlawful exportation.

Unknown: Madam President, may I?

Green: Yes.

Unknown: I'm sorry I'm interrupting. I agree with Director Anthony. I think at the closed session we decided as a board that Joel would present the lawsuit, and what his take on the lawsuit is. It was never meant for us to state a position or strategies at this meeting. And I feel it's not to our interest to do that.

Ford: My response to that. I do agree with you, but that's not what I'm trying to do here. We're not talking strategy. All I want to do is try to understand what this is, and unfortunately, we're calling on our counsel to try and interpret what the cause of action is, and we're really not in a position to do that.

Green: I think we need to stop.

Unknown: I agree.

Green: We've heard from enough. Okay. Director Bilodeau?

Bilodeau: I was just going to move that we receive and file this information.

Green: Director Anthony?

Anthony: Second.

Green: All right. Okay. Moving on to [inaudible] Director Anthony?

Anthony: Vote?

Green: Hmm?

Anthony: Are we going to vote?

Green: It's an informational item.

Anthony: Okay. All right.

Green: Well, you want to?

Anthony: I don't want to, unless you…

Green: Does anybody want to vote on that?

Anthony: [Inaudible] had a meeting yesterday, and the most interesting thing was they agreed to have another conference, a watershed [inaudible] conference this year, which hasn't happened for several years. And they did agree to start pursuing that. We also have a nasty lawsuit, which we discussed in closed session. I can't talk about that.

Green: Okay. All right. Moving on to committees. Joint Planning is in the packet. Let's see. Any reports? Okay. President's Report. Thursday and Friday I went up to Sacramento for an ACWA meeting, and I'll report that later. I guess it's now your turn, General Manager.

Unknown: Oh, I was in Sacramento on Monday. I was talking with the State Board with their water quality division on a potential prop on grant funding for research projects. So we're hoping to get about $3 million for the Water Environment and [inaudible] Foundation. And we would be able to submit grant applications to WERF, which [inaudible]. It was a good meeting. It looks like we'll get the prop won, so that's good.

Green: Okay. Directors' reports? General Counsel?

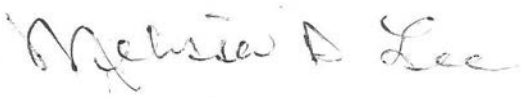
Kuperberg: Nothing to report, other than to inform the public that the OCW board will go into closed session pursuant to [inaudible] Section 5.956 [inaudible] to discuss OCW versus [inaudible], which we know as the MTVE case. It is also [inaudible] Section 5.957 General Management [inaudible].

Green: We are recessed.

I, Melissa D. Lee, professional transcriber, hereby certify that the audio recording of the audiotape labeled **2016-08-03_OCWD_BOD-Meeting** was transcribed by me on October 23, 2017 from an electronic file provided to me by eLitigation Services, Inc. That the foregoing pages contain a full, true and accurate record of all the proceedings and testimony. I further certify that I am not a relative or employee of any attorney of the parties, nor financially interested in the action.

I declare under penalty of perjury
under the laws of California that the foregoing is true and correct.

10/23/2017 _Melissa D. Lee_____
Date Printed Name



_____
Signature

RUTAN & TUCKER

ATTORNEYS AT LAW

COSTA MESA, CALIFORNIA 92626

August 18, 1982

RECEIVED
hand-delivered
AUG 18 1982
ORANGE COUNTY
WATER DISTRICT

Ms. Mary E. Johnson
Administrative Officer
and Assistant Secretary
Orange County Water District
P. O. Box 8300
Fountain Valley, California 92708

Dear Ms. Johnson:

In your letter of August 17, 1982, you set forth four separate questions regarding certain matters relating to the basin equity assessment provisions of the Orange County Water District Act. The following are the questions and the answers thereto:

(1) Question: Under the provisions of the District Act, can reclaimed water be considered as a supplemental source?

Supplemental source is precisely defined in Section 31.5 of the Orange County Water District Act as being sources of water outside the watershed of the Santa Ana River. This definition does not include reclaimed water. Therefore, the answer to the questions is that reclaimed water may not be considered as a supplemental source.

(2) Question: Can the County of Orange consolidate all wells owned by EMA, Cemetery District and Water Works #8, for example, with respect to filing the BEA reports?

It is to be noted that EMA is merely a department of the County and as such does not itself own any wells. Any wells which may be designated as owned by that agency are, in fact,

WITNESS Markus
EXHIBIT 26
DATE 10-11-17 RPTR NH
eLitigation Services Inc.

owned by the County of Orange. Cemetery District, Water Works District #8, as well as the Orange County Harbors, Beaches and Parks District and the Orange County Flood Control District, are separate entities distinct from the County of Orange even though the management of those districts are undertaken by EMA of the County. The basin equity assessments as provided in Section 31.5 of the Orange County Water District Act relate to individual persons or operators as defined in Section 24 of the District Act to include public agencies to whom a water producing facility is assessed, or if not separately assessed, who owns the land upon which the water producing facility is located. The BEA, then, applies to the individual public agency as distinguished from a collective group of public agencies insofar as the filing of the BEA report and the payment of any assessment due thereunder is concerned. Therefore, the County of Orange may not consolidate all wells owned by it and the other Districts within its supervision with respect to filing the BEA report.

(3) Question: If water is purchased by the County from an entity ouside the watershed and used within the District, can this water be counted as supplemental?

Whether water may be determined to be from supplemental sources is dependent upon the source of the water as distinguished from the location of the entity from whom the water may be purchased. Therefore, if the source of the water of the entity from which the County purchased the water is outside the watershed of the Santa Ana River, then that water may be counted as supplemental. If, on the other hand, the source of that water is from within the watershed, although the entity itself may be located outside the watershed, the water may not be counted as supplemental.

(4) Question: When in a "consumer" capacity, can the County claim as supplemental water water purchased from an entity within the District and used within the District?

When the County purchases its water from another entity within the District in a consumer capacity, it is not a person or operator within the meaning of the definitions of the District Act. Therefore, under such circumstances it may not claim the water so purchased as supplemental water. To allow it to do so would result in a double credit for supplemental water--one to the entity from whom it purchased it's water and secondly, to the County itself.

RUTAN & TUCKER
ATTORNEYS AT LAW
A PARTNERSHIP CONSISTING OF PROFESSIONAL CORPORATIONS

If there are any further questions, please advise.

Very truly yours,

RUTAN & TUCKER

Milford W. Dahl

Milford W. Dahl

MWD:ck

OCWD DISTRIBUTION	
ACTION	
BOARD FILE	
DISCUSS w/SM	
INFO COPY	NR, DM, NMC, MJ (2)
ROUTE COPY	
SUSPENSE	
AGENCY FILE	
AGENCY FILE	R. & T. Legal Opinions
CHRONO COPY	✓
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CERTIFIED COPY

SUPERIOR COURT OF THE STATE OF CALIFORNIA
FOR THE COUNTY OF LOS ANGELES

IRVINE RANCH WATER DISTRICT, A CALIFORNIA PUBLIC AGENCY,	)	
PLAINTIFF AND PETITIONER,	)	
vs.	)	CASE NO. BS168278
ORANGE COUNTY WATER DISTRICT, A CALIFORNIA PUBLIC AGENCY; ALL PERSONS INTERESTED IN THE MATTER OF ORANGE COUNTY WATER DISTRICT RESOLUTION NO. 16-4-37; and DOES 1 to 20, INCLUSIVE,	)	
DEFENDANTS AND RESPONDENTS.	)	

DEPOSITION OF JOHN KENNEDY

Taken on October 12, 2017

SUPERIOR COURT OF THE STATE OF CALIFORNIA

FOR THE COUNTY OF LOS ANGELES

IRVINE RANCH WATER DISTRICT, a California public agency, Plaintiff and Petitioner, v. ORANGE COUNTY WATER DISTRICT, a California public agency; ALL PERSONS INTERESTED IN THE MATTER OF ORANGE COUNTY WATER DISTRICT RESOLUTION NO. 16-4-37; and DOES 1 to 20, inclusive, Defendants and Respondents.	Case No. BS168278
GOLDEN STATE WATER COMPANY, Cross-Complainant, v. IRVINE RANCH WATER DISTRICT, a California public agency, and ROES 1 to 10, inclusive, Cross-Defendant.	

(Continued on following page)

Deposition of JOHN KENNEDY, taken on behalf of Plaintiff, at 12th Floor, 2030 Main Street, Irvine, California, beginning at 1:05 p.m. and ending at 4:53 p.m., on October 12, 2017, before Christianne Lee Fong, CSR No. 7559, CCRR.

EAST ORANGE COUNTY WATER DISTRICT, YORBA LINDA WATER DISTRICT, and MESA WATER DISTRICT,

Cross-Complainants,

v.

IRVINE RANCH WATER DISTRICT, and ROES 1 to 10, inclusive,

Cross-Defendants.

Case No. BS168278

CITY OF BUENA PARK,

Cross-Complainant,

v.

IRVINE RANCH WATER DISTRICT, a California public agency, and ROES 1 to 10, inclusive,

Cross-Defendant.

CITY OF ANAHEIM, a California municipal corporation and charter city,

Cross-Complainant,

v.

IRVINE RANCH WATER DISTRICT, a California public agency, and ROES 101-201, inclusive,

Cross-Defendant.

APPEARANCES:

FOR PLAINTIFF, PETITIONER AND CROSS-DEFENDANT
IRVINE RANCH WATER DISTRICT:

ALSTON & BIRD LLP
BY: EDWARD J. CASEY, ESQ.
BY: CLYNTON NAMUO, ESQ.
333 South Hope Street
Sixteenth Floor
Los Angeles, California 90071-1410
213.576.1000
ed.casey@alston.com
clynton.namuo@alston.com

FOR DEFENDANT AND RESPONDENT
ORANGE COUNTY WATER DISTRICT:

RUTAN & TUCKER
BY: MARK AUSTIN, ESQ.
BY: MORGAN GALLAGHER, ESQ.
611 Anton Boulevard
Suite 1400
Costa Mesa, California 92626-1931
714.641.5100
maustin@rutan.com
mgallagher@rutan.com

FOR DEFENDANT, RESPONDENT AND CROSS-COMPLAINANT
GOLDEN STATE WATER COMPANY [PARTY INTERESTED IN
THE MATTER OF ORANGE COUNTY WATER DISTRICT
RESOLUTION NO. 16-4-37]:

BROWNSTEIN HYATT FARBER SCHRECK, LLP
BY: DIANE C. DE FELICE, ESQ.
(Where Indicated)
2049 Century Park East
Suite 3550
Los Angeles, California 90067
310.500.4600
ddefelice@bhfs.com

APPEARANCES: (CONTINUED)

FOR DEFENDANT, RESPONDENT AND REAL PARTY IN INTEREST CITY OF ANAHEIM:

ANAHEIM CITY ATTORNEY'S OFFICE
BY: DANIEL J. PAYNE, DEPUTY CITY ATTORNEY
200 South Anaheim Boulevard
Suite 356
Anaheim, California 92805
714.765.5169
dpayne@anaheim.net

FOR DEFENDANT, RESPONDENT, REAL PARTY IN INTEREST AND CROSS-COMPLAINANT CITY OF ANAHEIM:

BEST BEST & KRIEGER LLP
BY: JEFFREY W. DUNN, ESQ.
(Where Indicated)
18101 Von Karman Avenue
Suite 1000
Irvine, California 92612
949.263.2600
jeffrey.dunn@bbklaw.com

FOR REAL PARTIES IN INTEREST AND CROSS-COMPLAINANTS EAST ORANGE COUNTY WATER DISTRICT, YORBA LINDA WATER DISTRICT AND MESA WATER DISTRICT:

MEYERS, NAVE, RIBACK, SILVER & WILSON
BY: GREGORY J. NEWMARK, ESQ.
707 Wilshire Boulevard
24th Floor
Los Angeles, California 90017
213.626.2906
gnewmark@meyersnave.com

I N D E X

W I T N E S S :

INFORMATION REQUESTED

(None)

QUESTIONS INSTRUCTED NOT TO ANSWER

PAGE	LINE
29	20

EXHIBITS PREVIOUSLY MARKED AND ATTACHED:

EXHIBITS PREVIOUSLY MARKED AND ATTACHED: (CONTINUED)

EXHIBITS-MARKED:

EXHIBITS-MARKED: (CONTINUED)

PLAINTIFF'S	DESCRIPTION	PAGE
51	Historical GAP Pricing/Supplemental Water/Reclaimed Water Classification Documents, OCWD004064, 1 pg	98
52	5/11/16 Email from Paul Shoenberger to John Kennedy, with Attachments, OCWD003357 - OCWD003360, 4 pgs	112
53	Email Chain, OCWD001674 - OCWD001675 2 pgs	115
54	Analysis of Hydraulic and Financial Operations of a Recycled Water System: A Case Study of the Orange County Water District's Green Acres Project, OCWD022175 - OCWD022535, 363 pgs	133

Irvine, California; Thursday, October 12, 2017

JOHN KENNEDY,

having been duly affirmed, was

examined and testified as follows:

EXAMINATION

BY MR. CASEY:

Q Good afternoon, Mr. Kennedy. My name is Ed Casey. I'm with the law firm Alston & Bird, and I represent the plaintiff in this case, the Irvine Ranch Water District.

Before we start our examination, I'll give the other attorneys in the room the opportunity to identify themselves for the record and who they represent.

MR. NAMUO: My name is Clynton Namuo with Alston & Bird, and I represent Irvine Ranch Water District.

MR. PAYNE: My name is Daniel Payne. I'm a deputy city attorney for City of Anaheim.

MR. NEWMARK: Gregory Newmark from Meyers Nave on behalf of East Orange County Water District, Yorba Linda Water District, and the Mesa Water District.

MS. GALLAGHER: Morgan Gallagher with Rutan & Tucker for OCWD.

MR. AUSTIN: Mark Austin from Rutan & Tucker, also on behalf of OCWD.

BY MR. CASEY:

Q So, Mr. Kennedy, before we start with the substantive examination, let me go through some ground rules.

The first one is I'll be asking you some questions. If you do not understand any of the questions, please ask me to rephrase them. I'll try to do so. If you do not ask me to rephrase them, I will assume that you understood the question.

Do you understand that?

A Okay.

Q When responding to my questions, please answer audibly, like you just did. Some witnesses have a shake of the head, and the court reporter cannot take that down.

Do you understand that?

A Okay, yes.

Q Please let me finish my questions, and I'll extend the same courtesy to you and let you finish your answers. If we talk over one another, then the reporter cannot take down the best testimony.

Do you understand that?

A Yes.

Q Similarly, some of these attorneys may be making evidentiary objections after my questions. Please let them finish stating their objections before you answer. Again, the court reporter has to take down the best transcript.

Do you understand that?

A Yes.

Q The oath you just took would be the same oath you would take if you were sitting in a courtroom and carries the same criminal penalty of perjury. So it's very important that you give us your best testimony today.

Do you understand that?

A Yes.

Q Everything that's being said today is being taken down by the court reporter sitting to your left. You will have an opportunity to read the transcript. Reads like a play: Question, answer, question, answer. You have the opportunity to make some changes.

However, if you make any substantive or material changes, I'll have the right to comment on that in any future proceedings in this matter. It's

important that you give us your best testimony today.
Do you understand that?
A Yes.
Q Is there any reason, medical or otherwise, you can't give us your best testimony today?
A No.
Q Have you ever testified either at trial or in a deposition as a designated expert witness?
A Yes, I have.
Q On how many occasions?
A I can remember twice.
Q Were both of those occasions while you were employed by the Orange County Water District?
A One was with Orange County Water District. And another one was with previous employer, City of Signal Hill.
MR. AUSTIN: I just want to make sure the witness understands.
Do you understand these questions are specifically for when you were designated by the court as an expert in the case?
BY MR. CASEY:
Q Or designated by a party.
Were you a designated expert in a case?
MR. AUSTIN: And not just any time you

testified.

THE WITNESS: Those -- I was just -- I was not an expert. They were just depositions. Sorry.

MR. AUSTIN: I'm sorry, I need to object to that. I don't think all witnesses understand --

MR. CASEY: I appreciate that clarification.

MR. AUSTIN: -- when you're designated as an expert.

MR. CASEY: Sure. I appreciate the clarification.

Q Just briefly, what did the lawsuit in which you testified at deposition when you were an employee of Orange County Water District, what did that involve?

A It's a MTBE lawsuit against parties who have contaminated the groundwater basin with MTBE.

Q And same question for your deposition testimony when you were employed by the City of Signal Hill?

A It was a -- it was a construction contract dispute with a grading contractor.

Q So let me go through some acronyms just for the record. I'll be referring to the Orange County Water District as "OCWD."

Do you understand that?

A Yes.

Q I'll be referring to the Irvine Ranch Water District as "IRWD."

Do you understand that?

A Yes.

Q I may be referring to the basin equity assessment as the "BEA."

Do you understand that?

A Yes.

Q And I may be referring to the basin production percentage as "BPP."

Do you understand that?

A Yes.

Q Other than with your attorney, did you discuss this deposition with anybody else?

A No.

Q Did you review any documents in preparation for this deposition today?

A Yes, I did.

Q What documents were those?

A I just went through my file of old documents I've collected over the last year, the actual complaint that was filed and the letter for the deposition and documents I've had in this file.

Q When you say "this file," what is this file?

A Well, this is a file I keep, like a working file.

Q What's it titled?

A "Irvine" -- "IRWD Reclaimed Water."

Q Besides the complaint and the letter, anything else in that file?

A No.

Q Any other documents you reviewed to prepare for today's deposition?

A No.

MR. CASEY: Let's have marked as Exhibit 37 a two-page document which appears to be Mr. Kennedy's bio from the OCWD website.

(Exhibit 37 marked.)

(Mr. Dunn joins the deposition.)

BY MR. CASEY:

Q Let the record reflect that Mr. Dunn has joined the deposition.

Mr. Dunn, would you like to announce your --

MR. DUNN: Yes, thank you.

Jeffrey Dunn for the City of Anaheim.

We're missing Ms. De Felice.

MR. CASEY: Off the record.

(A discussion was held off the record.)

///

BY MR. CASEY:

Q Mr. Kennedy, is this your website bio?

A It looks like it, yes.

Q I was looking forward, actually, today to seeing that nice tie on you. It's nice.

We learned yesterday from the deposition of Mr. Markus that the bios for the executives from OCWD on their website may be a few years old.

Is that the case with this one for you? It says on the second page you have 30 years of experience, have been there since '95.

Is anything out of date?

A It looks pretty up to date. The document could be a couple years old, but I don't think there's anything substantially that has changed.

Q Are you still the executive director of engineering and water resources for OCWD?

A Yes.

Q The second paragraph on the first page of Exhibit 37 identifies your job duties.

Are those still your job duties?

A Yes, they are.

Q Have your duties increased beyond the ones stated on the first page?

MR. AUSTIN: Objection. Misstates the

document. I'll note that it uses the word "include." Does not purport to be an exclusive list of his duties.

BY MR. CASEY:

Q Do you have other duties?

A I'm managing the Poseidon ocean desal project right now. So I don't see that on there. So there could be some other things.

Q Any other ones that come to mind besides the Poseidon project?

A Nothing major.

Q I see in the list of the duties that you oversee the development and production of OCWD board and committee meeting agendas.

Is that still accurate?

A Yes, it is.

MR. AUSTIN: Objection. Vague as to "oversee."

BY MR. CASEY:

Q So let's go to the second page of your bio. And it lists your bachelor's degree and your master's degree.

Is that information accurate?

A Yes.

Q When did you receive your bachelor's degree?

What year?

A In 1980.

Q Same question for the master's?

A 1982.

Q Any other formal education?

A The Pepperdine MBA in 1987.

Q That was the master's of business administration; right?

A Correct.

Q So let's focus on the period of time between 1987, when you got your MBA from Pepperdine, and 1995, when you joined OCWD.

Can you tell us your employment history?

A I worked for Moffat & Nichol engineers. They're a private consulting firm. Their main office is in Long Beach.

Q From what year to what year?

A I believe 1986 to 1989.

Q What was your job title?

A I was a senior engineer and the controller during those three years.

Q Is that mostly a construction company?

A Civil engineering consulting, yeah.

Q To 1989?

A From there I went to the City of Signal Hill

and worked as the assistant city engineer. I was promoted to public works director.

Q That was from '89 till when?

A Until '95.

Q Did you -- when you were with Signal Hill, did you work on any water-supply-related matters?

A I had the city Water Department underneath me.

Q All right. So then you joined OCW in 1995; right?

A Yes.

Q What was your job position?

A I started as a senior planner.

Q In which department?

A Planning department.

Q What does the planning department for OCWD do besides plan?

MR. AUSTIN: Objection. Vague.

BY MR. CASEY:

Q So understand, Mr. Kennedy, that your counsel may be making objections, but, unless he instructs you not to answer, you can still proceed to answer. Okay?

A Okay.

Q I see that you keep looking at him when he gives an objection. That's just a ground rule I

forgot to give you.

A Okay.

MR. AUSTIN: I'm just stating it for the record.

BY MR. CASEY:

Q So go ahead.

A We planned future capital projects. Did feasibility studies, and would look at different projects, were they feasible? Could they benefit the district? Yeah.

Q What was your next job position?

A I was promoted to -- okay, I was promoted to planning director/associate general manager.

Q What year was that?

A That was the year after being there. So that would have been 1996.

Q Still with the planning department; right?

A Yes.

Q You said also as associate general manager?

A General manager.

Q What duties did you have in that position?

A I'll have to remember. It was broad duties. A gentleman named John Chaufty had passed away, and I stepped into his role. He did a lot of financial planning, setting of the rates, setting of the basin

production percentage, looking at the long-term CIP forecasting rates. Issuing debt. General management of the groundwater basin programs.

Q So this change in position, was it fair to say that your duties expanded?

A Yes.

Q So how long were you in that position?

A I'll have to think back. That was '96. I was promoted to assistant general manager. I just don't remember exactly when. It could have been around the year 2000. Maybe 2001.

Q Who is the assistant general manager now for OCWD?

A Right now it's Mike Wehner.

Q Could you spell Wehner for the record?

A W-e-h-n-e-r.

Q Thank you. How long were you the assistant general manager?

A Okay, I'll think out loud here. Bill Mills left in 2002. I was still assistant. Virginia Grebbien came on. I would say until around 2005.

Q What position did you get in 2005?

A My current position.

Q Was there some reorganization that happened at the district?

A Yeah. There was a -- Virginia Grebbien left, and then Mike Markus became general manager, and there was a reshuffling, reorganization, yeah.

Q So you now head up the -- which department? I got my list from Mr. Markus.

Do you head up the engineering department?

A Yes. Engineering, HR, IT.

Q These are departments you head up now?

A Well, I oversee it. Those department heads report to me.

Q Oh, I see. Engineering, IT?

A IT, HR, the board secretaries, and I guess that's it.

Q Is there a hydrogeology department?

A Yes, there is.

Q That's headed up by Mr. Herndon?

A Yes.

Q Does he report to you?

A No.

Q He reports to Mr. Markus?

A To Mike Wehner.

Q Mike Wehner.

A Yeah.

Q You can put aside your bio. No one likes to keep looking at their picture. Trust me.

Oh, you have to give that back -- to the court reporter back.

(A discussion was held off the record.)

BY MR. CASEY:

Q So let me have marked as Exhibit 38 a two-page document. First page is an email to Mr. Kennedy, dated August 3, 2016, Bates stamp 2569.

(Exhibit 38 marked.)

THE WITNESS: (Witness reviews exhibit.)

BY MR. CASEY:

Q Mr. Kennedy, do you recognize this document?

A Yes.

Q What is it?

A Looks like the minutes of a Water Issues Committee, report that was given to that committee.

Q The Water Issues Committee, just for the record, is a committee of OCWD?

A Yes.

Q You can tell that because on the first page, it refers to "WIC"?

A Yes.

Q That stands for Water Issues Committee?

A Yes.

Q Is Ms. Durant in the board secretary office?

A Yes.

Q And she reports to you?
A Yes.
Q These minutes from the year 2013; is that right?
A It says 2016.
Q In the subject line, it refers to -- oh, 7/13.
So is that from 2013 or 2016?
A I'm guessing that's July 13 in 2016.
Q I see. So does Ms. Durant -- is her procedure to send you a draft of committee minute meetings for your review?
A Yes.
Q And she does that to ensure that they're accurate?
A Yes.
MR. AUSTIN: Objection. Calls for speculation, lack of foundation.
BY MR. CASEY:
Q Did you give any changes to Ms. Durant with respect to the WIC minutes that are attached to this email?
A I don't recall specifically.
Q So let's talk about the second paragraph on the second page. That paragraph seems to make a

reference to legislative amendments to the OCWD Act.

And another term, Mr. Kennedy, I'll be referring to the Orange County Water District statute as "the OCWD Act."

Okay?

A Okay.

Q So did you review the legislative history concerning Section 31.5 of the OCWD Act?

MR. AUSTIN: Objection. Vague as to time, vague as to legislative history, calls for legal conclusion.

THE WITNESS: I reviewed historical documents that I could find in our district office.

BY MR. CASEY:

Q Do you remember what they were?

A There was different documents. These were documents referring -- referencing the Green Acres Project, which is a reclaimed water project. And there were different files for the Green Acres Project, and I just went back, looking to see what the history was on the project.

Q What is the Green Acres Project?

A It's a recycled water project. Orange County Water District takes wastewater from Orange County Sanitation District, treats it to tertiary standards,

and we have about 50 customers in a distribution system. We have a treatment plan on site, and we serve that water to these 50 users, users like golf courses or greenbelts.

Q And the Green Acres Project is different than the GRS project; right?

A Yes.

Q For the record, why don't you describe the GRS project.

A The GWRS project also takes wastewater from Orange County Sanitation District but treats it to drinking water standards, and then that water is injected along the coastline in our seawater barrier.

About a third of it goes into the seawater barrier, and then the remaining two-thirds of that water is pumped up to Anaheim, where it's recharged into the groundwater basin.

Q So in the middle of the second paragraph, the sentence reads (as read):

Mr. Kennedy stated this gave the district the option to charge a higher rate for Green Acres Project reclaimed water but no action was taken.

What's that in reference to?

A The district charge for Green Acres Project

water. There's four retail producers: Mesa Water District, City of Newport Beach, City of Santa Ana, and City of Fountain Valley. They all receive Green Acres Project water, and we charge them a rate for that water.

And what this is referring to is that, after that reclaimed water was considered supplemental water, it made the water more valuable and the district could have charged a higher rate for it.

Q But it didn't, did it?

A Did not, yes.

Q That's because they couldn't get those four retail producers to agree to renegotiate the contract; correct?

MR. AUSTIN: Objection. Calls for speculation, lack of foundation, assumes facts not in evidence.

THE WITNESS: Yes. Now, I was not at the district at this time, and I don't know for sure. So I'm guessing that what you said is generally correct. But I don't know.

MR. AUSTIN: I'm also going to object on the basis of deliberative process privilege. You're kind of getting into that area. So to the extent you go any further into that, I may just direct the witness

not to answer.

BY MR. CASEY:

Q And the price that OCWD charges those four retail producers for the Green Acres Project water is about 80 percent of the producers' groundwater costs; isn't that true?

A Yes, yes.

Q And that price is far less than the actual cost to OCWD to produce the Green Acres Project water; is that correct?

MR. AUSTIN: Objection. Lacks foundation, calls for speculation, vague as to "far less."

THE WITNESS: It is less.

BY MR. CASEY:

Q So let's keep on going with that same paragraph. The next sentence says (as read):

Further, he stated in 1995 the district reversed the 1991 change in the definition of supplemental sources and amended the District Act to its original and current definition of supplemental water.

Do you see that sentence?

A Yes.

Q In that sentence, are you using the phrase

"supplemental water" interchangeably with "supplemental sources"?

MR. AUSTIN: Objection. Misstates the department, vague as to "you." Calls for legal conclusion.

THE WITNESS: I could have been, yes.

BY MR. CASEY:

Q And "supplemental sources" is defined in the OCWD Act; correct?

MR. AUSTIN: Calls for legal conclusion.

THE WITNESS: I -- yes.

BY MR. CASEY:

Q I have the OCWD Act if you want me to just check, but you do know it's there; correct?

A Yes.

Q And it's in Section 31.5(c); correct?

MR. AUSTIN: Same objection.

THE WITNESS: I know it is Section 31.

BY MR. CASEY:

Q Do you have any knowledge as to why the legislature amended the District Act as described in this paragraph?

MR. AUSTIN: Objection.

Don't answer that.

Calls for speculation, lack of foundation,

legislative motive, is irrelevant.

MR. CASEY: I'm asking if he knows why the state legislature did.

MR. AUSTIN: I understand that. I don't know why his opinion on that would be relevant at all.

MR. CASEY: It's reasonably calculated to lead to the discovery of admissible evidence.

MR. AUSTIN: It's really not.

MR. CASEY: So you're instructing not to answer on what grounds?

MR. AUSTIN: On the grounds of the legislative motive privilege.

MR. CASEY: Okay.

MR. AUSTIN: And also relevance.

BY MR. CASEY:

Q So the next sentence says (as read):

Mr. Kennedy reviewed the policy issues associated with changing the definition of supplemental water through a legislative change in the District Act.

What were you referring to there?

MR. AUSTIN: What sentence, Counsel?

MR. CASEY: The last sentence of the second paragraph.

MR. NEWMARK: Objection. Compound and vague.

Counsel, you are talking about the legislative change; right?

MR. CASEY: I'm asking what he's referring to in that sentence. It's that simple of a question.

MR. AUSTIN: Hold on, give me a chance to review it.

THE WITNESS: (Witness reviews exhibit.)

MR. AUSTIN: I'm also going to object as compound and vague and ambiguous.

BY MR. CASEY:

Q Go ahead, Mr. Kennedy.

A Yeah. I believe I was just talking about what it meant to the district by having reclaimed water classified as supplemental sources or not supplemental sources, how it impacted the water district.

Q How did it impact?

MR. AUSTIN: Objection. Vague and ambiguous as to "impact." Incomplete hypothetical.

THE WITNESS: If reclaimed water is not a supplemental source, then the district kind of ignores it in calculating the basin production percentage.

BY MR. CASEY:

Q So it's your understanding as we sit here today that OCWD does not include recycled or reclaimed

water in the definition of a supplemental source; is that correct?

MR. AUSTIN: Objection. Incomplete hypothetical, vague as to time and circumstances. Calls for legal conclusion.

MR. NEWMARK: Lack of foundation.

BY MR. CASEY:

Q Mr. Kennedy.

A I would say yes.

Q So one last question. Let's go back to the first paragraph. The middle of that paragraph -- I'm going to read it. (As read):

Mr. Kennedy stated that, because reclaimed water is created within the district's boundaries, has its source at a reclamation plant within the watershed, and is comprised of wastewater that was generated from within the watershed, reclaimed water is not a source of water outside the watershed of the Santa Ana River.

Do you see that?

A Yes.

Q Did you make that statement at this meeting of the Water Issues Committee?

MR. AUSTIN: Objection. Vague as to "that statement." Can you point to me which paragraph this is in?

MR. CASEY: First paragraph. The sentence begins with "Mr. Kennedy stated."

Q I'm just asking you, did you make that statement?

A I --

Q Go ahead.

A I may or may not have made that exact statement. Sometimes the board secretary could pull sentences out of the staff report to put into the minutes.

Q I see.

A So that sentence could have been in the staff report. I could have made that statement.

Q Was it generally correct, since Ms. Durant ran these minutes by you for factual accuracy? Is that correct?

A Yes.

Q Do you base that statement or position on your own analysis of the act?

MR. AUSTIN: Objection. Vague and ambiguous as to "your own analysis" and to "base that statement."

Don't answer that to the extent you have to rely upon advice of counsel or did rely upon the advice of counsel as part of that analysis. To the extent you even did an analysis.

THE WITNESS: Yeah. I'm not sure I did any analysis.

When I got to the district, that's how things were being done. I -- and I just, you know, continued processing documents in that same manner.

BY MR. CASEY:

Q When you got to the district, who told you that was the way things were being done?

MR. AUSTIN: Excluding any advice of counsel?

MR. CASEY: Of course.

THE WITNESS: I don't recall who exactly would have told me. There was just procedures in place. And these reports are filed every year, and it was just continuing what had been done, primarily for the GAP users.

The GAP system operates exactly like we're discussing here. Those same procedures got put in place for IRWD's reclaimed water.

BY MR. CASEY:

Q To a new document, Mr. Kennedy. Put that on the stack there. We're going to dig out Exhibit 4.

(Exhibit 4 previously marked.)

MR. CASEY: Let the record reflect that I've handed the document that was previously marked as Plaintiff's Exhibit 4, which is entitled "2014-2015 Engineer's Report."

Q Take a moment just to look through that, Mr. Kennedy, to the point where you can tell me if you recognize the document.

A Yes, I do.

Q What is the document?

A It's the 2014-2015 engineer's report for the groundwater basin conditions within Orange County Water District.

Q What is your role in the preparation of the annual engineer's report for the OCWD?

A This report comes out of the engineering department, and I will review it before it's finalized.

Q You review the entirety of the report for accuracy; is that correct?

MR. AUSTIN: Objection. Vague as to "entirety."

THE WITNESS: I will review parts of it. Maybe 80 percent of this is boilerplate, does not need to be reviewed.

BY MR. CASEY:

Q We're going to go through certain things. You let me know which is boilerplate and which is not. Okay?

A Okay.

Q Let's turn to page No. 20, which is entitled "Supplemental Water."

Is this one of those boilerplate provisions?

MR. AUSTIN: Objection. Vague as to "boilerplate."

THE WITNESS: I don't -- I don't think this section changes much each year, except for updating some of the numbers.

MR. AUSTIN: By "this section" are you referring to the section entitled "Supplemental Water," Counsel?

MR. CASEY: Yes.

Q Pointing to the first paragraph, second sentence, it starts off with (as read):

Supplemental water as defined in Section 31.5 of the District Act.

Do you see that?

A Yes.

Q Is that intended, as you understand this report, to refer to supplemental sources as defined in

Section 31.5 of the OCWD Act?

MR. AUSTIN: Calls for legal conclusion. Calls for speculation, lack of foundation.

Go ahead.

THE WITNESS: I believe so.

BY MR. CASEY:

Q So let's go to the last sentence of that paragraph. It says (as read):

In addition, supplemental water would also include deliveries from within the SAR watershed that involve water exchanges, i.e., releasing a quantity of water that originates from within the SAR watershed while importing an equal quantity of supplemental water to replace it.

What does that refer to?

MR. AUSTIN: Objection. Calls for speculation, lack of foundation. There's no evidence that he wrote this.

THE WITNESS: Yeah, give me a minute here.

BY MR. CASEY:

Q Sure, take your time.

A (Witness reviews exhibit.)

MR. AUSTIN: I'm going to object as compound

and assumes facts not in evidence.

Go ahead.

THE WITNESS: I'm not exactly sure. Before I got to the water district, there was some exchange contracts with people in the upper watershed that had expired a long time ago. This sentence could be referring to one of those. I don't -- I can't think of any current programs or projects that this applies to.

BY MR. CASEY:

Q It makes a reference to the term "SAR watershed." What does that refer to?

A Santa Ana watershed is all of that land area that generally drains into the Santa Ana River.

Q The drainage area?

A Drainage area.

MR. AUSTIN: Objection. Vague as to "drainage area." Also misstates prior testimony.

BY MR. CASEY:

Q So the next paragraph, Mr. Kennedy, talks about, quote, "non-local waters."

Do you see that?

A Yes.

Q What is your understanding of non-local waters?

MR. AUSTIN: Objection. Calls for speculation, lack of foundation, document speaks for itself.

THE WITNESS: This is referring to water from the Arlington desalter in Riverside and high groundwater that was pumped from San Bernardino Valley groundwater basin.

These were waters that were put into the Santa Ana River that came down to Orange County.

BY MR. CASEY:

Q They were put into the Santa Ana River where? The upper basin?

MR. AUSTIN: Objection. Calls for speculation, lack of foundation. The document here is defining what non-local waters are for purposes of this document. I'm not sure why you're asking this witness to expand upon that.

BY MR. CASEY:

Q Mr. Kennedy, you can answer.

A They were put into the river in the upper watershed above Prado Dam.

Q Let's go to the last sentence. It says (as read):

For the purpose of being consistent with previous engineer's reports and to

present information in a concise manner, non-local water deliveries that are purchased and used by OCWD for groundwater replenishment are included in the supplemental water totals in this report.

In your position as executive director of the engineering department, tell me, why are non-local water deliveries included in the supplemental water totals for the annual engineer's report?

MR. AUSTIN: Objection. The document speaks for itself. Lack of foundation, calls for speculation.

So you're asking him a question independent of what this document says? Because this document supplies an answer and --

MR. CASEY: You can make your objection, Counselor. My question stands.

MR. AUSTIN: What's the purpose of your preamble --

MR. CASEY: I don't have to answer your questions. You make an objection. You can instruct him not to answer or not.

MR. AUSTIN: The question is vague and ambiguous by virtue of the preamble that you're

providing before asking him the more direct question.
BY MR. CASEY:
Q Go ahead, Mr. Kennedy.
A This report calculates the annual overdraft for the groundwater basin. And when the annual overdraft is calculated, you exclude what is being referred to as supplemental water in making that calculation. So you need to take out different sources of water in making the annual overdraft calc.
Q Thank you.
Look at the next paragraph.
You see in that first sentence in the parenthetical there's a reference to the phrase "neutral water"? Do you see that?
A Yes.
Q What's your understanding of "neutral water"?
MR. AUSTIN: Objection. Calls for speculation, lack of foundation, calls for legal conclusion.
THE WITNESS: It's been loosely -- that's a term loosely used in the office by maybe some employees that recycled water is not groundwater and it's not supplemental water. So sometimes they will say it's neutral. It's neither.
///

BY MR. CASEY:

Q The next sentence says -- I'll read it (as read):

Therefore, recycled water that originates from with OCWD is reported separately from supplemental water totals.

Is that your understanding about how OCWD reports recycled water that originates from within OCWD?

MR. AUSTIN: Objection. Assumes facts not in evidence as to OCWD reporting. Calls for legal conclusion. Lack of foundation.

THE WITNESS: Yes.

BY MR. CASEY:

Q And in that sentence again we use the reference to supplemental water that's being used interchangeably for supplemental sources; is that right?

MR. NEWMARK: Objection. Vague. Misstates testimony. Document speaks for itself.

MR. AUSTIN: Same objections.

THE WITNESS: I believe so.

BY MR. CASEY:

Q Let's turn a couple pages to page No. 22. On

Table 4, if I can direct your attention to Table 4. The second half of Table 4 is entitled "Irrigation and Industrial." And then it lists "IRWD," and below that, "OCWD Green Acres Project." And it has to the right some water usage numbers.

Does Table 4 reflect the actual water -- I'm sorry.

Does Table 4 reflect the actual recycled water usage by IRWD and OCWD's Green Acre Projects for the year 2014 and '15?

MR. AUSTIN: Objection. Calls for speculation, lack of foundation, vague as to "actual." Document speaks for itself.

THE WITNESS: Yes.

BY MR. CASEY:

Q Let's go down to the bottom of the page, "Water Demands."

A Uh-huh.

(Ms. De Felice joins the deposition.)

BY MR. CASEY:

Q Next sentence, if you flip, it talks about water demand forecasts.

So for purposes of the preparation of the annual engineer's report, how does OCWD forecast and estimate future water demands?

A We've had two methodologies for doing that. The first was to call up and poll the 19 retail agencies within OCWD, ask them what they are projecting for future water demands, and then simply adding up those 19 numbers to get a projection.

And then we also participated in the report with MWDOC where future water demands were projected. And we've used that number also.

Q Let's lift the page to page 24. And direct your attention to Table 5, entitled "Water Demands Within OCWD."

Do you see that?

A Yes, yes.

Q What's your understanding what Table 5 reflects?

MR. AUSTIN: Objection. Document speaks for itself.

THE WITNESS: Yeah. The table shows the total water demands for '14-'15, and breaks it out by groundwater or imported water and Santiago Creek water or recycled water. And then it shows it for the current year and the ensuing year, same information.

BY MR. CASEY:

Q So for the ensuing year, that is an estimated water demands broken down for groundwater, imported

water, Santiago Creek native water, and recycled water; is that right?

A Yes.

Q Do you see Footnote 3 for Table 5?

A Okay.

Q Again, a reference to supplemental water.

Is it your understanding that's being used interchangeably for the term "supplemental sources"?

A Yes.

Q So I want to focus my next couple questions, Mr. Kennedy, for the 2016-'17 year, as reflected in Table 5.

If I wanted to get a total of the estimated amount of groundwater and supplemental water, what would I do -- which columns would I add up?

MR. AUSTIN: Just with respect to the numbers in the table?

MR. CASEY: Yes.

THE WITNESS: You would add up the numbers in the first three columns.

BY MR. CASEY:

Q I would not include the number under the "Recycled Water" column; is that right?

A I'm sorry, could you repeat the question?

Q Sure. If I wanted to get the total amount of

groundwater and supplemental water or supplemental sources, which columns would I add up?

A Yeah, you would add up the first three columns.

Q And just for the record, those are the columns entitled "Groundwater," "Imported Water," and "Santiago Creek Native Water"; correct?

A Yes.

Q I would not include the fourth column, which is the "Recycled Water" column; correct?

A Correct.

Q So, if I did my math -- and I'm a lawyer, Mr. Kennedy, so it's dangerous for me to do math -- the number for the total of groundwater plus supplemental sources for the 2016-'17 year should be 380,000 minus 22,000; correct?

MR. AUSTIN: Objection. Document speaks for itself.

THE WITNESS: Yes.

BY MR. CASEY:

Q So 358,000; is that correct?

A Yes.

Q So we'll pick out Exhibit 19. You may want to keep that Exhibit 4 by your side. Exhibit 19.

Let the record reflect I'm handing

Mr. Kennedy what was previously marked as plaintiff's Exhibit 19. First page is entitled "Agenda Item Submittal for Meeting Date of April 20, 2016."

Do you recognize this document, Mr. Kennedy?

A Yes.

(Exhibit 19 previously marked.)

BY MR. CASEY:

Q I will tell you that at his deposition yesterday, Mr. Markus said that you probably drafted this.

Is that correct?

A Correct.

Q So everything in this document is accurate; correct?

MR. AUSTIN: Objection. Calls for speculation, lack of foundation. Vague as to "everything."

BY MR. CASEY:

Q Mr. Kennedy?

A I hope it is.

Q The document on the first page, Mr. Kennedy, refers to four resolutions.

Do you see that?

A Yes.

Q Did you prepare those resolutions as well?

A With help, yes.

Q Whose help?

A There's accounting people will help. Legal counsel has helped.

Q But before the resolutions leave you to go to Mr. Markus, you believe that they are factually accurate; correct?

MR. AUSTIN: Objection. Assumes facts not in evidence.

MS. DE FELICE: Also, the resolutions in question are not attached to the exhibit that's before the witness.

MR. AUSTIN: Also vague as to time. It's unclear as to whether you're referring to general practice or to these resolutions.

MR. CASEY: That's a good point.

Q Is that your general practice, Mr. Kennedy, to make sure that the resolutions that would be part of the board package concerning the establishment of the replenishment assessment, BEA, and BPP would be accurate?

A Yes.

Q Let me have marked as Exhibit 39 a three-page document entitled "Resolution D," as in dog. It has a much longer title reflected in the first page. Bates

stamp 33184.

(Exhibit 39 marked.)

BY MR. CASEY:

Q Do you recognize this document, Mr. Kennedy?

A Yes.

Q What is it?

A It's Resolution D of the April 20, 2016, staff report.

Q Is it the same Resolution D that's referred to in the first page of the agenda item that we've marked as Exhibit 19?

A It appears so, yes.

Q So, going back to Exhibit 39, which is Resolution D, Mr. Kennedy, let me direct your attention to Section 1 on page 1. Under (b) it says, quote (as read):

The estimated total amount to be produced by such persons and operators from groundwater and supplemental sources is 380,000 acre-feet.

Do you see that?

A Yes.

Q Where does that number come from?

MR. AUSTIN: Objection. Vague and ambiguous as to "come from." Calls for speculation, lack of

foundation.

THE WITNESS: That comes from the staff.

BY MR. CASEY:

Q Does it come from the annual engineer's report?

A Yes.

Q Does it come from Table 5?

MR. AUSTIN: Objection. Vague as to "comes from."

THE WITNESS: It -- it could. There's -- it comes from documents used to prepare the engineer's report.

BY MR. CASEY:

Q Does it come from Table 5, Mr. Kennedy?

MR. AUSTIN: Objection. Asked and answered. He's already answered the question as to where it comes from.

THE WITNESS: Yeah. It comes -- there's a bunch of documents used in preparing the engineer's report, and it could come from one of those different documents. Or it could come from Table 5.

BY MR. CASEY:

Q So on Exhibit 39, on that Section 1(b), does the "supplemental sources" referred in Finding 1(b) exclude recycled water produced by IRWD?

MR. AUSTIN: Objection. Document speaks for itself. Calls for speculation, lack of foundation.

THE WITNESS: No, it does not exclude it.

BY MR. CASEY:

Q It includes it, doesn't it?

A Yeah.

Q Is there a reason why it includes it when it should be excluded, according to your prior testimony?

MR. AUSTIN: Objection. Calls for speculation, lacks foundation.

THE WITNESS: It's just an oversight among staff. The recycled water issue is a very minor issue to staff, and it just got overlooked in preparing this resolution.

BY MR. CASEY:

Q Is it a one-time oversight?

A I don't know. It could be done every year. It's just a minor thing that nobody would have picked up.

Q Let me have marked as Exhibit 40 a multipage document entitled "Minutes of Meeting, Board of Directors, Orange County Water District, April 20, 2016," Bates-stamped 33144.

(Exhibit 40 marked.)

///

BY MR. CASEY:

Q Do you recognize this document, Mr. Kennedy?

A Yeah. It looks like the minutes of the April 20, 2016, board meeting.

Q Who prepares these minutes?

A Janice Durant or her assistant.

Q They report to you; correct?

A Yes.

Q Let me direct your attention -- when we refer to Bates stamp numbers, Mr. Kennedy, that's that number in the lower right corner.

Okay?

A Okay.

Q So let me direct your attention to Bates Stamp No. 33153. Otherwise, it's page No. 10 on the document itself.

A Okay.

Q This page is entitled "Resolution No. 16-4-37"; correct?

A Yes.

Q Is this the now-final resolution of that Resolution D we looked at before?

A It appears so, yes.

Q If you look at Section 1(b) --

A Okay.

Q -- that's the same finding we just talked about on Resolution D; correct?

A Yes.

Q Let's go back to the second page of the document itself. Go back to the second page.

A (Witness complies.)

Okay.

Q Directing your attention to the last paragraph.

A Okay.

Q In the middle, let me read a couple sentences. (As read):

Mr. Kennedy responded that the District Act does not recognize recycled water. He stated that the recycled water is actually subtracted from the producer's total water demands, and that number is multiplied by the BPP to get the producer's allowable pumping number. Is that an accurate statement you made?

MR. AUSTIN: Objection. Vague as to -- well, compound, calls for speculation, lack of foundation, assumes facts not in evidence.

THE WITNESS: Yes.

///

BY MR. CASEY:

Q Goes on to say (as read):

Director Sheldon noted that it appears OCWD is penalizing producers for recycling water and suggested this policy be reviewed by the board at a future meeting.

Do you see that?

A Yes.

Q Did you state agreement with Mr. Sheldon at this meeting?

MR. AUSTIN: Objection. Agreement with that particular statement?

MR. CASEY: Did he express agreement with that statement at that meeting.

MS. DE FELICE: Which statement?

MR. AUSTIN: Statement he just read.

MR. CASEY: Statement I just read.

MS. DE FELICE: I just meant it was a compound statement. So which part of it?

BY MR. CASEY:

Q Go ahead.

A I don't remember how I responded to that.

Q As you sit here today, do you agree with it?

MR. AUSTIN: Objection. Compound.

THE WITNESS: No. It's a policy issue for our board.

BY MR. CASEY:

Q Okay. You can put that away.

Trying to find Exhibit 21, Mr. Kennedy. Let's see.

(Exhibit 21 previously marked.)

BY MR. CASEY:

Q Let the record reflect I'm handing Mr. Kennedy Exhibit 21 that was marked at Mr. Markus's deposition yesterday.

A (Witness reviews exhibit.)

Q Do you recognize this document, Mr. Kennedy?

A Yes.

Q What do you recognize it as?

A A letter that IRWD sent to Mike Markus regarding the April 20 hearing to set the basin production percentage and BEA.

Q Other than conversations in which legal counsel was present, did you have any conversations with anybody else about this letter?

A I don't remember. I don't believe I did. Yeah. I -- well, I don't -- I don't -- I don't remember.

Q This will be a quick one, Mr. Kennedy.

Mark Exhibit 41, multipage document, Bates-stamped 33188. Looks like a PowerPoint.

(Exhibit 41 marked.)

BY MR. CASEY:

Q Do you recognize Exhibit 41?

A Yeah. Looks like the presentation from the April 20, 2016, board meeting.

Q Do you -- did you prepare this PowerPoint?

A Yes, I did.

Q I just want to know if you were the one that prepared it. That's all. So you can put it aside.

A Right.

Q Mark as Exhibit 42 a multipage document entitled "2015-2016 Engineer's Report on Groundwater Conditions, Water Supply, and Basin Utilization in the Orange County Water District," dated February 2017.

(Exhibit 42 marked.)

THE WITNESS: (Witness reviews exhibit.)

BY MR. CASEY:

Q Do you recognize this document, Mr. Kennedy?

A Yes.

Q Is it the annual engineer's report for 2015-2016?

A Yes.

Q What was your role in preparing it?

A I oversaw the preparation of it.

Q So let's take a look at Table 5 again, page 22.

So --

A Okay.

Q -- similar question as before, Mr. Kennedy: With respect to the ensuing year, 2017-2018, how would I determine the amount of groundwater and supplemental sources? Which columns would I add up?

A The first three columns.

Q So the total groundwater and supplemental sources should be 395,000 minus 20,000?

A Yes.

MR. CASEY: Let the record reflect I'm handing Mr. Kennedy what was marked as Exhibit 33 at Mr. Markus's deposition yesterday.

(Exhibit 33 previously marked.)

BY MR. CASEY:

Q Mr. Kennedy, do you recognize this document?

A (Witness reviews exhibit.)

Yes.

Q What is it?

A It's the staff report on April 19, 2017, for the public hearing to set the BEA and the BPP.

Q Did you draft this document?

A Yes.

MR. CASEY: Let me have marked as Exhibit 43 a three-page document entitled "Resolution D."

(Exhibit 43 marked.)

BY MR. CASEY:

Q And ask you, Mr. Kennedy, do you recognize this document?

A (Witness reviews exhibit.)

Yes. It's the resolution for that staff report I referred to earlier.

Q Exhibit 33?

A Yes.

Q And on the first page of Exhibit 43, Section 1(b) says (as read):

The estimated total amount to be produced by such persons and operators from groundwater and supplemental sources is 395,000 acre-feet.

Do you see that?

A Yes.

Q Does that include or exclude recycled water?

MR. AUSTIN: Calls for speculation, lack of foundation, calls for legal conclusion.

THE WITNESS: It's -- it's including it in that statement, yes.

BY MR. CASEY:

Q By the way, Mr. Kennedy, on that resolution, is there a reference to "neutral water"?

MR. AUSTIN: Objection. Vague as to "reference to 'neutral water.'" Vague as to "neutral water."

THE WITNESS: I mean, I can read it to find out. You want me to --

BY MR. CASEY:

Q Sure, be my guest.

A (Witness reviews exhibit.)

MR. AUSTIN: Objection. Document speaks for itself and calls for a legal conclusion.

THE WITNESS: (Witness reviews exhibit.)

Yeah. After quickly reading it, I don't see the "neutral water" term.

BY MR. CASEY:

Q In the annual engineer's report we've looked at, it does use the phrase "neutral water"; correct?

MR. AUSTIN: Objection. Misstates the document.

MR. NEWMARK: Compound.

THE WITNESS: In that previous engineer's report we looked at, it did have that phrase in there.

///

BY MR. CASEY:

Q So, since you drafted Exhibit 43, the Resolution D, how come you didn't state how much neutral water was going to be produced in the upcoming year?

A Just lack of precision.

MR. CASEY: Let me put in front of the witness Exhibit 34 from Mr. Markus's deposition.

(Exhibit 34 previously marked.)

BY MR. CASEY:

Q For the record, it's a two-page letter dated April 11, 2017.

A (Witness reviews exhibit.)

Q Do you recognize this document?

A Yeah. I believe I saw it this spring.

Q Other than when attorneys may have been present, did you discuss the document with anybody else?

A No, I did not.

Q Do you still have Exhibit 33 in front of you, Mr. Kennedy?

A Yes.

Q So let's look at Exhibit 33, which is the staff report for the April 19, 2017, OCW board meeting, and Exhibit 34.

A Okay.

Q If you turn to -- turn to the fifth page of Exhibit 33. It's -- the page at the very bottom has a section entitled "IRWD Protest Letter."

Do you see that?

A Okay.

Q Take a moment to look at the bottom of that page and onto the whole next page.

A Okay. Okay.

(Witness reviews exhibit.)

Q Did you write this portion of Exhibit 33?

A (Witness reviews exhibit.)

I had help with legal counsel.

Q Okay. Anybody else help other than legal counsel?

A I don't believe so.

MR. CASEY: Let me have marked as Exhibit 44 a multipage document, appears to be a PowerPoint dated April 19, 2017.

(Exhibit 44 marked.)

THE WITNESS: (Witness reviews exhibit.)

BY MR. CASEY:

Q Do you recognize this document, Mr. Kennedy?

A Yes. It looks like the presentation I gave to the board of directors on April 19.

Q Did you prepare Exhibit 44?

A Yes.

Q My first question is going to be on page numbered 10. The photocopy has it a little bit hard to see, but you'll see it's after page No. 9 and before page numbered 11.

Do you see that?

A Yes, the table?

Q Yes. The table, for the record, is entitled "FY '17-'18 Groundwater Basin Water Balance."

Do you see that?

A Yes.

Q Okay. There's a reference to the line "Other." Do you see that? After "MWD Supplies"?

A Oh, okay.

Q What's that refer to?

A That is a small amount of water that gets injected into the groundwater basin for the Alamitos barrier.

Q Oh, okay. Just for the record, on the first line, it says "SAR Base Flow."

Does that mean Santa Ana River base flow?

A Yes.

Q That's the base flow from the Santa Ana River that naturally replenishes that Orange County

groundwater basin?

MR. AUSTIN: Objection. Calls for speculation, lack of foundation, compound.

MR. NEWMARK: Calls for a legal conclusion.

MR. AUSTIN: Vague and ambiguous.

BY MR. CASEY:

Q Mr. Kennedy.

A This is water coming down the Santa Ana River that we capture to recharge the groundwater basin.

Q And the same question with respect to "Santa Ana River Storm Flows," the second line?

MR. AUSTIN: Same objections as to the prior question.

MR. NEWMARK: Same. Calls for legal conclusion.

THE WITNESS: This is water coming down the Santa Ana River during the winter months that we capture and recharge into the groundwater basin.

BY MR. CASEY:

Q So if I go to page 18, Mr. Kennedy, it says "End of Presentation."

Simple question: Why are there slides after the end of the presentation?

A This is additional information that our board might find helpful.

Q So this is your practice of preparing slides that are in anticipation of questions that may be asked by the OCW board; is that right?

A Yeah.

MR. CASEY: Okay. I'm going to go off the record.

(A discussion was held off the record.)

(Recess taken.)

BY MR. CASEY:

Q Let me have marked as Exhibit 45 a multipage document entitled "Minutes of Meeting, Board of Directors, Orange County Water District, April 19, 2017."

(Exhibit 45 marked.)

BY MR. CASEY:

Q Do you recognize this document, Mr. Kennedy?

A It looks like the minutes of the board meeting on April 19, 2017.

Q And this was prepared by Ms. Durant or her staff; is that right?

A Yes.

Q And she would have sent it to you to review; is that right?

A Yes.

Q So if you go to page numbered 10, makes a

reference to Resolution D.

Do you see that?

A Yes.

Q Is the resolution that follows the same Resolution D we just discussed?

MR. AUSTIN: Objection. Vague as to "follows."

THE WITNESS: It appears it is.

BY MR. CASEY:

Q I'm going to move on to something else, Mr. Kennedy. Put the big stack here.

A All this here?

Q Might as well. Clear the way there.

So let me show you what was previously marked as Exhibit 17 at Mr. Markus's deposition.

(Exhibit 17 previously marked.)

BY MR. CASEY:

Q It's a multipage document entitled "A History of Orange County Water District."

And we established yesterday, Mr. Kennedy, this is a document that's available on the OCWD website.

Do you recognize this document?

A I've seen it before.

Q Do you know who prepared it?

A I believe our public education group. Eleanor Torres is the department head there.

Q Public affairs?

A Public affairs, yeah.

Q Were you asked to contribute to any portion of this document?

A I am typically asked to look at documents like this, so I could have reviewed it.

Q Why don't you turn to page 33.

A (Witness reviews exhibit.)

Q Which is entitled "Basin Equity Assessment."

Have you ever seen this portion or read this portion of Exhibit 17 before?

A I believe I have, yes.

Q Do you believe it to be factually accurate?

MR. AUSTIN: Objection. Compound, calls for speculation, lack of foundation.

THE WITNESS: I would believe it to be accurate.

BY MR. CASEY:

Q Makes a reference to a George Osborne.

Do you see that?

A Yes.

Q Do you know who he is?

A Yes.

Q Who is he?
A He was a former board member.
Q It makes a reference to a Mr. Owen.
Do you know who that's in reference to?
A He was a former board member.
Q What's his first name?
A Don.
Q Was he a general manager of OCWD at some point?
A Yes, he was.
Q And you understand that this section of Exhibit 17 is referring to the amendment to the OCWD Act of 1969 that established the basin equity assessment; correct?
MR. AUSTIN: Objection. Calls for speculation, lack of foundation, calls for legal conclusion.
THE WITNESS: I believe so, yes.
BY MR. CASEY:
Q So I want you to read to yourself, Mr. Kennedy, the third paragraph, the paragraph that begins "Historically, imported water costs." Just read that to yourself.
A Okay.
(Witness reviews exhibit.)

Okay.

Q Does that paragraph accurately state what you believe to be the purpose of the BEA?

MR. AUSTIN: Objection. Lack of foundation, calls for speculation, compound, vague as to purpose. Calls for legal conclusion. You mean the statutory purpose, Counsel?

MR. CASEY: You can state your objections, Counsel.

MR. AUSTIN: It's vague and ambiguous as to purpose.

MR. CASEY: Then you've stated your objection.

MR. AUSTIN: Okay. All right.

THE WITNESS: Could you repeat it?

BY MR. CASEY:

Q Sure. Does that paragraph accurately state what you understand to be the purpose of the BEA?

A Yes.

Q Let's go now to the introduction of this document, which they use these -- if you can take a look -- small vi? There you go.

A Okay.

Q Flip one more page to vii, and you go to the last paragraph, the one that begins with "Although a

skeptic," and just read that to yourself.

A (Witness reviews exhibit.)

MR. DUNN: I'm sorry, Mr. Casey. Where are we again? What page?

MR. CASEY: Small vii, last paragraph.

MR. DUNN: Thank you very much.

THE WITNESS: (Witness reviews exhibit.)

Okay.

BY MR. CASEY:

Q Does that paragraph accurately state -- let me take that back.

Does that paragraph accurately describe what you understand to be the Santa Ana River watershed?

MR. AUSTIN: Objection. Calls for legal conclusion, relevance as to this witness's understanding, compound --

MR. NEWMARK: Vague and ambiguous.

MR. AUSTIN: I'll join that one.

THE WITNESS: Yes. I'm not an expert on the watershed, but I believe so.

BY MR. CASEY:

Q Is there a person on OCWD staff who is more an expert on the Santa Ana River watershed than you are?

MR. AUSTIN: Objection. Vague as to

"expert." Legal expert, Counsel? Are you calling for a legal conclusion here?

MR. CASEY: Is that your objection, sir?

MR. AUSTIN: You're not going to answer my question?

MR. CASEY: Absolutely not.

MR. AUSTIN: Vague and ambiguous, calls for legal conclusion.

BY MR. CASEY:

Q Mr. Kennedy?

A Yeah. I don't know if we have an expert as to watershed -- goes way beyond our boundaries -- but there's probably half a dozen of us that have a good understanding of the watershed and what it is.

Q Who on OCWD staff would have a better understanding of the Santa Ana River watershed than you?

MR. AUSTIN: Calls for speculation, lack of foundation.

THE WITNESS: There's employees who go up to the upper watershed and deal with those agencies on a routine basis. So they probably have a better understanding.

BY MR. CASEY:

Q Would that include Mr. Herndon?

A It could be Roy Herndon. There's an individual named Greg Woodside who routinely goes into the upper watershed.

Q What's his name again?

A Greg Woodside.

Q Woodside?

A Yeah.

Q Greg is G-r-e-g or C-r-a-i-g?

A Greg, G-r-e-g.

Q G-r-e-g, okay.

Let the record reflect I'm handing Mr. Kennedy what we previously marked as Exhibit 27. It's a multipage document. The first page is dated November 14, 2007, entitled "Workshop: Basin Production Percentage Methodology."

(Exhibit 27 previously marked.)

BY MR. CASEY:

Q Do you recognize this document, Mr. Kennedy?

A Yes, I do.

Q What is it?

A It's a staff report that went to our Water Issues Committee November 14, 2007.

Q And let's go to page numbered 3.

A Okay.

Q And there's a diagram that picks Option 4.

Do you see that?

A Yes.

Q We've talked about this with Mr. Markus yesterday.

On the denominator, do you see that?

A Yes.

Q It says "Total water demands, minus expected reclaimed and local supplies."

Mr. Markus didn't know what "local supplies" meant and told us to ask you.

What do "local supplies" refer to?

MR. AUSTIN: Objection --

MS. DE FELICE: Objection.

MR. AUSTIN: -- misstates testimony. Calls for speculation, lack of foundation.

THE WITNESS: I believe at the time local supplies were -- I need to think about that.

BY MR. CASEY:

Q Go ahead, take your time.

A Yeah.

I believe it's small amounts of water that Serrano Water District would get -- small amounts of water that Serrano Water District would receive coming off the watershed.

Q What kind of water? Is that natural water?

A Yes.

Q Why did OCWD consider that to be local supply?

MR. AUSTIN: Objection. Calls for speculation, lack of foundation, vague as to "local supply."

THE WITNESS: You just -- you need to call it something. That's what the staff was calling it. It's a very small amount of water. I believe it was 2- to 3,000 acre-feet a year.

I don't believe a whole lot of thought went into calling it "local supply" or even worrying about it.

BY MR. CASEY:

Q But this was water originating within the Santa Ana River watershed?

MR. NEWMARK: Objection. Calls for legal conclusion, vague and ambiguous, calls for speculation.

MR. AUSTIN: I'll join those objections.

THE WITNESS: Yeah. I'm having a hard time recalling exactly. I think it was coming from within the watershed.

(Exhibit 46 marked.)

///

BY MR. CASEY:

Q We'll have marked as Exhibit 46 a multipage document entitled "Classification of Reclaimed Water, June 1, 2016," Bates stamp 31197.

Do you recognize this document, Mr. Kennedy?

A It looks like something I could have prepared.

Q It would have been prepared for presentation at some committee meeting?

MR. AUSTIN: I'm sorry, could you repeat the question?

MR. CASEY: I'll rephrase it.

Q Did you prepare it for presentation to a meeting of the committee of the OCWD?

MS. DE FELICE: Objection --

MR. AUSTIN: Objection. Assumes facts not in evidence. He didn't say he did prepare it.

BY MR. CASEY:

Q Go ahead, Mr. Kennedy.

A I could have prepared it for a meeting. I would need to check back and see what June 1, 2016, was.

Q I see.

Go to page numbered 3.

A Okay.

Q Go to Slide 6.
A Okay.
Q The first bullet point says (as read):
IRWD's loss of approximately 11,000 AFY of groundwater pumping is the other producers' gain.
What did you mean by that?
MR. AUSTIN: Objection. Assumes facts not in evidence. He did not say that he prepared this. That's been established multiple times. Vague and ambiguous, compound.
THE WITNESS: I believe this is referring to by how we do not recognize reclaimed water in the BPP calculation; that it reduces how much groundwater IRWD can pump at the RA rate that follows under the BPP.
So, because IRWD is pumping less, that means the other producers are allowed to pump a little bit more.
BY MR. CASEY:
Q At the RA rate; correct?
A At the RA rate.
Q So let's flip the page to page numbered 4. And under "Policy Issues" -- this is Slide 8 -- the first bullet point says (as read):
OCWD policy sends negative pricing

signal for development of reclaimed water projects.

Below that it says "Buena Park."

What OCW policy are you referring to?

MR. AUSTIN: Objection. Assumes facts not in evidence. Calls for speculation, lack of foundation.

THE WITNESS: This is referring to how OCWD does not recognize reclaimed water in setting the BPP.

BY MR. CASEY:

Q What negative pricing signal are you referring to?

MR. AUSTIN: Same objections as the prior question.

THE WITNESS: It's because of how reclaimed water is accounted for. If you develop a reclaimed water system, you are not reducing on a one-for-one basis the amount of imported water you need to bring.

BY MR. CASEY:

Q What's the reference to Buena Park?

MR. AUSTIN: Calls for speculation, lack of foundation.

THE WITNESS: They were considering development of a reclaimed water system.

BY MR. CASEY:

Q Did they actually develop one?

A No.

Q Do you know why they didn't develop one?

A It's too costly.

Q The third bullet point on Slide 8 says (as read):

Don't want to encourage any new recycling by a producer.

What does that refer to?

MR. AUSTIN: Calls for speculation, lack of foundation.

THE WITNESS: That is referring to the sewage being generated in our service area is coming to the Orange County Sanitation District. And it's being recycled by our groundwater replenishment system. So the sewage is already being recycled.

So the district does not need to have a policy that encourages the development of individual recycling projects.

BY MR. CASEY:

Q Does all the wastewater treated by Orange County Sanitation District go to OCWD's GWRS project?

A No. Currently --

MR. NEWMARK: Objection. Lacks foundation, vague as to time.

///

BY MR. CASEY:

Q Now.

A There's two separate sanitation treatment plants, Plant 1 and Plant 2. Currently, all of Plant 1's sewage is coming to OCWD for recycling. And we are in the process right now, we are designing an expansion of the groundwater replenishment system so we can start recycling sewage going to Plant 2.

Q Plant 2 is OCWD's Plant 2; right?

A Right.

Q Where does Orange County Sanitation District discharge the treated wastewater from their plant to?

MR. NEWMARK: Objection. Foundation. Vague and ambiguous as to time.

BY MR. CASEY:

Q Currently, sir.

MR. AUSTIN: Join those objections.

THE WITNESS: They discharge their treated water to the Pacific Ocean from Plant 2.

BY MR. CASEY:

Q Let's flip the page to page 5. On the Slide 10, the third bullet point says (as read):

If change reclaimed water classification for IRWD, should the change include GAP customers?

What does that refer to?

MR. AUSTIN: Objection. Calls for speculation. Lack of foundation.

THE WITNESS: The way we classify reclaimed water is -- isn't consistent for everybody in our service area, for IRWD and for our GAP customers. And so, if you were going to consider a change for IRWD, you need to account for the GAP customers and include them in that change.

MR. AUSTIN: Did you say "consistent"?

THE WITNESS: Consistent, yeah.

BY MR. CASEY:

Q In Slide 9 on page No. 5, the third bullet point says (as read):

February 15, 1995, OCWD staff report suggests can handle via a contract versus changing the District Act.

What's that refer to?

MR. AUSTIN: Calls for speculation, lack of foundation.

THE WITNESS: That's a staff report from 1995, and it had that sentence in there that perhaps you could use a contract with different agencies on how you classify reclaimed water. And I didn't write that staff report and completely understand it, but I

mentioned it there, yeah.

BY MR. CASEY:

Q So, going down to the third bullet point on Slide 10, could you change the reclaimed water classification for IRWD via contract?

MR. AUSTIN: Objection. Calls for speculation, lack of foundation, calls for legal conclusion, relevance as to this witness's understanding.

THE WITNESS: Yeah. I don't have a good comment on that. When we have changed the classification of reclaimed water, it's been done by changing the District Act. So that sentence in the February 15 staff report confused me.

MR. CASEY: Let's have marked as Exhibit 47 a multipage email from Mr. Herndon to Mr. Kennedy dated December 14, 2009, Bates stamp 51756.

(Exhibit 47 marked.)

BY MR. CASEY:

Q Do you recognize this document, Mr. Kennedy?

A Looks like an email from Roy Herndon to me and Craig Miller.

Q Who is Mr. Miller?

A Craig Miller was a senior manager at the water district back at this time in 2009.

Q He's no longer at the district?
A Correct.
Q The third page of Exhibit 47, which includes a bar chart, do you know who prepared this page?
A This looks like something I prepared.
Q And based upon the email exchange here, looking at the bottom of the first page from Jill Everhart to a whole bunch of people, was this bar chart presented at a December 9 producers meeting?
A (Witness reviews exhibit.)
It looks like it was discussed at December 9 producers meeting and then, a couple days later, emailed out to all the producers.
Q So let's go back to the first page, Mr. Herndon's email.
After receiving this email, did you ever discuss its content with Mr. Herndon?
A I can't remember, but it's very possible.
Q Let's direct your attention to the final paragraph of Mr. Herndon's email to you. It says (as read):
I think we need to be careful about opening up the discussion of counting reclaimed water as anything but neutral, as currently in the OCWD Act. If the

current structure disincentivizes producers from buying GWRS water directly or building their own reclaimed water projects, so what? It doesn't stop OCWD from expanding GWRS for the benefit of all.

Did you ever discuss anything in that paragraph with Mr. Herndon?

A I could have.

Q Did you?

A I -- I can't recall for this specific case, but Mr. Herndon and I have talked about this issue in the past.

Q What have you talked about on that issue?

A Just how we account for reclaimed water. And Mr. Herndon likes to use the term "neutral." But just how we account for it.

Q How about what Mr. Herndon says in the final paragraph, though, in terms of the incentive structure? Did you ever talk about that with Mr. Herndon?

A Probably. And I previously mentioned the same thing, how we account for it. If you build a reclaimed water project, because of how we account for it, you do not get to reduce on a one-for-one basis

how much imported water you need to take in.

Q Do you, Mr. Kennedy, personally agree with the statements being made by Mr. Herndon in that last paragraph?

MR. AUSTIN: Objection. Compound, calls for speculation, lack of foundation, vague and ambiguous.

THE WITNESS: Generally, yes, because we have the groundwater replenishment system that's recycling the wastewater in the area.

MR. CASEY: Let me have marked as Exhibit 48 a three-page email from Mr. Kennedy, dated February 10, 2015, Bates-stamped 54147.

(Exhibit 48 marked.)

THE WITNESS: (Witness reviews exhibit.)

BY MR. CASEY:

Q Do you recognize this document, Mr. Kennedy?

A Yes. It looks like an email from me back in February 2015.

Q Who's Cathy Green?

A She's a board member.

Q Who's Dennis Bilodeau?

A A board member.

Q Who's Stephen Sheldon?

A A board member.

Q Board members of OCWD; correct?

A Yes.
Q We know Mr. Markus.
So in the second line of this email, it says (as read):
Here is a graphic Director Bilodeau asked me to prepare.
Do you see that?
A Yes.
Q Did Mr. Bilodeau explain why he wanted you to prepare this graphic?
A This can be a confusing issue for board members to understand the implications, and so this graphic was prepared to help them understand it.
Q So when you say in the email at the end, quote, "This is a unique and confusing issue --"
A Yeah, that's what I mean.
Q It's complex, in other words?
A Complex, yeah. Yeah.
Q Just if you can -- couple questions about the chart so I can understand.
A Okay.
Q There's a couple acronyms. Let me ask you that first.
"DATS." What is that?
A Deep aquifer treatment system.

Q What is that?

A That is a treatment plant that Irvine Ranch Water District constructed. It's drawing colored water from a deep aquifer and treating the colored water and then serving it to IRWD customers.

Q That's the type of project that receives a BEA exemption; correct?

MR. AUSTIN: Objection. Vague as to "type of project."

THE WITNESS: Yes.

MR. AUSTIN: Incomplete hypothetical.

BY MR. CASEY:

Q Now we've got another acronym, "DRWF."

What's that refer to?

A Dyer Road well field.

Q D-y-e-r.

What's that refer to?

A Irvine Ranch Water District constructed a very large well field along Dyer Road and the 55 Freeway, and there might be, I'm guessing, 15 to 18 extraction wells they constructed in that well field. It's referring to that.

Q I see. And at the bottom of the graph, it's got an asterisk, and it says (as read):

Project designed to operate above BPP

and receive a BEA exemption.

What does that mean?

A Those projects are expensive. They're designed to offset imported water deliveries that IRWD needs to bring in. And because they're expensive, the water -- normally, when you pump above the BPP, you have to pay the additional BEA. But to offset the expense of developing these treatment projects, OCWD will exempt the BEA.

Q Got it.

So after you sent this graphic to the three OCWD directors, did you ever talk to any one of them about it?

A Oh, I don't remember or recall.

Q Did you ever talk about it with Mr. Markus?

A Yes. Oh, this specific graphic?

Q Yes.

A I don't know about this specific email. But we've talked about the issue.

Q On the first page, the last sentence of your second paragraph says (as read):

Per my previous email, 7,700 AFY of groundwater pumping is worth about $4.6 million annually.

What's that refer to?

A Yes. I guess I sent them a previous email estimating what the issue was worth to IRWD.

Q The issue being whether or not recycled water would be included in supplemental sources?

A Yes.

Q And it's worth, based upon these numbers, $4.6 million each year; correct?

MR. AUSTIN: Objection. Vague and ambiguous as to "worth." Calls for speculation, lack of foundation, misstates testimony.

THE WITNESS: I believe so.

MR. CASEY: We'll have marked as Exhibit 49 an email from Mr. Herndon to Mr. Kennedy, dated May 24, 2016, Bates stamp 51791.

(Exhibit 49 marked.)

THE WITNESS: (Witness reviews exhibit.)

BY MR. CASEY:

Q Do you recognize this document, Mr. Kennedy?

A It looks like an email from Roy Herndon to me on May 2016.

Q In the email, when Mr. Herndon says, quote, "I've been grappling with this," do you know what he's referring to?

A No, I don't.

Q Do you know -- did you ask Mr. Herndon to

prepare this graphic?

A No. I don't recall what generated this. Yeah, I could only speculate, yeah.

Q We don't want you to do that.

The second paragraph has a sentence that says (as read):

I haven't been in on the discussions with you and Mike, so I'm not sure how you're leaning on this.

Do you know who you're referring to?

A Probably referring to Mike Markus.

Q Do you know what he's referring to when he says, "I'm not sure how you're leaning on this"?

MR. AUSTIN: Objection. Calls for speculation, lack of foundation.

THE WITNESS: No, I don't.

BY MR. CASEY:

Q If you got this email from Mr. Herndon, did you ever talk to him about this email?

A I -- probably. I don't recall the exact conversation, but --

Q Have you had conversations with Mike Markus, with just Mike Markus present, about the lawsuit filed by IRWD that brings you here for your deposition?

A Conversation with Mike Markus --

Q About this lawsuit?
A About this lawsuit? About our deposition?
Q No. Anything about the lawsuit.
A Probably, yes.
Q What did you guys talk about?
A I can't recall. It's a pretty broad issue that's been talked about at the water district for years.
Q For years?
A Yeah. Well, IRWD, you know, at least for the last few years, has been wanting us to change our policy. So it gets talked about periodically.
Q Have you ever talked about changing the policy with any director of the OCWD board?
MR. AUSTIN: Objection. Vague as to "changing the policy."
THE WITNESS: I don't think any board member has suggested changing the policy. Well, Director Steve Sheldon maybe. But I can't recall any other board members. Yeah.
BY MR. CASEY:
Q Last question on Mr. Herndon's email, Exhibit 49. The first paragraph, he says (as read):
The second graph seems to contradict the argument of cost impacts to IRWD.

Do you know who he's referring to?

MR. AUSTIN: Objection. Calls for speculation, lack of foundation.

THE WITNESS: No, I really don't. No, I don't.

I could add to that last question.

BY MR. CASEY:

Q Sure. You remember that?

A Speculating.

Q Don't speculate. If you recall.

MR. AUSTIN: Don't speculate.

BY MR. CASEY:

Q Do you recall versus speculate?

A No. I can recall that IRWD has projects that get the basin equity assessment exemption. And it was hard to calculate how changing the definition of reclaimed water was going to impact those projects getting the BEA exemption. It was a complicated issue.

Q Okay. Let me show you what was previously marked as Exhibit 35 at Mr. Markus's deposition. Ask you if you recall this document.

(Exhibit 35 previously marked.)

MR. AUSTIN: Can I have a copy, Counsel? Oh, sorry, it's not a new exhibit? Exhibit what?

MR. CASEY: 35.

THE WITNESS: 35.

Yeah. It looks like a presentation I sent to Mike.

BY MR. CASEY:

Q In the email, you say (as read):

Mike, take a look at this, especially Slide 5.

Why did you want Mr. Markus to take a look at Slide 5?

A Just wanted him to agree with the wording I was using here.

Q Did he eventually tell you he agreed?

A I don't recall. Yeah.

Q But you prepared the PowerPoint that's attached to the email?

A I'm pretty sure I did, yeah.

Q So let's look at Slide 5.

A I'll go to Slide 5.

Q Slide 5.

A Five?

Q Five, yes, five.

A Okay.

Q Let's look at the final bullet point. Says (as read):

IRWD is considering diverting remaining wastewater that goes to OCSD to their Michelson plant.

Does "OCSD" refer to the Orange County Sanitation District?

A Yes.

Q And in preparing the PowerPoint, what were you referring to in this bullet point?

A IRWD recycles most of its wastewater, but a small amount -- and this is estimating -- about 5 mgd still goes to Orange County Sanitation District. And I had heard they were looking at what it would take to divert that remaining 5 mgd to their Michelson plant and not send it to Orange County Sanitation District.

Q If it wasn't sent to Orange County Sanitation District, would that mean Orange County Water District would get less treated wastewater for its GWRS project?

MR. AUSTIN: Objection. Calls for speculation, lack of foundation.

THE WITNESS: Potentially, because there's a general issue that wastewater flows coming into Orange County Sanitation District have generally declined. So there's higher awareness of how much wastewater is coming into Orange County Sanitation District and from

where.

BY MR. CASEY:

Q It's declined in recent years?

A Yes.

Q Do you know why?

A Why? Conservation. Low-flow toilets. Just recycling ethic. People are just using less water, and so Orange County Sanitation District is getting less water to treat.

Q Does that mean there's less water being sent by Orange County Sanitation District to OCWD for use at its GWRS project?

A So far we've been okay. We're still getting enough to make 100 mgd, as designed. But we're getting down there, so we're watching it.

Q Just for the record, "mgd" means?

A Million gallons per day.

Q What happens if the amount of treated wastewater falls below the hundred mgd level?

MR. AUSTIN: Objection. Vague as to "what happens."

MR. NEWMARK: Objection. Calls for speculation.

MR. AUSTIN: I'll join that objection.

THE WITNESS: If we don't get enough source

water, then you can't make 100 million gallons per day of water to recharge into the groundwater basin.

BY MR. CASEY:

Q What happens if that happens?

MR. AUSTIN: Same objections. Vague and ambiguous as to "what happens," and calls for speculation.

THE WITNESS: The plant was designed to make a hundred million gallons a day. So in some respects, you'd have a partially stranded asset not fully utilizing that plant. Yeah.

MR. CASEY: Let me have marked as Exhibit 50 a multipage document, an email from Mr. Kennedy, dated May 27, 2016, Bates stamp 53105.

(Exhibit 50 marked.)

BY MR. CASEY:

Q Mr. Kennedy, do you recognize this document?

A Yeah. It looks like an email I sent to Cathy Green.

Q Ms. Green is a director on the OCW board; correct?

A Yes.

Q And did Mr. Markus ask you to gather these historical documents?

A I don't know if he specifically asked, but I

1 did gather them at one time in the past, just to help
2 my understanding of the issue.
3 Q So you had previously gathered the historical
4 documents attached to your email prior to sending this
5 email and attachments to Ms. Green; is that right?
6 A Yes.
7 Q And you gathered them just on your own to
8 educate yourself?
9 A Yes.
10 Q Did you ever talk to Cathy Green about the
11 documents after you sent them to her?
12 A I could have. I don't specifically remember.
13 Q Do you generally remember any conversation
14 you had with her?
15 A No.
16 Q Is this the -- I'll strike that.
17 So did you ever talk to Bill Mills about any
18 of these historical documents?
19 A Not -- no. No. I mean, not about any of
20 this, no.
21 Q Mr. Mills retired in 2000- --
22 A -2.
23 Q -- -2? Have you talked to him about this
24 issue since he's left the district?
25 A I don't think so. I've maybe seen him half a

dozen times in different meetings, functions, and I don't think we talked about this. Yeah.

Q These historical documents, you didn't prepare any of these documents; correct?

A No, I did not.

Q Other than with legal counsel, have you discussed any of these historical documents with anybody at OCWD?

A I could have. Our CFO, Randy Fick, I probably gave him a copy of these documents. Maybe Roy Herndon, I gave him a copy of these documents. It was just good information.

We have an engineer who operates the GAP system; I probably gave them to him, Ben Smith. It was just good information, a good information search on the history of GAP.

Q How long ago did you gather these documents for the first time?

A Speculat- -- I'm guessing, three to four years ago.

Q Mr. Smith ended up doing a dissertation on that topic, didn't he?

A Yes. He did his master's at Cal State Long Beach on the GAP system.

Q It's an impressive piece of work. We have it

with us.

A Okay.

Q In the historical documents, if you look at -- again, I'm going by the Bates stamp numbers in the lower right-hand corner -- there's a Bates stamp No. 53136.

A Okay.

Q It's entitled "Draft Report on Expansion of the Green Acres Project."

Do you see that?

A Yes.

Q And it's not a complete copy of that report; correct?

A Correct.

Q Do you know where the complete version is?

MR. AUSTIN: Counsel, vague and ambiguous as to "complete." Do you mean full or do you mean final, when you say "complete"?

MR. CASEY: Thank you.

Q Full.

A I don't recall. I -- I dug this out, and I don't remember if it was just these pages that were in an old file, or the entire report was in the file and I just copied the relevant pages. I can't remember. Yeah.

Q It also says on the first page "Draft."
Do you know whether or not this report was ever run to final?
A I don't know.
MR. CASEY: Let me have marked as Exhibit 51 a one-page document entitled "Historical GAP Pricing/Supplemental Water/Reclaimed Water Classification Documents," Bates stamp 4064.
(Exhibit 51 marked.)
BY MR. CASEY:
Q Did you prepare this document, Mr. Kennedy?
A Yes, I did.
Q Was this -- did you prepare it to provide a written summary of the information you gleaned from the historical documents that we've marked as Exhibit 50?
A Yes.
Q Kind of tells it all, doesn't it?
MR. AUSTIN: Objection. Vague and ambiguous. Argumentative.
MR. CASEY: I'll withdraw it.
Q Did you ever send Exhibit 51 to any director from OCWD?
A I don't specifically recall, but I would guess I did.

Q Change topics, Mr. Kennedy. We're going to put in front of you Exhibit 5 from Mr. Xu's deposition.

MR. AUSTIN: Which number?

MR. CASEY: 5.

(Exhibit 5 previously marked.)

BY MR. CASEY:

Q Do you recognize this document, Mr. Kennedy?

A Looks like an email from Mitch Robinson to Wei Xu in our accounting staff.

Q And attaches the BEA report, Exhibit A and Exhibit B. You see that?

A Yes.

Q Do you have an understanding as to why IRWD submitted an Exhibit A version of the BEA report and an Exhibit B version?

A Yes, I do.

Q What's that?

A With Exhibit B, reclaimed water is excluded as supplemental water.

With Exhibit A, they include reclaimed water as supplemental water.

Q Let's look at the Exhibit B, which is Bates-stamped 50394. Under line 2(a), it has a negative number.

Do you see that?

A Yes.

Q Does that mean there's a negative supplemental water?

A I've seen IRWD put negative numbers in here before, and I never completely understood it. So I -- I can't answer that. Yeah.

Q Let's go back to the Exhibit A version, which is Bates stamp 50391. Section 2 says "All Water from Supplemental Sources."

Do you see that?

A Yes.

Q Do you understand "supplemental sources" to be supplemental sources as defined in Section 31.5 of the OCWD Act? Correct?

A Correct.

Q Under 2(c), it says "Water Conservation Credit." What's that mean?

A The water district put in a program around 1995 to where if you -- if they help pay for the installation of low-flow shower heads and low-flow toilets, that those devices would reduce demands in their service territory and would have the impact of also reducing how much groundwater pumping they could do that pays the RA.

And this program was put in place to give a credit that had the effect of boosting up total water demands so that the producer could still pump the same amount of groundwater that pays the RA.

Q And the conservation equipment that you just referred to in your last answer, is that conservation equipment that is installed by who? By the groundwater producers?

A Yeah, the producers -- the producers pay for it. The homeowner -- I don't know. I'm assuming the homeowner pays -- I'm assuming the homeowners, but I don't know. I don't know. I have not thought about it.

Q These are conservation equipment devices that are installed within the OCWD boundaries; correct?

A Correct.

Q So eventually was there a meeting with representatives of IRWD, you, Mr. Markus, in which you discussed the negative supplemental number that's on Exhibit B, Bates-stamped 50394?

A I don't know if we had a specific meeting to talk about the negative number. I can kind of recall a meeting where we were wondering how could it be negative.

Q Did you discuss that with representatives

from IRWD?

A Yes. And I don't recall getting an answer that I completely understood. But -- yeah.

Q So let me show you what's been previously marked as Exhibit 6 from Mr. Xu's deposition, which is an email from Mr. Fick to Mike Hoolihan, cc you, talking about the negative supplemental water number.

A Yeah. Okay.

(Exhibit 6 previously marked.)

THE WITNESS: Okay.

BY MR. CASEY:

Q We'll put in front of you -- keep all those -- Exhibit 7 --

(Exhibit 7 previously marked.)

BY MR. CASEY:

Q -- an email from Mr. Robinson to a number of people, including Mr. Kennedy, dated January 14, 2017, which refers to a discussion between Paul Cook, Mike Markus, John Kennedy, and Mike Hoolihan.

Does that refresh your recollection of what was discussed on this topic?

A (Witness reviews exhibit.)

It may. I remember at one time, yeah, we made an adjustment to the conservation credits to help make the math work out. This could be that situation.

Q Exhibit 7 refers to (as read):

An additional 300.2 acre-feet of conservation credit have been borrowed from Fiscal Year 2014-'15.

Do you see that?

A Yes.

Q Who came up with the idea of using the upcoming year's conservation credit to make the math work?

MR. AUSTIN: Objection. Calls for speculation, lack of foundation.

THE WITNESS: I believe Mike Hoolihan did.

BY MR. CASEY:

Q Was it necessary to make the math work to avoid a situation where OCWD believed that IRWD had exported groundwater produced within OCWD's boundaries and used at a place outside of OCWD's boundaries?

MS. DE FELICE: Objection.

MR. AUSTIN: Objection. Compound. Vague as to "necessary." Assumes facts not in evidence, calls for speculation, lack of foundation.

MS. DE FELICE: Join.

THE WITNESS: I'm remembering it could have been that issue, that -- in preparing these forms, there's a lot of estimating that goes on. And that

estimating -- there's kind of an error factor with these numbers. And making this adjustment was kind of within the error factor of this form.

And so I think everyone said, let's just make this adjustment to avoid the situation you just mentioned.

BY MR. CASEY:

Q Is it your understanding that OCWD has a policy that any groundwater produced by a person within OCWD's boundaries and used at a place outside of those boundaries is an unlawful export?

MR. AUSTIN: Objection. Calls for legal conclusion, vague and ambiguous as to "policy," vague and ambiguous as to "unlawful," calls for speculation, lack of foundation.

THE WITNESS: Yeah, I believe the District Act says there cannot be any exported water. I'd actually talk to legal counsel as to the exact way --

BY MR. CASEY:

Q Don't refer to that counsel. Don't refer to that conversation. We'll stop it there.

A Okay.

Q What methodology does OCWD use to determine if a person has exported groundwater from within OCWD's boundaries and used it at a place outside the

boundaries?

MR. AUSTIN: Objection. Assumes facts not in evidence, vague and ambiguous as to "methodology," compound.

MR. NEWMARK: Calls for legal conclusion, vague and ambiguous as to "export" and "unlawful export."

THE WITNESS: We calculate a producer's water demands that are within Orange County Water District, and the amount of pumping is based on the water demands within Orange County Water District. So that is their kind of groundwater allotment.

The district recognizes -- and we have this situation with maybe three or four producers that have boundaries outside of the water district. We recognize that there could be some groundwater molecules actually getting outside our boundaries.

But we calculate how much pumping you're allowed based on your water demands within Orange County Water District. And so that's your groundwater allotment, and if some of those -- because of your water system, if some of those groundwater molecules get outside of our boundaries, that's just so be it.

BY MR. CASEY:

Q When you say "so be it," what does that mean?

A That there's nothing you can do to prevent that.

Q When you say "total water demand," in calculating the total water demand referred to in your last answer, do you include recycled water?

A No.

Q You mentioned this is a situation for three or four producers; is that right?

A Yes.

Q Who are they?

A It used to be a situation with Yorba Linda Water District, but then they annexed in that land that was outside our boundaries, so it's no longer a situation with Yorba Linda.

The City of Orange, I believe, has a small area.

City of La Palma has a small area.

I think that's it.

Q Does the City of Orange produce or use any recycled water?

A No.

Q Does the City of La Palma use or produce any recycled water?

A No.

Q Let me hand Mr. Kennedy what was previously

marked as Exhibit 16.

(Exhibit 16 previously marked.)

THE WITNESS: (Witness reviews exhibit.)

BY MR. CASEY:

Q Have you ever seen Exhibit 16 before, Mr. Kennedy?

A Is this the Santa Ana River judgment?

Q It's the complaint.

A It's the complaint? Oh, I'm not sure.

Q So let me direct your attention to page No. 16. You'll see this is the type of document that has line numbers. I'll be referring to those line numbers.

Okay?

A Uh-huh.

Q So lines 25 to 27 says (as read):

The watershed of the Santa Ana River embraces approximately 2,000 square miles, the boundaries of which are delineated on Exhibit A.

Exhibit A immediately follows page numbered 27, if you want to check me.

A (Witness reviews exhibit.)

Q Based on your understanding of the Santa Ana River watershed, Mr. Kennedy, does Exhibit A

accurately describe and depict it?

MR. AUSTIN: Calls for speculation, lack of foundation, calls for legal conclusion.

MR. NEWMARK: Vague and ambiguous as to "depicted."

MS. DE FELICE: Document speaks for itself.

THE WITNESS: It could be, looking at it these few minutes here.

BY MR. CASEY:

Q Okay. Going back to page numbered 16, on lines 29 to 31, it says (as read):

From the standpoints of geography, geology, and hydrology, the Santa Ana River system is one watershed and one basin.

Do you see that?

A Yes.

Q Do you agree with that statement?

MR. AUSTIN: Objection. Vague and ambiguous, compound, calls for speculation, calls for legal conclusion.

MR. DUNN: Lacks foundation.

THE WITNESS: Yeah. I'm not sure. I'd have to understand what they mean by "one basin." I don't know if they're referring to one groundwater basin

or -- because there are multiple groundwater basins within the watershed.

BY MR. CASEY:

Q But you would agree with the statement that the Santa Ana River system is one watershed; correct?

MR. AUSTIN: Objection. Vague and ambiguous as to "Santa Ana River system." Calls for speculation, lack of foundation, calls for legal conclusion.

THE WITNESS: I believe so, based on what I'm seeing here.

MR. CASEY: Why don't we take a short break.

(A recess was taken.)

BY MR. CASEY:

Q Let me hand Mr. Kennedy what was previously marked as Exhibit 13, which is a copy of the OCWD Act.

I'm just going to use this, Mr. Kennedy, to ask a few technical questions.

Could you turn to page 14, please.

(Exhibit 13 previously marked.)

THE WITNESS: Okay.

BY MR. CASEY:

Q Under subparagraph K, if you want to read this paragraph to yourself before I ask you a question -- why don't you go ahead and do that.

A Okay.

MR. AUSTIN: What's the exhibit number?

MS. GALLAGHER: 13.

THE WITNESS: (Witness reviews exhibit.)

Okay.

BY MR. CASEY:

Q Do you have an understanding of what the phrase "alternative nontributary source" means?

MR. AUSTIN: Objection. Calls for legal conclusion, lack of foundation, calls for speculation.

THE WITNESS: (Witness reviews exhibit.)

I'm not really sure. "Alternative nontributary source of groundwater." I -- I really don't. Yeah.

BY MR. CASEY:

Q Are there any -- based upon your work for OCWD over the past -- how long has it been now, Mr. Kennedy?

A 22 years.

Q Over the last 22 years, do you know if there are bodies of water that are tributary to the Santa Ana River?

MR. AUSTIN: Hold on. Can you repeat that question.

(The record was read by the reporter.)

MR. AUSTIN: Objection. Vague and ambiguous as to "tributary" and "bodies of water." Calls for speculation, lack of foundation, calls for legal conclusion.

MR. NEWMARK: Vague and ambiguous as to "Santa Ana River."

THE WITNESS: If "bodies of water" is referring to lakes, there's lakes that are tributary to the Santa Ana River.

BY MR. CASEY:

Q How about creeks?

MR. AUSTIN: Same objections.

THE WITNESS: There are creeks tributary to the Santa Ana River.

BY MR. CASEY:

Q How about other rivers?

MR. AUSTIN: Same objections.

THE WITNESS: Well, there's creeks to the Santa Ana River. I don't think there's any other large rivers.

BY MR. CASEY:

Q Does OCWD enter into in-lieu contracts with groundwater producers?

MR. AUSTIN: As referenced in this paragraph?

MR. CASEY: Yes.

MR. NEWMARK: Objection. Foundation.

THE WITNESS: As referenced in this --

MR. AUSTIN: To the extent you know.

THE WITNESS: -- paragraph, I do not believe so. I'd have to think about that, but none off the top of my head.

BY MR. CASEY:

Q Let's turn to page 51 of Exhibit 13.

To your knowledge, Mr. Kennedy, is there a producer who is producing groundwater from a zone that is not replenished by the Santa Ana River or its tributaries?

MR. AUSTIN: Objection. Calls for speculation, lack of foundation, compound, assumes facts not in evidence.

THE WITNESS: I don't think there are any. That would be my initial -- yeah -- guess, yeah.

MR. CASEY: Let me have marked as Exhibit 52 an email from Paul Shoenberger, S-h-o-e-n-b-e-r-g-e-r, to Mr. Kennedy, dated May 11, 2016, Bates-stamped 3357.

(Exhibit 52 marked.)

BY MR. CASEY:

Q Do you recognize this exhibit, Mr. Kennedy?

A Yes.

Q What is it?

A It's a table and analysis that was prepared by Brady & Associates. And it was estimating the impact to the groundwater producers if we were to begin including recycled water as supplemental water.

Q Do you know Brady & Associates?

A I know employees over there, yes.

Q What does that company do?

A I just -- I think they're a general civil engineering consulting firm.

Q So in the email, when Mr. Shoenberger says (as read):

John, can you recommend some updated parameters that we should use to bring this analysis up to date,

do you know what he was asking you for?

MR. NEWMARK: Objection.

MR. AUSTIN: Objection. Calls for speculation, lack of foundation, document speaks for itself.

THE WITNESS: There's assumptions that you need to make the calculation: What is the cost of groundwater, the replenishment assessment? What is the cost of Met water? What is the energy cost to pump groundwater? He was asking for me to help in

updating those numbers.

BY MR. CASEY:

Q Is it your understanding that Mr. Shoenberger had hired Brady & Associates to prepare this analysis?

MR. AUSTIN: Calls for speculation, lack of foundation.

THE WITNESS: Yes.

BY MR. CASEY:

Q Did Mr. Shoenberger tell you why he hired Brady & Associates to prepare this analysis?

A Mr. Shoenberger was the chairman of the producers group, and there was a general concern by many producers as to how their water supply cost may increase if the change IRWD wanted was actually made. And he was trying to quantify the impacts -- water supply impacts to the producers.

Q So this is from that PowerPoint that you had prepared we talked about before.

This analysis shows the gain to the groundwater producers that would be taken away from them if recycled water was counted as supplemental sources; is that correct?

MS. DE FELICE: Objection --

MR. DUNN: Objection --

MR. AUSTIN: Objection. Argumentative,

compound, assumes facts not in evidence, vague and ambiguous.

MR. NEWMARK: Vague and ambiguous, particularly as to this analysis and the PowerPoint and how any of that relates to Exhibit 52.

MR. AUSTIN: Calls for speculation, lack of foundation.

THE WITNESS: Yeah. There's -- there was just a general concern to try to quantify what the change in policy might do to the water -- the other producers' water supply. And there was an attempt to try to quantify that.

BY MR. CASEY:

Q I'll have marked as Exhibit 53 a two-page email from Mr. Kennedy to Mr. Fick, dated December 6, 2016, Bates stamped 1676 [verbatim].

(Exhibit 53 marked.)

THE WITNESS: (Witness reviews exhibit.)

BY MR. CASEY:

Q Mr. Kennedy, do you recognize this email?

A Yes.

Q So had Mr. Fick asked you for some old emails involving IRWD's BEA reports?

A (Witness reviews exhibit.)

Yeah. It looks that way, yes.

Q Do you know why he asked you for those?
A Specifically, no, I do not. He -- these BEA reports are prepared by Wei Xu, who was in the accounting and finance department, and Randy Fick is the CFO. So -- but the specific reason why he was asking for this at this time, I don't know.
MR. CASEY: Let me go off the record for a second.
(A discussion was held off the record.)
BY MR. CASEY:
Q I'm going to hand Mr. Kennedy what was previously marked as Exhibit 26.
(Exhibit 26 previously marked.)
BY MR. CASEY:
Q As well as Exhibit 51.
A (Witness reviews exhibit.)
Q And my first question, Mr. Kennedy, is Exhibit 26 the document that's referenced in your Item 1 on Exhibit 51?
A Yes, yes.
Q Other than discussions with legal counsel, have you discussed with anybody at any point in time anything to do with Exhibit 26?
A I distributed Exhibit 26 to different people within the organization for general information.

Q Is that part of the package of historical documents you distributed?

A Yeah. Yeah.

Q Would you have distributed Exhibit 26 at any other time other than as part of that historical documents package?

A I -- I don't recall. I could have, but it's doubtful. Yeah.

Q So other than distributing it as part of that package, did you have any other conversations with anybody about that particular document, Exhibit 26, other than with legal counsel?

A (Witness reviews exhibit.)

Nothing I can specifically recall. It was -- I mean, this was an important document that went back to the original, you know, question and why we never called reclaimed water "supplemental water." It started with this document. And so I could have talked about it with other people. Probably did. I just don't recall any specific conversations.

MR. AUSTIN: Can we go off the record for a second?

MR. CASEY: Sure.

(A discussion was held off the record.)

MR. AUSTIN: In speaking with the witness,

I'm going to let you question him on Exhibits 22 and 23 and not make a work product or privilege objection as to those.

MR. CASEY: Which are those?

MR. AUSTIN: It's the bullet points you were referring to.

MR. CASEY: Oh, okay, thank you.

(Exhibits 22 and 23 previously marked.)

BY MR. CASEY:

Q So, Mr. Kennedy, we'll put in front of you Exhibits 22 and 23 that your counsel just referenced.

A Okay.

Q Do you recognize these documents?

A Yes.

Q What are they?

A Looks like a summary of the issue that I prepared to help people understand the issue.

Q Did anybody ask you to prepare Exhibits 22 and 23?

A Probably got asked by my boss, Mike Markus. But I've prepared documents on this issue that never saw the light of day. It's an issue that's been talked about for many years.

Q Did you ever provide a copy of either Exhibit 22 or 23 to a director on the OCWD board?

A I could have. I don't recall a specific time that I did, but this looks like the type of document I would have prepared to help board members understand the issue.

Q So let's focus on Exhibit 23.

A Okay.

Q Did you ask Mr. Herndon to provide you with comments and edits on your draft?

A I could have. I probably did, yes.

Q Did you and Mr. Herndon discuss the document?

A I don't know if we had a verbal discussion on this. I typically or he will send me documents and we'll edit each other's work. We have a relationship like that at the water district.

Q So on top of the second page of Exhibit 23, first bullet point, you make a reference to "purple pipe system."

What does that mean?

MR. AUSTIN: Counsel, that's --

BY MR. CASEY:

Q I'm sorry, third page. I'm sorry.

A Third page?

(Witness reviews exhibit.)

Which bullet point?

Q First bullet point.

A First?
Q Yes.
A In 1982?
Q Yes. Makes a reference to "purple pipe system"? What did you mean by that?
A Title 22 reclamation. The type of reclaimed water system IRWD has and the type of reclaimed system our GAP project is. They use purple pipe in installing those pipelines.
Q I got it.
A So if anyone digs them up, they know it's reclaimed water.
MR. AUSTIN: Where are you, Counsel? I'm lost.
MR. CASEY: Exhibit 23, turning to the third page.
MR. AUSTIN: Which to me is a three-page document.
MS. DE FELICE: It has a Bates stamp. Let's use the Bates stamp.
MR. CASEY: 3116.
MR. AUSTIN: We're missing 3116.
MS. DE FELICE: We're missing -- yeah.
MR. NEWMARK: We have from 3115 to 3117.
MR. CASEY: All right. My apologies. We've

got it.

THE WITNESS: I've got it.

MR. NEWMARK: Mr. Austin, can you take a look at it for all of us?

MR. AUSTIN: Sure.

BY MR. CASEY:

Q So that purple pipe system carries the treated recycled water; correct?

A Yes.

Q Is that purple pipe system part of the Santa Ana River system?

MR. AUSTIN: Objection. Calls for legal conclusion, calls for speculation, lack of foundation, vague and ambiguous.

THE WITNESS: Is it part of the Santa Ana River system?

BY MR. CASEY:

Q Yes, the phrase we saw in the 1966 complaint.

MR. AUSTIN: Calls for speculation, lack of foundation, vague and ambiguous as to the meaning of that term.

THE WITNESS: When I think of the Santa Ana River system, I think of all the water coming down from Mother Nature, all the creeks and tributaries. The purple pipe system is within the watershed, but

it's not contributing to the Santa Ana River.

BY MR. CASEY:

Q So let's keep going on that page, which you'll have to look over Mr. Austin's shoulder. Bottom of the page, the last bullet point.

A Okay.

Q (As read):

The theoretical maximum financial loss to IRWD is approximately $6 million per year.

Was that your calculation of the financial loss to IRWD from the recycled water not being included in supplemental sources by OCWD?

MR. AUSTIN: Objection. Calls for speculation, lack of foundation, document speaks for itself.

THE WITNESS: Yes --

MR. AUSTIN: Objection -- vague and ambiguous as to "financial loss."

BY MR. CASEY:

Q Was that a "yes," Mr. Kennedy?

A Yes.

Q Let's turn the page. Bates stamp 3117. The last bullet point on this document you prepared says (as read):

While IRWD has been reclaiming its own wastewater since the 1970s for nonpotable purposes, the success of the GWRS would be severely undermined if other water agencies were to individually develop their own reclaimed water systems that would divert wastewater away from the GWRS.

Since you prepared this document, Mr. Kennedy, what led you to believe that the GWRS system would be severely undermined if other water agencies were allowed to individually develop their own reclaimed water systems?

MR. AUSTIN: Objection. Vague and ambiguous, compound, calls for speculation, lack of foundation.

THE WITNESS: There's 19 groundwater producers.

MR. AUSTIN: Also assumes facts not in evidence. This is attached to an email from Mr. Herndon in which he is suggesting some edits. So the assumption that he wrote it may not be true.

BY MR. CASEY:

Q Go ahead, Mr. Kennedy.

A If all of the 19 groundwater producers were to develop their own reclaimed water systems and not

send their wastewater to Orange County Sanitation District, then the capital investment that was made with the groundwater replenishment system would have been a waste of money.

Q You can put that aside.

MR. DUNN: Mr. Casey, I need to add a late objection. The objection to the question as it was read or stated to the deponent included words that were not included in the bullet point, or at least one word. Thank you.

BY MR. CASEY:

Q Since we're on the topic, Mr. Kennedy, let me show you Exhibit 25, since Mr. Markus didn't recognize it yesterday, and ask you if you recognize it.

A (Witness reviews exhibit.)

(Exhibit 25 previously marked.)

THE WITNESS: Looks like something I prepared.

BY MR. CASEY:

Q Did someone ask you to prepare it?

A No. I probably did this on my own, anticipating the issue.

Q When did you prepare this?

A Oh, boy. This issue has been going on for a number of years, so last two or three years. Maybe

last year. I -- you know.

Q So let's focus on the fourth bullet point on Exhibit 25 on page 1. First sentence says (as read):

With their reclaimed water system and their water quality projects that pump above the BPP and receive a BEA exemption, IRWD's overall water reliability is much better than the typical producer.

In parentheses (as read):

Only about 10 percent of their water supply has to be imported.

Do you see that?

A Yes.

Q Since you wrote that, you agree with it; right?

MR. AUSTIN: Objection. Compound, calls for legal conclusion, calls for speculation, lack of foundation.

THE WITNESS: Yes.

BY MR. CASEY:

Q And those are projects referenced in that sentence I just read that IRWD undertook; is that right?

MR. AUSTIN: Calls for speculation, lack of

foundation, vague as to "undertook."

THE WITNESS: Yes.

BY MR. CASEY:

Q Next sentence reads (as read):

Given that OCWD generally wants all producers to have the same water reliability and water supply costs, this is not good (fair) to other producers.

What did you mean by that?

A It means IRWD is pumping more groundwater overall -- they're pumping a higher percentage than other producers, and so their water supply reliability is a little bit better than a typical producer because of those projects that get the BEA exemption.

Q And other producers haven't undertaken those projects like IRWD have; correct?

A A few producers have, but, in general, most of them have not.

Q Let's go to the next bullet point (as read):

IRWD continues to expand their reclaimed water system, taking sewage away from the OCSD and GWRS.

What did you mean by that?

A They're sending less and less sewage to the Orange County Sanitation District where it could be

recycled by the groundwater replenishment system.

Q Next sentence says (as read):

IRWD has a right to their sewage.

What did you mean by that?

MR. NEWMARK: Objection. Legal conclusion. Calls for legal conclusion.

THE WITNESS: Yeah. I'm probably getting into a legal area where I'm not qualified. But --

BY MR. CASEY:

Q I'm just asking what you meant by the sentence you wrote.

A Yeah. They have -- it's sewage being generated in their service territory, and, if they want to reclaim it, they probably can, yeah.

Q Let's go to the last bullet point. It says (as read):

Any changes will directly impact the GAP system.

"GAP system" meaning the Green Acres Project; correct?

A Correct.

Q What did you mean by that sentence?

MR. AUSTIN: Objection. Calls -- never mind.

THE WITNESS: The four producers who are taking Green Acres Project water have the same issue

as IRWD, and so any change for IRWD would impact those four producers taking GAP water.

BY MR. CASEY:

Q And those four producers we talked about before.

I think you mentioned that they have a contract with OCWD at which they pay for that GAP water a price equal to 80 percent of their groundwater cost; correct?

MR. NEWMARK: Objection. Facts not in evidence, misstates testimony.

MS. DE FELICE: Join.

MR. AUSTIN: Join.

THE WITNESS: That used to be the case. In the last year, we've updated the agreement with those four producers where they pay a different rate now.

BY MR. CASEY:

Q What's the rate?

A They pay the actual estimated cost to produce GAP water.

Q When did that change go into place?

A Roughly a year ago.

Q So different topic, Mr. Kennedy: Are you familiar with the -- where is that? -- are you familiar with the Santiago Creek water?

A Yes.
Q What does that refer to?
A It's the stream below Irvine Lake, goes through Villa Park down -- it's called Santiago Creek, through the -- down into the Santa Ana River eventually.
Q So the Santiago Creek water goes to the Santa Ana River; correct?
A Yes.
Q So the Santiago Creek is a tributary to Santa Ana River; correct?
A Yes.
MR. NEWMARK: Objection. Vague and ambiguous.
MS. DE FELICE: It calls for a legal conclusion.
BY MR. CASEY:
Q Mr. Kennedy, you understand that the Santiago Creek water is considered a supplemental source under Section 31.5 of the act?
MR. AUSTIN: Objection. Calls for legal conclusion, calls for speculation, lack of foundation.
THE WITNESS: Yes.
BY MR. CASEY:
Q Do you know why the Santiago Creek water is

1 considered a supplemental source even though it's a
2 tributary to Santa Ana River?
3 MR. AUSTIN: Objection. Calls for legal
4 conclusion.
5 MS. DE FELICE: Assumes facts not in
6 evidence.
7 MR. AUSTIN: Assumes facts not in evidence,
8 calls for speculation, lack of foundation.
9 THE WITNESS: I do not. I was not part of
10 that. I believe that happened before I got to the
11 water district.
12 BY MR. CASEY:
13 Q Do you know a guy named Joel Kuperberg?
14 A Yeah.
15 Q K-u-p-e-r-b-e-r-g.
16 Who is Mr. Kuperberg?
17 A He's the legal counsel for Orange County
18 Water District.
19 Q So if Mr. Kuperberg said at a public session
20 there is a carveout for Santiago Creek water, and that
21 was because those were water rights that were
22 established before the district was created in 1933,
23 you wouldn't have any reason to disagree with him,
24 would you?
25 MR. AUSTIN: Objection. Calls for

speculation, lacks foundation, calls for legal conclusion.

Where are you reading from, Counsel?

MR. NEWMARK: Facts not in evidence.

MR. AUSTIN: Agree. Assumes facts not in evidence. Compound.

THE WITNESS: Yeah. I -- I have no reason to not believe Joel.

BY MR. CASEY:

Q I'm going to give you back Exhibit 51, Mr. Kennedy.

You see Item 9 on Exhibit 51?

A Yes.

Q For the record, it says (as read):

1995 Assembly Bill AB 1140 removed reclaimed water from supplemental water definition.

Do you see that?

A Yes.

Q This is a document you prepared; correct?

A Correct.

Q It's a document you prepared after looking at those historical documents; correct?

A Correct.

Q So would you have any reason to disagree with

Mr. Kuperberg if he said at an open session of the board of directors that it's not clear, based on the documentation that I've seen, why that language was taken out?

MR. AUSTIN: Objection. Calls for speculation.

MR. NEWMARK: Lack of foundation, compound, calls for legal conclusion, relevance. Facts not in evidence.

THE WITNESS: Can you repeat that what I --

BY MR. CASEY:

Q Would you have any reason to disagree with Mr. Kuperberg's statement --

MR. AUSTIN: In the hypothetical situation that Mr. Kuperberg said that the way the question was phrased.

THE WITNESS: Yeah. I don't -- yeah. No, I don't.

BY MR. CASEY:

Q You can give those back.

All right. The final document today, Mr. Kennedy, is a big one. I'm sure no one on the other end is going to want it. Not because it's that important, guys; it's just because it's really thick. I have to have Mr. Kennedy verify it.

It's a document starting with Bates stamp 22175. It's dated December 2013, and it appears to be Ben Smith's master's thesis.

I just need you to verify that it is, since you're listed as one of the committee members, Mr. Kennedy.

So we'll make this Exhibit 54.

(Exhibit 54 marked.)

MR. NEWMARK: Counsel, you're not expecting him to read that whole stack to verify it.

MR. CASEY: No. I just want him to verify it.

I don't have one for the three of you; I don't know if you really want it.

MR. AUSTIN: Technically, Counsel, to properly have this witness verify that this is an authentic document would require him to look at the whole thing, I think is what Greg is getting at.

MR. CASEY: I see. You can make that objection.

MR. AUSTIN: I will object that you're not giving the witness sufficient time to analyze whether or not this is an authentic document. It therefore lacks foundation, calls for speculation.

MR. DUNN: Without getting into a speaking

1 objection here, even if he does recognize it, we'll
2 need more foundation for him to authenticate it.
3 BY MR. CASEY:
4 Q Let me ask you a preliminary question,
5 Mr. Kennedy.
6 Who is Benjamin Smith?
7 A He's an engineer in our engineering group.
8 Q Is he still employed as we sit here today by
9 OCWD?
10 A Yes.
11 Q And did you agree to be a committee member
12 for his preparation of thesis?
13 A Yes, I did.
14 Q What does that entail on your part?
15 A Reviewing the report, driving up to Cal State
16 Long Beach and listening to his presentation. That
17 was it.
18 Q Did you make available to Mr. Smith for
19 purposes of his master's thesis any historical
20 documents from OCWD's files?
21 A Yes, I'm sure I did.
22 Q Do you have a file of the documents you gave
23 him?
24 A No.
25 Q Would Mr. Smith have that?

A A file of the documents that I would have gave him?

Q Yes.

A I don't know. He might, yeah.

Q So did Mr. Smith ever give you drafts of the written thesis?

A I'm sure -- I'm sure he did.

Q And if you turn just to the second page of this exhibit, Bates-stamped 22176, is that your signature in the middle of that document?

A Yes.

Q Under "John Kennedy"?

A Yes.

Q And before signing it, did you read the document?

A Yes.

MR. AUSTIN: Objection. Same foundational and calls-for-speculation objections to the extent you're referring to this document.

BY MR. CASEY:

Q Before signing, Mr. Kennedy, did you have any discussions with Mr. Smith, saying, "I disagree with your conclusions or analysis in your thesis"?

A I don't believe I did.

Q Okay. Just turning to that second page again

where you signed at the top, it says (as read):

We, the undersigned members of the committee, have approved this thesis.

Did you read that before you signed it?

A Yes.

Q So you're a member of the committee; right?

A Yes.

Q So did you approve the thesis?

A Yes.

MR. CASEY: I'll take a short break and take a look at my notes. We could be done.

MR. NEWMARK: Counsel, I've been refraining from joining everybody's objection. Do you want us to -- I'd like to memorialize at the end that parties do not need to join so that we don't continue that in later depositions in this case.

MR. AUSTIN: I'm good with that.

MS. DE FELICE: Good idea, Greg.

MR. CASEY: That's fine.

(A recess was taken.)

(A discussion was held off the record.)

BY MR. CASEY:

Q Mr. Kennedy, have you had any discussions with anybody from IRWD about annexation agreements whereby IRWD annexed land into OCWD's boundaries?

MR. NEWMARK: Objection. Overly broad, vague and ambiguous.

THE WITNESS: Yeah, it's a very broad question. Yes. Annexation -- the issue of annexation has gone on for many, many years.

BY MR. CASEY:

Q Which department of OCWD would typically handle a request by a producer for annexation?

MR. AUSTIN: Objection. Vague as to "handle," assumes facts not in evidence.

MR. NEWMARK: Vague as to time.

THE WITNESS: I personally have worked on the annexation issue for IRWD.

BY MR. CASEY:

Q In connection with an annexation with IRWD, have you ever talked to anybody at IRWD about what the phrase "unlawful export" means in the OCWD Act?

MR. AUSTIN: Objection. Calls for legal opinions, lack of foundation, calls for speculation, vague as to "in connection with."

THE WITNESS: Have I talked to anyone at IRWD about what the phrase "unlawful exportation"?

We probably have talked about it in meetings we've had. I'm not recalling a specific conversation.

///

BY MR. CASEY:

Q What about a general conversation?

A We probably have had a general conversation, yeah.

Q What did you guys talk about?

A I can't remember the exact conversation, yeah.

MR. CASEY: Okay. That's all I have for the witness.

MR. AUSTIN: Same stipulation as previous?

MR. CASEY: Yes, we'll have the same stipulation concerning the handling of the transcript.

And I assume you guys will put on your same objections?

MR. NEWMARK: I wanted to propose a stipulation regarding -- strike that.

I'd like to propose that all counsel stipulate that during the depositions in this case, to avoid unnecessary joinders in objections asserted by other parties, that all parties other than the party questioning the witness are deemed to have joined any objections asserted.

MR. CASEY: Say that last part again? All --

MR. NEWMARK: All parties other than the party questioning the witness are deemed to have

joined objections asserted by another party.

MR. CASEY: Sure.

MR. AUSTIN: Stipulated.

MS. DE FELICE: Stipulated.

MR. CASEY: That will be the stipulation for everybody's depositions?

MS. DE FELICE: Right.

MR. DUNN: So stipulated.

MR. AUSTIN: So stipulated.

MR. CASEY: Do you guys want to put on the record the standing objection?

MS. DE FELICE: Correct, the same standing objection -- I don't know if you need me to restate it -- that was made yesterday and the day before with respect to real parties.

We'll assert an objection with respect to the deposition testimony being applicable to the first and second causes of action in petitioner's second amended petition or any cause of action that is based upon an administrative record.

MR. CASEY: Thank you, Mr. Kennedy. Nice meeting you.

(It was stipulated on October 10, 2017, at the deposition of Wei Xu:

MS. DE FELICE: Real-party-in-

interest Golden State Water Company basically objects to the testimony here being used today with respect to petitioner's first and second causes of action, which are reverse validation on a writ based upon their being quasi-legislative acts, and they should be considered within an administrative record. And, therefore, the deposition testimony should not be able to be introduced as evidence for those first two causes of action or any other cause of action that is based upon an administrative record.

Also, too, with respect to the depositions, the real parties and Respondent Orange County, as well as petitioner, I believe, have entered into a stipulation to have this witness, as well as some other Orange County Water District employee witnesses, recalled in the event necessary, and that is the reason why Golden State Water Company, as well as some of the other real parties in interest, are not questioning Mr. Xu

today.

MR. CASEY: Do you guys want to join?

MR. DUNN: City of Anaheim joins the objection.

MR. NEWMARK: East Orange County, Yorba Linda Water District, and Mesa Water join the objection as well and the notation of the stipulation and reservation of rights to question the witness subject to a later notice.

MR. CASEY: Okay. So with respect to the handling of the deposition transcript, I would propose the following stipulation: That the court reporter can send the original of the transcript to Mr. Austin in his role as attorney for the witness; that Mr. Austin will provide written notice of any changes to the transcript to all parties within three weeks of his receipt of the transcript.

MR. AUSTIN: Let's go ahead and make it 30 days. We'll have the same number for all depositions.

MR. CASEY: 30 days upon his receipt of the transcript. And that Mr. Austin

will produce the original of the transcript upon written request from any other party for purposes of its being used in any proceeding in this matter.

If the original is not produced, a certified copy can be used in lieu of the original for any purpose that the original could have been used.

And that, based on the stipulation, the court reporter is relieved of her responsibilities with respect to the original of the transcript under the code.

MR. DUNN: I would just qualify with respect to her responsibilities under the code regarding custody. She still has to produce the transcript.

MR. NEWMARK: So stipulated.

MS. DE FELICE: So stipulated.

MR. AUSTIN: So stipulated.

MR. DUNN: So stipulated.

MR. CASEY: So stipulated.)

(Proceedings adjourned at 4:53 p.m.)

STATE OF CALIFORNIA)
) Ss.
COUNTY OF LOS ANGELES)

I, JOHN KENNEDY, hereby certify under penalty of perjury under the laws of the State of California that the foregoing is true and correct.

Executed this_____ day of _____, 20___, at _____, California.

_____
JOHN KENNEDY

STATE OF CALIFORNIA)
) SS.
COUNTY OF LOS ANGELES)

I, Christianne Lee Fong, CSR 7559, CCRR, a Certified Shorthand Reporter in and for the County of Los Angeles, the State of California, do hereby certify:

That, prior to being examined, the witness named in the foregoing deposition was by me duly sworn to testify the truth, the whole truth, and nothing but the truth;

That said deposition was taken down by me in shorthand at the time and place therein named, and thereafter reduced to typewriting by computer-aided transcription under my direction.

I further certify that I am not interested in the event of the action.

In witness whereof, I have hereunto subscribed my name.

Dated: October 18, 2017

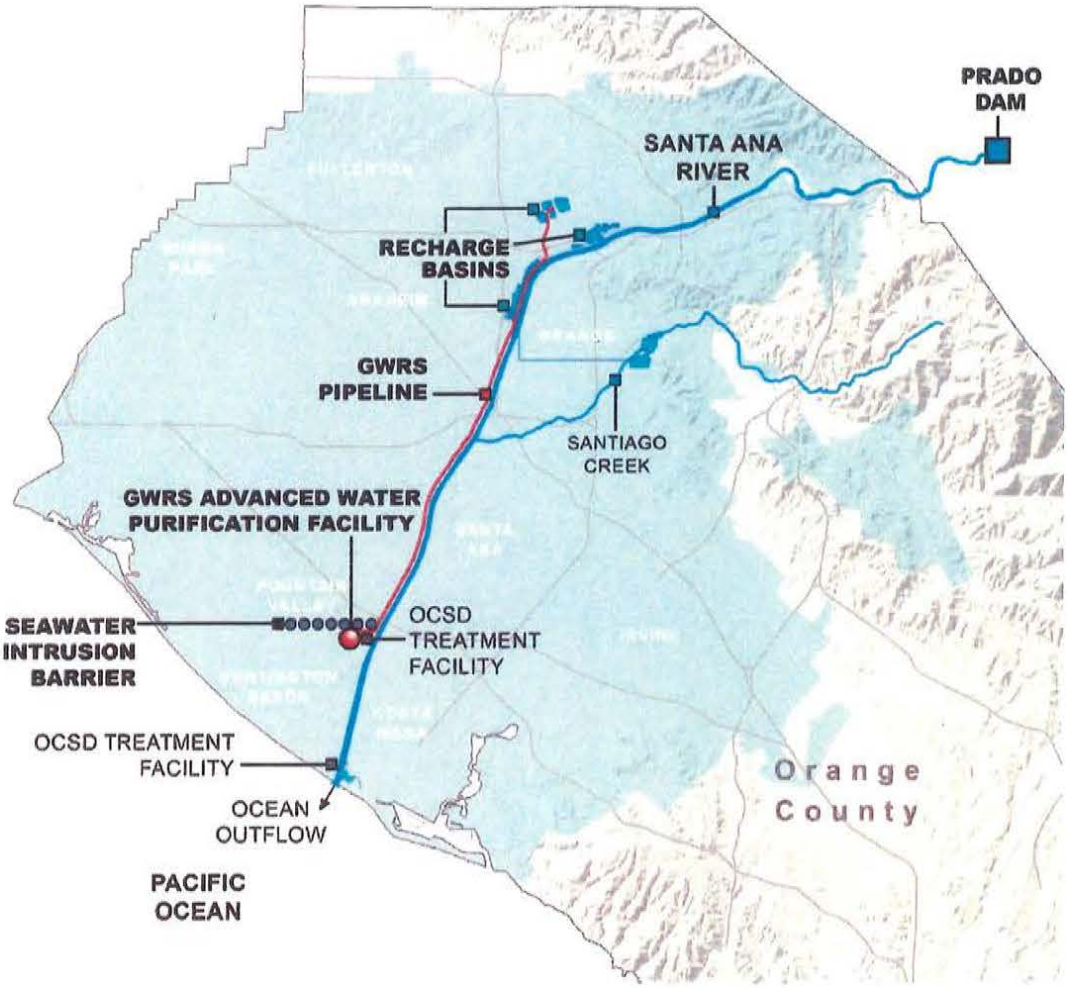
Christianne Lee Fong

Christianne Lee Fong, CSR 7559, CCRR

D

SINCE 1933

Orange County Water District Groundwater Management Plan 2015 Update



WITNESS Marlows
EXHIBIT 15
DATE 10-11-17 RPTR NB
eLitigation Services Inc.

Orange County Water District Groundwater Management Plan 2015 Update

June 17, 2015

Greg Woodside, PG CHg, Executive Director of Planning and Natural Resources
Marsha Westropp, Senior Watershed Planner

5.2.1 Santa Ana River

The Santa Ana River begins in the San Bernardino Mountains and flows through the Prado Dam to Orange County, as shown in Figure 5-4. The dam was built by the U.S. Army Corps of Engineers (the Corps) in 1941 "for flood control and other purposes."

Water from the Santa Ana River is the primary source of water used to recharge the groundwater basin. Downstream of the dam, OCWD diverts river water into recharge facilities where the water percolates into the groundwater basin. A 1969 legal settlement between OCWD and all upper watershed parties requires that a minimum of 42,000 afy of Santa Ana River base flows reach the Prado Dam. Since the 1973, base flow has exceeded the legal minimum, reaching a maximum of over 158,000 acre-feet in 1999. In July 2009, the State Water Resources Control Board approved Water Rights Permit No. 21243, which provides OCWD the right to divert and recharge up to 362,000 afy of Santa Ana River flows.

District recharge facilities are capable of recharging nearly all of the base flow. OCWD also has rights to all storm flows that reach Prado Dam. When storm flows exceed the capacity of the diversion facilities, river water reaches the ocean and this portion is lost as a water supply. Storing water behind Prado Dam significantly increases the amount of stormwater that OCWD is able to recharge into the groundwater basin.

Figure 5-4: Santa Ana River Watershed

In the 1960s, the Corps began working with OCWD to temporarily store storm water behind the dam. When rates of release through the dam are closely matched to the downstream diversion capacity, OCWD is able to maximize capture of this water supply and minimize the flow of water to the ocean. However, storing water behind the dam must be managed so as not to jeopardize the primary purpose of the dam for flood control. This is accomplished by limiting the volume of water stored behind the dam to a lower level during the storm season to maintain storage for future storm events. Outside of the storm season, the Corps allows a larger storage volume to be held behind the dam.

Agreements between OCWD and the Corps signed in 1994 and 2006 set dam operating procedures to allow temporary storage behind Prado Dam up to an elevation of 498 feet mean sea level (msl) during the flood season (October 1 – February 28), which equates to just under 10,000 acre-feet of storage. During the non-storm season, which extends from March 1 to September 30, the allowable elevation increases to an elevation of 505 feet msl, which equates to just less than 20,000 acre-feet of storage. The areas inundated behind Prado Dam and the storage for the non-storm season and storm season pools are depicted in Figure 5-5.

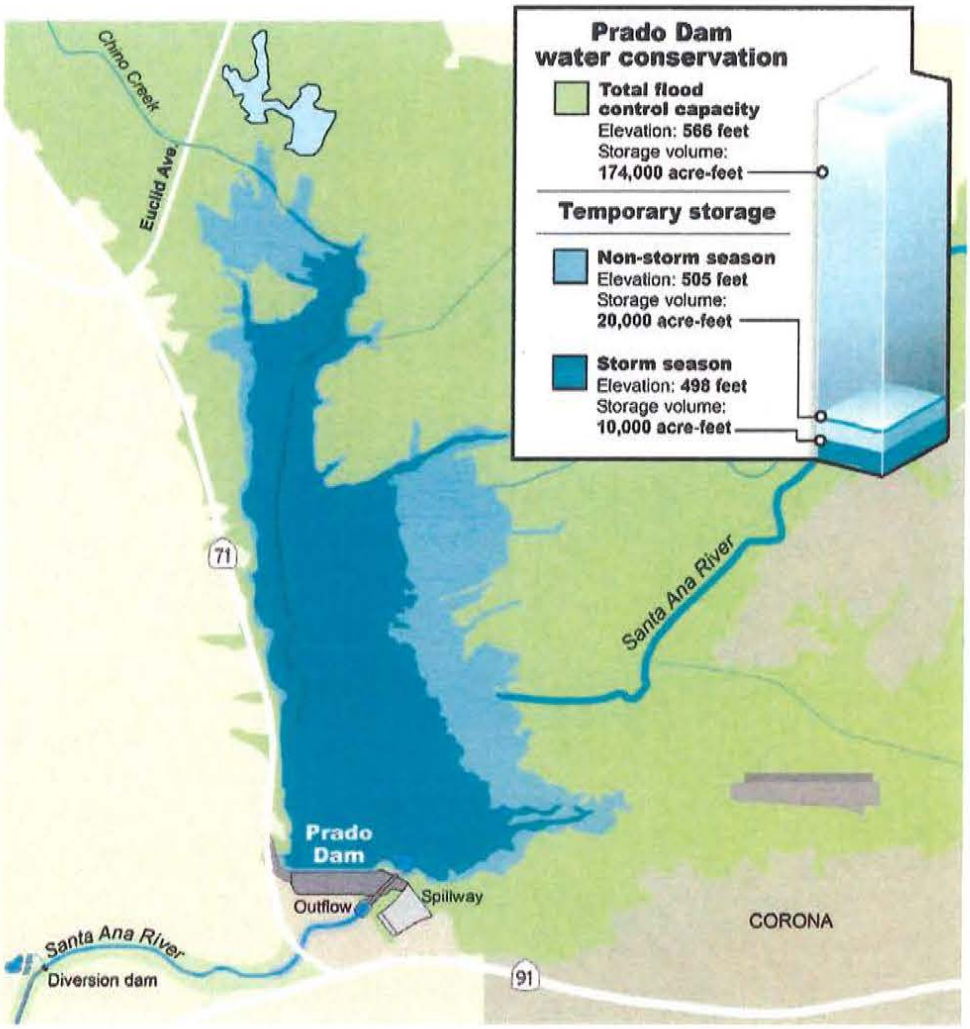


Figure 5-5: Area of Inundation and Storage Volume for Water Conservation Pools

Both the base flow and the storm flow in the Santa Ana River vary from year to year as shown in Figure 5-6. Recent trends show a decline in base flow, which may be a result of increased recycling, drought conditions, declining per capita water use, and changing economic conditions in the upper watershed. The volume of storm water that can be recharged into the basin is highly dependent on amount and timing of precipitation in the upper watershed, which is highly variable, as shown in Figure 5-7.

Figure 5-8 shows the amount of stormwater captured since 1936. Although storm flow averages approximately 33 percent of the total Santa Ana River flows, only approximately half of that amount is recharged by OCWD. This is primarily because most of the flows that are lost to the ocean occur during relatively brief periods of high releases from Prado Dam that exceed the District's diversion capacity. During dry years, very little water is lost to the ocean; however, in wet years, losses can be great. In water year 1997-98, for example, the District was able to capture and recharge over 74,000 acre-feet of storm flow, but was unable to capture approximately 270,000 acre-feet of storm flow.

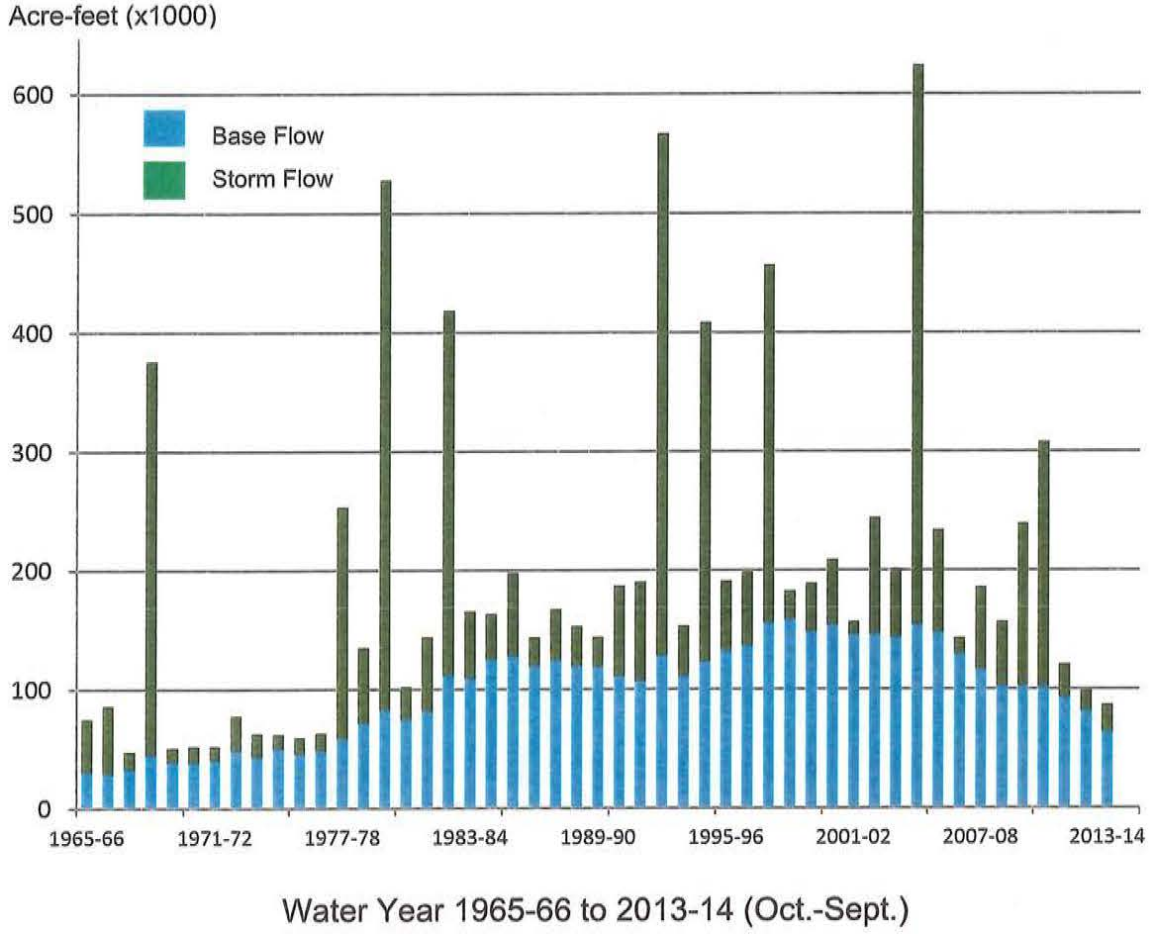


Figure 5-6: Annual Base and Storm Flow in the Santa Ana River at Prado Dam
Source: Santa Ana River Watermaster, 2014

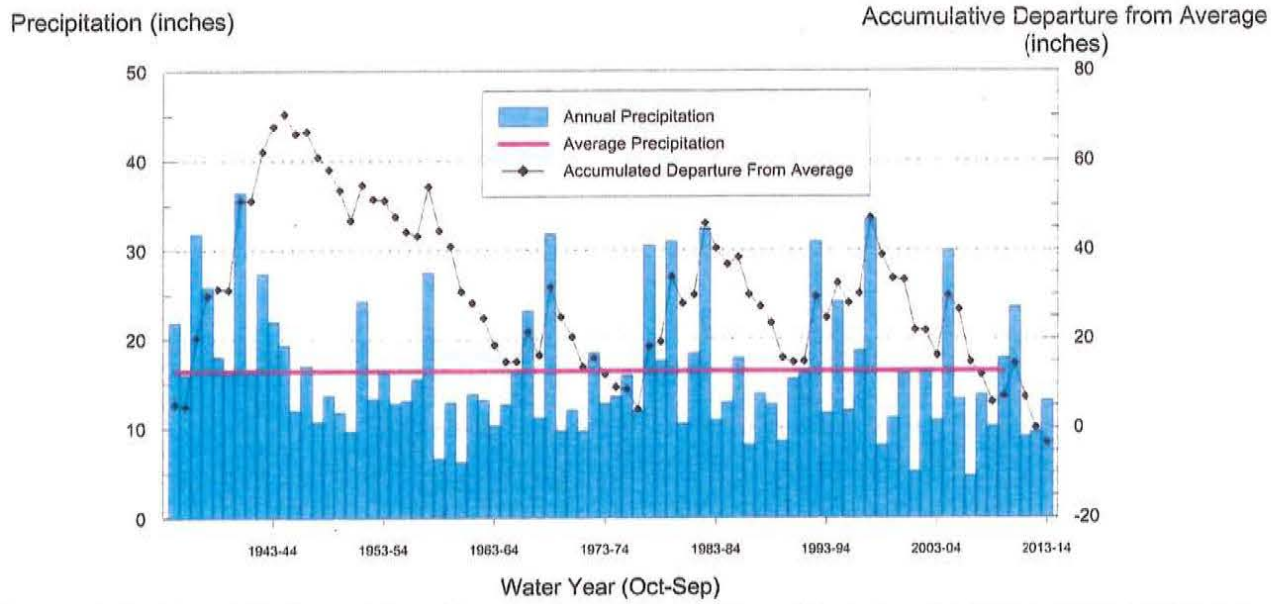


Figure 5-7: Precipitation at San Bernardino, Water Year (Oct.-Sept.) 1934-35 to 2013-14

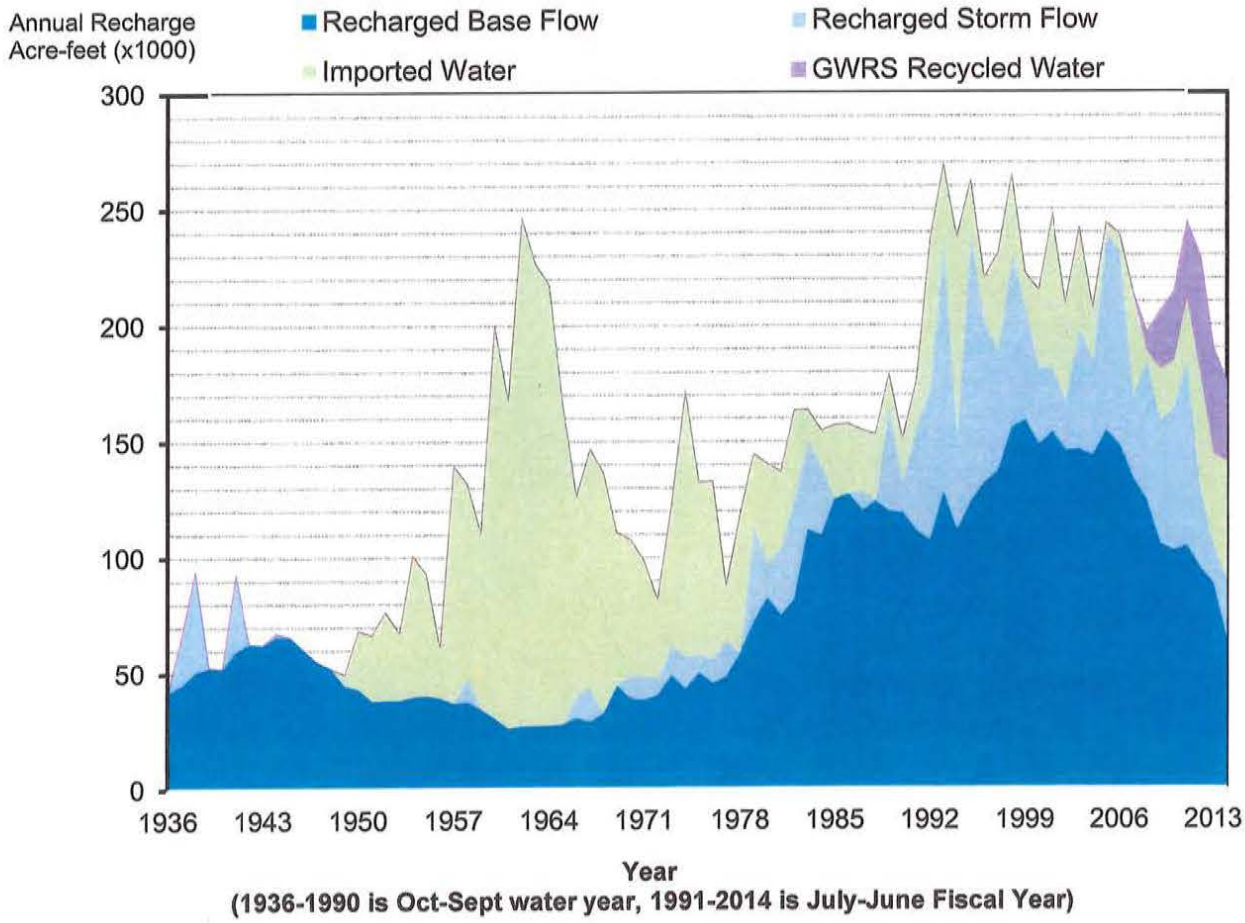


Figure 5-8: Historical Recharge in Surface Water Recharge System

MWD:ee 10-15-6

600

PILLSBURY, MADISON & SUTRO
JAMES MICHAEL
WILLIAM C. MILLER
Standard Oil Building
San Francisco 4, California
Telephone: GArfield 1-6133

RUTAN, LINDSAY, DAHL, SMEDEGAARD,
HOWELL & TUCKER
MILFORD W. DAHL
JAMES E. ERICKSON
401 West Eighth Street
Santa Ana, California
Telephone: KImberly 3-9411

Attorneys for Plaintiff

FILED
1963 OCT 15 AM 10:08
CLERK OF THE SUPERIOR COURT
ORANGE COUNTY, CALIF.
BY Deputy

SUPERIOR COURT OF THE STATE OF CALIFORNIA

FOR THE COUNTY OF ORANGE

ORANGE COUNTY WATER DISTRICT,
a public corporation,

Plaintiff,

-vs-

(A) CITY OF CHINO, CITY OF COLTON, CITY OF LA VERNE, CITY OF ONTARIO, CITY OF POMONA, CITY OF REDLANDS, CITY OF RIALTO, CITY OF RIVERSIDE, CITY OF SAN BERNARDINO, CITY OF UPLAND,

(B) ARROW BEAR PARK COUNTY WATER DISTRICT, BLOOMINGTON COUNTY WATER DISTRICT, CREST FOREST COUNTY WATER DISTRICT, CRESTLINE VILLAGE COUNTY WATER DISTRICT, CUCAMONGA COUNTY WATER DISTRICT, EAST SAN BERNARDINO COUNTY WATER DISTRICT, MENTONE COUNTY WATER DISTRICT, MONTE VISTA COUNTY WATER DISTRICT, RUNNING SPRINGS COUNTY WATER DISTRICT, SEMI-TROPIC COUNTY WATER DISTRICT, SOUTH SAN BERNARDINO COUNTY WATER DISTRICT, WEST SAN BERNARDINO COUNTY WATER DISTRICT,

(C) CALIFORNIA STATE COLLEGE AT SAN BERNARDINO, CALIFORNIA INSTITUTION FOR MEN, CALIFORNIA INSTITUTION FOR WOMEN, CALIFORNIA STATE POLYTECHNIC COLLEGE, COUNTY OF RIVERSIDE, COUNTY OF SAN BERNARDINO, DEPARTMENT OF FISH AND GAME, PATTON STATE HOSPITAL, STATE OF CALIFORNIA, UNIVERSITY OF CALIFORNIA,

(D) CHINO BASIN MUNICIPAL WATER DISTRICT, SAN BERNARDINO VALLEY MUNICIPAL WATER DISTRICT, WESTERN MUNICIPAL WATER DISTRICT OF RIVERSIDE COUNTY,

(E) CHINO BASIN WATER CONSERVATION

No. 117628

COMPLAINT FOR GENERAL ADJUDICATION OF WATER RIGHTS AND INJUNCTIVE RELIEF

WITNESS Markus
EXHIBIT 16
DATE 10-11-77 RPTR NA
eLitigation Services Inc.

A-1

DISTRICT, SAN BERNARDINO VALLEY WATER CONSERVATION DISTRICT,

(F) RIVERSIDE COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT, SAN BERNARDINO COUNTY FLOOD CONTROL DISTRICT,

(G) BEAUMONT IRRIGATION DISTRICT,

(H)(1) AGUA MANSA WATER COMPANY, ALTA LOMA DOMESTIC WATER COMPANY, ALTA LOMA MUTUAL WATER COMPANY, ALTA LOMA MUTUAL AND MICHAEL WATER COMPANY, ALTA MESA MUTUAL WATER COMPANY, ANDERSON MUTUAL WELLS COMPANY, ARENA MUTUAL WATER ASSOCIATION, INC., ARLINGTON MUTUAL WATER COMPANY, ARROW-BEAR MUTUAL WATER COMPANY, ARROYO VERDE MUTUAL WATER COMPANY, AVENUE LINE MUTUAL WATER COMPANY, BANYAN HEIGHTS WATER COMPANY, BASELINE GARDENS MUTUAL WATER COMPANY, BEAR VALLEY EXTENSION & PIPELINE COMPANY, BEAR VALLEY MUTUAL WATER COMPANY, BEDFORD HEIGHTS MUTUAL WATER COMPANY, BIG BEAR CITY MUTUAL SERVICE COMPANY, BIG PINE TRACT IMPROVEMENT & WATER ASSN., BONITA VISTA MUTUAL WATER COMPANY, BONNIE BRAE WATER CO., BON VIEW MUTUAL WATER COMPANY, BOX SPRINGS MUTUAL WATER COMPANY, BROOKINGS PIPE LINE MUTUAL WATER COMPANY, BRYN MAWR MUTUAL WATER COMPANY, CAJALCO MUTUAL WATER COMPANY, CAMERON RANCHO MUTUAL WATER COMPANY, CAMP WATERMAN MUTUAL WATER COMPANY, CARDIFF FARMS MUTUAL WATER COMPANY, CEDARPINES PARK MUTUAL WATER COMPANY, CHERRY VALLEY MUTUAL WATER COMPANY, THE CHINO WATER COMPANY, CHRISTINA WATER COMPANY, CHURCH STREET MUTUAL WELL COMPANY, CITIZENS LAND & WATER COMPANY, CITIZENS WATER COMPANY OF BLOOMINGTON, CITY CREEK WATER COMPANY, CLAREMONT HEIGHTS IRRIGATION CO., CLEARVIEW MUTUAL WATER COMPANY, THE CLEAR WATER COMPANY, COLIMA PARK WATER SYSTEM, CONEJO RANCHO MUTUAL WATER COMPANY, CORONA HEIGHTS WATER COMPANY, CORWIN WELL COMPANY, COURT STREET WATER COMPANY, CRAFTON MESA WATER COMPANY, CRAFTON WATER COMPANY, CRAWFORD CANYON MUTUAL WATER COMPANY, CRESCENT HEIGHTS PIPELINE COMPANY, CRESTMORE HEIGHTS MUTUAL WATER COMPANY, DEL ROSA HEIGHTS WATER COMPANY, DEL ROSA MUTUAL WATER COMPANY, DEVORE MUTUAL WATER COMPANY, DILLSON MUTUAL WATER COMPANY, DUFFERIN HEIGHTS PUMPING COMPANY, EAGLE VALLEY MUTUAL WATER COMPANY, EAST BARTON WATER COMPANY, EAST COLTON AVENUE WATER COMPANY, EAST COLTON HEIGHTS MUTUAL WATER COMPANY, EAST LUGONIA MUTUAL WATER COMPANY, EAST PIONEER MUTUAL WELL COMPANY, EAST REDLANDS WATER COMPANY, EAST RIVERSIDE WATER COMPANY, EDGEMONT GARDENS MUTUAL WATER COMPANY, ETIWANDA WATER COMPANY, EUCALYPTUS STREET WATER COMPANY, FAIRVIEW MUTUAL WATER CO., FAIRVIEW WATER COMPANY, INC., FALLSVALE SERVICE COMPANY, FAWNSKIN MUTUAL WATER COMPANY, FELSPAR GARDENS MUTUAL WATER COMPANY, FONTANA UNION

WATER COMPANY, FOREST PARK MUTUAL WATER COMPANY, FORT FREMONT MUTUAL WATER COMPANY, FRUIT STREET WATER COMPANY, THE GAGE CANAL COMPANY, THE GAYLORD MUTUAL WATER COMPANY, GIFFORD PARK MUTUAL WATER COMPANY, GLADYSTA WELL & WATER CO., GLEN EYRIE HEIGHTS MUTUAL WATER COMPANY, GRANT WELL COMPANY, GREAT VIEW MUTUAL WATER COMPANY, GREEN SPOT MUTUAL WATER CO., GREENSPOT MUTUAL WELL COMPANY, GREEN VALLEY MUTUAL WATER COMPANY, GREEN VALLEY PARK MUTUAL WATER COMPANY, HAPPE MUTUAL WELL CO., HERMOSA WATER COMPANY, HIGHLAND AVENUE WATER COMPANY, HIGHGROVE WATER COMPANY, HIGHLAND WELL COMPANY, HILL-SIDE WELLS CORPORATION, HOLDEN MUTUAL WATER COMPANY, HOME GARDENS WATER COMPANY, HOME MUTUAL WATER COMPANY, HOPE SPRINGS ETERNAL WELL, INC., O. E. HUBBARD & ARLIN, IRRIGATION COMPANY OF POMONA, IOMOSA WATER COMPANY, JEWEL WATER COMPANY, JOYA MUTUAL WATER COMPANY, JUDSON MUTUAL WELL COMPANY, JUDSON MUTUAL WATER COMPANY, JUMAL WATER COMPANY, KANSAS STREET MUTUAL WATER COMPANY, KING STREET MUTUAL WELL COMPANY, LA BONITA MUTUAL WATER COMPANY, INC., LA CADENA MUTUAL WATER COMPANY, LAKESIDE AVENUE MUTUAL WELL COMPANY, LANKERSHIM STREET MUTUAL WELL COMPANY, LA SIERRA WATER COMPANY, LA VERNE WATER ASSOCIA-TION, LOMA LINDA MUTUAL SERVICE COMPANY, LONG ACRES MUTUAL WATER COMPANY, LOWER YUCAIPA WATER COMPANY, LUGO WATER COMPANY, LUGONIA PARK WATER COMPANY, LUGONIA WATER COMPANY, LYTLE CREEK WATER & IMPROVEMENT CO., MARIGOLD MUTUAL WATER COMPANY, GLEN MARTIN MUTUAL WATER COMPANY, MARYGOLD MUTUAL WATER COMPANY, MASCART WATER COMPANY, MC CROSKEY WATER COMPANY, MEEKS & DALEY WATER CO., MENTONE ACRES MUTUAL WATER COMPANY, MENTONE ACRES MUTUAL WELL COMPANY, MENTONE GROVES WATER COMPANY, MENTONE WATER COMPANY, MERRY-FIELD WATER COMPANY, MESA LINDA WATER COMPANY, MILL CREEK MUTUAL SERVICE COMPANY, MISSION MUTUAL WATER COMPANY, MONTECITO MUTUAL WATER COMPANY, MONTE RUE ACRES MUTUAL WATER COMPANY, MONTE VISTA IRRIGATION COMPANY, MOONRIDGE MUTUAL WATER COMPANY, MT. BALDY IMPROVEMENT & WATER ASSN., MT. HARRISON MUTUAL WATER COMPANY, MT. VERNON WATER COMPANY, MOUNTAIN PIONEER MUTUAL WATER COMPANY, MOUNTAIN VIEW MUTUAL WATER COMPANY, MOUNTAIN VIEW PARK MUTUAL WATER COMPANY, MOUNTAIN VIEW WATER COMPANY, MUSCOY MUTUAL WATER COMPANY, MUSCOY MUTUAL WATER COMPANY NO. 1, MUTUAL LAND & WATER COMPANY OF RIALTO, MUTUAL WATER COMPANY OF GLEN AVON HEIGHTS, MUTUAL WELL COMPANY, NEALEY MUTUAL WATER COMPANY, NEALY WATER COMPANY, D. L. NELSON WATER COMPANY, NEW ENGLAND WATER COMPANY, NORTH BRAE WATER COMPANY, NORTH FORK WATER COMPANY, NORTHSIDE WATER COMPANY, NORTH SHORE MUTUAL WATER COMPANY, NOYES WATER COMPANY, OAK GLEN WATER DOMESTIC COMPANY, ONTARIO WATER CO., ORANGE ACRES MUTUAL WATER CO., PALOMARES IRRIGATION

CO. OF POMONA, PEARSON'S MUTUAL WATER COMPANY, PENN WELL COMPANY, PIONEER MUTUAL WATER COMPANY, PLANTATION MUTUAL PUMPING CO., POINT D WATER CO., POMONA HOME ACRES MUTUAL WATER COMPANY, P T AND D WATER COMPANY, RANCHERIA WATER COMPANY, RAUGHT MUTUAL WELL COMPANY, REDLANDS HEIGHTS WATER COMPANY, REDLANDS WATER COMPANY, REX MUTUAL WATER COMPANY, RIALTO MUTUAL LAND WATER COMPANY, RICHARDS IRRIGATION CO., RIO RANCHO MUTUAL WATER COMPANY, RIVERSIDE HIGHLANDS WATER COMPANY, RIVERSIDE WATER COMPANY, RIVINO WATER COMPANY, ROBINSON WATER COMPANY, ROCHESTER WATER COMPANY, ROCKY COMFORT MUTUAL WATER COMPANY, ROSEDALE WATER COMPANY, SALAZAR WATER COMPANY, SAN ANTONIO CANYON MUTUAL SERVICE COMPANY, SAN ANTONIO WATER COMPANY, SAN BERNARDINO AVENUE WATER COMPANY, SANTA ANA RIVER DEVELOPMENT COMPANY, SANTA ANA RIVER WATER COMPANY, SAPPHIRE MUTUAL WATER COMPANY, SMITH TRACT MUTUAL WATER COMPANY, SCHOWALTER MUTUAL WATER COMPANY, SEALEY WELL COMPANY, SECTION 30 MUTUAL WATER COMPANY, SELEY WELL COMPANY, SKY FOREST MUTUAL WATER COMPANY, SLOVER MUTUAL WATER COMPANY, SOUTH ELSINORE MUTUAL WATER COMPANY, SOUTH MESA WATER COMPANY, SOUTH MOUNTAIN WATER COMPANY, SOUTHSIDE MUTUAL WATER COMPANY, STOWE WATER COMPANY, INC., STRAWBERRY LODGE MUTUAL WATER COMPANY, SULLIVAN WATER SYSTEM, SUNNYMEAD MUTUAL WATER COMPANY, SYCAMORE HEIGHTS WATER CO., INC., TEMESCAL WATER COMPANY, TENNESSEE MUTUAL WELL COMPANY, TENNESSEE MUTUAL WELL, TERRACE WATER COMPANY, TIOGA MUTUAL WATER CO., TREASURE ISLAND MUTUAL WATER COMPANY, TRI-CITY MUTUAL WATER COMPANY, TRUJILLO WATER COMPANY, TWIN BUTTES WATER COMPANY, VALENCIA DRIVE MUTUAL WATER COMPANY, VALENCIA MUTUAL WATER COMPANY, VALLEY OF ENCHANTMENT MUTUAL WATER COMPANY, VALLEY FARMS MUTUAL WATER COMPANY, VALLEY VIEW PARK MUTUAL WATER COMPANY, VAN LOON MUTUAL WATER COMPANY, VICTORIA FARMS MUTUAL WATER COMPANY, VISTA GRANDE WATER COMPANY, WARM CREEK MUTUAL WATER COMPANY, WEBSTER MUTUAL WELL COMPANY, WEST END CONSOLIDATED WATER COMPANY, WEST END IRRIGATION COMPANY, WESTERN HEIGHTS WATER COMPANY, WEST HIGHLAND WATER COMPANY, WEST HIGHLAND WELL COMPANY, WEST LAKEVIEW IMPROVEMENT ASSOCIATION, WEST REDLANDS WATER COMPANY, WEST RIVERSIDE 350 INCH WATER COMPANY, WEST TWIN CREEK WATER COMPANY, WILLIAMS WELL CORPORATION, WINELAND VINEYARDS MUTUAL WATER COMPANY, WOEHR MUTUAL WATER COMPANY, WRACH WATER COMPANY, YUCAIPA TRIPLE FALLS MUTUAL WATER COMPANY, YUCAIPA VALLEY MUTUAL WATER COMPANY, YUCCA MESA MUTUAL WATER COMPANY,

(H)(2) ALGER CREEK MUTUAL WATER COMPANY, ARROW CREST WATER ASSOCIATION, ARROWVIEW WATER ASSOCIATION, BLAND WATER SYSTEM, BOVEY WATER SYSTEM, BURNT MILL MUTUAL WATER COMPANY, COLTAMA WELL, COLTON AVENUE WELL CO., EASTWOOD ACRES WATER COMMUNITY USERS, FERN AVENUE WATER COMPANY, GLEN IVY HOTEL, B. H. HIMES, LOT 6 - SMITH TRACT PUMP COMPANY, MILLER MUTUAL WELL COMPANY, NEIGHBORS WATER COMPANY, NICKERSON WATER CO. NO. 1, NICKERSON WATER CO., NORTH YUCAIPA SYNDICATE, CAROLINE OTTO, PHAROAH POWELL WATER COMPANY, ROBERTS WELL COMPANY, SMILEY PARK COUNTRY CLUB WATER SYSTEM, STRAWBERRY FLATS WATER COMPANY, TENNESSEE WATER COMPANY, YUCAIPA GATEWAY SYNDICATE,

(H)(3) ARROWHEAD HIGHLANDS MUTUAL WATER COMPANY, BEAR VALLEY HIGH LINE, HOPE WATER CO.,

INTER-CITY MUTUAL WATER COMPANY, LANDERIA MUTUAL WATER COMPANY, RANCHERS MUTUAL WATER COMPANY, SUNNYSIDE MUTUAL WATER COMPANY, WEST ONTARIO MUTUAL WATER COMPANY, YUCCA MUTUAL WATER COMPANY,

(I) ARROWHEAD MANOR WATER COMPANY, ARROWHEAD UTILITY COMPANY, BANNING WATER COMPANY, CORONA CITY WATER COMPANY, CRESTMORE VILLAGE WATER COMPANY, DELMANN WATER COMPANY, EAST HIGHLANDS DOMESTIC WATER COMPANY, FONTANA RANCHOS WATER COMPANY, GAULD'S IMPROVED WATER SYSTEM, INTER COUNTY WATER COMPANY, JURUPA HEIGHTS WATER COMPANY, JURUPA HILLS WATER COMPANY, LAKE GREGORY WATER COMPANY, LA VERNE HEIGHTS DOMESTIC WATER COMPANY, LUCERNE WATER COMPANY, LYTLE SPRINGS WATER COMPANY, MEADOWBROOK WATER CO., MENTONE DOMESTIC WATER CO., INC., NORTH CUCAMONGA WATER COMPANY, PACIFIC WATER COMPANY, PARK WATER COMPANY, PETERSON WATER COMPANY, POMONA VALLEY WATER COMPANY, RUBIDOUX VISTA WATER SYSTEM, SAN BERNARDINO WATER UTILITIES CORPORATION, SAN GABRIEL VALLEY WATER COMPANY, SLACK, H. V. DOMESTIC WATER SUPPLY, SMITHSON SPRINGS WATER COMPANY, SOUTHERN CALIFORNIA WATER COMPANY, SOUTHWEST WATER COMPANY, WEST RIVERSIDE CANAL COMPANY,

(J) ALTA VINEYARDS CO., ANDREWS BROS. OF CALIFORNIA, ANZA REALTY, ARMSTRONG NURSERIES, INC., ARROWCREST ASSOCIATION, INC., ARROWHEAD COUNTRY CLUB, ARROWHEAD HIGHLANDS MUTUAL SERVICE COMPANY, ARROWHEAD AND PURITAS WATER, INC., ARROWHEAD VILLAS MUTUAL SERVICE COMPANY, THE ATCHISON, TOPEKA AND SANTA FE RAILWAY COMPANY, ATLAS MATERIALS COMPANY, B. B. COMPANY, BIG BEAR LAND AND WATER COMPANY, BIG BEAR PINES WATER COMPANY, B.M.I. FUNDS, BODGER SEEDS, LTD., BOYS' REPUBLIC, BROOKSIDE DAIRY, INCORPORATED, CALIFORNIA ELECTRIC POWER COMPANY, CALIFORNIA PORTLAND CEMENT COMPANY, CANYON RIDGE WATER CORPORATION, CAPISTRANO WINERY & VINEYARD COMPANY, CHINO WATER COMPANY, CONSOLIDATED ROCK PRODUCTS, CO., CORONA FOOTHILL LEMON COMPANY, CRESTLAWN MEMORIAL PARK ASSOCIATION, CRYSTAL SPRINGS WATER CO., CUCAMONGA DEVELOPMENT COMPANY, CUCAMONGA WINERY, DIVERSACAL PROPERTIES, INC., EAST HIGHLANDS ORANGE COMPANY, EL RANCHO-CHINO CORPORATION, FOOTHILL IRRIGATION COMPANY, FOOTHILL VISTA DEVELOPMENT COMPANY, INC., FOREST HOMES, INC., GABRIEL ROCK, GADCO PRODUCTS, INC., GALLEANO WINERY, INC., GARRETT & COMPANY, INCORPORATED, GENERAL AMERICAN TRANSPORTATION CORPORATION, THE GRANT WATER COMPANY, GREEN ACRES THOROUGHBRED FARM, GROW FARMS, INC., HEDGES WELL INCORPORATED, HELLMAN WATER COMPANY, HEMET PACKING COMPANY, HIGGINS BRICK & TILE COMPANY, HOLLIDAY ROCK CO., J. K. HOUSSELS THOROBRED FARMS, INC., JOSEPH HUNTER FOUNDATION, INDUSTRIAL PARK CORPORATION, INSTITUTE OF

MENTALPHYSICS, JAMESON COMPANY, JAMESON RANCH COMPANY, J.M.S. RANCH, INC., C. H. JONES & SONS, INC., JURUPA HILLS WATER CO., INC., JURUPA WATER COMPANY, KAISER STEEL CORPORATION, KINGSLEY TRACT WATER COMPANY, LIMITED, LA MIRADA WATER CO., LAS CASITAS WATER COMPANY, LINDA VISTA WATER COMPANY, LOMA LINDA UNIVERSITY, LOS RIOS, LUCERNE VISTA WATER CO., MARIGOLD FARMS COMPANY, MARSHBURN, INC., MC CLEAN RANCH COMPANY, MENTONE GROVES COMPANY, MESA LAND & WATER COMPANY, MINNESOTA MINING AND MANUFACTURING COMPANY, MISSION WATER COMPANY, MONARCH INVESTMENT COMPANY, MOUNTAIN VIEW CEMETERY OF SAN BERNARDINO, NATIONAL ORANGE SHOW, OLD SETTLERS' WATER COMPANY, ORANGE PARK WATER COMPANY, OWENS-ILLINOIS GLASS COMPANY, PEYTON CORPORATION, PIONEER GARDENS WATER COMPANY, RAMONA AVENUE IRRIGATION COMPANY, REATEN, INC., REES - REES RANCHES, RICHARDSON POULTRY BREEDING FARM AND HATCHERY COMPANY, RIVERSIDE CEMENT COMPANY, ROLLING-RIDGE FARMS, INC., HARRY V. ROQUET, ASSOCIATES, ROYAL CORONA RANCH CO., ROYAL CORONA RANCHES, RUNNING SPRINGS FOREST WATER CO., SANTA FE LAND IMPROVEMENT COMPANY, SCOTT BROS. DAIRY, INC., SERVICE ROCK CO., SHADY GROVE DAIRY, INC., SHAW SALES AND SERVICE CO., BEN F. SMITH, INC., SMITH TRACT WELL, SOUTHERN CALIFORNIA EDISON COMPANY, SOUTHERN SERVICE COMPANY, LTD., SUNNY SLOPE HEIGHTS WATER COMPANY, SUNSET WATER COMPANY OF CUCAMONGA, TRIANGLE ROCK PRODUCTS, INC., TRI-CITY ROCK COMPANY, TWIN BUTTES MUTUAL WATER COMPANY, THE UNION ICE COMPANY, UPLAND FOOTHILL WATER COMPANY, VISTA, INC., THE WARM CREEK WATER COMPANY, WEST END CONSOLIDATED WATER COMPANY, YEAGER CONSTRUCTION COMPANY, INCORPORATED, YUCAIPA WATER COMPANY NO. 1,

(K) ARTH, BEELER, MARCUM WELL, AVENUE LINE WATER ASSOCIATION, BEAUMONT-YUCAIPA WATER CONSERVATION ASSOCIATION, BOLEY LEEDOM RANCH, CANYON KNOLLS RANCH, CHERRYCROFT RANCH, CRAM-PATTERSON WELL, FRINK RANCH, HASKELL RANCH, HIGHLAND COMMUNITY WATER ASSOCIATION, HOBS WELL PARTNERSHIP, INDUSTRIAL PARK INVESTMENT CO., LANGFORD RANCHES, MEADOWBROOK DAIRY, OLD TOWN WELL CO., P.R.H. RANCH, RAMIREZ BROTHERS, RANNEY RANCH, R.M.P.B. RANCH CO., 7TH AVENUE WELL, SOLANO WELL, SOLANO WELL NO. 2, TRI-CITY ROCK FONTANA, VALLE VISTA RANCH CO., VICTORIA GUERNSEY, YUCAIPA VALLEY ACRES,

(L)(1) CHAFFEY UNION JUNIOR COLLEGE SCHOOL DISTRICT, MOUNT SAN ANTONIO JUNIOR COLLEGE DISTRICT, MOUNT SAN JACINTO JUNIOR COLLEGE DISTRICT, RIVERSIDE CITY JUNIOR COLLEGE DISTRICT, SAN BERNARDINO VALLEY JOINT UNION JUNIOR COLLEGE DISTRICT,

(L)(2) CHAFFEY UNION HIGH SCHOOL DISTRICT, COLTON JOINT UNION HIGH SCHOOL DISTRICT, ELSINORE UNION HIGH SCHOOL DISTRICT, LA PUENTE UNION HIGH SCHOOL DISTRICT, PERRIS UNION HIGH SCHOOL DISTRICT, REDLANDS UNION HIGH SCHOOL DISTRICT, SAN BERNARDINO CITY HIGH SCHOOL DISTRICT,

(L) (3) ALVORD UNIFIED SCHOOL DISTRICT, BANNING UNIFIED SCHOOL DISTRICT, BEAR VALLEY UNIFIED SCHOOL DISTRICT, BEAUMONT UNIFIED SCHOOL DISTRICT, CHINO UNIFIED SCHOOL DISTRICT, CLAREMONT UNIFIED SCHOOL DISTRICT, CORONA UNIFIED SCHOOL DISTRICT, FONTANA UNIFIED SCHOOL DISTRICT, JURUPA UNIFIED SCHOOL DISTRICT, MORENO VALLEY UNIFIED SCHOOL DISTRICT, POMONA UNIFIED SCHOOL DISTRICT, REDLANDS UNIFIED SCHOOL DISTRICT, RIM OF THE WORLD UNIFIED SCHOOL DISTRICT, RIVERSIDE UNIFIED SCHOOL DISTRICT, SAN JACINTO UNIFIED SCHOOL DISTRICT, YUCAIPA JOINT UNIFIED SCHOOL DISTRICT,

(L) (4) ALBERHILL SCHOOL DISTRICT, ALTA LOMA SCHOOL DISTRICT, BANNING SCHOOL DISTRICT, BLOOMINGTON SCHOOL DISTRICT, CENTRAL SCHOOL DISTRICT, COLTON JOINT SCHOOL DISTRICT, CUCAMONGA SCHOOL DISTRICT, ELSINORE UNION SCHOOL DISTRICT, ETIWANDA SCHOOL DISTRICT, FALLSVALE SCHOOL DISTRICT, GUASTI SCHOOL DISTRICT, HIGHLAND SCHOOL DISTRICT, MILL SCHOOL DISTRICT, MISSION SCHOOL DISTRICT, MT. BALDY SCHOOL DISTRICT, MOUNTAIN VIEW SCHOOL DISTRICT, ONTARIO SCHOOL DISTRICT, PERRIS SCHOOL DISTRICT, RIALTO SCHOOL DISTRICT, RIVERSIDE CITY SCHOOL DISTRICT, SAN BERNARDINO CITY SCHOOL DISTRICT, SAN SALVADOR SCHOOL DISTRICT, TERRACE UNION SCHOOL DISTRICT, UPLAND SCHOOL DISTRICT, VAL VERDE SCHOOL DISTRICT, WALNUT SCHOOL DISTRICT, WRIGHTWOOD SCHOOL DISTRICT,

(M) BANK OF AMERICA NATIONAL TRUST & SAVINGS ASSOCIATION AND HENRY G. BODKIN, CO-EXECUTORS OF THE ESTATE OF GIOVANNI VAI, DECEASED, HOWARD M. HANZLIK, AGENT FOR H. W. CHING, HORACE P. HINCKLEY, TRUSTEE, C. T. JOHNSON, RECEIVER FOR SAN BERNARDINO ROCK & GRAVEL, GEORGE F. JOHNSTON CO., ROBERT T. PAINE, TRUSTEE OF THE ESTATE OF CHARLES T. PAINE, S. D. TABER, EXECUTOR OF THE ESTATE OF EARL TABER, DECEASED, MARY S. WOODILL, EXECUTRIX OF THE ESTATE OF A. CHESNAYE WOODILL, DECEASED,

(N) SAM K. AIHARA, DAVE AKKERMAN, J. N. ALBERS, ISAAC E. ALEXANDER, BEN F. ALLEN, CLARE ALLISON, ALBERT ALLUIS, JR., MANUEL LOUIS ALVAREZ, PEDRO ALVEREZ, AUGUST AMAR, CARL S. ANDERSON, DEAN ANDERSON, LAWRENCE W. ANDERSON, A. G. ANDREWS, JOE JACINTO ANDREWS, C. EUSTACE ARCHER, GEORGE W. ARCHER AND LORA K. ARCHER, DOUGLAS ARMSTRONG, PIERRE ARRATEIG, PETER ARTH, CLARENCE F. ARVIDSON, LOUISE ASHE, MASSIMO AUDENINO, ALFRED C. AUSTIN AND RUBY AUSTIN, ELIZABETH P. BAHR, R. D. BALCOM, R. W. BALDWIN, NICK BAN, JACK M. BARBOUR, NELSON W. BARCUS, WILLIAM BARE, WILLIAM L. BARKER, FRED F. BARNES, PAUL BARNHILL, KARL F. BAUMANN, NEWELL BAUMUNK, LLOYD BEARD, EARL J. BEATTY, RAMON M. BECERRA, FOREST BEEBOWER, RAYMOND A. BEELER, H. EUGENE BELL, JOE E. BERNARD, PAUL BERNARD, BERNARD BIDART, JOHN BINNELL, THEODORE BLOEMHOF, ALBERT BOCK, ROBERT M. BODDY, GERRIT BOER, GERRIT P. BOERTJE, TENA ANNA BOERTJE, HOMER A. BOGUE, JR., CARL M. BONNER, JIM BOOTSMA, L. A. BORBA, ALLECK BORDISSO, FRED BOTILLER, MABEL E. BOWER, MARY C. BRANDLIN, PAUL A. BRADNEY, EUGENE J. BRAGA, S. WESLEY BREAK, JAMES W. BREAM, W. A.

1 BREWER, JOHN BRIGHT, RALPH BROADY, TOM BROMLEY,
DEAN J. BRUINGTON, RAY BRUMBAUGH, JOE BRUNO
2 AND JOSEPHINE L. BRUNO, DOMINIC BRUSSO, JOHN
BUMA, MRS. ALBERT L. BURFORD, JR., THEO. J.
3 BURGER, F. L. BURNS AND LAURA BURNS, ROSE BURSON,
ERNEST CAHLEY, CHARLES CAMBIO, MAX L. CARDEY,
4 TOM CARNESI, ABRAM B. CARTER, MANUEL R.
CARVIERO, BENJAMIN R. CASEY, GALEN CHAMBERLAIN,
5 C. STANLEY CHAPMAN, ALSO KNOWN AS C. S. CHAPMAN,
J. J. CHARLES, CHARLES E. CHASE, JOE CHEZ, W.
6 DREW CHIPMAN, HERMAN P. CHRISTENSEN, RONALD S.
CHRISTY, MIGUEL J. CIRIZA, ALSO KNOWN AS MIKE
7 J. CIRIZA, ALSO KNOWN AS M. H. CIRIZA, ARTHUR
C. CLARK, CLIFFORD A. CLARK, CHAI. L. CLAUSON,
8 THOMAS L. CLAY, CHARLES H. CLOCK, JOHN CLOCKE,
ROBERT COCKE AND ELSIE V. COCKE, CHARLES F.
9 COFFEE AND CATHERINE COFFEE, IRVEY L. COTE, FRED
H. COURTNEY, DOROTHY E. COTE, GORDON CRAM,
10 HENRY CRAM, JAMES E. CRAM, HARLEY A. CRANE AND
BERTHA M. CRANE, MANUEL R. CRAVIERO, HUGH P.
11 CRAWFORD, RAYMOND CRAWFORD, PAUL J. CREVOLIN,
ARTHUR P. CRIM, JR., CLIFFORD J. CRIM, EMM
12 S. CRIM, ROBERT L. CRIM, W. ROSCOE CRIM, H. E.
CROUSE, WILLIAM J. CROUSE, FOREST N. DAGETT,
13 JOHN B. DAVIS, M. M. DAVIS, L. H. DE BOER,
ANDY DE BOS, DICK DE GROOT, JOHN DE GROOT,
14 LEO A. DE ZOETE, VICTOR DI CARLO AND TONY DI
CARLO, FRANK DI TOMMASO, ELBERT E. DIXON,
15 MATTIE M. DIXON, JAMES S. DODS, EARL E. DORATHY,
P. E. DOTY, FRANCIS M. DOWLING, JR., ROBERT H.
16 DOWNING, WALTER DUDA AND BETTY DUDA, GLENN C.
DUDLEY, E. R. DUNLOP, W. F. DURRINGTON, FRANK
17 DUTRA, EDWIN EARL, H. A. EASTMAN, HENRY W.
EILERS, FRANCIS K. ELLSWORTH, MARY ELLSWORTH,
18 WALT EMBERTSON, GLEN A. EMENHISER, JOSEPH F.
ENGELN, JOHN ETCHARD, CELESTIN ETEROVICH,
19 BERNARD G. EVANS, MORGAN EVANS, RICHARD V.
EVANS, AMERICO FERRARO, ANTHONY J. FIGUEREDO,
20 GRACE FIGUEREDO, ARNOLD FILIPPI, JOSEPH
FILIPPI AND MARY E. FILIPPI, R. B. FINCH, EDWARD
21 M. FISHER, CHARLES E. FLANIGAN, GLADYS FLATTE,
E. FORD, THAD E. FORNEY, STEPHEN J. FRANK,
22 FRED FREEMAN, MYRON FREIBURG, FRANK T. FREITAS,
MARIE J. FRICKE, ERNEST C. FRIEDEMANN, BERT
23 FRINGS, MILTON FRINK AND MRS. MILTON J. FRINK,
ROBERT V. FULLERTON, CARLO GAGGINO, ED GAGNER,
24 PAUL A. GARRISON, AUSTIN B. GATES, PHILIP L.
GAY, J. DALE GENTRY, H. GERWIN, DAVID B. GILLETTE,
25 HILL GOEDHART, ALBERT GOUBERT, MALCOM C. GOULD,
MARSHALL T. GOULET, EVA MARIE GOULET, FRED W.
26 GOWLAND, FLORENCE E. GRANT, JOHN W. GRANT,
O. C. GREENE, PAUL GREENING, H. H. GREER,
27 DALE P. GROSS, SANTE GROSSI, SECONDO GROSSI,
FRANCIS A. GRUNENFELDER, HELEN E. GRUNENFELDER,
28 WILLIAM H. GUERTH, SANFORD C. GUNTER, JOHN
GURNEY, HARRIET E. GUTTING, CHESTER R. HARGROVE,
29 NEWTON R. HARGROVE, JOSEPH HARICH, ELLISON E.
HARRIS, FRED HARRIS, CALEB B. HARVEY, HENRY L.
30 HARVILL, CATHERINE E. HASTINGS, RAY R. HASTINGS,
CHARLES E. HAWES, CHLES B. HAWKS, D.D.S., GEORGE
31 G. HAYES, JOE T. HEAD, A. C. HEDRICK, HARM HEIDA,
SAM HEIDA, H. E. HERMAN, M.D., DAVID F. A. HILL,
32 ELVA M. HILL, HORACE P. HINCKLEY, JULIA HINCKLEY,

R. W. HITCHCOCK, EBER R. HIVELY, JESSIE MAY HIVELY, GEORGE HOEKSTRA, PHILIP F. HOFER, CORNELIUS HOFFMAN, MARVIN S. HOHBERG, RICHARD HUBER, FRANK B. HUNGERFORD, JAMES T. HUGHES, JOHN W. HUNTER, HAROLD A. HUTSON, CASE IEST, RUDOLPH C. IEST, OSCAR K. IMBACH, JOHN JACQUES, MRS. C. G. JENNINGS, N. C. JENSEN, ALBERT L. JOHNSON, DORRIS JOHNSON, ELWOOD B. JOHNSON, F. H. JOHNSON, RAYMOND L. JOHNSON, TRUMAN JOHNSON, ROBERT P. JONES, HAROLD JONGSMA, LEE P. JORDON, JR., HELEN R. KAHN, H. KAMPLING, ERNEST L. KEECHLER, LESTER J. KEECHLER, EDWARD J. KEHL, BURT KENYON, CHARLES KIRKPATRICK, WILLIAM M. KIRKPATRICK, EJNAR KNUDSEN, GEORGE J. KOCH, JAMES C. KOCH, RUTH KOCH, JOHN D. KORTZ, REINOLD E. KRAEMER, ROY P. LADEGAARD, ROSS I. LANDON, GORDON B. LANE, EDWARD LANGER, BROER LANTING, C. W. LANTZ, CHARLES H. LA ROSSEE, L. D. LARSEN, CHARLES R. LATIMER, W. H. LATIMER, BERTRAND LAUDA, C. T. LEAVITT, ALFRED H. LEDIG, JOHN LENERT, J. RICHARD LEONARD, MARGARET M. LEONARD, C. J. LENDESMITH, THOMAS A. LINN, GLEN E. LIVINGSTON, GUY LONG, PETE LOOGMAN, ANTONIA LO PORTO, ARTHUR K. LOSSNITZER, HELEN M. LOVELY, JOHN W. LOVELY, MINNIE I. LUGINBILL, FLOY E. MADDEN, C. L. MAIN, MAY J. MALONE, CHARLES E. MARCY, C. N. MARIETTA, JOHN MARQUEZ, CLIFFORD F. MARTIN, CLIFFORD P. MARTIN, FRED G. MARTIN, NANCY MARTIN, ROGER W. MARTIN, HAROLD R. MARTINI, A. J. MARTINS, N. O. MAYBELL, MARGARIETE T. MC CARTY, JAMES B. MC GILL, ROBERT K. MC GILL, LLOYD MC LAUGHLIN, JOSEPH Y. MC NAUGHT AND RUTH MC NAUGHT, B. D. MELLEMA, T. B. MELTON, J. LOWELL MERRIL, RICHARD S. METZGER, CHARLES R. MEYER, NADINE MEYER, LLOYD W. MICHAEL, OWEN H. MICKEL, C. W. MIDDLETON, M. MIKETERIAN, RICHARD A. MILLER, BERNARD MIRANDETTE, WAYNE W. MISHAK, MICHAEL C. MIZE, GLENNA L. MIZE, FUMIO MOGI, BART MONSELLO, DR. SAMUEL A. MONTGOMERY, OLIVER B. MOORE, RAY MORISETTE, JENS A. MORLEY, SCOTT H. MORRIS, ALBERT MULLER, GEORGE T. MUSSON, STEVE MUZIO, E. D. NICKERSON, EARL NICKS, KENNETH T. NORRIS, WILLIAM H. NYE, EARL E. OHMER, EGBERT OLDENGARM, ANTON OMLIN, JOSE A. ORTEGA, LOWELL PALMER, RICHARD K. PARRY, SHIRLEY R. PARRY, W. T. PASCOE, HOMER PATE, M. R. PATON, E. D. PATTERSON, JOHN A. PATTERSON, MARGO M. PAYNE, PHIL PECHARICH AND GLADYS PECHARICH, MANUEL JOE PEDRO, FOREST S. PERDEW, M. E. PERIAN, JACK PERISITS, H. W. PETERS, RAY PETERSON, MRS. A. AL. PEYTON, F. L. PHILLIPS, L. D. PHILLIPS, A. L. PICKERING, JR., ALBERT J. PICO, HELEN A. PINE, FRANK PINKERTON, JOHN F. PIPER, C. B. PITZER, DAVID POLLOCK, HERLINDA POLLOCK, STEVE POLOPOLUS, VERA MC CARTY PORTSMOUTH, B. PRECIADO, FRED C. PRENGER, WILLIAM J. QUAST, JOE B. RAMOS, G. RANNEY, MIKE RAYMOND, J. T. REEDY, G. R. REES, THEODORE REHM, ANNA REINHOLDSEN, HARRY C. REYNOLDS, MARSHALL RICHARDSON AND LORNA RICHARDSON, KATHERINE E. RICHEY, FRED M. RIEDMAN, ROBERT RIETMANN, RAMON RIVAS, AMERICO RIZZARDINI, RITA M. RIZZARDINI, WALTER C. ROBERTS, FRANK L. ROBERTSON, L. GRANT ROBINSON, MILDRED I. ROGERS,

LOUIS ROHRER, ELIZABETH ROHRS, JOE ROMOLO AND LOUIS ROMOLO, CHARLES E. ROOS, GAYNE ROOT, STEPHEN H. ROOT, LEO RORIPAUGH, JOE L. ROSE, SAM ROSS, ROBERT P. ROTH, JOE RUSSO, ELWOOD RUTHERFORD, LYLE RUTHERFORD, JOHN B. SATRAGNI, JR., JESSE SAXBURY, GEORGE P. SCARAMELLA, GIOVANI THERESA SCARRONE, FRANK SCHAFFER, MADELEINE SCHMIDT, ALBERT T. SCHROEDER, FRED SCHULHOF, MARTHA SCHULHOF, JOHN N. SCHURMAN, RALPH F. SECHREST, EARL J. SECORD, J. B. SE LEGUE, RUTH A. SE LEGUE, HOWARD R. SELF, W. E. SHEARER, GEORGE J. SHERMAN, ROBERT J. SHOLANDER, R. D. SHOWLER, CONSTANCE SILVERWOOD, W. E. SILVERWOOD, JACK SILVIERA, JIM SINNOTT, HERMAN E. SMITH, J. HENRY SMITH, A. J. SOARES, HARRY H. SONKE, C. E. SOUTHWORTH, JOHN F. SPERRY, HOWARD B. SQUIER AND MARIE SQUIER, V. O. STAHL AND ZIPPORA P. STAHL, ERNEST J. STANDING, RICHARD G. STASAND, JAMES STEIN AND WILLIAM STEIN, DELBERT STEPHENSON, MILES STEVENS, R. H. STRASBAUGH, D. D. SULLIVAN AND R. J. SULLIVAN, DONALD SWIERSTRA, KAZUKO TAKENAGA, JOHN S. TAYLOR, W. B. TENCH, F. A. TETLEY, JR., FRED J. TEUNISSEN, GEORGE TE VELDE, CHARLES A. THOMAS, FRITZ THOMMEN, MRS. R. W. THOMPSON, WILLIS A. THOMPSON, ARTHUR E. TISSOT, HAROLD TOLLERUP, A. A. TOLSTOY AND VERA TOLSTOY, EDWIN R. TYSON, V. E. UNGER, AGNES V. UNGER, BEN VALDEPENA, GILBERT C. VAN CAMP, MAURICE VAN CANNEYT, MARINUS VAN DEN BERG, JACK VAN DEN BERGE, PETER VANDENHOEK, JACK VANDERHORST, MARTIN VAN DER LAAN, JOHN VAN DER LINDEN, STANLEY VAN DER LINDEN, WILLIAM VANDERPOL, JOHN VAN DER SCHAFF, JOE VAN DER VEEN, E. B. VAN PELT, JOHN VEENSTRA, JOHN MARTIN VERHOEVEN, ARIE T. VERKAIK, DICK VERMEER, PAT F. VERNOLA, LOUIS VISSER, GEORGE VON EUW, ALFRED VON KANEL, DON WALKER, JR., H. B. WARD, F. G. WAYMAN, W. G. WEATHERWAX, O. L. WEEKS, MARGARET WHEELER, ALFRED WHITE, E. R. WHITE, EDNA MAY WHITE, HARRY W. WHITE, PAUL N. WHITTIER, C. H. WIGHT AND MARY LOUISE WIGHT, JAMES E. WILKINS, EDWARD E. WILSON, RUSSELL WILSON, VERNE WINCHELL, GEORGE C. WITTER, FRANK WOO, JOHN C. WOOD, FRANK YBARROLA, FLORIS YKEMA, VERA ZINKE, HERMAN ZWEIACHER,

(O) UNITED STATES OF AMERICA,

(P) ALTA DENA DAIRY, ANDLER CORPORATION, ARROW ROUTE WATER COMPANY, BARNES RANCH, C. C. BARNES RANCH, W. E. BENNETT, BOB-WILL CO., BROOKINGS MUTUAL PIPELINE COMPANY, PETE BORBA & SONS, CLARENCE BROWN, CHEZ BROS., CHERBAK BROTHERS, CHEZ, CHEZ AND GEMMILL, THOMAS A CHAPIN, CLOCK, WAESTMAN AND CLOCK, JOHN C. COLDWELL, COLLEGE OF MEDICAL EVANGELISTS WATER SYSTEM, CUCAMONGA TOP WINERY, WALTER M. DAVIDSON, DE BERARD BROS., DEER LODGE PARK WATER COMPANY, ERNEST DE GROOT, DOTTA BROS., DREW PIPE LINE, EDYTHE ELLIS, ERIC T. EMTMAN, ERSUL WATER COMPANY, ETIWANDA GRAPE PRODUCTS, ETIWANDA STEEL PRODUCTS, HENRY & ALBERT FIKSE, FILLIPI AND GALLEANO RANCH, FULLER RANCH TRUST, THE GOODWIN WELL, GREEN ACRES MEMORIAL PARK ASSOCIATION, GREEN ACRES STUD FARM, GREENWAY FARM, GRIMSLEY WATER SERVICE, V. W. GRUBBS, HAMADA BROS., HARADA BROS., ROBERT H. HERVIG, HIGHLANDERS WATER COMPANY, HILL, CUNNINGHAM & SOOY,

BERNICE HOUSTON, DONALD B. HOUSTON, HELEN HOUSTON, LEE HOUSTON, ROBERT HOUSTON, ROSE HOUSTON, INDIAN KNOLL FARM AND DAIRY, DOROTHY, LARRY, TONI JOHNSON, KIMBALL BROS., LAWRENCE E. KRAGE, LA CASA CONTENTA MOTEL, LA GRANADA WATER COMPANY, LAMBERT RANCH WELLS, LAS PALMAS WATER COMPANY, LAS VEGAS LAND & WATER COMPANY, LAYAYE BROS., LEMON HEIGHTS WATER COMPANY, LEMON PRODUCTS DIVISION, SUNKIST GROWERS, LINDE CO., HARRY MAAS, MACHADO DAIRY FRANCO, MAGNET WATER COMPANY, MAHJ INVESTMENT CORPORATION, MANDALA BROTHERS, MARQUINE & MINNABERRY, MARSHBURN BROS., LOUIS B. MAYER, BERNARD MC COY, MEADOW BROOK WOODS WATER CO., MOGLE WATER COMPANY, JAMES E. MOUNT, J. M. MOUNT, MUCHENTHALER RIVER ROAD RANCH, MUTI WATER COMPANY, NORCO COMMUNITY SERVICE DISTRICT, ORANGE PRODUCTS DIVISION, SUNKIST GROWERS, JOSEPH PAGLIUSO, INC., HAROLD PAYTON AND AVON PAYTON, PEACH PARK WATER COMPANY, RANCHO DE SANTA FE, RIM OF THE WORLD WATER COMPANY, RIVERSIDE FOUNDRY & MACHINE WORKS, RIVERSIDE INDUSTRIAL PARK, ROLLING RIDGE RANCH, RUBIDOUX COMMUNITY SERVICE DISTRICT, SCARRONE BROS., FRANK SILVA SONS, SOGIOKA BROS., SOUTH EUCLID WATER COMPANY, STEPHENS WELL BY BADDERS, JESSIE TABER, TEPPER & SWAIN, THREE MILE CORPORATION WATER CO., K.D. TILLEMA SONS, TIPPECANOE WATER COMPANY, TISSOT & LONGANECKER, UPLAND WATER COMPANY, VERHOEVEN & RAVENSWAAY, ANTONIETTA VERNOLA, PAT F. VERNOLA, J. C. VIDEEN AND MATSON L. VIDEEN, ROY VISBEEK AND HENRIETTA VISBEEK, WALNUT STREET PUMPING PLANT, WARD STREET WATER USERS, ALLEN H. WATERMANN, THEODORE WATJE, BOB WEATHERMAN, WEISEL RANCHES, VIRGIL R. WHITMAN, WILLIAMS BROS., ETHEL E. WILSON, FRANK WOO AND SEM GEE WOO, EVA YERIAN, YUCAIPA DOMESTIC WATER COMPANY,

(Q) DOES ONE TO TWENTY THOUSAND,

DEFENDANTS.

Plaintiff, ORANGE COUNTY WATER DISTRICT (hereinafter sometimes referred to as the "District") complains of defendants and for cause of action alleges:

THE PARTIES

I

The plaintiff is a public corporation, organized and existing under an act of the Legislature of the State of California approved June 14, 1933, being chapter 924 of the Statutes of the State of California of 1933, and subsequent acts amendatory thereof, said Act being designated therein and hereinafter referred to as the "Orange County Water District Act."

Said Act, among other things, empowers the plaintiff District to prevent interference with or diminution of the natural flow of any stream of water or subterranean supply of water used or useful for any purpose of said District, or of common benefit to any land within said District, or of its inhabitants, and in connection therewith to commence, maintain, intervene in and compromise in the name of the District, or otherwise, any action or litigation affecting or concerning the foregoing powers.

II

The subject matter and questions involved in this action are of common and general interest to the many owners of land within the plaintiff District and bordering upon and riparian to the Santa Ana River and to the many owners of land overlying, and users of water in, the hereinafter-mentioned District Basin, and to the inhabitants of the District. By reason thereof and by reason of the aforesaid powers granted to and vested in the plaintiff District, this action is brought, maintained and prosecuted for the benefit of the

District and also of all riparian, overlying and other landowners, water users and inhabitants within the plaintiff District.

III

The exterior boundaries of the lands within the plaintiff District are established and defined by the Orange County Water District Act and are shown on Exhibit A attached hereto, which said exhibit is incorporated herein by reference. There are embraced within the exterior boundaries of the plaintiff District approximately 201,000 acres of land, all of which are situated entirely within the boundaries of Orange County, California.

IV

Each of the defendants named in paragraph (A) of the caption is a municipal corporation organized pursuant to and existing under the laws of the State of California. The rights of plaintiff against the defendants City of Colton, City of Redlands, City of Riverside and City of San Bernardino have previously been adjudicated in that certain action entitled Orange County Water District, a public corporation, plaintiff v. City of Riverside, a municipal corporation, et al., defendants, being docket No. 84671 in the Superior Court of the State of California in and for the County of San Bernardino. Said four defendants are included in this action in order that they will be parties to and be bound by any general adjudication, physical solution, or other judgment which may be entered in this action.

Each of the defendants named in paragraph (B) of the caption is a county water district organized pursuant to and existingunder the laws of the State of California.

The defendants named in paragraph (C) of the caption are the State of California and certain political subdivisions,

agencies and institutions thereof.

Each of the defendants named in paragraph (D) of the caption is a municipal water district organized pursuant to and existing under the laws of the State of California.

Each of the defendants named in paragraph (E) of the caption is a water conservation district organized pursuant to and existing under the laws of the State of California.

Each of the defendants named in paragraph (F) of the caption is a flood control district organized pursuant to and existing under the laws of the State of California.

The Beaumont Irrigation District named in paragraph (G) of the caption is an irrigation district organized pursuant to and existing under the laws of the State of California.

Upon information and belief, each of the defendants named in paragraph (H) of the caption is a mutual water company. Each of the defendants named in subparagraph (1) of paragraph (H) is a corporation. Each of the defendants named in subparagraph (2) of paragraph (H) is an unincorporated association. The status, whether incorporated or unincorporated, of the mutual water companies named in subparagraph (3) of paragraph (H) of the caption is unknown to the plaintiff.

Upon information and belief, each of the defendants named in paragraph (I) of the caption is a public utility water company organized pursuant to and existing under the laws of the State of California.

Upon information and belief, each of the defendants named in paragraph (J) of the caption is a corporation.

Upon information and belief, each of the defendants named in paragraph (K) of the caption is an unincorporated association.

Each of the defendants named in paragraph (L) of the caption is a school district organized pursuant to and existing under the laws of the State of California. Each of the defendants named in subparagraph (1) of paragraph (L) is a Junior College District. Each of the defendants named in subparagraph (2) of paragraph (L) is a High School District. Each of the defendants named in subparagraph (3) of paragraph (L) is a Unified School District. Each of the defendants named in subparagraph (4) of paragraph (L) is an Elementary School District.

Each of the defendants named in paragraph (M) of the caption is sued in the representative capacity by which said defendant is described in the caption and upon information and belief each said defendant is duly qualified and acting in such capacity.

Each of the defendants named in paragraph (N) of the caption is an individual. The following named individual defendants are residents of the County of Orange: C. Stanley Chapman, also known as C. S. Chapman, Rose Houston, Sam K. Aihara, Robert Reitman, Elizabeth Rohrs, Albert T. Schroeder and John Van der Schaff.

The United States of America, named in paragraph (O) of the caption, is made a defendant in this action pursuant to the provisions of section 666, Title 43, of the United States Code.

The capacity of each of the defendants named in paragraph (P) of the caption is unknown to plaintiff. Each said defendant is sued herein under the name by which claim has been made by said defendant to water rights.

The true names and capacities, whether individual, corporate, associate or otherwise, of defendants named in paragraph (Q) of the caption as Does 1 to 20,000, inclusive,

are unknown to plaintiff, who therefore sues said defendants by such fictitious names, and plaintiff prays leave of court to substitute the true names and capacities of said defendants, or any of them, when the same are ascertained, together with appropriate charging allegations.

GEOGRAPHY, GEOLOGY AND HYDROLOGY

V

At all times herein mentioned the Santa Ana River has been and now is a natural nonnavigable stream which rises in the San Bernardino Mountains in San Bernardino County, California, northeasterly from the City of San Bernardino and flows down from said mountains through the San Bernardino valley or plain in said county in a southwesterly direction to and into Riverside County, California, and thence through the northwestern portion of said Riverside County to and into the County of Orange, California, through the Santa Ana Mountains and thence to the coastal plain situated within said Orange County and the plaintiff District, where the waters of said Santa Ana River then sink underground except for portions thereof which during certain periods of large storms pass on down the channel of the river and into the Pacific Ocean.

VI

The watershed of the Santa Ana River embraces approximately 2,000 square miles, the boundaries of which are delineated on Exhibit A hereto.

VII

From the standpoints of geography, geology and hydrology, the Santa Ana River System is one watershed and one basin. It has been and can be divided into three general subdivisions which are known as the Upper Basin, the Middle

Basin, and the Lower Basin, each of which is delineated on plaintiff's Exhibit A hereto. The boundaries of said subdivisions are generally protrusions of the bedrock, faults, relatively impervious zones or in some cases arbitrary lines drawn in order to completely bound the area so designated. Irrespective of the method of division used, any such subdivisions or further divisions are parts of the entire Santa Ana River System, and all the waters thereof, underground and surface alike, are part of one interconnected common supply. In all cases, except those of continuous protrusions of the bedrock, some restricted underflow across the boundaries of such subdivisions is possible and water passes underground, as well as on the surface, from one subdivision to the next lower subdivision.

VIII

Numerous streams within the watershed are tributary to the Santa Ana River. The waters of the natural, usual and ordinary flow of the Santa Ana River and its said tributaries, when permitted without interruption or interference and when not artificially diverted or extracted, naturally and normally flow down in their respective channels through, over and across the Upper and Middle Basins and into the Lower Basin. Portions of the surface lands in said basins are underlaid to various depths with alluvial deposits composed of boulders, gravel, clay, sand, silt and other fluvial and detrital materials of varying textures, all of which materials have been laid down by said Santa Ana River and its tributaries. In a state of nature said materials are saturated with waters supplied by said Santa Ana River and its tributaries which waters percolate and flow as a continuous body of underground waters and which in turn supply, support and contribute to the surface flow of the Santa Ana

River.

IX

The Upper Basin is bounded on its southwesterly side by an underground barrier or dike, which is generally known as "Bunker Hill Dike" and which is sufficiently impervious throughout most of its length to retard the flow of underground waters. In the area where the channels of the Santa Ana River and Warm Creek traverse the Bunker Hill Dike, there is a break, or what is referred to as a "gap," in said dike. In a state of nature all the waters, both surface and underground, originating in the Upper Basin, with the exception of those portions of such waters which cross over or through the Bunker Hill Dike at places other than the gap, flow toward the area of the gap. Such waters then pass from the Upper Basin into the Middle Basin either as surface flow in the channels of the Santa Ana River and Warm Creek or as underflow below the surface of the ground.

X

Of the said waters reaching the Middle Basin from the Upper Basin, a portion thereof follows the channel of the Santa Ana River downstream and past Riverside Narrows and the remainder moves underground through the Middle Basin and joins the surface flow of the Santa Ana River downstream from Riverside Narrows. In a state of nature, rainfall and runoff originating in the Middle Basin contribute to the flow of the Santa Ana River.

XI

All the waters, surface and underground, in the Upper and Middle Basins, except such amounts as are lost by evaporation, transpiration or other natural causes, if not artificially diverted or extracted, would naturally and normally reach the channel of the Santa Ana River and ultimately

arrive at Prado Dam. Said Prado Dam is operated by the Corps of Engineers of the United States Army for flood control purposes only and does not alter or change the natural flow of the river except in cases of large floods, at which times it is operated to reduce the rate of flood flows and prolong the passage of flood waters.

XII

The natural and normal flow of the Santa Ana River, if not artifically reduced either by surface diversions or extractions from the underground waters in the Upper and Middle Basins, after passing Prado Dam thence proceeds downstream through the lower Santa Ana Canyon and into the Lower Basin. Substantially all of the lands which overlie the underground waters in the Lower Basin are situated within the boundaries of the plaintiff District and said portion of the Lower Basin is referred to herein as the "District Basin." Said District Basin embraces an area of approximately 152,900 acres. The waters of the Santa Ana River sink into the fluvial and detrital materials underlying said District Basin at the head or upper reaches thereof and thence seep and percolate in and spread and flow both laterally and forward throughout the underground strata underlying said basin and constitute the main natural source of water replenishment in and to the underground strata underlying the lands within said basin and thereby provide the principal natural water supply to said plaintiff District and most of its landowners, water users and inhabitants.

XIII

The higher the water tables are in the Upper Basin, the greater is the flow of water, both surface and underground, from the Upper Basin to the Middle Basin and the greater is the flow at Prado Dam. The higher the water

tables are in the Middle Basin, the greater is the flow at Prado Dam.

XIV

All of the lands within the plaintiff District are valuable for the raising of fruits, vegetables and other farm products, the raising of livestock, and for residential, commercial and industrial purposes. Most of said lands heretofore have been and now are used for such purposes and are dependent upon the waters of the Santa Ana River System to maintain and continue said uses. Without such waters said lands would be of little value for the purposes aforesaid.

CONDITION OF OVERDRAFT

XV

For more than five consecutive years immediately prior to the commencement of this action, there has been and now is, and during the foreseeable future will be, a condition of overdraft in each and all of the basins of said watershed (the Upper Basin, Middle Basin, and Lower Basin) and a condition of overdraft in the Santa Ana River System as a whole. The total annual demands upon the watershed have greatly exceeded and do now exceed the average annual supply of water to the watershed from natural sources. On information and belief, the annual overdraft in the watershed is not less than 180,000 acre-feet. There has been a progressive general lowering of ground water levels throughout the basins of the watershed; the available natural supply in said basins has been and is being gradually and increasingly depleted; and if the demands upon said supply are not limited, the said basins eventually will be exhausted.

XVI

The total quantity of water used in the Upper, Middle

and Lower Basins now exceeds, and for more than 15 years last past has exceeded, the safe yield of the watershed. By "safe yield" is meant the maximum quantity of water which may be used annually from the watershed without causing permanent damage or eventual depletion of the ground water basins within the watershed, said maximum quantity being determined without reference to imported waters from nontributary sources.

RIGHTS OF THE PARTIES

XVII

The greater portion of the land within the plaintiff District overlies the water-bearing strata and continuous body of underground waters in the District Basin and is supplied with water from wells drilled to depths sufficient to penetrate and contact said water-bearing strata, which is supplied and replenished with waters of the natural flow of the Santa Ana River and its tributaries. The remaining lands within the plaintiff District receive their supply of water either from wells drilled into the water-bearing strata and continuous body of underground waters within said District Basin or by way of surface diversions from the flow of the Santa Ana River. The two principal water companies making such surface diversions from the flow of the Santa Ana River are the Santa Ana Valley Irrigation Company and the Anaheim Union Water Company, both of which have been diverting water from the river for approximately three quarters of a century.

XIX

The total use of water within the plaintiff District and the total amount of water needed for beneficial uses exceeds 300,000 acre-feet per year. Of this amount, 130,000

acre-feet was and is reasonably needed by landowners and water users who own and exercise overlying rights in such amount for beneficial uses upon lands overlying the District Basin. The remaining amount was and is reasonably needed for beneficial uses by landowners and water users within the District who own and exercise riparian, appropriative and prescriptive rights in such amount.

XX

The quantities of water reaching Prado Dam from the Upper and Middle Basins are the principal source of natural supply to the District Basin and said quantities under the long-time mean or average conditions of rainfall and runoff are less than the amounts necessary to meet the needs for beneficial uses within the plaintiff District.

XXI

The defendants, other than those named in Exhibit B hereto, have and each of them has for many years past taken, pumped, appropriated and diverted water from the natural supply of the Santa Ana watershed in either or both the Upper and the Middle Basins. Plaintiff is informed and believes and therefore alleges that the combined production of water by said defendants constitutes substantially all of the annual production of water from the Upper and Middle Basins and that each of said defendants claims a right to take said water and threatens to increase its taking of water without regard to the rights of the District and the landowners and inhabitants thereof in and to the waters of the Santa Ana watershed.

XXII

Defendants named in paragraph (1) of Exhibit B to this complaint, which said exhibit is incorporated herein as though set out at length, are owners of lands overlying

portions of either or both the Upper Basin and the Middle Basin. Water has never been produced from said lands owned by said defendants for use thereon. The defendants named in paragraph (2) of Exhibit B have not produced water from said watershed continuously for a period of five years, although said defendants have produced water from either or both of the Upper Basin and the Middle Basin of said watershed for periods less than five consecutive years. The defendants named in paragraph (3) of said Exhibit B have previously extracted water from either or both the Upper and Middle Basins of said watershed under claim of right, but have not produced water from said basins for a period greater than five years immediately prior to the commencement of this action. By reason of the facts aforesaid, none of the defendants listed in Exhibit B has any present right to produce water from the said watershed.

XXIII

The District claims that no defendant has the right to take or increase its taking of said water, and that any right of any defendant so to do is subordinate to the rights of the District and the landowners, water users and inhabitants thereof, and producers of water serving and distributing water within the plaintiff District. There is an actual controversy existing between the plaintiff and each of the defendants regarding the amount of water rights, if any, which each said defendant possesses and the priority of such rights.

IRREPARABLE INJURY

XXIV

The overdraft in the Santa Ana River System and the use of water in excess of the safe yield of said watershed, as hereinabove alleged, has been and is being caused or contributed to by the production of each of the defendants who

is extracting or has extracted water from the Upper and Middle Basins. The drafts on the Upper and Middle Basins of the river system by said defendants and each of them adversely affect the sufficiency of the water supply all the way down the river. The use of water by the defendants tends substantially to reduce the water tables in the Upper Basin, the Middle Basin and in all the lower reaches of the Santa Ana River, and thereby contributes to the deficiency of the supply in the river system as a whole. The effect of the deficiency is a shortage of water in the plaintiff District. Any increased use of water by the defendants will further reduce the quantity and quality of the supply reaching the plaintiff District.

XXV

Each of the defendants claims the right to take the water it is presently taking from the Santa Ana River System, and each threatens to increase such taking without regard to the rights of the District, the landowners, water users and inhabitants thereof, and producers of water serving and distributing water within the plaintiff District, and unless restrained by order of court, each defendant will continue to take larger and increasing amounts of water to the great and irreparable damage and injury to such District, landowners, water users, inhabitants and producers, which cannot be compensated for in money damages.

XXVI

By reason of the condition of overdraft in the Santa Ana River system and the large and increasing amounts of water being produced by the defendants, as alleged herein, the amount of water reaching the Lower Basin has been reduced in quantity and impaired in quality. The ground water levels in the Lower Basin have been lowered to the point where salt water from the ocean has intruded the basin, thereby impairing

its utility as a ground water reservoir. Unless defendants and each of them are enjoined and restrained as prayed, the aforesaid conditions will continue and will become more severe; there will occur further depletion of the ground water basins which will further permanently damage and ultimately will destroy the utility of said basins as natural underground reservoirs; there will be increased intrusion of sea water into the Lower Basin; and the quality of water in the entire river system will be substantially impaired.

XXVII

In order to prevent the irreparable injury hereinbefore alleged, it is necessary that the annual production and uses of water by the defendants and each of them be reduced and controlled under the continuing jurisdiction of this court.

W H E R E F O R E, plaintiff prays judgment as follows:

1. That each defendant be required to set forth the nature and extent of its claim in and to the common water supply of the Santa Ana River System, and if any defendant fails to appear, that it be determined that such defendant has no right to take any water from said common supply;

2. That the right, if any, of each defendant in and to said water be fixed and determined;

3. That the defendants and each of them be perpetually restrained and enjoined from taking any water from the natural supply of the Santa Ana River System in excess of their respective rights, as determined, or in excess of such other amounts as the court may determine is necessary to assure that the safe yield of the system is not exceeded;

4. That it be adjudged and decreed that an overdraft exists on the common water supply of the Santa Ana River System and each and every subdivision thereof; that there is no

surplus water available for appropriation; and that the safe yield of the Santa Ana River System be determined;

5. That the defendants and each of them be enjoined pending the determination of this lawsuit from increasing their annual production of water from the natural supply of the Santa Ana River System;

6. That this court reserve continuing jurisdiction to make such adjustments in its decree and judgment from time to time as may be necessary for the protection of the common water supply of the Santa Ana River System against diminution of the quantity or impairment of the quality thereof;

7. That each of the defendants be required to pay their proportionate and equitable part as determined by the court of any costs or expenses which may be incurred in this action;

8. For such other and further relief as the court may deem proper.

Dated: October 18, 1963

PILLSBURY, MADISON & SUTRO
JAMES MICHAEL
WILLIAM C. MILLER
RUTAN, LINDSAY, DAHL, SMEDEGAARD, HOWELL & TUCKER
MILFORD W. DAHL
JAMES E. ERICKSON

By: Milford W. Dahl
Attorneys for Plaintiff

STATE OF CALIFORNIA)
: ss
COUNTY OF ORANGE)

I am the Secretary-Manager of ORANGE COUNTY WATER DISTRICT, plaintiff in the above entitled action; I have read the foregoing Complaint for General Adjudication of Water Rights and Injunctive Relief and know the contents thereof; and I certify that the same is true of my own knowledge, except as to those matters which are therein stated upon my information or belief, and as to those matters, I believe it to be true.

I certify, under penalty of perjury, that the foregoing is true and correct.

Executed on October 18, 1963 , at Santa Ana, California.

Howard W. Crooks

May 20, 1964

EXHIBIT "A"

Orange County Water District vs. City of Chino et al
Case No. 117628

BOUNDARY OF SANTA ANA RIVER SYSTEM

The Santa Ana River System generally comprises that area shown on Attachment A, hereto, within Orange County, Riverside County, San Bernardino County, and Los Angeles County which includes all areas that derive their common water supply, either surface or subsurface or both, in whole or in part, from rainfall or runoff within said areas and which are also tributary or distributary to the Santa Ana River.

A detailed description of the basin boundaries is presented following:

1. Beginning at the mean high tide of the Pacific Ocean on the common boundary between Los Angeles County and Orange County;

2. Thence northerly along said common boundary between Los Angeles and Orange Counties to the southwest corner of Section 18, T3S, R10W, SBB&M;

3. Thence in a general easterly direction along the watershed divide of Coyote Hills, through the south 1/2 of Sections 18 and 17 in said last-mentioned township and range, to a point on Las Palmas Drive about 500 feet westerly of State Highway 101;

4. Thence southerly along the crest of the ridge which drains easterly into Brea Dam and continuing southerly along said crest to a point on State Highway 101 at the East-West quarter section line of Section 28, T3N, R10W, SBB&M;

5. Thence in a northeasterly direction along the drainage divide upon which Skyline Drive is located, to the top, and continuing across, Fullerton Dam;

6. Thence northeasterly along the drainage divide which drains into Fullerton Reservoir, through Sections 24 and 13, T3S, R10W, SBB&M, and Sections 18 and 7, T3S, R9W, SBB&M, to a high point near the northeast corner of said last-mentioned section;

7. Thence northerly along the drainage divide which drains westerly into Tonner Canyon to the most northerly divide of Tonner Canyon located on an unnamed peak (elevation 1,469 feet) in the northwest 1/4 of Section 12, T2S, R9W, SBB&M;

8. Thence northerly and easterly along the ridge line which separates the watersheds of San Jose Creek and Chino Creek, to the edge of the alluvium on Phillips Boulevard about 500 feet northwest of its intersection with Buena Vista Avenue in the City of Pomona as said intersection is shown on Attachment B hereto;

9. Thence in a northeasterly direction along a ground water divide located as shown on said Attachement B hereto, to the intersection with the San Jose Fault, which is located east of Orange Grove Avenue and north of Lincoln Avenue;

10. Thence southwesterly along the San Jose Fault as shown on said Attachment B hereto, to a point near the intersection of Orange Grove Avenue and White Avenue, which is the intersection of the ridge

which goes through Ganesha Park extended southerly to the San Jose Fault;

11. Thence northerly and westerly along the ridge of the San Jose Hills which extends through Ganesha Park, and continuing along the ridge which forms the southerly and westerly boundary of the watershed which drains into Puddingstone Reservoir, to Puddingstone Reservoir Dam;

12. Thence northerly over the top of the Puddingstone Reservoir Dam and continuing easterly along the ridge, which forms a drainage divide into Puddingstone Reservoir, to a high point about 3,000 feet east of San Dimas Avenue and 1,500 feet south of the Pacific Electric Railroad Tracks;

13. Thence northerly down the ridge to a point on De Anza Hts. Drive about 1,200 feet east of Walnut Drive as shown on Attachment C hereto;

14. Thence along a ground water divide in a northeasterly direction as shown on said Attachment C hereto, to a point on the San Bernardino Base Line about 1,400 feet west of the southeast corner of Section 31, T1N, R8W, SBB&M;

15. Thence northerly along the drainage divide which drains easterly into Live Oak Canyon to an unnamed peak (elevation 3,685 feet) located in the south 1/2 of Section 17, T1N, R8W, SBB&M said unnamed peak (elevation 3,685 feet) being on the boundary of the San Dimas Experimental Forest;

16. Thence northeasterly along the above mentioned San Dimas Experimental Forest boundary to an unnamed peak (elevation 4, 743 feet) located in the north 1/2 of Section 15, T1N, R8W, SBB&M;

17. Thence northerly along the westerly drainage divide of San Antonio Canyon, over Sunset Peak (elevation 5, 796 feet) through Cow Canyon Saddle (elevation 4, 523 feet) over West Baldy (elevation 9, 988 feet) to Mount San Antonio (elevation 10, 064 feet) in Section 6, T2N, R7W, SBB&M;

18. Thence northerly along the westerly drainage divide of the North Fork Lytle Creek over Dawson Peak (elevation 9, 575 feet), Pine Mountain (elevation 9, 648 feet), to Wright Mountain (elevation 8, 505 feet), in Section 20, T3N, R7W, SBB&M;

19. Thence northeasterly along the northwesterly drainage divide of Lone Pine Canyon to Circle Mountain (elevation 6, 875 feet) in Section 14, T3N, R7W, SBB&M;

20. Thence northerly and easterly along the watershed divide which drains into the Cajon Canyon, crossing highway 138 about 1, 200 feet southerly of the junction with highway 2, to the Cajon Summit (elevation 4, 259 feet) at State Highway 395;

21. Thence easterly and southerly along the watershed divide which drains into the said Cajon Canyon, through Cajon Pass, through Cleghorn Pass to Sugarpine Mtn., (elevation 5, 478 feet) in Section 14, T2N, R5W, SBB&M;

22. Thence easterly along the watershed divide between the Mojave Desert and the Santa Ana River over Jobs Peak (elevation 5,388 feet) through Camp Paivika and Valley View Park, over Strawberry Peak (elevation 6,153 feet) through Sky Forest, through Running Springs, over Mill Peak (elevation 6,670 feet), over Keller Peak (elevation 7,882 feet), over Slide Peak (elevation 7,841 feet), through Lake View Point (elevation 7,180 feet), over Crafts Peak (elevation 8,364 feet), over Butler Peak (elevation 8,537 feet), to an unnamed peak (elevation 8,385 feet) in the East 1/2 of the East 1/2 of Section 17, T2N, R1W, SBB&M;

23. Thence easterly along the northern drainage divide of Big Bear Lake, over Little Bear Peak (elevation 7,610 feet), over Delamar Mtn. (elevation 8,357 feet), over Bertha Peak (elevation 8,198 feet), to an unnamed peak (elevation 7,701 feet) in Section 10, T2N, R1E, SBB&M;

24. Thence down the ridge in a southeaterly direction to the community of Big Bear City in Section 11, T2N, R1E, SBB&M as shown on Attachment D hereto;

25. Thence southerly along the drainage divide between Baldwin Lake and Big Bear Lake, as shown on said Attachment D hereto, to Sugar Loaf Mountain (elevation 9,952 feet) located in Section 6, T1N, R2E, SBB&M;

26. Thence easterly along Sugar Loaf Mountain a distance of about three miles to the principal drainage divide between the Desert and the Santa Ana River located in the northeast 1/4 of Section 4, T1N, R2E, SBB&M;

27. Thence in an easterly then southwesterly direction along the watershed divide between the Santa Ana River and the Desert over San Gorgonio Mountain (elevation 11,502 feet), over Galena Peak (elevation 9,330 feet), over Little San Gorgonio Peak (elevation 9,140 feet), and continuing along the said drainage divide to the most northerly point of the watershed of Smith Creek located in the northeast 1/4 of Section 7, T2S, R1E, SBB&M;

28. Thence southwesterly along the westerly drainage divide of said Smith Creek to the East West quarter section line of Section 36, T2S, R1W, SBB&M;

29. Thence across the San Gorgonio Pass along a ground water divide as shown on Attachment E hereto to the intersection of San Timoteo Creek easterly drainage divide and the Southern Pacific Railway Track in Section 10, T3S, R1W, SBB&M;

30. Thence southerly and westerly along the boundary of the southerly divide which drains into San Timoteo Creek, to the drainage divide between the San Jacinto Basin and the Santa Ana Basin located in Section 21, T2S, R3W, SBB&M;

31. Thence westerly and southerly along the drainage divide between San Jacinto Basin and Santa Ana Basin, a portion of which is shown on Attachment F hereto, through Pigeon Pass, along the ridge of Box Springs Mountains, easterly of Edgemont, westerly of Arnold Heights, through Steele Valley to the vicinity of the north watershed line of Elsinore

Lake located on an unnamed peak with an approximate elevation of 1,962 feet located in the southeast 1/4 of the northeast 1/4 Section 4, T6S, R4W, SBB&M;

32. Thence northwesterly along the drainage divide of Elsinore Lake and Temescal Creek as a portion of which is shown on Attachment G, continuing along the ridge of the Santa Ana Mountains following the ridge between Rice Canyon and McVicker Canyon, over Trabuco Peak (elevation 4,604 feet), over Santiago Peak (elevation 5,687 feet), on the southerly watershed divide of Santiago Creek to the watershed divide of Serrano Creek;

33. Thence southwesterly along the easterly divide of the watershed draining into Serrano Creek and continuing along the drainage divide between San Diego Creek and Aliso Creek through the community of El Toro located in the projected Sections 26 and 27, T6S, R8W, SBB&M to an unnamed peak (elevation 777 feet), 300 feet south of the southerly line of Section 32, T6S, R8W, SBB&M;

34. Thence northerly and southerly along the drainage boundary of Laguna Canyon and continuing along the crest of the San Joaquin Hills along the southerly drainage divide of Boomer Canyon, Coyote Canyon, and Buck Gully, past Pelican Hill (elevation 704 feet) and continuing along the ridge line to the mean high tide line of the Pacific Ocean at a location near Pelican Point and about 1-1/4 miles southeast of Corona Del Mar.

35. Thence northwesterly along the mean high tide line of the Pacific Ocean to the point of beginning.

The peaks, elevations, drainage divides, watershed boundaries, political boundaries, stream names, communities, highways, and other features described above are those shown on the latest available quadrangle maps prepared by the United States Geological Survey as of January 1964.

Imaged

ATTACHMENTS TO EXHIBIT A

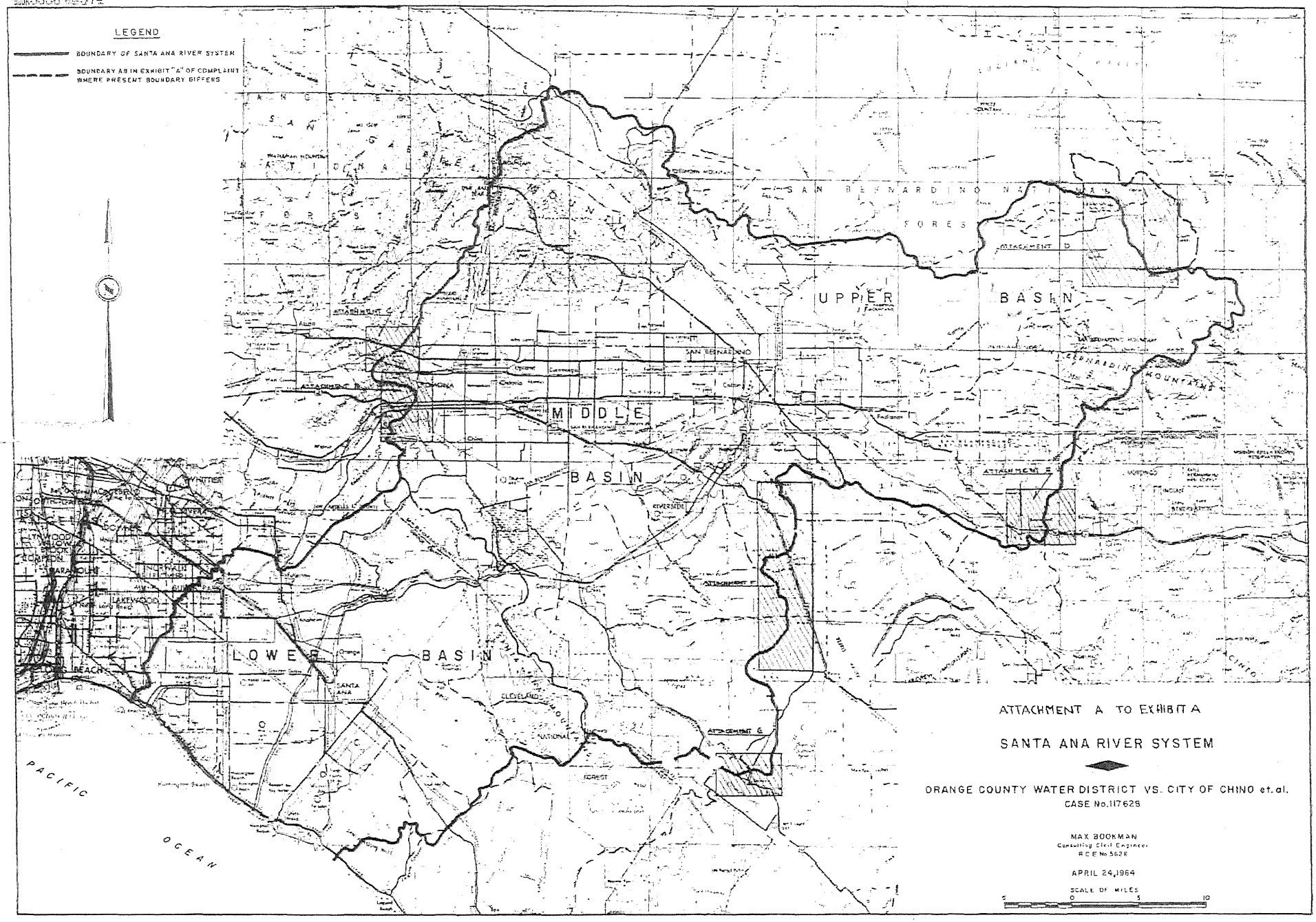
Attachment	
A	Santa Ana River System
B	Ground Water Divide in City of Pomona
C	Ground Water Divide in Vicinity of La Verne
D	Drainage Divide between Big Bear Lake and Baldwin Lake
E	Ground Water Divide in San Gorgonio Pass
F	Portion of Drainage Divide between Santa Ana Basin and San Jacinto Basin
G	Portion of Drainage Divide between Lake Elsinore and Temescal Creek

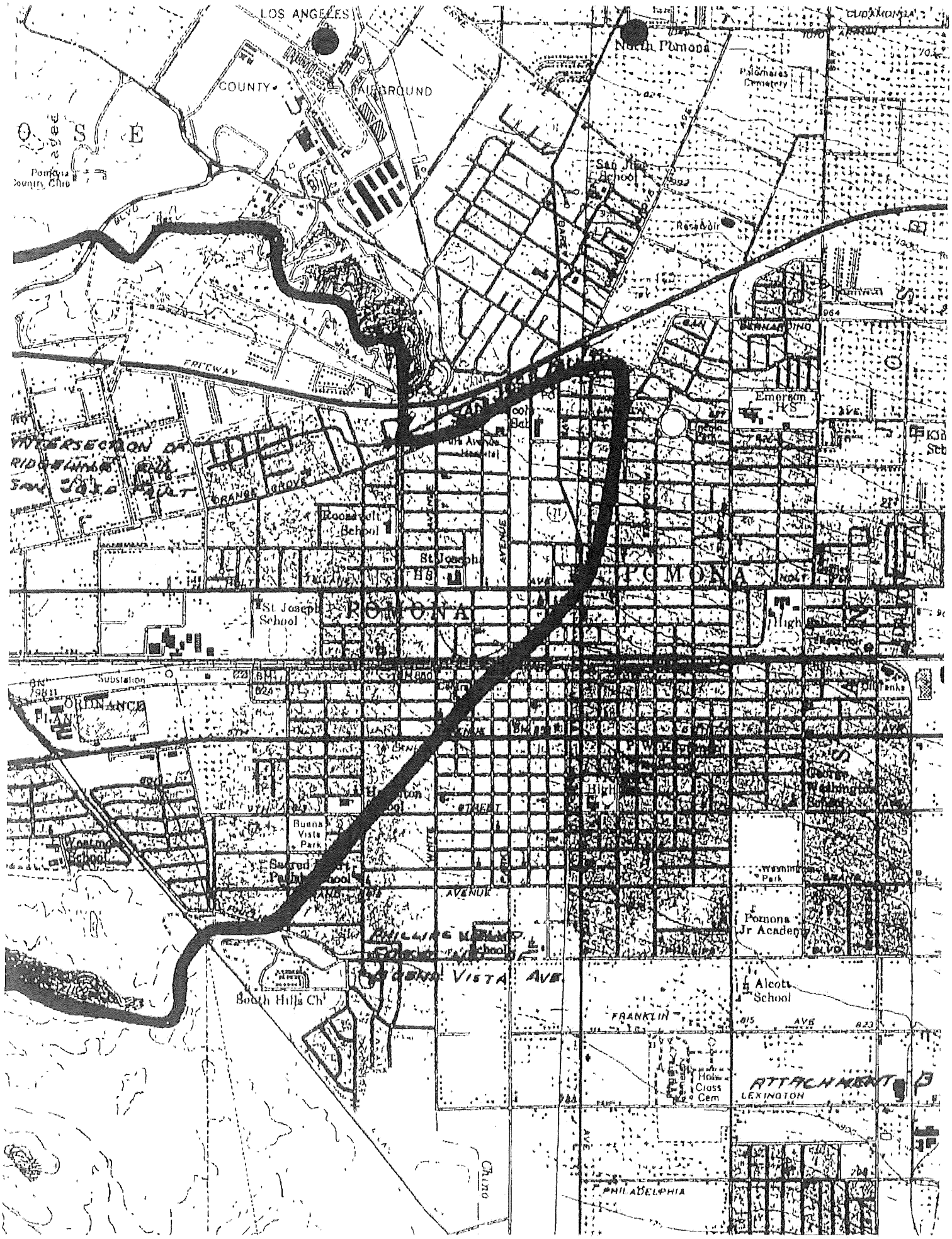
Imaged

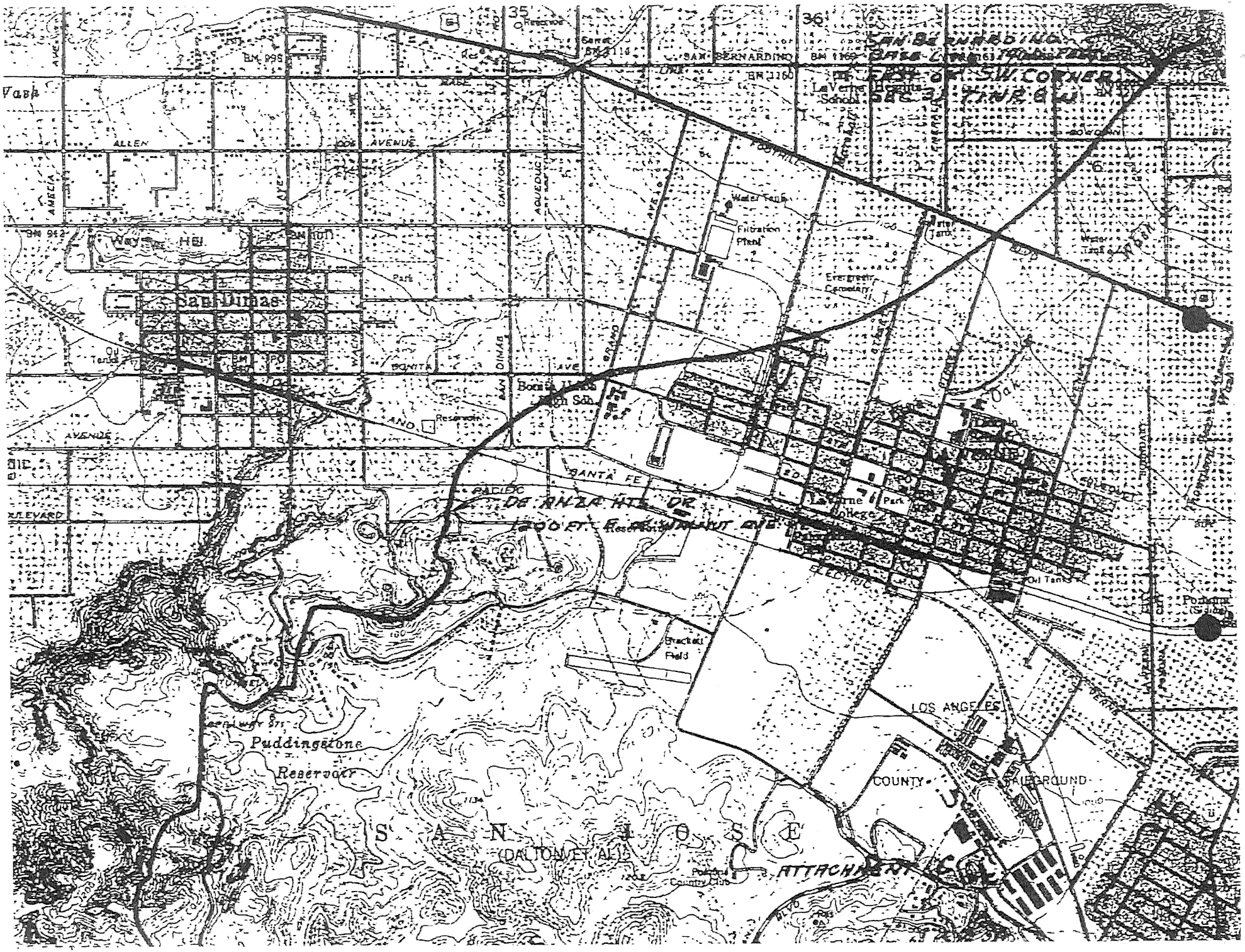
UNITED STATES GEOLOGICAL SURVEY QUADRANGLE MAPS USED IN PREPARATION OF DESCRIPTION OF THE BOUNDARY OF THE SANTA ANA RIVER SYSTEM

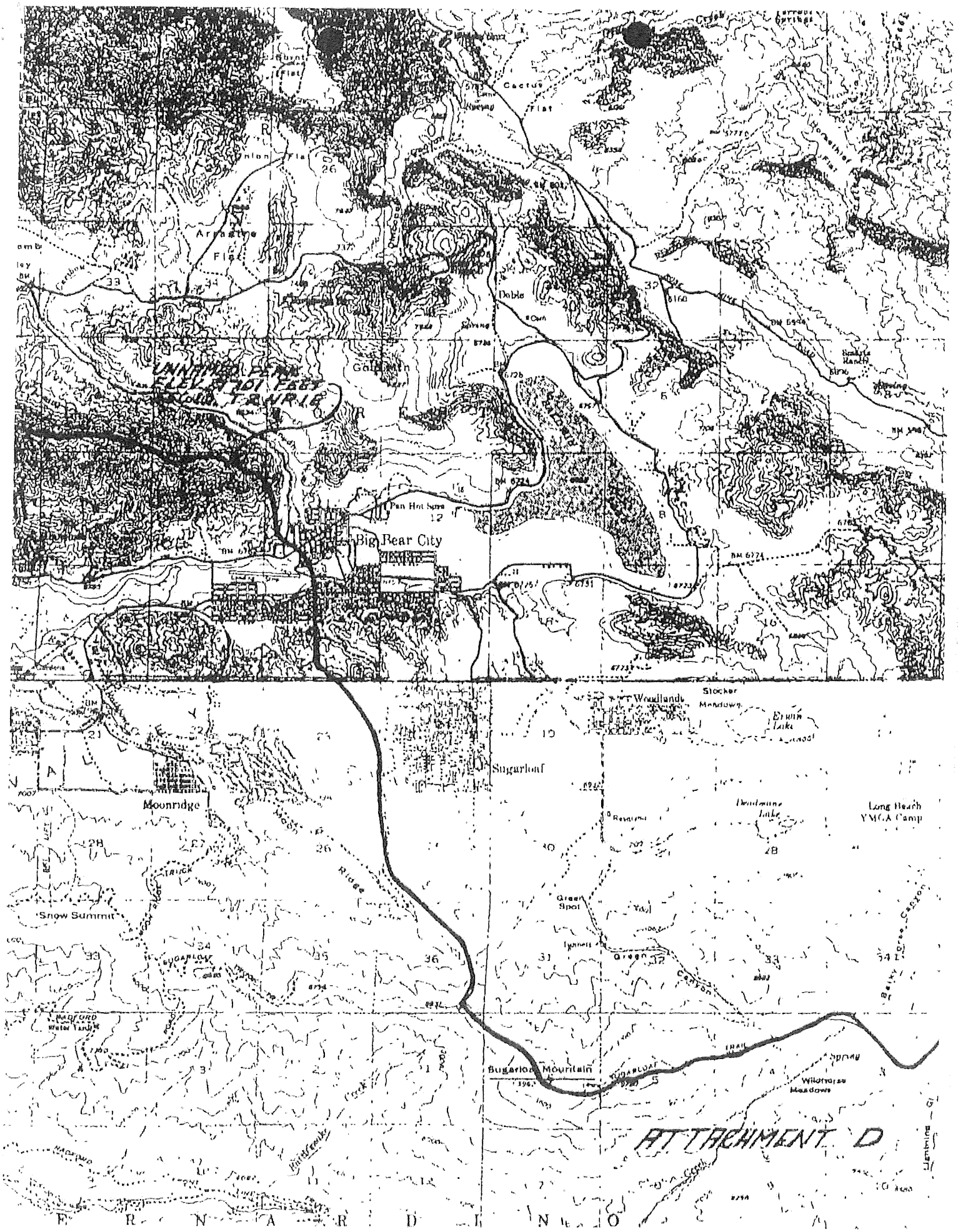
Orange County Water District vs. City of Chino et al
Case No. 117628

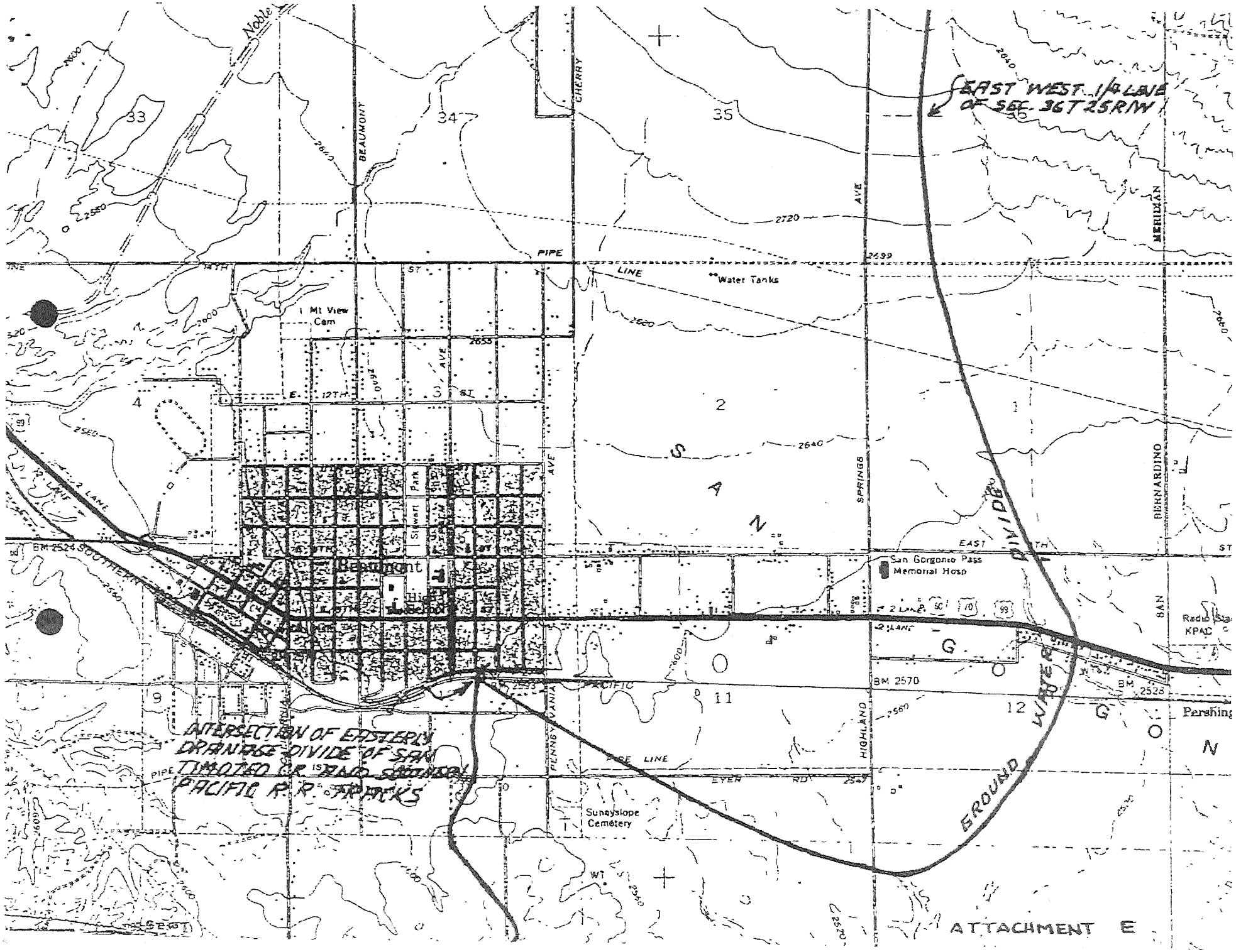
Name of Quadrangle	Date	Series
Seal Beach	1949	7.5 minute
Los Alamitos	1949	7.5 minute
Whittier	1949	7.5 minute
La Habra	1950	7.5 minute
Yorba Linda	1949	7.5 minute
San Dimas	1954	7.5 minute
Glendora	1953	7.5 minute
Mt. Baldy	1954	7.5 minute
Mount San Antonio	1955	7.5 minute
Telegraph Peak	1956	7.5 minute
Phelan	1956	7.5 minute
Cajon	1956	7.5 minute
Devore	1954	7.5 minute
Cedar Springs	1956	7.5 minute
San Bernardino North	1954	7.5 minute
Harrison Mtn.	1953	7.5 minute
Keller Peak	1953	7.5 minute
Lake Arrowhead	1956	15 minute
Lucerne Valley	1947	15 minute
San Gorgonio Mountain	1954	15 minute
Morongo Valley	1955	15 minute
Beaumont	1953	7.5 minute
El Casco	1953	7.5 minute
Sunnymead	1953	7.5 minute
Riverside East	1953	7.5 minute
Steele Peak	1953	7.5 minute
Redlands	1954	7.5 minute
Elsinore	1953	7.5 minute
Alberhill	1954	7.5 minute
Santiago Peak	1951	7.5 minute
El Toro	1949	7.5 minute
San Juan Capistrano	1948	7.5 minute
Tustin	1948	7.5 minute
Laguna Beach	1948	7.5 minute


LEGEND
BOUNDARY OF SANTA ANA RIVER SYSTEM
BOUNDARY AS IN EXHIBIT "A" OF COMPLAINT WHERE PRESENT BOUNDARY DIFFERS
UPPER BASIN
MIDDLE BASIN
LOWER BASIN
SAN BERNARDINO NATIONAL FOREST
ATTACHMENT D
ATTACHMENT B
ATTACHMENT E
ATTACHMENT F
ATTACHMENT G
SAN BERNARDINO
RIVERSIDE
WHITTIER
LAKEWOOD
LONG BEACH
SANTA ANA
PACIFIC OCEAN
ATTACHMENT A TO EXHIBIT A
SANTA ANA RIVER SYSTEM
ORANGE COUNTY WATER DISTRICT VS. CITY OF CHINO et. al.
CASE No. 117628
MAX BOOKMAN
Consulting Civil Engineer
R.C.E. No. 5628
APRIL 24, 1964
SCALE OF MILES
5 0 5 10

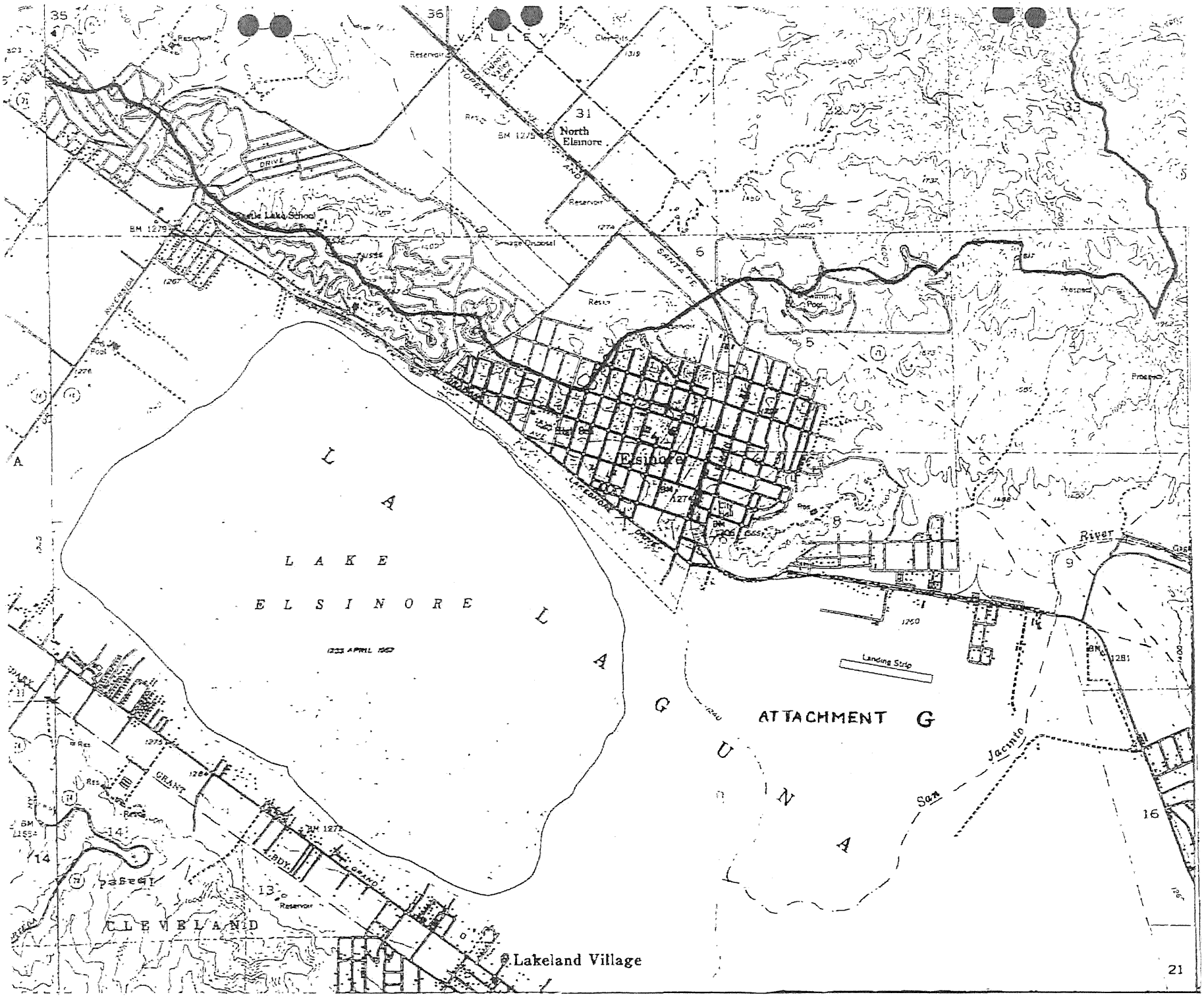

LOS ANGELES
COUNTY
FAIRGROUND
North Pomona
Palomares Cemetery
Pomona Country Club
San Jose School
Reservoir
FREEWAY
Emerson JHS
INTERSECTION OF
ORANGE GROVE
Roosevelt School
St Joseph HS
POMONA
St Joseph School
POMONA
Substation
ORDINANCE
PLANT
Buena Vista Park
Sacred Heart School
Washington Park
Pomona Jr Academy
VISTA AVE
South Hills Ch
Alcott School
FRANKLIN
Holy Cross Cem
ATTACHMENT
LEXINGTON
PHILADELPHIA
Chino


San Dimas
Wayne Hill
Vasa
ALLEN
AVENUE
BONITA
AVE
SAN DIMAS
CANYON
AQUEDUCT
BRAND
AVE
SAN BERNARDINO
BASE LINE
FOOTHILL
Water Tank
Filtration Plant
Emergency Cemetery
Park
Oil Tanks
Reservoir
AND
SANTA FE
PACIFIC
DE ANZA HTS. DR.
1200 FT.
Laverne College
Park
ELECTRIC
Oak
Pomona
Bracket Field
LOS ANGELES
COUNTY
FAIRGROUND
Puddingstone
Reservoir
S A N J O S E
(DALTON ET AL)
Pomona Country Club
ATTACHMENT


Cactus Flat
Arrastre Flat
Doble
Gold Mtn
UNNAMED PEAK
ELEV. 8701 FEET
Pan Hot Spring
Big Bear City
Stocker Meadows
Woodlands
Sugarloaf
Moonridge
Snow Summit
Green Spot
Green Canyon
Sugarloaf Mountain
Wildhorse Meadows
Long Beach YMCA Camp
ATTACHMENT D


EAST WEST 1/4 LINE OF SEC. 36 T 2S R 1W
INTERSECTION OF EASTERLY DRAINAGE DIVIDE OF SAN TIMOTEO CR. IS BAD SOUTHERN PACIFIC R.R. TRACKS
GROUND WATER DIVIDE
Beaumont
Mt View Cem
Water Tanks
San Gorgonio Pass Memorial Hosp
Sunnyslope Cemetery
Noble
BEAUMONT
CHERRY
AVE
SPRINGS
HIGHLAND
PENNSYLVANIA
BERNARDINO
MERIDIAN
PIPE LINE
SOUTHERN PACIFIC
EAST
Pershing
Radio Sta KPAC
ATTACHMENT E

SANTA ANA BASIN
SAN JACINTO BASIN
Mazeppa Field
ATTACHMENT F
POREIGN DRAINAGE DIVIDE
BETWEEN SANTA ANA AND
SAN JACINTO BASINS



ATTACHMENT G

Imaged

(1) Karl F. Baumann
Gerrit P. Boertje
Tena Anna Boertje
Francis K. Ellsworth
Mary Ellsworth
Francis A. Grunenfelder
Helen E. Grunenfelder
Harriet E. Gutting
Horace P. Hinckley
Horace P. Hinckley, Trustee
Julia Hinckley
Eber R. Hively
Jessie May Hively
J. Richard Leonard
Margaret M. Leonard
Michael C. Mize
Glenna L. Mize
Richard I. Pollard
Katherine E. Richey
San Bernardino Valley Water Conservation District
San Bernardino County Flood Control District
West San Bernardino County Water District

(2) Lawrence W. Anderson
Anza Realty
Jack M. Barbour
C. Stanley Chapman, also known as C. S. Chapman
Miguel J. Ciriza, also known as Mike J. Ciriza, also known as M. J. Ciriza
Irvey L. Cote
Dorothy E. Cote
Elbert E. Dixon

Mattie M. Dixon
Marshall T. Goulet
Eva Marie Goulet
L. D. Larsen
Richard K. Parry
Shirley R. Parry
David Pollock
Herlinda Pollock
Riverside Cement Co., a corporation
Americo Rizzardini
Rita M. Rizzardini

(3) Cucamonga Top Winery
De Berard Brothers
Jurupa Hills Water Co.
Linde Co.
Lugonia Water Company
Owen H. Mickel

SUPERIOR COURT OF THE STATE OF CALIFORNIA

FOR THE COUNTY OF LOS ANGELES

IRVINE RANCH WATER DISTRICT, a California public agency,	)	
Plaintiff and Petitioner,	)	
v.	)	Case No. BS168278
ORANGE COUNTY WATER DISTRICT, a California public agency; ALL PERSONS INTERESTED IN THE MATTER OF ORANGE COUNTY WATER DISTRICT RESOLUTION NO. 16-4-37; and DOES 10 to 20, inclusive,	)	
Defendants and Respondents.	)	

(Caption Continued on Following Pages)

DEPOSITION OF MICHAEL L. MARKUS, P.E.

IRVINE, CALIFORNIA

WEDNESDAY, OCTOBER 11, 2017

1:03 P.M.

Reported by:

NANCY A. HENDERSON, CSR, RMR
CSR No. 4112

1 page being entitled Orange County Water District
2 Groundwater Management Plan and the 2015 update?
3 A. Yes.
4 Q. Does that refresh your recollection that OCWD
5 prepares groundwater management plans and updates
6 thereto?
7 A. Yes.
8 Q. And do you believe -- is it your understanding
9 that the most recent update to the groundwater
10 management plan that OCWD prepared was June 2015?
11 A. Yes. That's what it says.
12 MR. AUSTIN: Objection. Lack of foundation.
13 Calls for speculation.
14 BY MR. CASEY:
15 Q. Referring to the third page of the exhibit,
16 Mr. Markus. If you could read the second sentence of
17 the second paragraph. I am going to read it into the
18 record. Okay?
19 A. Down --
20 MR. CASEY: This is the second entitled 5.2.1
21 Santa Ana River. The second paragraph begins with the
22 following sentence:
23 "Water from the Santa Ana River is the primary
24 source of water used to recharge the groundwater basin."
25 Do you see that?

1 A. Yes.
2 Q. Is that a true statement?
3 MR. AUSTIN: Objection. Calls for speculation.
4 Lack of foundation.
5 MR. NEWMARK: Objection. Vague as to time.
6 MR. AUSTIN: Is there a particular time to
7 which you are referring to, Counsel?
8 MR. CASEY: You can state your objection,
9 Counsel.
10 MR. AUSTIN: I will join in Greg's objection.
11 MR. CASEY: You can answer.
12 THE WITNESS: Could you restate the question.
13 BY MR. CASEY:
14 Q. Is that statement true?
15 A. Historically it has been, yes.
16 Q. Now in that same paragraph the third sentence
17 reads as follows:
18 "A 1969 legal settlement between OCWD and all
19 upper watershed parties requires that a minimum of
20 42,000 Afy of Santa Ana River base flows reach the Prado
21 Dam."
22 Do you see that?
23 A. Yes.
24 Q. Do you know what 1969 legal settlement is being
25 referred to?

1 A. Yes.
2 Q. What is it?
3 A. It gave the district an adjudicated right to
4 Santa Ana River flows.
5 Q. If you would just turn to the first page,
6 Mr. Markus, of Exhibit 15. This is a -- I am going to
7 say a picture or a diagram. Do you see that?
8 A. Yes.
9 Q. What is that? Let me rephrase that.
10 What is that intended to depict?
11 MR. AUSTIN: Objection. Calls for speculation.
12 Lack of foundation. Vague as to "intended."
13 THE WITNESS: The shaded area represents the
14 groundwater basin.
15 BY MR. CASEY:
16 Q. I don't want to cut your answer before you're
17 through?
18 A. Yes.
19 Q. Okay. There is a reference toward the bottom
20 of the picture to OCSD. Do you see that?
21 A. Yes.
22 Q. What does that stand for?
23 A. Orange County Sanitation District.
24 Q. Do you know what OCSD does in life?
25 MR. AUSTIN: Objection. Vague and ambiguous.

1 THE WITNESS: Yes.
2 BY MR. CASEY:
3 Q. What do they do?
4 A. They treat industrial and domestic wastewater
5 in north and central Orange County.
6 Q. To your knowledge did they ever discharge that
7 treated wastewater to the Santa Ana River except during
8 emergency situations?
9 MS. DE FELICE: Objection. Assumes facts not
10 in evidence.
11 MR. NEWMARK: Vague and ambiguous as to time.
12 MR. AUSTIN: I will join in those objections.
13 Also calls for speculation. Lack of foundation.
14 BY MR. CASEY:
15 Q. You can answer.
16 A. Could you restate the question, please.
17 MR. CASEY: Could you reread it, please,
18 Madam Court Reporter.
19 (Record read.)
20 THE WITNESS: No.
21 BY MR. CASEY:
22 Q. They discharged that treated wastewater to the
23 ocean; correct?
24 MR. AUSTIN: Same objections.
25 THE WITNESS: Yes.

1 STATE OF CALIFORNIA)
) ss.
2 COUNTY OF RIVERSIDE)
3
4
5 I, NANCY A. HENDERSON, Certified Shorthand
6 Reporter No. 4112, hereby certify that the foregoing
7 deposition of MICHAEL L. MARKUS, P.E., was taken by me
8 at the time and place herein set forth, at which time
9 the witness was put under oath by me;
10 That the said deposition was taken down by me in
11 shorthand and thereafter transcribed under my direction
12 and supervision, and I hereby certify the foregoing
13 deposition is a full, true, and correct transcript of my
14 shorthand notes so taken;
15 That dismantling this transcript will void the
16 certification by the Certified Shorthand Reporter.
17 I further certify that I am neither counsel for
18 nor am I in any way related to any party to said action,
19 nor am I in any way interested in the outcome thereof.
20
21 IN WITNESS WHEREOF, I have subscribed my name
22 this 23rd day of October 2017.
23
24 Nancy A. Henderson
NANCY A. HENDERSON, CSR No. 4112
25

Classification of Reclaimed Water

June 1, 2016

1

Groundwater Producers Annual BPP Calculation

District Act Section 31.5. (c) (1) & (2)

$$BPP = \frac{\text{Groundwater}}{\text{Groundwater + Supplemental Sources + Reclaimed?}}$$

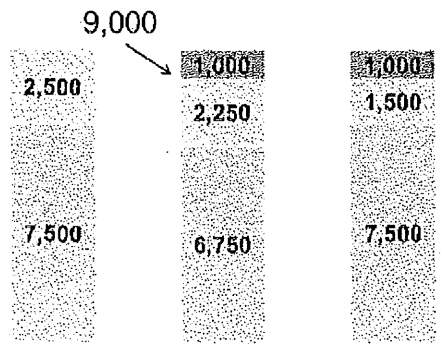
"Supplemental sources means sources of water outside the watershed of the Santa Ana River … such as but not limited to water produced from MWD"

2

Exhibit No. 46
Witness: John Kennedy
Date: 10/12/17
Christianne Lee Fong, CSR 7559

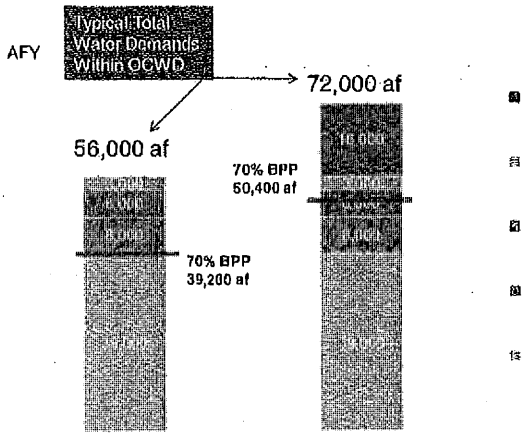
Theoretical Producer Groundwater Pumping With and Without Reclaimed Water

(Assumes 10,000 afy total water demands and 75% BPP)



3

Typical IRWD Water Supplies within OCWD



Impact to IRWD

- IRWD has invested $100 of millions in their reclaimed water system
- Extensive system
- Serving ~ 16,000 afy of reclaimed water within OCWD
- Have reduced how much groundwater they can pump paying the RA by about 11,000 afy (16,000 x 70%)

5

Impact to Producers

- IRWD's loss of approximately 11,000 afy of groundwater pumping is the other Producers gain
- Allows the BPP to be about 2-3% higher for the remaining Producers
- 11,000 afy x the BEA of $527/af = $5.8 million loss to IRWD and collective gain for the remaining 18 Producers

6

History

- 1982 – Attorney memorandum that reclaimed water is not considered supplemental water
- 1991 District Act (via legislation in Sacramento) was changed - classified reclaimed water as supplemental water
  - OCWD considered charging higher rate for GAP reclaimed water
- 1995 District Act changed – reclaimed water is not considered supplemental water (reversing 1991 Act change)

7

Policy Issues

- OCWD policy sends negative pricing signal for development of reclaimed water projects
  - Buena Park
- With GWRS recycling all wastewater that is not an issue
- Don't want to encourage any new recycling by a Producer
- IRWD system and plans were established before GWRS

8

Policy Issues

- Does OCWD need to change the District Act to change how reclaimed water is classified?
- Changed District Act in 1991 and 1995
- February 15, 1995 OCWD staff report suggests can handle via a contract vs changing the District Act
- How OCWD classifies reclaimed water has worked for the Green Acres Project

9

Green Acres Project

- Producers using GAP water are located along the coast
- Reducing coastal GW pumping is a good basin management strategy
- If change reclaimed water classification for IRWD should the change include GAP customers?

10

Directly Selling GWRS Water from the SAR Pipeline

- Policy discourages use of GWRS water directly from the GWRS pipeline
- Selling additional GWRS water off of the pipeline "frees up" recharge basin capacity for SAR flows
- OCWD charges more for GWRS water directly purchased vs receiving RA
- Anaheim recently agreed to directly purchase GWRS water despite policy

11

End

12

From: Kennedy, John
Sent: Tuesday, February 10, 2015 12:46 PM
To: Green, Cathy; Bilodeau, Denis; Sheldon, Stephen
Cc: Markus, Mike
Subject: RE: February 11th IRWD Meeting
Attachments: IRWD Reclaimed Water Classification.ppt

Cathy, Denis and Steve

Here is a graphic Director Bilodeau asked me to prepare.

It shows IRWD's system and supplies without and with the change they would like. If we count reclaimed water as supplemental water as IRWD will request, IRWD's total water demands increase to 72,000 afy as shown. Multiplying an assumed 70% BPP times the higher demands means IRWD can pump 50,400 afy (70% x 72,000) of groundwater that pays the RA. Under the OCWD Act, reclaimed water is not counted as supplemental water, so OCWD basically ignores reclaimed water and IRWD's total demands are 61,000 afy for purposes of this calculation. IRWD's then pumping reduces to 42,700 afy (70% x 61,000) which is a reduction of 7,700 afy. Per my previous email, 7,700 afy of groundwater pumping is worth about $4.6 million annually.

This is a unique and confusing issue. Call or email if you have any questions. We can also get together 20 minutes ahead of the IRWD meeting tomorrow if anyone has questions.

John Kennedy
Executive Director Engineering and Local Resources
Orange County Water District
18700 Ward Street, Fountain Valley, CA 92708
tel: (714) 378-3304
email: jkennedy@ocwd.com

From: Kennedy, John
Sent: Friday, February 06, 2015 1:33 PM
To: Green, Cathy; Bilodeau, Denis; Sheldon, Stephen
Cc: Markus, Mike
Subject: February 11th IRWD Meeting

Cathy, Dennis and Steve

Exhibit No. 48
Witness: John Kennedy
Date: 10/12/17
Christianne Lee Fong, CSR 7559

Attached is information for the February 11th meeting with IRWD regarding how OCWD handles reclaimed water with the annual BPP calculation.

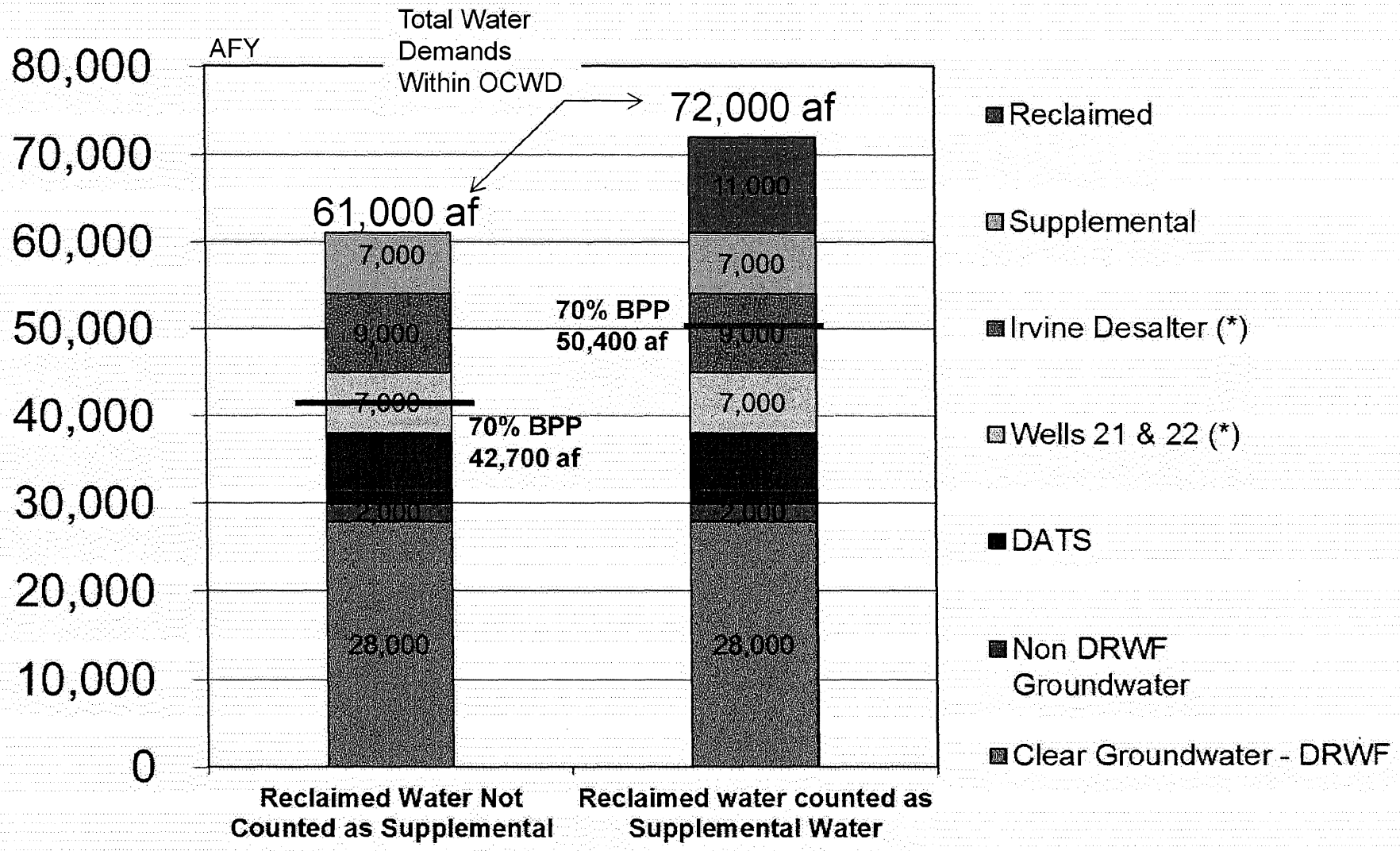
John Kennedy
Executive Director Engineering and Local Resources
Orange County Water District
18700 Ward Street, Fountain Valley, CA 92708
tel: (714) 378-3304
email: jkennedy@ocwd.com

GWRS GROUNDWATER REPLENISHMENT SYSTEM

Follow OCWD on Twitter

www.ocwd.com www.gwrsystem.com

Typical IRWD Water Supplies within OCWD



(*) Project designed to operate above BPP and receive a BEA Exemption

From: Kennedy, John
Sent: Wednesday, July 06, 2016 12:01 PM
To: Markus, Mike
Subject: IRWD Reclaimed Water Issue - WIC Presentation
Attachments: OCWD Classification of Reclaimed Water.pptx

Mike,
Take a look at this. Especially slide #5. I would only put out the first 10 slides.

John Kennedy
Executive Director of Engineering and Water Resources
Orange County Water District
18700 Ward Street, Fountain Valley, CA 92708
tel: (714) 378-3304
email: jkennedy@ocwd.com

WITNESS Markus
EXHIBIT 35
DATE 10/11/17 RPTR NN
eLitigation Services Inc.

Water Issues Committee
Classification of Reclaimed Water

July 13, 2016

Groundwater Producers Annual BPP Calculation

District Act Section 31.5. (c) (1) & (2)

$$BPP = \frac{\text{Groundwater}}{\text{Groundwater} + \text{Supplemental Sources} + \text{Reclaimed?}}$$

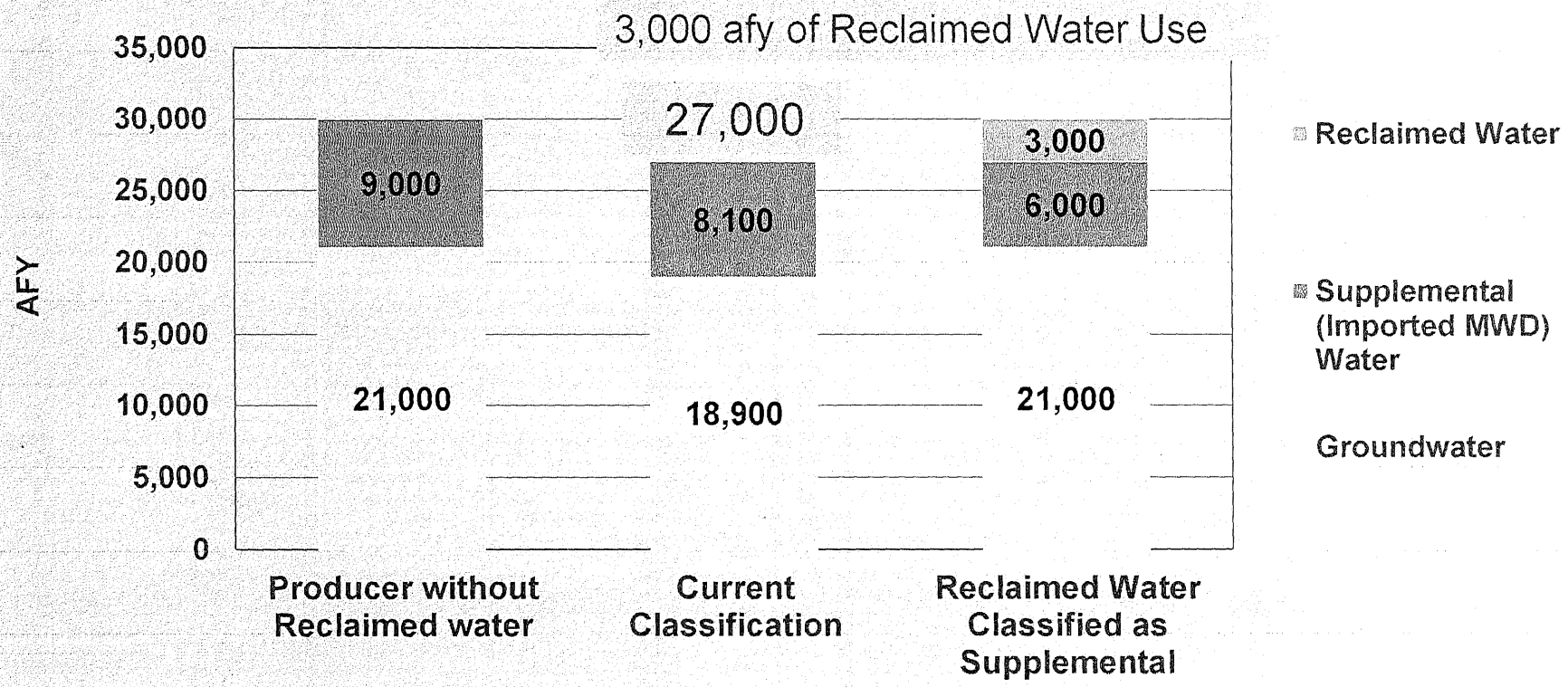
Supplemental sources means sources of water outside the watershed of the Santa Ana River … such as but not limited to water produced from MWD"

History

- 1982 – Attorney memorandum that reclaimed water is not considered supplemental water
- 1991 District Act (via legislation in Sacramento) was changed - classified reclaimed water as supplemental water
  - OCWD considered charging higher rate for GAP reclaimed water
- 1995 District Act changed (reversing 1991 Act change) – reclaimed water is not considered supplemental water

Theoretical Producer Example

Assumes 30,000 afy Total Water Demands and 70% BPP)



Policy Issues

- OCWD classification sends negative pricing signal for development of reclaimed water projects
  - IRWD, Buena Park, Anaheim
- With GWRS recycling all wastewater, that is not an issue
  - Don't want to encourage any new recycling by a Producer that reduces source water for GWRS
  - IRWD is considering diverting remaining wastewater that goes to OCSD to their Michelson Plant (~5 mgd)

Policy Issues

- IRWD has always been aware of OCWD classification
- IRWD system and recycling plans were established before GWRS
- OCWD would need to change the District Act to change how reclaimed water is classified

General Impact to IRWD

- Serving ~ 17,000 afy of reclaimed water within OCWD
- Reduces how much groundwater they can pump up to the BPP that only pays the RA by about 11,900 afy (17,000 x 70%)
- Approximate maximum annual cost impact $6 million
- Actual impact varies annually due to BEA exempt water quality projects

Green Acres Project

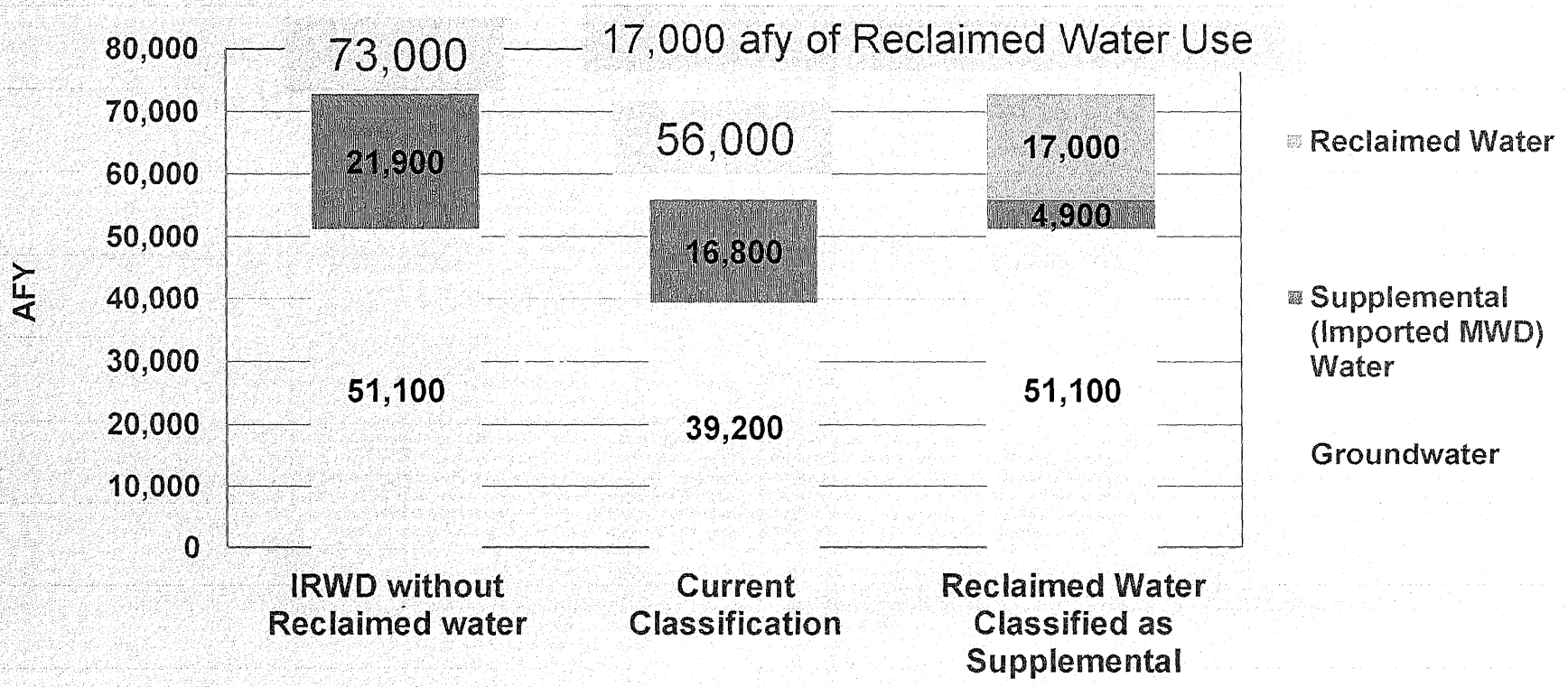
- How OCWD classifies reclaimed water has worked for the Green Acres Project
- Producers using GAP water are located along the coast
- Reducing coastal GW pumping is a good basin management strategy
- If change reclaimed water classification for IRWD should the change include GAP customers?

Directly Selling GWRS Water from the SAR Pipeline

- Classification discourages use of GWRS water directly from the GWRS pipeline
- Selling additional GWRS water off of the pipeline "frees up" recharge basin capacity in Anaheim for SAR & MWD water
- Anaheim recently agreed to directly purchase a small amount of GWRS water despite classification issue

End of Presentation

IRWD General Example - 70% BPP



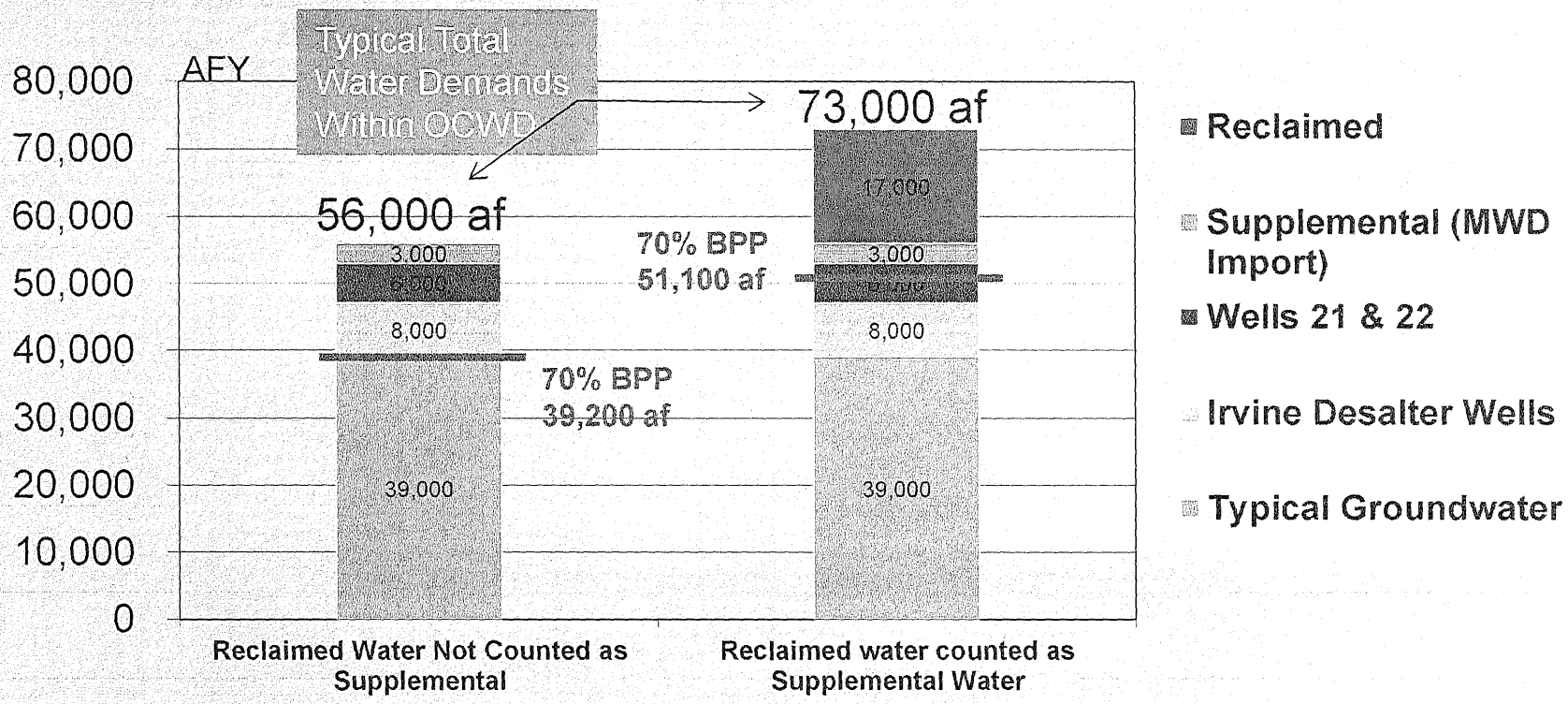
Details of Impact to IRWD

- 11,900 afy pumping decline x $515/af BEA = $6.1 million maximum annual general cost impact
- Actual cost to IRWD varies annually
- Complicated due to two BEA exempt Water Quality Projects
  - Projects designed to operate above the BPP
  - OCWD waives the BEA
    - Irvine Desalter
    - Wells 21 & 22
      - Projects are pumping and treating contaminated groundwater
      - IRWD constructed and operates projects

Impact to IRWD

- With requested change, large percentage of Irvine Desalter and Wells 21 & 22 pumping would fall below the BPP
- Most of Irvine Desalter BEA exemption is gone in approximately 3 years
  - Project would have to pay BEA if IRWD continues operation
  - With requested change, Irvine Desalter pumping would fall below the BPP and IRWD would avoid paying approximately $3.7 million annually in BEA payments to OCWD

Typical IRWD Water Supplies within OCWD



Rough Estimate for FY15-16 Impact to IRWD

- Total water demands have significantly decreased due to State's water conservation requirement
- IRWD allowable groundwater pumping at the BPP will decline in the area of approximately 4,000 af
- Approximately $2.4 million cost to IRWD – would not occur if reclaimed water was counted as supplemental water

Impact to Groundwater Producers

- Zero sum game - IRWD's loss is the Producers gain
- IRWD total pumping should stay about the same.
- If IRWD avoids paying BEA on some GW pumping that is less revenue to OCWD
- RA will be slightly higher to all

From: Herndon, Roy
Sent: Monday, December 14, 2009 12:43 PM
To: Kennedy, John; Miller, Craig
Subject: FW: Reclaimed Water
Attachments: Reclaimed Water.doc; GWRS Water Neutral or Not.xls

John and Craig –

It's good to remind the Producers how direct purchase of reclaimed water affects the BPP calculation. Following are my comments:

Regarding the last paragraph, "developing reclaimed supplies" can be taken different ways. Counting reclaimed water as "neutral" for BPP purposes has certainly not impacted OCWD from developing the GWRS. The "neutral" issue does, however, disincentivize producers from taking GWRS water directly, as explained below.

I prepared the attached spreadsheet with 3 scenarios (base case, 2 alternatives) to figure out the impact to a hypothetical participating (GWRS water-purchasing) producer and a hypothetical non-participating producer, both with the same demands. I used a large enough GWRS direct purchase amount (10,000 afy) so that the resulting numbers could be illustrated – otherwise, everything gets lost in the minutiae. **The spreadsheet indicates that the most equitable way of distributing the benefit of GWRS water is to recharge all of it in the basin to maximize the BPP (the base case).**

Alternative 1 (direct GWRS water counted as "neutral") shows how the participating producer is negatively impacted by purchasing more expensive water than under the base case. This assumes GWRS water is priced at least at what it costs to make – which is a lot more than current GW costs. This also shows how non-participating producers are negatively impacted because the BPP is reduced because supplies to the basin are reduced and not completely offset by the reduced "BPP demand" of the participating producer. The lowering of the BPP also negatively affects the participating producer.

Alternative 2 (direct GWRS water counted as "imported") shows how the participating producer is negatively impacted (but to a much lesser extent than Alternative 1), essentially to the same degree as all other producers, because the BPP is lowered for everyone (including the participant) and forces everyone to proportionately buy more imported water to offset the lost supply to the basin. The non-participating producers are impacted more than under Alternative 1, because the BPP is lower in this case. **What is not shown is the potential financial benefit the participating producer would have if the GWRS water was sold <u>below</u> alternative imported water rates. If that happens, then the participating producer could receive a financial windfall.**

This analysis only applies to GWRS water. GAP or Michelson water (which is not able to be recharged to the basin) is a different situation, and I have not analyzed that type of water. Since the base case does not exist for GAP or Michelson water, I suspect the "neutral" Alternative [assuming GAP and Michelson water are priced at what they REALLY cost to produce] will also appear onerous to the participating producers. However, counting GAP or Michelson water as "imported" would likely provide a financial benefit to the participants at the expense of non-participants by impacting the BPP.

I think we need to be careful about opening up the discussion of counting reclaimed water as anything but "neutral," as currently in the OCWD Act. If the current structure disincentivizes producers from buying GWRS water directly or building their own reclaimed water projects, so what? It doesn't stop OCWD from expanding GWRS for the benefit of all.

Roy

From: Everhart, Jill
Sent: Monday, December 14, 2009 8:02 AM
To: A.T. Kilani (KILANI@irwd.com); Alan Bramlett (SB); Amy Rego, MWD; Ann Michel, Serrano; Anthony Manzano (YLWD); Art Valenzuela, Tustin; Barbara - GM's Office @ IRWD; Betsy Eglash (betsy.eglash@surfcity-hb.org); Bob McVicker, MCWD; Brian Jones (BP); Burnett, Alice; Carl Ballard (IRWD); Carolyn for Heiertz, IRWD; Cel Pasillas (GG); Chuck Fowler, BP; Craig Justice (NB); David Eikamp, GSWC; David Entsminger (Garden Grove); David Noyes, Serrano;

Exhibit No. 47
Witness: John Kennedy
Date: 10/12/17
Christianne Lee Fong, CSR 7559

David Schickling, Fullerton; Denise Garcia (MCWD); Deshmukh, Shivaji; Diana for Don Calkins, Anaheim; Diana Leach (GSWC); Dick Wilson, Anaheim; dnguyen@ylwd.com; Don Calkins, Anaheim; Everhart, Jill; Fick, Randy; Fred Adjarian, Tustin; Fred Bockmiller (MCWD); Fuller, Christina; Gary Tegel (gtegel@city.newport-beach.ca.us); George Murdoch, NB; Greg Heiertz, IRWD; Harvey De La Torre (MWDOC); Howard Johnson, HB; James Tsumura (jamest@cityoflapalma.org); Jay Kleinheinz, HB; Jeff Moneda (City of La Palma); Jeff Watson, SB; Jennifer for Joe D. (Orange); Jerry Mendzer, EOCWD; Jerry Vilander (Mesa); Jim Atkinson (MESA); Jim Biery, Buena Park; Joan for Davidson@NB; Joe DeFrancesco, Orange; John DeCriscio, YLWD; John Hills, IRWD; Karl Seckel, MWDOC; Kate Brophy (GSWC); Lyon, Keith; Ken Dills, HB; Ken Vecchiarelli. YLWD; Kennedy, John; Kevin Hunt, MWDOC; Kovacevic, Janice; Lars Oldewage, IRWD; Lee Cory, YLWD; Leslie for Paul Jones @irwd; Lisa Ohlund (lohlund@eocwd.com); Lorrie Lausten; Lyle, Joan; Mark Lewis (FV); Markus, Mike; Mike Green (mike.green@fountainvalley.org); Mike Hoolihan, IRWD; Mike Jouhari, Anaheim; Miller, Craig; Miller, Scott; Nabil Henein, BP; Nabil Saba (SA); Nancy Savedra IRWD GM's Office; Parks, Casey; Patrick Scanlon, GSWC; Paul Cook, IRWD; Paul Jones, GM IRWD; Paul Shoenberger (Mesa); Peggi Oviedo; pmeszaros@mwdoc.com; Raquel Manson (rmanson@ci.garden-grove.ca.us); Ray Burk (SA); Richard Bell, MWDOC; Rick Hurtado, Orange; Rick Shintaku, Anaheim; Rob Hanford (Robert.Hanford@gswater.com); Robert Baehner, Orange; Robert Bermudez, GG; Robert Jordan (GSWC); Scott Moulton, YLWD; Shawn Dewane (MESA); sray@anaheim.net; Stan Kennedy (Mesa); Stan Yarbrough, GSWC; Steve Conklin (YLWD); Steve Garten; Tim DeTurk, Serrano; Toby Moore, GSWC; Umeda, Cheryl; Vi Atiya, Anaheim; Vikki Beatley, Mesa; Vince Mastrosimone (Seal Beach); Warren, Karen; Wil Davee (wdavee@westminster-ca.gov); Zack Barrett (GG)
Cc: DePinto, Gina; Dosier, Bruce; Greene, Kevin; Herndon, Roy; Hutchinson, Adam; Kuperberg, Joel; Sharma, Vishav; Sharp, Gwen; Sovich, Tim; Swanson, Dianne; Tan, Lo; Tate, Alexis; Torres, Eleanor; Wehner, Mike; Woodside, Greg; Yamachika, Nira; Youngblood, David
Subject: Reclaimed Water

Attached is information requested at the December 9th Producers Meeting regarding how taking reclaimed water impacts a Producers' annual BPP calculation.

Jill Everhart for John Kennedy
(714) 378-3301

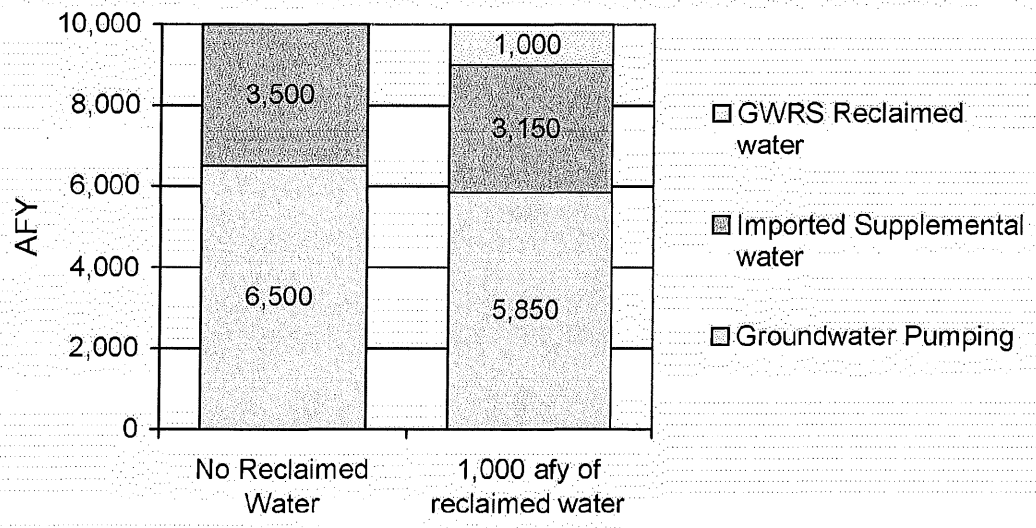
Reclaimed Water Purchase Impact to Annual Producer BPP Calculation

Any GWR System water directly received by the Producers would be considered "neutral" water per the District Act. The water is not considered groundwater or imported supplemental water for purposes of calculating the Producers annual Basin Production Percentage (BPP). The net effect is that the Producer would pump less groundwater (which is much less expensive) when using more expensive GWR System water supplies to meet their water demands.

This policy for reclaimed water was developed when the price of Green Acres Project water was established. The current cost to purchase GAP water is $326/af which is relatively low. However this low price is offset by the fact that taking GAP water also reduces how much low cost groundwater the Producer can receive. This pricing policy also recognizes that GAP customers are along the coast and reducing pumping along the coast is good basin management.

The following figure demonstrates the impacts of using GWR System or reclaimed water (1,000 afy) for a hypothetical producer who has 10,000 afy of total water demands. The figure assumes the BPP is 65 percent. As shown, if no reclaimed water is taken, allowable pumping is 6,500 afy (65% BPP x 10,000 afy of total water demands). However, if 1,000 afy of reclaimed water is used, allowable pumping is 5,850 (10,000 afy -1,000 afy x 75%).

PRODUCER BASIN PUMPING IMPACT OF USING RECLAIMED WATER



It has been argued that this policy can discourage the development of reclaimed water supplies. That it would be better to have new local reclaimed water supplies completely offset the need for more expensive imported water supplies.

From: Mitchell Robinson <Robinson@irwd.com>
Sent: Wednesday, November 12, 2014 11:22 AM
To: Xu, Wei
Cc: Eric Akiyoshi; Mike Hoolihan
Subject: IRWD BEA 2013-2014 Backup Data
Attachments: Sept 30th Final signed BEA Report Exhibit A Reclaimed Inclu.pdf; Sept 30th Final signed BEA Report Exhibit B Reclaimed Exclu.pdf; BEA IDP DATS Finance FY2014.xlsx; DRWF 2014.xlsx; SGU FY2014.xlsx; Wells 21 & 22 Project 1081&Process 5187 FY2014.xlsx; Debt & Investments Historical Data.pdf; BEA form 2013-14 - Exhibit A Reclaimed Included For OCWD.xlsx; BEA form 2013-14 - Exhibit B Reclaimed Excluded For OCWD.xlsx

Hi Wei,

Thank you for your patience while our backup data was being gathered. The attachments include the electronic signed amended BEA forms for both Exhibit A and B. I have also attached the O&M details and the BEA spreadsheet as requested. The summary for each capital project drawdown is within the BEA spreadsheet as separate worksheets. It should be noted that in the 'BEA Form' worksheet, line item 9.b has changed from $199.59 to $210.48.

If you have any questions regarding changes please call or email me at any time.

Thank you,

Mitch Robinson, E.I.T.
Assistant Engineer, Planning
Irvine Ranch Water District
15600 Sand Canyon Avenue, Irvine, California 92618
Mailing: PO Box 57000, Irvine, California 92619-7000
(949) 453-5694 office (559) 681-6307 cell
Email: robinson@irwd.com

Exhibit No. 5
Witness: Wei Xu
Date: 10/10/17
Christianne Lee Fong, CSR 7559

Orange County Water District
Mailing Address: P.O. Box 8300
Fountain Valley, CA 92728-8300
(714) 378-3200

Exhibit A
Ammended 10/9/13

BASIN EQUITY ASSESSMENT REPORT

Water Year from July 1, 2013 Through June 30, 2014

BASIN EQUITY ASSESSMENT REPORT

For the year commencing Jul 01, 2013 and ending Jul 01, 2014

To be completed and filed no later than September 30, 2013 by all Operators of Water Producing Facilities in OCWD who during the Water Year 2013 produced more than 25 acre-feet of water for both irrigation and other than irrigation purposes.

Name/Agency	**Irvine Ranch Water District**
Contact Person	**Mitchell Robinson**
Mailing Address	**P.O. BOX 57000**
City, State & Zip Code	**Irvine, CA 92619**

Line

1 Total Groundwater Production (See attached schedule)

a) Non-agricultural for period	Jul 01, 2013 to	Dec 31, 2013	29,023.6		
b) Non-agricultural for period	Jan 01, 2014 to	Jun 30, 2014	23,687.5		
c) Agricultural for period	Jul 01, 2013	Dec 31, 2013	912.9		
d) Agricultural for period	Jan 01, 2014	Jun 30, 2014	786.4		
e) In-Lieu Water Production	Jul 01, 2013 to	Dec 31, 2013	0.0		
f) In-Lieu Water Production	Jan 01, 2014 to	Jun 30, 2014	0.0		
g) Total Actual Groundwater and In-Lieu Water Production				**54,410.4**	(1g)

2 All Water from Supplemental Sources (Ag AND Non-ag) used solely within OCWD boundaries excluding MWD in-lieu water, in acre-feet to nearest 1/10th: ~~Reclaimed water excluded~~

a) For period	Jul 01, 2013 to	Dec 31, 2013	2,738.3		
b) For period	Jan 01, 2014 to	Jun 30, 2014	7,154.2		
c) Water conservation Credit for	Jul 01, 2013 to	Jun 30, 2014	508.6		
d) Total Water from Supplemental Sources				10,401.1	(2d)

3 Total Groundwater Production and Water from Supplemental Sources (1g + 2d)	64,811.5	3
4 Basin Production Percentage (%)	70.0%	4
5 Multiply line 3 by line 4 in acre-feet to nearest 1/10th (BPP Production)	**45,368.1**	5
6 If Line 5 is less than line 1g, enter the difference in Line 6 **Pumping Over BPP**	**9,042.3**	6

If Line 5 is greater than Line 1g, enter zero at Line 6 and Line 8

7 a BASIN EQUITY ASSESSMENT PER ACRE-FOOT for Non-Ag Water	**$609.00 /af**	7a
b BASIN EQUITY ASSESSMENT PER ACRE-FOOT for Ag Water	**$672.00 /af**	7b
c PROPORTIONAL BASIN EQUITY ASSESSMENT Based on Ag and Non Ag Production amounts	**$610.97 /af**	7c
8 BASIN EQUITY ASSESSMENT: (Multiply Line 6 by Line 7C)	**$5,524,577**	8

If Line 8 = zero then ignore lines 9-11 and enter zero on line 12

Orange County Water District
Mailing Address: P.O. Box 8300
Fountain Valley, CA 92728-8300
(714) 378-3200

Exhibit A
Ammended 10/9/13

BASIN EQUITY ASSESSMENT REPORT

For the year commencing **Jul 01, 2013** and ending Jul 01, 2014

9	**Groundwater Produced from Colored Water Treatment Facility**			
	DATS Well Nos. C8 and C9 For period Jul 01, 2013 to Dec 31, 2013	**4,284.4**		
	DATS Well Nos. C8 and C9 For period Jan 01, 2014 to Jul 01, 2014	**4,422.8**		
a	Total		8,707.2	9a
b	Documented O&M cost for Colored Water Treatment Facility - $/af		**$199.59** /af	9b
c	BEA Credit - DATS O&M (if line 6> line 9A then line 9A x line 9B; if not line 6 x line 9B)		$1,737,854	9c
d	Remaining BEA Capital Credit (line 7C - line 9B)		$411.38 /af	9d
e	Amount of BEA Capital Credit applied against Project Capital Cost (IF line 6 > line 9A then line 9A X line 9D, if not then line 6 x line 9D)		$3,581,963	9e
10	**Groundwater Produced from Irvine Desalter Project Treatment Facility**			
	IDP Well Nos. ET1 and ET2; IRWD 76, 77, 78, 107, 110 & Navy SGU Wells For period Jul 01, 2013 to Dec 31, 2013	**5,093.9**		
	IDP Well Nos. ET1 and ET2; IRWD 76, 77, 78, 107, 110 & Navy SGU Wells For period Jan 01, 2014 to Jul 01, 2014	**4,878.7**		
a	Total		9,972.6	10a
b	Documented O&M cost for Irvine Desalter Treatment Facility - $/af		**$112.87** /af	10b
c	BEA Credit - IDP O&M (if line 6 - line 9a> line 10a then line 10a x line 10b; if not, then (line 6 - line 9a) x line 10b)		$37,827	10c
d	Remaining BEA Capital Credit (line 7c - line10b)		$498.10 /af	10d
e	Amount of BEA Capital Credit applied against Project Capital Cost (IF line 6 - line 9a) > line 10a then line 10a x line 10d, if not then (line 6 - line 9a) x line 10d)		$166,934	10e
11	**Groundwater Produced from Wells 21 and 22 Water Treatment Facility**			
	Well Nos. 21 and 22 For period Jul 01, 2013 to Dec 31, 2013	**3,733.6**		
	Well Nos. 21 and 22 For period Jan 01, 2014 to Jun 30, 2014	**3,200.8**		
a	Total		6,934.4	11a
b	Documented O&M cost for Wells 21/22 Facility - $/af		**$214.31** /af	11b
c	BEA Credit - Wells 21/22 O&M (IF line 6 - line 9a - line 10a> line 11a then line 11a x line 11b; if not, then (line 6 - line 9a - line 10a) x line 11b)		$0	11c
d	Remaining BEA Capital Credit (line 7c - line11b)		$396.66 /af	11d
e	Amount of BEA Capital Credit applied against Project Capital Cost (IF line 6 - line 9a - line 10a) > line 11a then line 11a x line 11d, if not then (line 6 - line 9a - line 10a) x line 11d)		$0	11e
12	TOTAL BASIN EQUITY ASSESSMENT CREDIT FROM PROJECTS (9c+9e+10c+10e)		$5,524,577	12
13	REMAINING BASIN EQUITY ASSESSMENT TO BE PAID (line 8 - line 11)		$0	13

Note: Return original statements and pay assessment on or before September 30, 2013 to avoid penalties and interest.

I DECLARE under the penalties of perjury that this Basin Assessment Report, including the

Date 9/29/14 Signature Kevin L Burton

Enclosed is check or money order No. _____ on _____ for $_____
(Bank No.)

ORANGE COUNTY WATER DISTRICT
Mailing Address: P. O. Box 8300
Fountain Valley, CA 92728-8300
(714)378-3200

DRWF

BASIN EQUITY ASSESSMENT REPORT

For the year commencing July 1, 2013 and ending June 30, 2014

To be completed and filed no later than September 30, 2014 by Irvine Ranch Water District for Dyer Road Wellfield production, per Third Amendment to the Agreement, dated November 3, 1999.

Irvine Ranch Water District
P. O. Box 57000
Irvine, CA 92619-7000

Line		Actual A.F.		Exceedance A.F.	
1	GROUNDWATER AND IN-LIEU WATER PRODUCTION FROM DYER ROAD WELL FIELD (DRWF)				
a)	CLEAR Water Production for Period July 1, 2013 to Sept. 30, 2013	8,502.1	1a		
b)	CLEAR Water Production for Period May 1, 2014 to June 30, 2014	4,961.8	1b		
c)	CLEAR Water Production ~~that exceeds 20,000 AF~~ "Summer" ~~limitation~~ months (Line 1a + Line 1b).	13,463.9		N/A	1c
d)	Total CLEAR Water Production for Period July 1, 2013 to June 30, 2014	27,773.9	1d		
e)	Amount of CLEAR Water Production for Period July 1, 2013 to June 30, 2014 that exceeds above 20,000 AF and up to 28,000 AF	7,773.9	1e		
f)	Total COLORED Water Production up to 8,000 AF for Period July 1, 2013 to June 30, 2014	8,000.0	1f		
g)	Amount of CLEAR Water Production over above 20,000 AF and up to 28,000 AF that exceeds COLORED Water Production Match for Period July 1, 2013 to June 30, 2014 (If Line 1f is less than 8,000 AF and Line 1e is greater than Line 1f, Subtract Line 1f from Line 1e, otherwise zero).			0.0	1g
h)	Total IN LIEU Water Received for Period July 1, 2013 to June 30, 2014	0.0	1h		
i)	Total CLEAR Water Production and IN LIEU Water Received for Period July 1, 2013 to June 30, 2014 (Line 1d plus Line 1h)	27,773.9	1i		
j)	Amount of CLEAR Water Production and IN LIEU Water Received for Period July 1, 2013 to June 30, 2014 that exceeds 28,000 AF limitation (Subtract 28,000 AF from Line 1i).			0.0	1j
2	BASIN EQUITY ASSESSMENT PER ACRE-FOOT			$ 609.00	2
3	BASIN EQUITY ASSESSMENT: Multiply the total of Lines 1c, 1g, and 1j by Line 2			$ 0.00	3

Note: Return original statement and pay assessment on or before September 30, 2014 to avoid penalties and interest.

I DECLARE under the penalties of perjury that this Basin Equity Assessment Report, including the statements made and the figures shown, has been examined by me, and to the best of my knowledge and belief is a true, correct and complete statement.

Date 9/29/14 Signature [signature] Phone: 949-453-5594

ENCLOSED IS CHECK OR MONEY ORDER NO. _____ ON _____ FOR $ _____
(Bank No.)

OCWD050393

Orange County Water District
Mailing Address: P.O. Box 8300
Fountain Valley, CA 92728-8300
(714) 378-3200

Exhibit B
Ammended 10/9/13

BASIN EQUITY ASSESSMENT REPORT

Water Year from July 1, 2012 Through June 30, 2013

BASIN EQUITY ASSESSMENT REPORT

For the year commencing **Jul 01, 2013** and ending Jul 01, 2014

To be completed and filed no later than September 30, 2013 by all Operators of Water Producing Facilities in OCWD who during the Water Year 2013 produced more than 25 acre-feet of water for both irrigation and other than irrigation purposes.

Name/Agency	**Irvine Ranch Water District**
Contact Person	**Mitchell Robinson**
Mailing Address	**P.O. BOX 57000**
City, State & Zip Code	**Irvine, CA 92619**

Line

1 Total Groundwater Production (See attached schedule)

a) Non-agricultural for period	Jul 01, 2013 to	Dec 31, 2013	29,023.6		
b) Non-agricultural for period	Jan 01, 2014 to	Jun 30, 2014	23,687.5		
c) Agricultural for period	Jul 01, 2013	Dec 31, 2013	912.9		
d) Agricultural for period	Jan 01, 2014	Jun 30, 2014	786.4		
e) In-Lieu Water Production	Jul 01, 2013 to	Dec 31, 2013	0.0		
f) In-Lieu Water Production	Jan 01, 2014 to	Jun 30, 2014	0.0		
g) Total Actual Groundwater and In-Lieu Water Production				54,410.4	(1g)

2 All Water from Supplemental Sources (Ag AND Non-ag) used solely within OCWD boundaries excluding MWD in-lieu water, in acre-feet to nearest 1/10th: Reclaimed water excluded

a) For period	Jul 01, 2013 to	Dec 31, 2013	-2,673.1		
b) For period	Jan 01, 2014 to	Jun 30, 2014	1,469.9		
c) Water conservation Credit for	Jul 01, 2013 to	Jun 30, 2014	508.6		
d) Total Water from Supplemental Sources				-694.6	(2d)

3 Total Groundwater Production and Water from Supplemental Sources (1g + 2d)	53,715.8	3
4 Basin Production Percentage (%)	70.0%	4
5 Multiply line 3 by line 4 in acre-feet to nearest 1/10th (BPP Production)	37,601.1	5
6 If Line 5 is less than line 1g, enter the difference in Line 6 **Pumping Over BPP**	16,809.3	6

If Line 5 is greater than Line 1g, enter zero at Line 6 and Line 8

7 a BASIN EQUITY ASSESSMENT PER ACRE-FOOT for Non-Ag Water	$609.00 /af	7a
b BASIN EQUITY ASSESSMENT PER ACRE-FOOT for Ag Water	$672.00 /af	7b
c PROPORTIONAL BASIN EQUITY ASSESSMENT Based on Ag and Non Ag Production amounts	$610.97 /af	7c
8 BASIN EQUITY ASSESSMENT: (Multiply Line 6 by Line 7C)	$10,269,957	8

If Line 8 = zero then ignore lines 9-11 and enter zero on line 12

Orange County Water District
Mailing Address: P.O. Box 8300
Fountain Valley, CA 92728-8300
(714) 378-3200

Exhibit B
Ammended 10/9/13

BASIN EQUITY ASSESSMENT REPORT

For the year commencing **Jul 01, 2013** and ending Jul 01, 2014

9	**Groundwater Produced from Colored Water Treatment Facility**			
	DATS Well Nos. C8 and C9			
	For period Jul 01, 2013 to Dec 31, 2013	**4,284.4**		
	DATS Well Nos. C8 and C9			
	For period Jan 01, 2014 to Jul 01, 2014	**4,422.8**		
a	Total		8,707.2	9a
b	Documented O&M cost for Colored Water Treatment Facility - $/af		**$199.59** /af	9b
c	BEA Credit - DATS O&M (if line 6> line 9A then line 9A x line 9B; if not line 6 x lirie 9B)		$1,737,854	9c
d	Remaining BEA Capital Credit (line 7C - line 9B)		$411.38 /af	9d
e	Amount of BEA Capital Credit applied against Project Capital Cost (IF line 6 > line 9A then line 9A X line 9D, if not then line 6 x line 9D)		$3,581,963	9e
10	**Groundwater Produced from Irvine Desalter Project Treatment Facility**			
	IDP Well Nos. ET1 and ET2; IRWD 76, 77, 78, 107, 110 & Navy SGU Wells			
	For period Jul 01, 2013 to Dec 31, 2013	**5,093.9**		
	IDP Well Nos. ET1 and ET2; IRWD 76, 77, 78, 107, 110 & Navy SGU Wells			
	For period Jan 01, 2014 to Jul 01, 2014	**4,878.7**		
a	Total		9,972.6	10a
b	Documented O&M cost for Irvine Desalter Treatment Facility - $/af		**$112.87** /af	10b
c	BEA Credit - IDP O&M (if line 6 - line 9a> line 10a then line 10a x line 10b; if not, then (line 6 - line 9a) x line 10b)		$914,477	10c
d	Remaining BEA Capital Credit (line 7c - line10b)		$498.10 /af	10d
e	Amount of BEA Capital Credit applied against Project Capital Cost (IF line 6 - line 9a) > line 10a then line 10a x line 10d, if not then (line 6 - line 9a) x line 10d)		$4,035,663	10e
11	**Groundwater Produced from Wells 21 and 22 Water Treatment Facility**			
	Well Nos. 21 and 22			
	For period Jul 01, 2013 to Dec 31, 2013	**3,733.6**		
	Well Nos. 21 and 22			
	For period Jan 01, 2014 to Jun 30, 2014	**3,200.8**		
a	Total		6,934.4	11a
b	Documented O&M cost for Wells 21/22 Facility - $/af		**$214.31** /af	11b
c	BEA Credit - Wells 21/22 O&M (IF line 6 - line 9a - line 10a> line 11a then line 11a x line 11b; if not, then (line 6 - line 9a - line 10a) x line 11b)		$0	11c
d	Remaining BEA Capital Credit (line 7c - line11b)		$396.66 /af	11d
e	Amount of BEA Capital Credit applied against Project Capital Cost (IF line 6 - line 9a - line 10a) > line 11a then line 11a x line 11d, if not then (line 6 - line 9a - line 10a) x line 11d)		$0	11e
12	TOTAL BASIN EQUITY ASSESSMENT CREDIT FROM PROJECTS (9c+9e+10c+10e)		$10,269,957	12
13	REMAINING BASIN EQUITY ASSESSMENT TO BE PAID (line 8 - line 11)		$0	13

Note: Return original statements and pay assessment on or before September 30, 2013 to avoid penalties and interest.

I DECLARE under the penalties of perjury that this Basin Assessment Report, including the

Date 9/29/14 Signature Kevin L Burton

Enclosed is check or money order No. _____ on _____ for $_____
(Bank No.)

ORANGE COUNTY WATER DISTRICT
Mailing Address: P. O. Box 8300
Fountain Valley, CA 92728-8300
(714)378-3200

DRWF

BASIN EQUITY ASSESSMENT REPORT

For the year commencing July 1, 2013 and ending June 30, 2014

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Irvine Ranch Water District
P. O. Box 57000
Irvine, CA 92619-7000

Line		Actual A.F.	Exceedance A.F.
1	GROUNDWATER AND IN-LIEU WATER PRODUCTION FROM DYER ROAD WELL FIELD (DRWF)		
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d)	Total CLEAR Water Production for Period July 1, 2013 to June 30, 2014	27,773.9 1d	
e)	Amount of CLEAR Water Production for Period July 1, 2013 to June 30, 2014 that exceeds above 20,000 AF and up to 28,000 AF	7,773.9 1e	
f)	Total COLORED Water Production up to 8,000 AF for Period July 1, 2013 to June 30, 2014	8,000.0 1f	
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h)	Total IN LIEU Water Received for Period July 1, 2013 to June 30, 2014	0.0 1h	
i)	Total CLEAR Water Production and IN LIEU Water Received for Period July 1, 2013 to June 30, 2014 (Line 1d plus Line 1h)	27,773.9 1i	
j)	Amount of CLEAR Water Production and IN LIEU Water Received for Period July 1, 2013 to June 30, 2014 that exceeds 28,000 AF limitation (Subtract 28,000 AF from Line 1i).		0.0 1j
2	BASIN EQUITY ASSESSMENT PER ACRE-FOOT		$ 609.00 2
3	BASIN EQUITY ASSESSMENT: Multiply the total of Lines 1c, 1g, and 1j by Line 2		$ 0.00 3

Note: Return original statement and pay assessment on or before September 30, 2014 to avoid penalties and interest.

I DECLARE under the penalties of perjury that this Basin Equity Assessment Report, including the statements made and the figures shown, has been examined by me, and to the best of my knowledge and belief is a true, correct and complete statement.

Date 9/29/14 **Signature** Kevin L Burton **Phone:** 949-453-5574

ENCLOSED IS CHECK OR MONEY ORDER NO. _____ **ON** _____ **FOR $** _____
(Bank No.)

OCWD050396

From:	Mitchell Robinson <Robinson@irwd.com>
Sent:	Wednesday, January 14, 2015 8:57 AM
To:	Xu, Wei
Cc:	Kevin Burton; Mike Hoolihan; Kennedy, John; Fick, Randy
Subject:	Revised Conservation Credit for BEA Report FY 2013-14
Attachments:	Jan. 13 2015 Resigned BEA Report (Conservation Credit Rev) Exhibit A Rec. Included.pdf; Jan. 13 2015 Resigned BEA Report (Conservation Credit Rev) Exhibit B Rec. Excluded.pdf

Hi Wei,

Attached is a revised copy of the signed 2013-14 BEA Form. Included are revisions to the conservation credit on line 2c of the first page. Recently updates were made and increased the original 508.6 acre-feet value to 680 acre-feet. Per discussion between Paul Cook, Mike Marcus, John Kennedy and Mike Hoolihan, an additional 380.2 acre-feet of conservation credit have been borrowed from fiscal year 2014-15. If you have any questions, please contact Mike Hoolihan at (949) 453-5553.

Best Regards,

Mitch Robinson, E.I.T.
Assistant Engineer, Planning
Irvine Ranch Water District
15600 Sand Canyon Avenue, Irvine, California 92618
Mailing: PO Box 57000, Irvine, California 92619-7000
(949) 453-5694 office (559) 681-6307 cell
Email: robinson@irwd.com

Exhibit No. 7
Witness: Wei Xu
Date: 10/10/17
Christianne Lee Fong, CSR 7559

Orange County Water District
Mailing Address: P.O. Box 8300
Fountain Valley, CA 92728-8300
(714) 378-3200

Exhibit A
Ammended 10/9/13

BASIN EQUITY ASSESSMENT REPORT

Water Year from July 1, 2013 Through June 30, 2014

BASIN EQUITY ASSESSMENT REPORT

For the year commencing **Jul 01, 2013** and ending Jul 01, 2014

To be completed and filed no later than September 30, 2014 by all Operators of Water Producing Facilities in OCWD who during the Water Year 2013 produced more than 25 acre-feet of water for both irrigation and other than irrigation purposes.

Name/Agency	**Irvine Ranch Water District**
Contact Person	**Mitchell Robinson**
Mailing Address	**P.O. BOX 57000**
City, State & Zip Code	**Irvine, CA 92619**

Line

1 Total Groundwater Production (See attached schedule)

a) Non-agricultural for period	Jul 01, 2013 to	Dec 31, 2013	29,023.6		
b) Non-agricultural for period	Jan 01, 2014 to	Jun 30, 2014	23,687.5		
c) Agricultural for period	Jul 01, 2013	Dec 31, 2013	912.9		
d) Agricultural for period	Jan 01, 2014	Jun 30, 2014	786.4		
e) In-Lieu Water Production	Jul 01, 2013 to	Dec 31, 2013	0.0		
f) In-Lieu Water Production	Jan 01, 2014 to	Jun 30, 2014	0.0		
g) Total Actual Groundwater and In-Lieu Water Production				**54,410.4**	(1g)

2 All Water from Supplemental Sources (Ag AND Non-ag) used solely within OCWD boundaries excluding MWD in-lieu water, in acre-feet to nearest 1/10th: ~~Reclaimed water excluded~~

a) For period	Jul 01, 2013 to	Dec 31, 2013	2,802.0		
b) For period	Jan 01, 2014 to	Jun 30, 2014	7,212.3		
c) Water conservation Credit for[1]	Jul 01, 2013 to	Jun 30, 2014	1,081.4		
d) Total Water from Supplemental Sources				11,095.7	(2d)

3 Total Groundwater Production and Water from Supplemental Sources (1g + 2d)		65,506.1	3
4 Basin Production Percentage (%)	* (Included additional 380.2 af credit from 2014-15)	70.0%	4
5 Multiply line 3 by line 4 in acre-feet to nearest 1/10th (BPP Production)		**45,854.3**	5
6 If Line 5 is less than line 1g, enter the difference in Line 6	**Pumping Over BPP**	**8,556.1**	6

If Line 5 is greater than Line 1g, enter zero at Line 6 and Line 8

7 a BASIN EQUITY ASSESSMENT PER ACRE-FOOT for Non-Ag Water		**$609.00** /af	7a
b BASIN EQUITY ASSESSMENT PER ACRE-FOOT for Ag Water		**$672.00** /af	7b
c PROPORTIONAL BASIN EQUITY ASSESSMENT Based on Ag and Non Ag Production amounts		**$610.97** /af	7c
8 BASIN EQUITY ASSESSMENT: (Multiply Line 6 by Line 7C)		**$5,227,498**	8

If Line 8 = zero then ignore lines 9-11 and enter zero on line 12

1. Included additional 380.2 af credit from 2014-15

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Ammended 10/9/13

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For the year commencing **Jul 01, 2013** and ending Jul 01, 2014

9	**Groundwater Produced from Colored Water Treatment Facility**			
	DATS Well Nos. C8 and C9 For period Jul 01, 2013 to Dec 31, 2013	**4,284.4**		
	DATS Well Nos. C8 and C9 For period Jan 01, 2014 to Jul 01, 2014	**4,422.8**		
a	Total		8,707.2	9a
b	Documented O&M cost for Colored Water Treatment Facility - $/af		**$210.48** /af	9b
c	BEA Credit - DATS O&M (if line 6> line 9A then line 9A x line 9B; if not line 6 x line 9B)		$1,800,867	9c
d	Remaining BEA Capital Credit (line 7C - line 9B)		$400.49 /af	9d
e	Amount of BEA Capital Credit applied against Project Capital Cost (IF line 6 > line 9A then line 9A X line 9D, if not then line 6 x line 9D)		$3,426,631	9e
10	**Groundwater Produced from Irvine Desalter Project Treatment Facility**			
	IDP Well Nos. ET1 and ET2; IRWD 76, 77, 78, 107, 110 & Navy SGU Wells For period Jul 01, 2013 to Dec 31, 2013	**5,093.9**		
	IDP Well Nos. ET1 and ET2; IRWD 76, 77, 78, 107, 110 & Navy SGU Wells For period Jan 01, 2014 to Jul 01, 2014	**4,878.7**		
a	Total		9,972.6	10a
b	Documented O&M cost for Irvine Desalter Treatment Facility - $/af		**$112.87** /af	10b
c	BEA Credit - IDP O&M (if line 6 - line 9a> line 10a then line 10a x line 10b; if not, then (line 6 - line 9a) x line 10b)		$0	10c
d	Remaining BEA Capital Credit (line 7c - line10b)		$498.10 /af	10d
e	Amount of BEA Capital Credit applied against Project Capital Cost (IF line 6 - line 9a) > line 10a then line 10a x line 10d, if not then (line 6 - line 9a) x line 10d)		$0	10e
11	**Groundwater Produced from Wells 21 and 22 Water Treatment Facility**			
	Well Nos. 21 and 22 For period Jul 01, 2013 to Dec 31, 2013	**3,733.6**		
	Well Nos. 21 and 22 For period Jan 01, 2014 to Jun 30, 2014	**3,200.8**		
a	Total		6,934.4	11a
b	Documented O&M cost for Wells 21/22 Facility - $/af		**$339.46** /af	11b
c	BEA Credit - Wells 21/22 O&M (IF line 6 - line 9a - line 10a> line 11a then line 11a x line 11b; if not, then (line 6 - line 9a - line 10a) x line 11b)		$0	11c
d	Remaining BEA Capital Credit (line 7c - line11b)		$271.50 /af	11d
e	Amount of BEA Capital Credit applied against Project Capital Cost (IF line 6 - line 9a - line 10a) > line 11a then line 11a x line 11d, if not then (line 6 - line 9a - line 10a) x line 11d)		$0	11e
12	TOTAL BASIN EQUITY ASSESSMENT CREDIT FROM PROJECTS (9c+9e+10c+10e)		$5,227,498	12
13	REMAINING BASIN EQUITY ASSESSMENT TO BE PAID (line 8 - line 11)		$0	13

Note: Return original statements and pay assessment on or before September 30, 2013 to avoid penalties and interest.

I DECLARE under the penalties of perjury that this Basin Assessment Report, including the

Date 1/13/15 Signature Kevin L Burton

Enclosed is check or money order No. _____ on _____ for $_____
(Bank No.)

1. Included additional 380.2 af credit from 2014-15

Orange County Water District
Mailing Address: P.O. Box 8300
Fountain Valley, CA 92728-8300
(714) 378-3200

Exhibit B
Ammended 10/9/13

BASIN EQUITY ASSESSMENT REPORT

Water Year from July 1, 2013 Through June 30, 2014

BASIN EQUITY ASSESSMENT REPORT

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To be completed and filed no later than September 30, 2014 by all Operators of Water Producing Facilities in OCWD who during the Water Year 2013 produced more than 25 acre-feet of water for both irrigation and other than irrigation purposes.

Name/Agency	**Irvine Ranch Water District**
Contact Person	**Mitchell Robinson**
Mailing Address	**P.O. BOX 57000**
City, State & Zip Code	**Irvine, CA 92619**

Line

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a) Non-agricultural for period	Jul 01, 2013 to	Dec 31, 2013	29,023.6		
b) Non-agricultural for period	Jan 01, 2014 to	Jun 30, 2014	23,687.5		
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d) Agricultural for period	Jan 01, 2014	Jun 30, 2014	786.4		
e) In-Lieu Water Production	Jul 01, 2013 to	Dec 31, 2013	0.0		
f) In-Lieu Water Production	Jan 01, 2014 to	Jun 30, 2014	0.0		
g) Total Actual Groundwater and In-Lieu Water Production				**54,410.4**	(1g)

2 All Water from Supplemental Sources (Ag AND Non-ag) used solely within OCWD boundaries excluding MWD in-lieu water, in acre-feet to nearest 1/10th: Reclaimed water excluded

a) For period	Jul 01, 2013 to	Dec 31, 2013	-2,609.5		
b) For period	Jan 01, 2014 to	Jun 30, 2014	1,528.1		
c) Water conservation Credit for[1]	Jul 01, 2013 to	Jun 30, 2014	1,081.4		
d) Total Water from Supplemental Sources				0.0	(2d)

3 Total Groundwater Production and Water from Supplemental Sources (1g + 2d)		54,410.4	3
4 Basin Production Percentage (%)	* (Included additional 380.2 af credit from 2014-15)	70.0%	4
5 Multiply line 3 by line 4 in acre-feet to nearest 1/10th (BPP Production)		**38,087.3**	5
6 If Line 5 is less than line 1g, enter the difference in Line 6	**Pumping Over BPP**	**16,323.1**	6

If Line 5 is greater than Line 1g, enter zero at Line 6 and Line 8

7 a BASIN EQUITY ASSESSMENT PER ACRE-FOOT for Non-Ag Water		**$609.00** /af	7a
b BASIN EQUITY ASSESSMENT PER ACRE-FOOT for Ag Water		**$672.00** /af	7b
c PROPORTIONAL BASIN EQUITY ASSESSMENT Based on Ag and Non Ag Production amounts		**$610.97** /af	7c
8 BASIN EQUITY ASSESSMENT: (Multiply Line 6 by Line 7C)		**$9,972,878**	8

If Line 8 = zero then ignore lines 9-11 and enter zero on line 12

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d	Remaining BEA Capital Credit (line 7C - line 9B)		$400.49 /af	9d
e	Amount of BEA Capital Credit applied against Project Capital Cost (IF line 6 > line 9A then line 9A X line 9D, if not then line 6 x line 9D)		$3,487,146	9e
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	IDP Well Nos. ET1 and ET2; IRWD 76, 77, 78, 107, 110 & Navy SGU Wells For period Jul 01, 2013 to Dec 31, 2013	**5,093.9**		
	IDP Well Nos. ET1 and ET2; IRWD 76, 77, 78, 107, 110 & Navy SGU Wells For period Jan 01, 2014 to Jul 01, 2014	**4,878.7**		
a	Total		9,972.6	10a
b	Documented O&M cost for Irvine Desalter Treatment Facility - $/af		**$112.87** /af	10b
c	BEA Credit - IDP O&M (if line 6 - line 9a> line 10a then line 10a x line 10b; if not, then (line 6 - line 9a) x line 10b)		$859,596	10c
d	Remaining BEA Capital Credit (line 7c - line10b)		$498.10 /af	10d
e	Amount of BEA Capital Credit applied against Project Capital Cost (IF line 6 - line 9a) > line 10a then line 10a x line 10d, if not then (line 6 - line 9a) x line 10d)		$3,793,466	10e
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	Well Nos. 21 and 22 For period Jul 01, 2013 to Dec 31, 2013	**3,733.6**		
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a	Total		6,934.4	11a
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c	BEA Credit - Wells 21/22 O&M (IF line 6 - line 9a - line 10a> line 11a then line 11a x line 11b; if not, then (line 6 - line 9a - line 10a) x line 11b)		$0	11c
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e	Amount of BEA Capital Credit applied against Project Capital Cost (IF line 6 - line 9a - line 10a) > line 11a then line 11a x line 11d, if not then (line 6 - line 9a - line 10a) x line 11d)		$0	11e
12	TOTAL BASIN EQUITY ASSESSMENT CREDIT FROM PROJECTS (9c+9e+10c+10e)		$9,972,878	12
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Date 1/13/15 Signature Kevin L Burton

Enclosed is check or money order No. _____ on _____ for $_____
(Bank No.)

1. Included additional 380.2 af credit from 2014-15

From: Xu, Wei
Sent: Thursday, May 12, 2016 11:35 AM
To: Mitchell Robinson
Cc: Eric Akiyoshi
Subject: BEA FY 2014/2015
Attachments: IRWD BEA FY13-14.pdf; BEA form 2014-15-ExbtA.Recy.Inc.rev4 for OCWD.xlsx

Hi Mitchell,

Our CFO Randy Fick pointed out one more thing on your last year's BEA report that needs to be amended. That is the water conservation credit. On your final BEA report for FY 2014/15, the conservation credit is 648.2 acre feet (1,028.4 acre feet – 380.2 = 648.2 acre feet) where 1,028.4 is the total available conservation credits and 380.2 is the credits IRWD borrowed in your FY 2013/14 BEA report in order to make the negative supplemental water volume become zero. However, instead of 380.2 acre feet, IRWD actually borrowed 418.4 acre feet (663 acre feet + 418.4 = 1,081.4 acre feet), where 663 is the total available conservation credits for FY 2013/14, and 1,081.4 is the total negative supplemental water volume that needs to be offset with water conservation credits (-2,609.5 + 1,528.1 = 1,081.4), where -2,609.5 is the first half year supplemental water and 1,528.1 is the second half year supplemental water. I am attaching your FY 2013/14 BEA report for your reference.

Therefore, the correct conservation credits for FY 2014/15 BEA report should be 1,028.4 – 418.4 = 610 acre feet. Attached here please find your FY 2014/15 BEA report revised with the corrected water conservation credits. Due to this slight decrease in conservation credits, your total BEA amount for the FY 2014/15 increased a little. However, this increase only impacts Wells 21/22 Facility O&M BEA credits. Nothing else changes.

Please review the revised BEA report attached here and let me know should you have any questions. Thanks.

Regards,

Wei Xu
Principal Project Accountant
Orange County Water District
18700 Ward Street, Fountain Valley, CA 92708
tel: (714) 378-3291
email: wxu@ocwd.com

SINCE 1933

G W R S
GROUNDWATER REPLENISHMENT SYSTEM

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www.ocwd.com

Exhibit No. 8
Witness: Wei Xu
Date: 10/10/17
Christianne Lee Fong, CSR 7559

Orange County Water District
Mailing Address: P.O. Box 8300
Fountain Valley, CA 92728-8300
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Contact Person	**Mitchell Robinson**
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2013

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d) Total Water from Supplemental Sources				0.0	(2d)

3 Total Groundwater Production and Water from Supplemental Sources (1g + 2d)	54,410.4	3
4 Basin Production Percentage (%) * (Included additional 380.2 af credit from 2014-15)	70.0%	4
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Date 1/13/15 Signature Kevin L Burton

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1. Included additional 380.2 af credit from 2014-15

BPP Calcs

☐ Include RW in Total Water

Water Use	JUL-DEC	JAN-JUN	Total		
Total Potable Water Use	32,157	27,402	59,560		Total Potable Water Use
Total Untreated Calculated Water Use (Exclude RW Supplement)	1,334	1,700	3,035		Total Untreated Calculated Water Use
Total Recycled Water Use (- water served to GAP)	18,516	14,109	32,625		Total Recycled Water Use
Total Water Use	**52,008**	**43,212**	**95,220**		**Total Water Use**
Recycled Water Production Only	**11,982**	**10,884**	**22,866**		
Water use inside OCWD (excluding RW)					
% Potable Water Used inside OCWD	75.0%	75.0%	75.0%		% Potable Water Used inside OCWD
% Untreated Water Used inside OCWD	14.6%	14.6%	14.6%		% Untreated Water Used inside OCWD
% Recycled Water Used inside OCWD	75.7%	75.7%	75.7%		% Recycled Water Used inside OCWD
Total Potable Water Use inside OCWD	24,131	20,563	44,694		Total Potable Water Use inside OCWD
Total Untreated Water Use inside OCWD	195	248	442		Total Untreated Water Use inside OCWD
MWD Supplement to Recycled Water System	3,793	1,904	5,697		MWD Supplement to Recycled Water System
GW Supplement to Recycled Water System	2,741	1,321	4,063	(includes SGU Water)	Groundwater to Recycled Water System
RW used Inside OCWD	0	0	0		RW used Inside OCWD
Total Water used inside OCWD	**30,860**	**24,036**	**54,895**		**Total Water used inside OCWD**
BPP=	**70%**		**38,427**		
Secondary BPP=	**70%**		**38,427**	(only use during MWD Alloctions)	
Non-exempt Groundwater Production					**Non-exempt Groundwater Production**
DRWF	15,832	12,472	28,305		DRWF
Well 115	505	644	1,148		Well 115
OPA Well	0	200	200		OPA Well
In-lieu Production	0	0	0	Line 1e and 1f of BEA form	In-lieu Production
Well 106 & 72 (non-potable)	578	0	578		Well 106 & 72 (non-potable)
DATS (Moved from exempt to non-exempt in 2014/15	4,310	4,290	8,600		DATS (Moved from exempt to non-exempt in 2014/15
Total Non-exempt GW	**21,225**	**17,605**	**38,830**	-403	**Total Non-exempt GW**
Exempt Groundwater Production					**Exempt Groundwater Production**
DATS	0	0	0		DATS (Moved from exempt to non-exempt in 2014/15
IDP - Potable	2,420	2,210	4,630		IDP - Potable
IDP - Non-potable	1,860	1,024	2,884		IDP - Non-potable
IDP - SGU	304	297	601		IDP - SGU
Wells 21/22	2,160	1,392	3,552		Wells 21/22
Total Exempt GW	**6,743**	**4,923**	**11,666**		**Total Non-exempt GW**
Total GW Production (inside OCWD)	27,968	22,528	50,496		**Total Non-exempt GW**
Total Supplemental Water Inside OCWD before Water Conservation	**2,892**	**1,507**	**4,400**	Line 2a and 2b of BEA Form	**Total GW Production (inside OCWD)**
					Total Supplemental Water Inside OCWD including RW
Potable Ag Groundwater (Type 66 Water Users inside OCWD)	73	20	93	From Acre20FY.xls (2008 water certified as MWD Ag, so used 0)	
Non-potable Ag Groundwater (Type 68 Water Users inside OCWD)	600	441	1,040	From Ag RA Credits, Email Denise To-Nguyen for report	
Total Ag Groundwater	**673**	**460**	**1,133**	Line 1c and 1d of BEA Form	
Total M&I Groundwater	**27,295**	**22,068**	**49,363**	Line 1a and 1b of BEA Form	
Water Conservation Credits			610	From Wei Xu BEA Spreadsheet, Line 2c of BPP Form. This number is verified by IRWD Conservation Group (Fiona Sanchez)	
Total Supplemental Water inside OCWD			**5,010**		

PCL XL error

Subsystem: GE_VECTOR

Error: GEEmptyClipPath Warning: IllegalMediaSize

Orange County Water District
Mailing Address: P.O. Box 8300
Fountain Valley, CA 92728-8300
(714) 378-3200

Exhibit B
Ammended 10/9/13

BASIN EQUITY ASSESSMENT REPORT

Water Year from July 1, 2014 Through June 30, 2015

BASIN EQUITY ASSESSMENT REPORT

For the year commencing **Jul 01, 2014** and ending Jun 30, 2015

To be completed and filed no later than September 30, 2015 by all Operators of Water Producing Facilities in OCWD who during the Water Year 2014 produced more than 25 acre-feet of water for both irrigation and other than irrigation purposes.

Name/Agency	**Irvine Ranch Water District**
Contact Person	**Mitchell Robinson**
Mailing Address	**P.O. BOX 57000**
City, State & Zip Code	**Irvine, CA 92619**

Line

1 Total Groundwater Production (See attached schedule)

a) Non-agricultural for period	Jul 01, 2014 to	Dec 31, 2014	27,294.7		
b) Non-agricultural for period	Jan 01, 2015 to	Jun 30, 2015	22,068.1		
c) Agricultural for period	Jul 01, 2014	Dec 31, 2014	672.8		
d) Agricultural for period	Jan 01, 2015	Jun 30, 2015	460.2		
e) In-Lieu Water Production	Jul 01, 2014 to	Dec 31, 2014	0.0		
f) In-Lieu Water Production	Jan 01, 2015 to	Jun 30, 2015	0.0		
g) Total Actual Groundwater and In-Lieu Water Production				**50,495.8**	(1g)

2 All Water from Supplemental Sources (Ag AND Non-ag) used solely within OCWD boundaries excluding MWD in-lieu water, in acre-feet to nearest 1/10th: Recycled water excluded

a) For period	Jul 01, 2014 to	Dec 31, 2014	2,892.1		
b) For period	Jan 01, 2015 to	Jun 30, 2015	1,507.4		
c) Water conservation Credit for[1]	Jul 01, 2014 to	Jun 30, 2015	610.0		
d) Total Water from Supplemental Sources				5,009.5	(2d)

3 Total Groundwater Production and Water from Supplemental Sources (1g + 2d)	55,505.3	3
4 Basin Production Percentage (%)	70.0%	4
5 Multiply line 3 by line 4 in acre-feet to nearest 1/10th (BPP Production)	**38,853.7**	5
6 If Line 5 is less than line 1g, enter the difference in Line 6 — **Pumping Over BPP**	**11,642.1**	6
If Line 5 is greater than Line 1g, enter zero at Line 6 and Line 8		
7 a BASIN EQUITY ASSESSMENT PER ACRE-FOOT for Non-Ag Water	**$598.00** /af	7a
b BASIN EQUITY ASSESSMENT PER ACRE-FOOT for Ag Water	**$704.00** /af	7b
c PROPORTIONAL BASIN EQUITY ASSESSMENT Based on Ag and Non Ag Production amounts	**$600.38** /af	7c
8 BASIN EQUITY ASSESSMENT: (Multiply Line 6 by Line 7C)	**$6,989,654**	8

If Line 8 = zero then ignore lines 9-11 and enter zero on line 12

1. Excludes additional 380.2 af credit used in 2013-14

Orange County Water District
Mailing Address: P.O. Box 8300
Fountain Valley, CA 92728-8300
(714) 378-3200

Exhibit B
Ammended 10/9/13

BASIN EQUITY ASSESSMENT REPORT

For the year commencing Jul 01, 2014 and ending Jun 30, 2015

9	**Groundwater Produced from Colored Water Treatment Facility (No longer Exempt a**			
	DATS Well Nos. C8 and C9			
	For period Jul 01, 2014 to Dec 31, 2014	0.0		
	DATS Well Nos. C8 and C9			
	For period Jan 01, 2015 to Jul 01, 2015	0.0		
	a Total		0.0	9a
	b Documented O&M cost for Colored Water Treatment Facility - $/af		**$20.00** /af	9b
	c BEA Credit - DATS O&M (if line 6> line 9A then line 9A x line 9B; if not line 6 x line 9B)		$0	9c
	d Remaining BEA Capital Credit (line 7C - line 9B)		$580.38 /af	9d
	e Amount of BEA Capital Credit applied against Project Capital Cost (IF line 6 > line 9A then line 9A X line 9D, if not then line 6 x line 9D)		$0	9e
10	**Groundwater Produced from Irvine Desalter Project Treatment Facility**			
	IDP Well Nos. ET1 and ET2; IRWD 76, 77, 78, 107, 110 & Navy SGU Wells			
	For period Jul 01, 2014 to Dec 31, 2014	4,582.8		
	IDP Well Nos. ET1 and ET2; IRWD 76, 77, 78, 107, 110 & Navy SGU Wells			
	For period Jan 01, 2015 to Jul 01, 2015	3,531.4		
	a Total		8,114.2	10a
	b Documented O&M cost for Irvine Desalter Treatment Facility - $/af		**$43.96** /af	10b
	c BEA Credit - IDP O&M (if line 6 - line 9a> line 10a then line 10a x line 10b; if not, then (line 6 - line 9a) x line 10b)		$356,705	10c
	d Remaining BEA Capital Credit (line 7c - line10b)		$556.42 /af	10d
	e Amount of BEA Capital Credit applied against Project Capital Cost (IF line 6 - line 9a) > line 10a then line 10a x line 10d, if not then (line 6 - line 9a) x line 10d)		$4,514,885	10e
11	**Groundwater Produced from Wells 21 and 22 Water Treatment Facility**			
	Well Nos. 21 and 22			
	For period Jul 01, 2014 to Dec 31, 2014	2,160.0		
	Well Nos. 21 and 22			
	For period Jan 01, 2015 to Jun 30, 2015	1,391.5		
	a Total		3,551.5	11a
	b Documented O&M cost for Wells 21/22 Facility - $/af		**$600.38** /af	11b
	c BEA Credit - Wells 21/22 O&M (IF line 6 - line 9a - line 10a> line 11a then line 11a x line 11b; if not, then (line 6 - line 9a - line 10a) x line 11b)		$2,118,063	11c
	d Remaining BEA Capital Credit (line 7c - line11b)		$0.00 /af	11d
	e Amount of BEA Capital Credit applied against Project Capital Cost (IF line 6 - line 9a - line 10a) > line 11a then line 11a x line 11d, if not then (line 6 - line 9a - line 10a) x line 11d)		$0	11e
12	TOTAL BASIN EQUITY ASSESSMENT CREDIT FROM PROJECTS (10c+10e+11c+11e)*		$6,989,654	12
13	REMAINING BASIN EQUITY ASSESSMENT TO BE PAID (line 8 - line 11)		$0	13

Note: Return original statements and pay assessment on or before September 30, 2015 to avoid penalties and interest.

I DECLARE under the penalties of perjury that this Basin Assessment Report, including the

* In Line 12 eliminated DATS (Line 9) and added Wells 21 and 22 (Line 11)

Date _____ Signature _____

Enclosed is check or money order No. _____ on _____ for $_____
(Bank No.)

1. Excludes additional 380.2 af credit used in 2013-14

ORANGE COUNTY WATER DISTRICT
Mailing Address: P. O. Box 8300
Fountain Valley, CA 92728-8300
(714)378-3200

DRWF

BASIN EQUITY ASSESSMENT REPORT

For the year commencing July 1, 2014 and ending June 30, 2015

To be completed and filed no later than September 30, 2015 by Irvine Ranch Water District for Dyer Road Wellfield production, per Third Amendment to the Agreement, dated November 3, 1999.

Irvine Ranch Water District
P. O. Box 57000
Irvine, CA 92619-7000

Line		Actual A.F.	Exceedance A.F.
1	GROUNDWATER AND IN-LIEU WATER PRODUCTION FROM DYER ROAD WELL FIELD (DRWF)		
a)	CLEAR Water Production for Period July 1, 2014 to Sept. 30, 2015	9,036.6 1a	
b)	CLEAR Water Production for Period May 1, 2015 to June 30, 2015	5,520.1 1b	
c)	CLEAR Water Production ~~that exceeds 20,000 AF~~ "Summer" ~~limitation~~ months (Line 1a + Line 1b).	14,556.7	N/A 1c
d)	Total CLEAR Water Production for Period July 1, 2014 to June 30, 2015	28,304.7 1d	
e)	Amount of CLEAR Water Production for Period July 1, 2014 to June 30, 2015 that exceeds above 20,000 AF and up to 28,000 AF	8,000.0 1e	
f)	Total COLORED Water Production up to 8,000 AF for Period July 1, 2014 to June 30, 2015	8,000.0 1f	
g)	Amount of CLEAR Water Production over above 20,000 AF and up to 28,000 AF that exceeds COLORED Water Production Match for Period July 1, 2014 to June 30, 2015 (If Line 1f is less than 8,000 AF and Line 1e is greater than Line 1f, Subtract Line 1f from Line 1e, otherwise zero).		0.0 1g
h)	Total IN LIEU Water Received for Period July 1, 2014 to June 30, 2015	0.0 1h	
i)	Total CLEAR Water Production and IN LIEU Water Received for Period July 1, 2014 to June 30, 2015 (Line 1d plus Line 1h)	28,304.7 1i	
j)	Amount of CLEAR Water Production and IN LIEU Water Received for Period July 1, 2014 to June 30, 2015 that exceeds 28,000 AF limitation (Subtract 28,000 AF from Line 1i).		304.7 1j
2	BASIN EQUITY ASSESSMENT PER ACRE-FOOT		$ 598.00 2
3	BASIN EQUITY ASSESSMENT: Multiply the total of Lines 1c, 1g, and 1j by Line 2		$ 182,210.60 3

Note: Return original statement and pay assessment on or before September 30, 2015 to avoid penalties and interest.

I DECLARE under the penalties of perjury that this Basin Equity Assessment Report, including the statements made and the figures shown, has been examined by me, and to the best of my knowledge and belief is a true, correct and complete statement.

Date_____ **Signature** _____ **Phone:** _____

ENCLOSED IS CHECK OR MONEY ORDER NO. _____ **ON** _____ **FOR $**_____
(Bank No.)

DATS 2014-15 O&M Expenses

Raw DATS water pumped: -

G/L 443 Expenses		Total O&M $/AF of Raw DATS Water	
43 Expense Codes 110, 120, & 130:	[redacted]	Treatment Plant Staff costs:	$0.00
		DATS Plant Energy:	$0.00
G/L 443 Expense Code 240:	[redacted]	Telephone service:	$0.00
G/L 443 Expense Code 310:	[redacted]	Chemical treatment:	$0.00
G/L 443 Expense Code 320:	[redacted]	Operating Supplies:	$0.00
G/L 443 Expense Code 460:	[redacted]	Membrane Replacements:	$0.00
G/L 443 Expense Code 490:	[redacted]	Cost of disposing of concentrate to OCSD:	$0.00
G/L 443 Expense Code 500:	[redacted]	Repairs:	$0.00
G/L 443 Expense Code 600:	[redacted]	Equipment Usage:	$0.00
	-	**Subtotal O&M $/AF:**	**$0.00**
Land Lease	[redacted]	DATS Land Lease Payment:	$0.00

DATS Capital Credit on 7-01-14 (without the debt *interest* on original construction costs):	[redacted]	Change Cell link to current year's capital exemption credit	
From Tanya Fournier or Jennifer Davis: Average IRWD interest rate for servicing debt for fiscal year 2014-15:	[redacted]		
Cost of financing the DATS Capital for fiscal year 2014-15:	$0	$55,260.52	
Cost of debt service on DATS capital per AF:	**$0.00**	0	
$20/AF Incentive from OCWD:	**$20.00**		
Total O&M $/AF for treating DATS Water:	**$20.00**		

	DATS Energy $/AF
G/L 443 Expense Code 220:	[redacted]
DATS Plant plus Wells $/AF:	$0.00
Cost to lift well water to ground surface:	$0.00
DATS Plant Energy:	$0.00

IRWD does not include Expense Code 210 in the above because it pays the non-exempt OCWD Replenishment Assessment.

IDP Potable, Nonpotable, and SGU O&M Expenses
FY 2014-15

IDP Potable Treatment Plant O&M Expenses

	G/L 468 Expenses			
			4,629.5	IDP potable well water pumpage (without Well 115) in AF. (Ofelia's Water Flow Consolidated spreadsh
			$727,781.17	Process 5180 (historical G/L 468) Expense Code 220 (Electricity) for both Wells 76,77,110 and LAWRF
G/L 468 Expense Codes 110, 120, & 130:	$344,382.02	Treatment Plant Staff costs	$353,169	Cost to lift well water to ground surface for wells 76, 77, 107, & 110. (See Tom Bonkowski to prepare t
	374,612	IDP Plant Electrical Energy	$374,612	
G/L 468 Expense Code 240:	$0	Telephone		
G/L 468 Expense Code 310:	$207,044	Chemical treatment		
G/L 468 Expense Code 320:	$48,612	Operating Supplies		
G/L 468 Expense Code 340:	$0	Postage		
G/L 468 Expense Code 420:	$0	Equipment Rental		
G/L 468 Expense Code 460:	$0	Membrane Replacements		
G/L 468 Expense Code 490:	$0	Repairs - Other Agencies		
G/L 468 Expense Code 500:	$0	Repairs		
G/L 468 Expense Code 530:	$866	Water Quality Sampling & Lab Fees		
G/L 468 Expense Code 600:	$26,682	Equipment Usage		
Subtotal:	$1,002,198.37	IDP Potable O&M $/AF:	$216.48	

IDP Nonpotable Wells and Plant (PAP) O&M Expenses

	G/L 567 Expenses			
		ET-1 Pumpage only (in AF):		
		ET-1, ET-2, and w78 pumpage:	2,883.6	From Ofelia's Water Flow Consolidated spreadsheet.
G/L 567 Expense Codes 110, 120, & 130:	79,827	Principal Aquifer Plant Staff costs		
(Do NOT type the Expense code 220)	69,820	Electricity for PAP Treatment Costs (Well ET-1 pump motor electricity is not included.)		
G/L 567 Expense Code 310:	34,697	Chemical treatment		
G/L 567 Expense Code 320:	8,927	Operating Supplies		
G/L 567 Expense Code 340:	-	Postage		
G/L 567 Expense Code 500:	-	Repairs		
G/L 567 Expense Code 530:	2,186	Water Quality Sampling & Lab Fees		
G/L 567 Expense Code 600:	3,677	Equipment Usage		
Subtotal:	199,134	IDP Nonpotable O&M $/AF:	$69.06	

IDP SGU Expenses

	G/L 568 Expenses			
		Raw SGU water pumped in AF:	601.1	From Ofelia's Water Flow Consolidated spreadsheet.
G/L 568 Expense Codes 110, 120, & 130:	99,839	Treatment Plant Staff costs		
G/L 568 Expense Code 220:	85,499	Electricity		
G/L 568 Expense Code 310:	68,774	Chemical treatment		
G/L 568 Expense Code 320:	(74,955)	Operating Supplies		
G/L 568 Expense Code 340:	-	Postage		
G/L 568 Expense Code 420:	3,325	Equipment Rental		
G/L 568 Expense Code 490:	-	Repairs - Other Agencies		
G/L 568 Expense Code 500:	42,376	Repairs		
G/L 568 Expense Code 530:	2,873	Water Quality Sampling & Lab Fees		
G/L 568 Expense Code 550:	-	Data Processing		
G/L 568 Expense Code 600:	5,102	Equipment Usage		
Subtotal:	$232,834	IDP SGU O&M $/AF:	$387.35	

Other Expenses and Credits

		Pumpage for 3 types of IDP water:	8,114.2	
O&M $ for the 3 types of water above:	$1,434,167	O&M per AF before credits:	$176.75	
Annual Navy reimbursement (IDP "Off-Station"):	(460,057)	See 'Shed of Navy TCE ra'. Change to new FY.		
Annual Navy reimbursement (SGU):	($91,687.00)	to obtain number, see IRWD Accounting (Sophia Phuong) for annual O&M expenses accrued to G/L 371		
Annual MWD LRP (GRP):	(1,115,500)	see Denise To-Nguyen for the annual MWD LRP (Local Resource Project)		
Net IRWD O&M Exempted Costs:	($233,077)	O&M per AF after credits:	($28.72)	

IDP Capital Costs as of 7-01-14	$20,955,800	Remember to draw the Capital Costs down by the Capital Credit
Average IRWD interest rate for servicing debt for fiscal year 2014-15	2.04%	
Interest on the IDP Capital for fiscal year 2014-15	$427,498	
Cost of debt service on IDP capital per AF:	**$52.69**	
$20/AF Incentive from OCWD:	**$20.00**	
Total O&M $/AF for treating IDP Potable, Nonpotable, and SGU Water:	**$43.96**	

Portion c

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Wells 21/22 2014-15 O&M Expenses

Raw Wells 21/22 water pumped: 3,552

	Process 5187 Expenses		Total O&M $/AF of Raw Wells 21/22 Water
43 Expense Codes 110, 120, & 130:	253,695	Treatment Plant Staff costs:	$71.43
	340,528	Wells 21/22 Plant Energy:	$95.88
G/L 443 Expense Code 240:	-	Telephone service:	$0.00
G/L 443 Expense Code 310:	79,333	Chemical treatment:	$22.34
G/L 443 Expense Code 320:	8,790	Operating Supplies:	$2.48
G/L 443 Expense Code 460:	-	Membrane Replacements:	$0.00
G/L 443 Expense Code 490:	990,043	Cost of disposing of concentrate to OCSD:	$278.77
G/L 443 Expense Code 500:	56,251	Repairs:	$15.84
G/L 443 Expense Code 600:	23,381	Equipment Usage:	$6.58
	1,752,021	**Subtotal O&M $/AF:**	**$493.32**

Wells 21/22 Capital Credit on 7-01-14 (without the debt *interest* on original construction costs):	$27,946,799	Change Cell link to current year's capital exemption credit
From Tanya Fournier or Jennifer Davis: Average IRWD interest rate for servicing debt for fiscal year 2014-15:	2.04%	0.51% For 3 months of operation in FY2012-13. Use 0.53% instead
Cost of financing the Wells 21/22 Capital for fiscal year 2014-15:	$570,115	
Cost of debt service on Wells 21/22 capital per AF:	**$160.53**	
$20/AF Incentive from OCWD:	**$20.00**	
Total O&M $/AF for treating Wells 21/22 Water:	**$673.85**	

IRWD does not include Expense Code 210 in the above because it pays the non-exempt OCWD Replenishment Assessment.

If needed to verify, see IRWD Accounting (Bonnie MacDonald) for ar

Facility Capital and Operation and Maintenance
Reimbursements Schedule

Investment Rate 5.475%
Average inflation rate 3.000%

O&M Startup date 08/16/06

	Year O&M	Year Project	Trust Deposit	Payments Facility	Payments O&M	Accumulated Payments	Trust Balance	Interest		
Facility										
6/20/2003	received	0.0	14,911,000	500,000		500,000	15,200,082		14,411,000	
7/26/2004	received	1.0		707,200		1,207,200	15,286,405		13,703,800	
7/24/2006	received	2.0		3,182,400		4,389,600	12,104,005		10,521,400	
2/12/2007	(invoiced)			3,182,400		7,572,000	9,410,100		7,339,000	
Total			14,911,000	7,572,000			9,410,100	2,071,100	7,339,000	
O&M										
2/16/2007	0.5	2.5			182,619	7,754,619	9,480,102	252,621	9,227,481	
8/16/2007	1.0	3.0			185,358	7,939,977	9,548,207	253,463	9,294,744	
2/16/2008	1.5	3.5			188,139	8,128,116	9,617,347	257,279	9,360,068	
8/16/2008	2.0	4.0			190,961	8,319,077	9,684,453	258,067	9,426,386	report to OCWD for 08-09
2/16/2009	2.5	4.5			193,825	8,512,902	9,750,453	259,825	9,490,628	report to OCWD for 08-09
8/16/2009	3.0	5.0			196,732	8,709,634	9,815,273	261,552	9,553,721	report to OCWD for 09-10
2/16/2010	3.5	5.5			199,684	8,909,318	9,878,836	263,247	9,615,589	report to OCWD for 09-10
8/16/2010	4.0	6.0			202,679	9,111,997	9,941,062	264,905	9,676,157	report to OCWD for 10-11
2/16/2011	4.5	6.5			205,719	9,317,716	10,001,868	266,525	9,735,343	report to OCWD for 10-11
8/16/2011	5.0	7.0			208,804	9,526,520	10,061,169	268,105	9,793,064	report to OCWD for 11-12
2/16/2012	5.5	7.5			211,937	9,738,457	10,118,875	269,643	9,849,232	report to OCWD for 11-12
8/16/2012	6.0	8.0			215,116	9,953,573	10,174,895	271,136	9,903,759	report to OCWD for 12-13
2/16/2013	6.5	8.5			218,343	10,171,916	10,229,133	272,581	9,956,552	report to OCWD for 12-13
8/16/2013	7.0	9.0			221,617	10,393,533	10,281,492	273,976	10,007,516	report to OCWD for 13-14
2/16/2014	7.5	9.5			224,942	10,618,475	10,331,869	275,319	10,056,550	report to OCWD for 13-14
8/16/2014	8.0	10.0			228,316	10,846,791	10,380,158	276,605	10,103,553	report to OCWD for 14-15
2/16/2015	8.5	10.5			231,741	11,078,532	10,426,251	277,834	10,148,417	report to OCWD for 14-15
8/16/2015	9.0	11.0			235,217	11,313,749	10,470,035	279,001	10,191,034	
2/16/2016	9.5	11.5			238,746	11,552,495	10,511,392	280,103	10,231,289	
8/16/2016	10.0	12.0			242,326	11,794,821	10,550,202	281,136	10,269,066	
2/16/2017	10.5	12.5			245,961	12,040,782	10,586,341	282,100	10,304,241	
8/16/2017	11.0	13.0			249,651	12,290,433	10,619,678	282,988	10,336,690	
2/16/2018	11.5	13.5			253,396	12,543,829	10,650,081	283,799	10,366,282	
8/16/2018	12.0	14.0			257,196	12,801,025	10,677,411	284,526	10,392,885	
2/16/2019	12.5	14.5			261,054	13,062,079	10,701,526	285,169	10,416,357	
8/16/2019	13.0	15.0			264,970	13,327,049	10,722,278	285,722	10,436,556	
2/16/2020	13.5	15.5			268,945	13,595,994	10,739,515	286,182	10,453,333	
8/16/2020	14.0	16.0			272,979	13,868,973	10,753,079	286,543	10,466,536	
2/16/2021	14.5	16.5			277,074	14,146,047	10,762,808	286,803	10,476,005	
8/16/2021	15.0	17.0			281,230	14,427,277	10,768,533	286,955	10,481,578	
2/16/2022	15.5	17.5			285,448	14,712,725	10,770,080	286,995	10,483,085	
8/16/2022	16.0	18.0			289,729	15,002,454	10,767,272	286,921	10,480,351	
2/16/2023	16.5	18.5			294,076	15,296,530	10,759,921	286,725	10,473,196	
8/16/2023	17.0	19.0			298,487	15,595,017	10,747,838	286,404	10,461,434	
2/16/2024	17.5	19.5			302,964	15,897,981	10,730,823	285,949	10,444,874	
8/16/2024	18.0	20.0			307,509	16,205,490	10,708,674	285,360	10,423,314	
2/16/2025	18.5	20.5			312,122	16,517,612	10,681,180	284,628	10,396,552	
8/16/2025	19.0	21.0			316,803	16,834,415	10,648,123	283,746	10,364,377	
2/16/2026	19.5	21.5			321,555	17,155,970	10,609,279	282,711	10,326,568	
8/16/2026	20.0	22.0			326,379	17,482,349	10,564,416	281,516	10,282,900	
2/16/2027	20.5	22.5			331,274	17,813,623	10,513,295	280,153	10,233,142	
8/16/2027	21.0	23.0			336,243	18,149,866	10,455,669	278,617	10,177,052	
2/16/2028	21.5	23.5			341,287	18,491,153	10,391,284	276,902	10,114,382	
8/16/2028	22.0	24.0			346,406	18,837,559	10,319,877	274,999	10,044,878	
2/16/2029	22.5	24.5			351,603	19,189,162	10,241,177	272,903	9,968,274	
8/16/2029	23.0	25.0			356,876	19,546,038	10,154,903	270,602	9,884,301	
2/16/2030	23.5	25.5			362,230	19,908,268	10,060,768	268,095	9,792,673	
8/16/2030	24.0	26.0			367,663	20,275,931	9,958,474	265,369	9,693,105	
2/16/2031	24.5	26.5			373,178	20,649,109	9,847,713	262,417	9,585,296	
8/16/2031	25.0	27.0			378,775	21,027,884	9,728,169	259,231	9,468,938	
2/16/2032	25.5	27.5			384,458	21,412,342	9,599,515	255,804	9,343,711	
8/16/2032	26.0	28.0			390,224	21,802,566	9,481,415	272,124	9,209,291	
2/16/2033	26.5	28.5			396,077	22,198,643	9,313,519	228,181	9,085,338	
8/16/2033	27.0	29.0			402,019	22,600,662	9,155,471	243,971	8,911,500	
2/16/2034	27.5	29.5			408,049	23,008,711	8,966,901	219,479	8,747,422	
8/16/2034	28.0	30.0			414,169	23,422,880	8,807,428	254,696	8,552,732	
2/16/2035	28.5	30.5			420,383	23,843,263	8,616,658	229,613	8,387,045	
8/16/2035	29.0	31.0			426,688	24,269,951	8,414,167	224,197	8,189,970	
2/16/2036	29.5	31.5			433,088	24,703,039	8,199,598	218,519	7,981,079	
8/16/2036	30.0	32.0			439,584	25,142,623	7,972,480	212,466	7,760,014	
2/16/2037	30.5	32.5			446,179	25,588,802	7,732,329	206,028	7,526,301	
8/16/2037	31.0	33.0			452,871	26,041,673	7,478,748	199,290	7,279,458	
2/16/2038	31.5	33.5			459,664	26,501,337	7,211,245	192,161	7,019,084	
8/16/2038	32.0	34.0			466,559	26,967,896	6,929,337	184,651	6,744,686	
2/16/2039	32.5	34.5			473,557	27,441,453	6,632,519	176,739	6,455,780	
8/16/2039	33.0	35.0			480,661	27,922,114	6,320,278	168,420	6,151,858	
2/16/2040	33.5	35.5			487,871	28,409,985	5,992,082	159,675	5,832,407	
8/16/2040	34.0	36.0			495,189	28,905,174	5,647,382	150,489	5,496,893	
2/16/2041	34.5	36.5			502,616	29,407,790	5,285,614	140,848	5,144,766	
8/16/2041	35.0	37.0			510,156	29,917,946	4,906,196	130,738	4,775,458	
2/16/2042	35.5	37.5			517,808	30,435,754	4,508,529	120,141	4,388,388	
8/16/2042	36.0	38.0			525,576	30,961,330	4,091,995	109,042	3,982,953	
2/16/2043	36.5	38.5			533,459	31,494,789	3,655,958	97,422	3,558,536	
8/16/2043	37.0	39.0			541,460	32,036,249	3,199,763	85,265	3,114,498	
2/16/2044	37.5	39.5			549,583	32,585,832	2,722,735	72,555	2,650,180	
8/16/2044	38.0	40.0			557,827	33,143,659	2,224,177	59,269	2,164,908	
2/16/2045	38.5	40.5			566,194	33,709,853	1,703,374	45,391	1,657,983	
8/16/2045	39.0	41.0			574,686	34,284,539	1,159,587	30,899	1,128,688	
2/16/2046	39.5	41.5			583,307	34,867,846	592,057	15,777	576,280	
8/16/2046	40.0	42.0			592,057	35,459,903	-	-	-	
Total			14,911,000	7,572,000	27,887,903			20,548,903		

460,057

Summary

Initial Deposit to Trust	14,911,000
Interest	20,548,903
Facility Payments	(7,572,000)
O&M Payments	(27,887,903)
Balance	-

Drawdown of the IDP BEA Capital Credit

	Balance on the IDP BEA Capital Credit
Total of IDP Capital Credits on 11-30-09:	$36,821,998
Just for this year only: Offset from MWD LRP for IDP for FY 07-08:	$784,800
IDP Capital Exemption Credit spent to pay the Preliminary Basin Equity Assessment in 2007-08:	$0
Best estimate of balance of IDP Capital Credits on 7-1-08:	$36,037,198
IDP Capital Exemption Credit spent to pay the Preliminary Basin Equity Assessment in 2008-09:	$2,733,141
Remaining balance of IDP Capital Credits on 7-1-09:	$33,304,056
IDP Capital Exemption Credit spent to pay the Preliminary Basin Equity Assessment in 2009-10:	$2,979,857
Remaining balance of IDP Capital Credits on 7-01-10:	$30,324,199
IDP Capital Exemption Credit spent to pay the Preliminary Basin Equity Assessment in 2010-11:	$1,267,984
Remaining balance of IDP Capital Credits on 7-01-11:	$29,056,215
IDP Capital Exemption Credit spent to pay the Preliminary Basin Equity Assessment in 2011-12:	$2,130,270
Remaining balance of IDP Capital Credits on 7-01-12:	$26,925,945
IDP Capital Exemption Credit spent to pay the Preliminary Basin Equity Assessment in 2012-13	$2,176,679
Remaining balance of IDP Capital Credits on 7-01-13:	$24,749,266
IDP Capital Exemption Credit spent to pay the Preliminary Basin Equity Assessment in 2013-14	$3,793,466
Remaining balance of IDP Capital Credits on 7-01-14:	$20,955,800
IDP Capital Exemption Credit spent to pay the Preliminary Basin Equity Assessment in 2014-15	$4,514,885
Remaining balance of IDP Capital Credits on 7-01-15:	**$16,440,915**

Xu, Wei:
This is the credit applied from 2013/14 BEA report filed by Il

Drawdown of the DATS BEA Capital Credit

	Drawing down the original DATS BEA Capital Credit	Drawing down the DATS BEA Capital Credit from the **interest** on the capital spent in 4 years of original construction	Totals
Total of DATS Capital Credits on 7-01-02:	$15,991,665	$558,447	$16,550,112
DATS Capital Exemption Credit spent to pay the Preliminary Basin Equity Assessment in 2002-03:	$175,305	$6,122	$181,427
Remaining balance of DATS Capital Credits on 7-01-03:	$15,816,360	$552,326	$16,368,685
DATS Capital Exemption Credit spent to pay the Preliminary Basin Equity Assessment in 2003-04:	$980,901	$34,254	$1,015,155
Remaining balance of DATS Capital Credits on 7-01-04:	$14,801,205	$518,071	$15,353,530
DATS Capital Exemption Credit spent to pay the Preliminary Basin Equity Assessment in 2004-05:	$576,410	$20,129	$596,538
Remaining balance of DATS Capital Credits on 7-01-05:	$14,224,795	$497,943	$14,756,992
DATS Capital Exemption Credit spent to pay the Preliminary Basin Equity Assessment in 2005-06:	$767,411	$26,799	$794,210
Remaining balance of DATS Capital Credits on 7-01-06:	$13,457,384	$471,144	$13,962,782
DATS Capital Exemption Credit spent to pay the Preliminary Basin Equity Assessment in 2006-07:	$338,780	$11,831	$350,611
Remaining balance of DATS Capital Credits on 7-01-07:	$13,118,604	$459,313	$13,612,171
DATS Capital Exemption Credit spent to pay the Preliminary Basin Equity Assessment in 2007-08:	$33,996	$1,187	$35,183
Remaining balance of DATS Capital Credits on 7-01-08:	$13,084,608	$458,126	$13,576,988
DATS Capital Exemption Credit spent to pay the Preliminary Basin Equity Assessment in 2008-09:	$1,828,543	$63,855	$1,892,398
Remaining balance of DATS Capital Credits on 7-01-09:	$11,256,065	$394,271	$11,684,590
DATS Capital Exemption Credit spent to pay the Preliminary Basin Equity Assessment in 2009-10:	$2,165,865	$75,635	$2,241,500
Remaining balance of DATS Capital Credits on 7-01-10:	$9,090,199	$318,636	$9,443,090
DATS Capital Exemption Credit spent to pay the Preliminary Basin Equity Assessment in 2010-11:	$1,193,059	$41,663	$1,234,722
Remaining balance of DATS Capital Credits on 7-01-11:	$7,897,140	$276,973	$8,208,368
DATS Capital Exemption Credit spent to pay the Preliminary Basin Equity Assessment in 2011-12:	$2,151,417	$75,130	$2,226,547
Remaining balance of DATS Capital Credits on 7-01-12:	$5,745,723	$201,844	$5,981,821
DATS Capital Exemption Credit spent to pay the Preliminary Basin Equity Assessment in 2012-13:	$1,464,167	$51,130	$1,515,298
Remaining balance of DATS Capital Credits on 7-01-13:	$4,281,556	$150,713	$4,466,523
DATS Capital Exemption Credit spent to pay the Preliminary Basin Equity Assessment in 2013-14:	$3,367,750	$117,606	$3,485,355

This cell is presently linked to "BEA Form I62." After each FYE, do a Paste Special - Value command on this cel... Check last year:

Drawdown of the Wells 21/22 BEA Capital Credit

	Balance on the IDP BEA Capital Credit	
Total of Wells 21/22 Capital Credits on 04-01-13:	$40,536,207	
Just for this year only: Offset from Grant Funding	($12,589,408)	
	$27,946,799	
Wells 21/22 Capital Exemption Credit spent to pay the Preliminary Basin Equity Assessment in 2012-13:	$0	
Remaining balance of Wells 21/22 Capital Credits on 7-1-13:	$27,946,799	
Wells 21/22 Capital Exemption Credit spent to pay the Preliminary Basin Equity Assessment in 2013-14:	$0	
Remaining balance of Wells 21/22 Capital Credits on 7-1-14:	$27,946,799	
Wells 21/22 Capital Exemption Credit spent to pay the Preliminary Basin Equity Assessment in 2014-15:	$0	This cell is p
Remaining balance of Wells 21/22 Capital Credits on 7-1-15:	$27,946,799	and then mo

resently linked to "BEA Form I88." After each FYE, do a Paste Special - Value command on this cel...
ve the link down to the next FY...

DATS Capital Costs

Largest DATS Purchase Orders (Project 15050)		
P&L constructs DATS treatment plant & two well head facilities (includes 14 Change Orders):	$10,801,125	
Beylik Drilling costs to construct well casings C-8 and C-9 :	$2,258,789	
Boyle Engineering Corp -- design:	$329,009	
City of Santa Ana -- cost of land for treatment plant:	$175,000	
Separate Pascal & Ludwig costs for DATS permits and landscaping the treatment plant:	$167,995	
CDM hydrogeological services during well construction:	$143,431	
Malcolm Pirnie -- design:	$70,895	
Subtotal of major expenditures; percentage of the total:	$13,946,244	96%
All Purchase Orders on Accounts Payable:	$14,591,513	
IRWD Payroll:	$496,043	
IRWD Payroll Benefits:	$7,542	
IRWD G&A:	$861,376	
Subtotal:	$15,956,474	
Rental of IRWD equipment, purchase of inventory out of the warehouse, etc.:	$35,191	
Total of all DATS expenditures:	**$15,991,665**	

Financing the DATS Capital Costs

		Principle spent in	0.33%	13.49%
Total "Acquisition Amount" for Project 15050, Construction of DATS:	**$15,991,665**	each fiscal year:	$52,772	$2,157,276
Deduct any state or federal grants or gifts to construct DATS:	**$0**	(IRWD did not receive any state or federal grants o		
	$15,991,665			

Debt servicing for planning, designing, and constructing DATS		Annual interest rate for financing IRWD's debt		
year 1998-99:	$1,710	**3.24%**	$1,710	$0
year 1999-00:	$76,026	**3.44%**	$1,815	$74,210
year 2000-01:	$181,668	**3.36%**	$1,773	$72,484
year 2001-02 (DATS pumped into the system for the 1st time in the spring of 2002):	$299,044	**1.87%**	$987	$40,341
Total debt servicing for original DATS costs:	**$558,447**		$6,285	$187,036

Total original DATS Capital Cost plus the cost of debt servicing: **$16,550,112**

19.99%	66.19%	100.00%
$3,196,734	$10,584,883	

r any other gift money to construct DATS.)

$0	$0
$0	$0
$107,410	$0
$59,779	$197,937
$167,189	$197,937

ORANGE COUNTY WATER DISTRICT
Mailing Address: P.O. Box 8300
Fountain Valley, CA 92728-8300
(714) 378-3291

QUANTIFIABLE WATER CONSERVATION PROGRAM
CREDIT CERTIFICATION FORM

Water Year from July 01, 2013 through June 30, 2014

To be completed and filed no later than September 30, 2014 by all Operators of Water Producing Facilities in the Orange County Water District for Water Year 2014.

IRVINE RANCH WATER DISTRICT
ATTN: FIONA SANCHEZ
P.O. BOX 57000
IRVINE, CA 92619

CONSERVATION CREDITS FOR AGENCY (IN ACRE FEET):

1. AMOUNT OF HIGH EFFICIENCY TOILETS (HET) RETROFIT(S):

a) Current Period (7/1/12 to 6/30/13) 810 HET retrofits x 38 gal. per day x 365 days / 325,900 gal. per a.f.	34.5	1a	
b) Previous accumulated total credit (Limited to 10 years)	663.0	1b	
c) Less fully utilized credit	0.0	1c	
c1) Conservation Credits from 2014-15	418.4		
d) Total HET Conservation Credit			**1115.9** 1d

2. AMOUNT OF ULTRA-LOW-FLOW SHOWER HEADS (ULSH) RETROFIT(S):

a) Current Period (7/1/12 to 6/30/13) -- **Program Ended** 244 ULSH retrofits x 5.5 gal. per day x 365 days x 2.5 people per dwelling / 325,900 gal. per a.f.	3.8	2a	
b) Previous accumulated total credit (Limited to 2 years)	0.0	2b	
c) Total ULSH Conservation Credit			**3.8** 2c

3. GRAND TOTAL QUANTIFIABLE WATER CONSERVATION CREDITS **1119.6** 3

(For OCWD Accounting Use Only) **DO NOT WRITE IN THIS SPACE**

Figures Verified By:

CERTIFICATION

I declare under the penalties of perjury that this credit certification form, including the statements made and the figures shown, has been examined by me and to the best of my knowledge and belief is a true, correct and complete statement.

Date **Signature** **Phone No.**

ORANGE COUNTY WATER DISTRICT
Mailing Address: P.O. Box 8300
Fountain Valley, CA 92728-8300
(714) 378-3291

QUANTIFIABLE WATER CONSERVATION PROGRAM
CREDIT CERTIFICATION FORM

Water Year from July 01, 2014 through June 30, 2015

To be completed and filed no later than September 30, 2015 by all Operators of Water Producing Facilities in the Orange County Water District for Water Year 2015.

IRVINE RANCH WATER DISTRICT
ATTN: FIONA SANCHEZ
P.O. BOX 57000
IRVINE, CA 92619

CONSERVATION CREDITS FOR AGENCY (IN ACRE FEET):

1. AMOUNT OF HIGH EFFICIENCY TOILETS (HET) RETROFIT(S):

a) Current Period (7/1/14 to 6/30/15) 8,585 HET retrofits x 38 gal. per day x 365 days / 325,900 gal. per a.f.	365.4	1a		
b) Previous accumulated total credit (Limited to 10 years)	663.0	1b		
c) Less fully utilized credit (credits used in 2013-14 BEA Report)	418.4	1c		
d) Total HET Conservation Credit			**610.0**	1d

2. AMOUNT OF ULTRA-LOW-FLOW SHOWER HEADS (ULSH) RETROFIT(S):

a) Current Period (7/1/14 to 6/30/15) -- **Program Ended** 0 ULSH retrofits x 5.5 gal. per day x 365 days x 2.5 people per dwelling / 325,900 gal. per a.f.	0.0	2a		
b) Previous accumulated total credit (Limited to 2 years)	0.0	2b		
c) Total ULSH Conservation Credit			**0.0**	2c

3. GRAND TOTAL QUANTIFIABLE WATER CONSERVATION CREDITS	**610.0**	3

(For OCWD Accounting Use Only) **DO NOT WRITE IN THIS SPACE**

Figures Verified By:

CERTIFICATION

I declare under the penalties of perjury that this credit certification form, including the statements made and the figures shown, has been examined by me and to the best of my knowledge and belief is a true, correct and complete statement.

Date **Signature** **Phone No.**

ORANGE COUNTY WATER DISTR

Conservation Credit Program

Irvine Ranch Water District

TOILETS

Program Period:	7/1/96-6/30/97	7/1/97-6/30/98	7/1/98-6/30/99	7/1/99-6/30/00	7/1/00-6/30/07	7/1/07-6/30/08	7/1/08-6/30/09	7/1/09-6/30/10	7/1/10-6/30/11	7/1/11-6/30/12	7/1/12-6/30/13	7/1/13-6/30/14	7/1/14-6/30/15
Quantity	**1187**	**1356**	**750**	**544**	**9334**	**250**	**5161**	**2120**	**325**	**588**	**600**	**810**	**8585**
Consv Cr A.F.	**31.5**	**36.0**	**19.9**	**14.4**	**247.8**	**6.6**	**219.6**	**90.2**	**13.8**	**25.0**	**25.5**	**34.5**	**365.4**

Wtr Yr Ending	Toilet A.F. Credit Per Year (10 years)													Ttl Toilet Cr
6/30/96														9.0
6/30/97	31.5													40.5
6/30/98	31.5	36.0												76.5
6/30/99	31.5	36.0	19.9											96.4
6/30/00	31.5	36.0	19.9	14.4										110.8
6/30/01	31.5	36.0	19.9	14.4										110.8
6/30/02	31.5	36.0	19.9	14.4										110.8
6/30/03	31.5	36.0	19.9	14.4										110.8
6/30/04	31.5	36.0	19.9	14.4										110.8
6/30/05	31.5	36.0	19.9	14.4										110.8
6/30/06	31.5	36.0	19.9	14.4										101.8
6/30/07		36.0	19.9	14.4	247.8									318.1
6/30/08			19.9	14.4	247.8	6.6								288.7
6/30/09				14.4	247.8	6.6	219.6							488.4
6/30/10					247.8	6.6	219.6	90.2						564.2
6/30/11					247.8	6.6	219.6	90.2	13.8					578.0
6/30/12					247.8	6.6	219.6	90.2	13.8	25.0				603.0
6/30/13					247.8	6.6	219.6	90.2	13.8	25.0	25.5			628.5
6/30/14					247.8	6.6	219.6	90.2	13.8	25.0	25.5	34.5		663.0
6/30/15					247.8	6.6	219.6	90.2	13.8	25.0	25.5	34.5	365.4	**1,028.4**
6/30/16					247.8	6.6	219.6	90.2	13.8	25.0	25.5	34.5	365.4	1,028.4
6/30/17						6.6	219.6	90.2	13.8	25.0	25.5	34.5	365.4	780.6
6/30/18							219.6	90.2	13.8	25.0	25.5	34.5	365.4	774.0
								90.2	13.8	25.0	25.5	34.5	365.4	554.4
									13.8	25.0	25.5	34.5	365.4	464.2
										25.0	25.5	34.5	365.4	450.4

7/1/02-6/30/03		Total Credit for Water Year	Accumulated Credit Program To Date
0			
0.0			
	Ttl SH Cr		
	3.8	12.8	12.8
	12.6	53.1	65.90
	15.1	91.6	157.50
	7.0	103.4	260.90
	0.7	111.5	372.40
	-	110.8	483.20
	-	110.8	594.00
-	-	110.8	704.80
-	-	110.8	815.60
	-	110.8	926.40
	-	101.8	1,028.20
	-	318.1	1,346.30
	-	288.7	1,635.00
	-	488.4	2123.4
	-	564.2	2687.6
	-	578.0	3265.6
		603.0	3868.6
		628.5	4497.1
		663.0	5160.1
		1,028.4	**6188.5**
		1,028.4	7216.9
		780.6	7997.5
		774.0	8771.5
		554.4	9325.9
		464.2	9790.1
		450.4	10240.5

121817-42799968

RUTAN & TUCKER, LLP
Joel D. Kuperberg (State Bar No. 90248)
jkuperberg@rutan.com
Mark J. Austin (State Bar No. 208880)
maustin@rutan.com
Jeremy N. Jungreis (State Bar No. 256417)
jjungreis@rutan.com
Morgan L. Gallagher (State Bar No. 297487)
mgallagher@rutan.com
611 Anton Boulevard, Suite 1400
Costa Mesa, California 92626-1931
Telephone: 714-641-5100
Facsimile: 714-546-9035

Attorneys for Defendant and Respondent
ORANGE COUNTY WATER DISTRICT

SUPERIOR COURT OF THE STATE OF CALIFORNIA

FOR THE COUNTY OF LOS ANGELES, STANLEY MOSK COURTHOUSE

IRVINE RANCH WATER DISTRICT, a California public agency, Plaintiff and Petitioner, v. ORANGE COUNTY WATER DISTRICT, a California public agency; ALL PERSONS INTERESTED IN THE MATTER OF ORANGE COUNTY WATER DISTRICT RESOLUTION NO. 16-4-37; and DOES 1 to 20, inclusive, Defendants and Respondents.	Case No. BS168278 Assigned For All Purposes To: Hon. Amy Hogue, Dept. 86 **RESPONDENT ORANGE COUNTY WATER DISTRICT'S SUPPLEMENTAL RESPONSES TO FIRST SET OF SPECIAL INTERROGATORIES PROPOUNDED BY PETITIONER IRVINE RANCH WATER DISTRICT** Date Action Filed: June 28, 2016 Trial Date: None Set
GOLDEN STATE WATER COMPANY, Cross-Complainant; v. IRVINE RANCH WATER DISTRICT, a California public agency; and ROES 1-10, inclusive, Cross-Defendants.	

EAST ORANGE COUNTY WATER DISTRICT; YORBA LINDA WATER DISTRICT; and MESA WATER DISTRICT,

Cross-Complainants,

v.

IRVINE RANCH WATER DISTRICT; and ROES 1-10, inclusive,

Cross-Defendants.

CITY OF BUENA PARK,

Cross-Complainant,

v.

IRVINE RANCH WATER DISTRICT, a California public agency; and ROES 1-10, inclusive,

Cross-Defendants.

CITY OF ANAHEIM, a California municipal corporation and charter city,

Cross-Complainant,

v.

IRVINE RANCH WATER DISTRICT, a California public agency; and ROES 101-201, inclusive,

Cross-Defendants.

PROPOUNDING PARTY: Plaintiff and Petitioner IRVINE RANCH WATER DISTRICT

RESPONDING PARTY: Defendant and Respondent ORANGE COUNTY WATER DISTRICT

SET NO.: One (Supplemental)

Pursuant to Sections 2030.010 *et seq.* of the California Code of Civil Procedure, and the meet-and-confer efforts between counsel for Petitioner and Respondent, Defendant and Respondent Orange County Water District ("Respondent" or "OCWD") hereby presents these

supplemental responses to the First Set of Special Interrogatories propounded by Plaintiff and Petitioner Irvine Ranch Water District ("Petitioner," "propounding party," or "IRWD"). Unless a response is entitled "Supplemental Response," all responses are the same as provided in OCWD's original responses to these interrogatories, served on June 9, 2017.

PRELIMINARY STATEMENT

Each of the following responses and/or objections is based on information presently known by and/or reasonably available to Respondent at the time of the preparation of these responses and/or objections. Respondent has not yet completed its discovery or investigation, or the preparation of this case for trial. It is anticipated that further discovery, investigation, legal research, and/or analysis may supply additional facts and/or add new meaning to the known facts, as well as establish new factual conclusions and legal contentions, all of which may lead to the discovery of additional documents, further information, and/or additional witnesses. Accordingly, the responses set forth herein are provided without prejudice to Respondent's rights to produce evidence of any subsequently discovered facts or interpretations thereof, and/or to add to, modify, or otherwise change or amend the responses herein.

The information set forth herein is true and correct to the best knowledge of Respondent at this particular time, but is subject to correction for inadvertent errors or omissions, if any errors or omissions shall be found to exist. In addition, these responses are given for the purpose of this litigation only.

If any documents or information within the scope of the attorney-client privilege or the attorney work-product doctrine are inadvertently disclosed, Respondent has not done so intentionally, and reserves the right to assert those privileges at any time in these proceedings. Respondent further reserves the right to request return of all privileged information and/or documents, including any copies or abstracts of that information. In addition, all evidentiary objections are reserved, and no waiver of any objections is to be implied from these responses. To the extent that these responses might arguably waive an otherwise assertable objection or claim of privilege, such waiver shall be limited to these responses only and shall not extend to any further discovery requests.

GENERAL OBJECTIONS

1. Respondent objects to all interrogatories insofar as they call for information protected by the attorney-client privilege, the attorney work-product protection afforded by Code of Civil Procedure section 2018.010 *et seq.*, the right of privacy provided by the California Constitution, Article I, section 1, or any other applicable privilege. Respondent further objects to all requests insofar as they seek privileged information protected from disclosure by the privacy interests of the individuals involved, as well as by applicable evidentiary rules and/or California Code provisions. Such information is specifically excluded from Respondent's responses to these requests. Respondent does not intend to waive such privileges, and responses to these interrogatories are not intended, and should not be construed, as such a waiver.

2. Respondent objects to these interrogatories insofar as they seek to impose greater obligations on Respondent than those permitted under sections 2031.210 *et seq.* of the California Code of Civil Procedure and/or are burdensome, oppressive, harassing, and/or annoying, such that requiring answers results in an injustice to Respondent. Among other examples, the interrogatories are unreasonably and unduly burdensome to the extent the documents that are responsive thereto are public records, are communications between Petitioner and Respondent, and/or are equally available to the propounding party, for responding to such interrogatories would place a burden and expense on Respondent that should equally be borne by the propounding party.

3. Respondent objects to these interrogatories insofar as they seek the disclosure of information relating to, prepared by, or concerning expert witnesses, or that is otherwise exclusively controlled by the provisions of Code of Civil Procedure sections 2034.010 *et seq.*

4. Respondent objects to these interrogatories insofar as they are vague and ambiguous, misconstrue facts, and/or assume facts not yet in evidence. Nothing in these responses is to be construed as an admission as to the existence or non-existence of any piece of information. Further, nothing herein should be construed as an admission by Respondent respecting the admissibility or relevance of any fact or document, or of the truth or accuracy of any characterization or statement of any kind contained in the requests.

/ / /

5. Respondent objects to these interrogatories to the extent this action challenges Respondent's quasi-legislative actions and/or other matters subject to limited judicial review under a closed record, and the interrogatories seek information that is outside the scope of that record and is thus irrelevant as a matter of law.

Each of the foregoing general objections and qualifications is incorporated in full in each of the responses set forth below, as if fully set forth therein, and each of the responses below is provided subject to, and without waiving, the general objections and qualifications asserted herein.

Subject to and without waiving the foregoing reservations and objections, Respondent responds as follows:

SPECIAL INTERROGATORIES AND RESPONSES THERETO

SPECIAL INTERROGATORY NO. 1:

Identify the legal or statutory authority YOU consider to determine whether an exportation of groundwater from the BASIN to a location outside of OCWD's boundaries is "unlawful" within the meaning of Section 2.9 of the OCWD ACT.

SUPPLEMENTAL RESPONSE TO SPECIAL INTERROGATORY NO. 1:

Respondent objects to this interrogatory on the following grounds:

1. The interrogatory seeks information that is protected from disclosure by the attorney-client privilege and/or the attorney work-product doctrine.

2. The interrogatory seeks information this is protected from disclosure by the deliberative-process privilege.

3. The interrogatory is vague and ambiguous in its use of the terms "legal or statutory authority," "consider," "determine," "BASIN," and "Section 2.9 of the OCWD Act." For purposes of these responses, Respondent interprets the term "Section 2.9 of the OCWD Act" to refer to Section 2, subdivision (9), of the OCWD Act.

4. The interrogatory is vague and ambiguous, in that it provides an incomplete hypothetical that fails to provide context for the referenced "determination."

5. The interrogatory seeks information that is equally available to the propounding party.

6. The interrogatory seeks information that is irrelevant and not calculated to lead to the discovery of admissible evidence, and assumes facts not in evidence, in that Petitioner has not identified or alleged any instance in which Respondent has ever sought to enforce against Petitioner the "unlawful exportation" provision (Section 2, subdivision (9)) of the OCWD Act.

7. The interrogatory seeks information that is irrelevant and not calculated to lead to the discovery of admissible evidence, in that it refers to the "exportation of groundwater from the BASIN," whereas Section 2, subdivision (9), of the OCWD Act refers to the "exportation of water from the district."

Subject to and without waiving the foregoing objections, Respondent responds as follows:

Section 2(9) is the only provision of the OCWD Act that expressly references the "unlawful exportation" of groundwater. OCWD has not promulgated any regulations or written-guidance document concerning its interpretation of the phrase "unlawful exportation" in Section 2(9) of the OCWD Act.

SPECIAL INTERROGATORY NO. 2:

State the methodology YOU use to determine whether an exportation of groundwater from the BASIN to a location outside of OCWD's boundaries is "unlawful" within the meaning of Section 2.9 of the OCWD ACT.

SUPPLEMENTAL RESPONSE TO SPECIAL INTERROGATORY NO. 2:

Respondent objects to this interrogatory on the following grounds:

1. The interrogatory seeks information that is protected from disclosure by the attorney-client privilege and/or the attorney work-product doctrine.

2. The interrogatory seeks information this is protected from disclosure by the deliberative-process privilege.

3. The interrogatory is vague and ambiguous in its use of the terms "consider," "determine," "BASIN," and "Section 2.9 of the OCWD Act." For purposes of these responses, Respondent interprets the term "Section 2.9 of the OCWD Act" to refer to Section 2, subdivision (9), of the OCWD Act.

4. The interrogatory is vague and ambiguous, and calls for speculation, in that it

provides an incomplete hypothetical that fails to provide context for the referenced "determination."

5. The interrogatory seeks information that is equally available to the propounding party.

6. The interrogatory seeks information that is irrelevant and not calculated to lead to the discovery of admissible evidence, and assumes facts not in evidence, in that Petitioner has not identified or alleged any instance in which Respondent has ever sought to enforce against Petitioner the "unlawful exportation" provision of the OCWD Act.

7. The interrogatory seeks information that is irrelevant and not calculated to lead to the discovery of admissible evidence, in that it refers to the "exportation of groundwater from the BASIN," whereas Section 2, subdivision (9), of the OCWD Act refers to the "exportation of water from the district."

Subject to and without waiving the foregoing objections, Respondent responds as follows:

The "methodology" applied by OCWD on the issue of unlawful exportation is that, when OCWD is faced with the issue of whether a threatened act may be considered an unlawful exportation of groundwater within the meaning of Section 2(9) of the OCWD Act, OCWD staff interprets and applies the OCWD Act (with the assistance of counsel, if necessary) to determine whether the threatened act would be considered an unlawful exportation of groundwater under the provisions of the OCWD Act. Otherwise, OCWD has not promulgated or adopted any "methodology" regarding the interpretation or application of the "unlawful exportation" provision of the OCWD Act.

Notably, OCWD staff have had a practice of working with groundwater producers whose service areas encompass territory that is both within and outside of OCWD, to account for produced groundwater in a manner that both meets the requirements of the OCWD Act and avoids any potential "unlawful exportation" of groundwater within the meaning of Section 2(9) of the OCWD Act.

SPECIAL INTERROGATORY NO. 3:

Identify any and all policies, ordinances, resolutions, rules and/or regulations YOU have

adopted that RELATE TO the "unlawful" exportation of groundwater from the BASIN to a location outside of OCWD's boundaries within the meaning of Section 2.9 of the OCWD ACT.

RESPONSE TO SPECIAL INTERROGATORY NO. 3:

Respondent objects to this interrogatory on the following grounds:

1. The interrogatory is vague and ambiguous in its use of the terms "policies," "ordinances," "resolutions," "rules," "regulations," "adopted," "RELATE TO," "BASIN," and "Section 2.9 of the OCWD Act." For purposes of these responses, Respondent interprets the term "Section 2.9 of the OCWD Act" to refer to Section 2, subdivision (9), of the OCWD Act.

2. The interrogatory seeks information that is equally available to the propounding party.

3. The interrogatory seeks information that is irrelevant and not calculated to lead to the discovery of admissible evidence, and assumes facts not in evidence, in that Petitioner has not identified or alleged any instance in which Respondent has ever sought to enforce against Petitioner the "unlawful exportation" provision (Section 2, subdivision (9)) of the OCWD Act.

4. The interrogatory seeks information that is irrelevant and not calculated to lead to the discovery of admissible evidence, in that it refers to the "exportation of groundwater from the BASIN," whereas Section 2, subdivision (9), of the OCWD Act refers to the "exportation of water from the district."

5. The interrogatory seeks information that is protected from disclosure by the attorney-client privilege and/or the attorney work-product doctrine.

6. The interrogatory seeks information this is protected from disclosure by the deliberative-process privilege.

Subject to and without waiving the foregoing objections, Respondent responds as follows:

- OCWD Resolution No. 68-9-69, "Adopting Statement of Policy regarding Requesting Local Agency Formation Commission to Place Condition Upon Annexation of Areas Outside the Boundary of the Orange County Water District," September 18, 1968;
- OCWD Resolution No. 82-10-86, "Resolution of the Board of Directors of the Orange County Water District Adopting Policy re Annexation as to the District," October 13,

1982;

- OCWD Resolution No. 86-2-15, "Resolution of the Board of Directors of the Orange County Water District Adopting Policy Regarding Annexations to the District," 1986;
- Motion No. 99-107, "Reaffirming the Existing District Annexation Policy with Existing Boundaries," June 20, 1999; and
- Resolution No. 99-9-108, "Establishing a Policy for Processing Annexation Requests, September 1, 1999.

SPECIAL INTERROGATORY NO. 4:

Identify any and all policies, ordinances, resolutions, rules and/or regulations YOU have adopted that RELATE TO preventing the exportation of groundwater from the BASIN to a location outside of OCWD's boundaries.

RESPONSE TO SPECIAL INTERROGATORY NO. 4:

Respondent objects to this interrogatory on the following grounds:

1. The interrogatory is vague and ambiguous in its use of the terms "policies," "ordinances," "resolutions," "rules," "regulations," "adopted," "RELATE TO," "preventing," "BASIN."

2. The interrogatory seeks information that is equally available to the propounding party.

3. The interrogatory seeks information that is irrelevant and not calculated to lead to the discovery of admissible evidence, and assumes facts not in evidence, in that Petitioner has not identified or alleged any instance in which Respondent has ever sought to enforce against Petitioner the "unlawful exportation" provision (Section 2, subdivision (9)) of the OCWD Act.

4. The interrogatory seeks information that is irrelevant and not calculated to lead to the discovery of admissible evidence, in that it refers to the "exportation of groundwater from the BASIN," whereas Section 2, subdivision (9), of the OCWD Act refers to the "exportation of water from the district."

5. The interrogatory seeks information that is protected from disclosure by the attorney-client privilege and/or the attorney work-product doctrine.

6. The interrogatory seeks information this is protected from disclosure by the deliberative-process privilege.

Subject to and without waiving the foregoing objections, Respondent responds as follows:

- OCWD Resolution No. 72-6-81, re Annexation 71-2, re lands within Yorba Linda;
- OCWD Resolution No. 72-7-95, re Annexation 72-1, re Annexation of lands within Yorba Linda;
- OCWD Resolution No. 72-3-34, re Annexation 71-3, re Annexation of Yorba Linda lands;
- OCWD Resolution No. 75-4-39, re Annexation 75-2, re Annexation of Yorba Linda lands;
- OCWD Resolution No. 75-4-40, re Annexation 75-3, April 17, 1975, re Annexation of Yorba Linda lands;
- OCWD Resolution re Annexation 75-5, June 18, 1975, re Yorba Linda lands;
- OCWD Resolution re Annexation 75-7, August 20, 1975, re Yorba Linda lands;
- OCWD Resolution re Annexation 75-8, re Annexation of County of Orange lands, July 21, 1976;
- OCWD Resolution No. 75-4-39, April 17, 1975, re Yorba Linda lands;
- OCWD Resolution No. 83-3-22, March 16, 1983, re Annexation of IRWD lands;
- January 14, 1987 OCWD-City of Anaheim Agreement re Annexation of Anaheim lands;
- January 20, 1988 OCWD-City of Orange Agreement re Annexation of County of Orange lands;
- May 18, 1988 OCWD-Santiago Water District Agreement re Annexation of Santiago Water District lands;
- OCWD Resolution No. 97-9-124, September 17, 1997, re Annexation 96-1, re Annexation of IRWD lands;
- OCWD Resolution No. 13-10-125, October 2, 2013, Approving IRWD Annexation Agreement;

- October 2, 2013 OCWD-IRWD Agreement re Annexation of IRWD lands;
- Agreement between OCWD, IRWD, and other entities entitled "Phase 1 of the Emergency Service Program Connecting IRWD's System to the South Orange County Import System To Improve Emergency Water Service," 2006; and
- November 14, 2008 Phase 1 Emergency Service Program Participation and Operations Agreement: South Orange County.

SPECIAL INTERROGATORY NO. 5:

Do YOU contend that any PERSON(S) who exports groundwater from the BASIN to a location outside of OCWD's boundaries does so "unlawfully" within the meaning of Section 2.9 of the OCWD ACT?

SUPPLEMENTAL RESPONSE TO SPECIAL INTERROGATORY NO. 5:

Respondent objects to this interrogatory on the following grounds:

1. The interrogatory seeks information that is protected from disclosure by the attorney-client privilege and/or the attorney work-product doctrine.

2. The interrogatory seeks information this is protected from disclosure by the deliberative-process privilege.

3. The interrogatory is vague and ambiguous in its use of the terms "contend," "BASIN," and "Section 2.9 of the OCWD Act." For purposes of these responses, Respondent interprets the term "Section 2.9 of the OCWD Act" to refer to Section 2, subdivision (9), of the OCWD Act.

4. The interrogatory seeks information that is irrelevant and not calculated to lead to the discovery of admissible evidence, and assumes facts not in evidence, in that Petitioner has not identified or alleged any instance in which Respondent has ever sought to enforce against Petitioner the "unlawful exportation" provision (Section 2, subdivision (9)) of the OCWD Act.

5. The interrogatory seeks information that is irrelevant and not calculated to lead to the discovery of admissible evidence, in that it refers to the exportation of "groundwater from the BASIN," whereas Section 2, subdivision (9), of the OCWD Act refers to the "exportation of water from the district."

6. The interrogatory seeks information that is irrelevant and not calculated to lead to the discovery of admissible evidence.

Subject to and without waiving the foregoing objections, Respondent responds as follows:

Within the meaning of Section 2(9) of the OCWD Act, "unlawful export" would include any exportation, to a location outside of OCWD's boundaries, of groundwater that is pumped from within OCWD's boundaries.

However, OCWD staff have had a practice of working with groundwater producers whose service areas encompass territory that is both within and outside of OCWD, to account for produced groundwater in a manner that both meets the requirements of the OCWD Act and avoids any potential "unlawful exportation" of groundwater within the meaning of Section 2(9) of the OCWD Act.

SPECIAL INTERROGATORY NO. 6:

If YOUR response to Special Interrogatory No. 5 is "yes," state the basis for YOUR contention.

RESPONSE TO SPECIAL INTERROGATORY NO. 6:

Respondent objects to this interrogatory on the following grounds:

1. Respondent incorporates by reference its objections to Special Interrogatory No. 5.

2. The interrogatory seeks information that is protected from disclosure by the attorney-client privilege and/or the attorney work-product doctrine.

3. The interrogatory seeks information this is protected from disclosure by the deliberative-process privilege.

4. The interrogatory is vague and ambiguous in its use of the terms "basis" and "contention."

5. The interrogatory seeks information that is irrelevant and not calculated to lead to the discovery of admissible evidence, and assumes facts not in evidence, in that Petitioner has not identified or alleged any instance in which Respondent has ever sought to enforce against Petitioner the "unlawful exportation" provision (Section 2, subdivision (9)) of the OCWD Act.

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SPECIAL INTERROGATORY NO. 7:

Identify any and all policies, ordinances, resolutions, rules and/or regulations YOU have adopted that RELATE TO the classification of CONSERVED WATER as a "Supplemental Source" within the meaning of Section 31.5(c)(l) of the OCWD ACT.

RESPONSE TO SPECIAL INTERROGATORY NO. 7:

Respondent objects to this interrogatory on the following grounds:

1. The interrogatory is vague and ambiguous in its use of the terms "policies," "ordinances," "resolutions," "rules," "regulations," "adopted," "RELATE TO," "classification," and "CONSERVED WATER."

2. The interrogatory seeks information that is equally available to the propounding party.

3. The interrogatory seeks information that is irrelevant and not calculated to lead to the discovery of admissible evidence.

4. The interrogatory seeks information that is protected from disclosure by the attorney-client privilege and/or the attorney work-product doctrine.

5. The interrogatory seeks information this is protected from disclosure by the deliberative-process privilege.

6. The interrogatory assumes facts not in evidence.

Subject to and without waiving the foregoing objections, Respondent responds as follows:

OCWD Motion No. 95-201, "Authorizing Implementation of Program to Credit Groundwater Producing Agencies for Quantifiable Water Conservation Programs," September 20, 1995, along with the associated Water Issues Committee agenda report of September 13, 1995, and the minutes from that meeting.

SPECIAL INTERROGATORY NO. 8:

Identify any and all statutory or other legal authority YOU contend allows YOU to classify recycled water as NEUTRAL WATER.

SUPPLEMENTAL RESPONSE TO SPECIAL INTERROGATORY NO. 8:

Respondent objects to this interrogatory on the following grounds:

1. The interrogatory seeks information that is protected from disclosure by the attorney-client privilege and/or the attorney work-product doctrine.

2. The interrogatory seeks information this is protected from disclosure by the deliberative-process privilege.

3. The interrogatory is vague and ambiguous in its use of the terms "legal or statutory authority," "contend," "allows," "classify," "recycled water," and "NEUTRAL WATER."

4. The interrogatory seeks information that is equally available to the propounding party.

5. The interrogatory seeks information that is irrelevant and not calculated to lead to the discovery of admissible evidence.

6. The interrogatory assumes facts not in evidence.

Subject to and without waiving the foregoing objections, Respondent responds as follows:

For purposes of answering this interrogatory, OCWD interprets the term "recycled water" to mean wastewater that is generated within the watershed of the Santa Ana River, treated and recycled at a facility within the watershed of the Santa Ana River, and delivered for use within the watershed of the Santa Ana River. Furthermore, for purposes of answering this interrogatory, OCWD interprets the term "NEUTRAL WATER" to mean "water produced by persons and operators from all other sources" within the meaning of Section 31.5, subdivision (d)(3), of the OCWD Act. Subject to those understood definitions, OCWD considers "recycled water" to be "NEUTRAL WATER" pursuant to Section 31.5, subdivision (d)(3), of the OCWD Act.

SPECIAL INTERROGATORY NO. 9:

Identify any and all policies, ordinances, resolutions, rules and/or regulations YOU have adopted that RELATE TO the classification of recycled water as NEUTRAL WATER.

RESPONSE TO SPECIAL INTERROGATORY NO. 9:

Respondent objects to this interrogatory on the following grounds:

1. The interrogatory is vague and ambiguous in its use of the terms "policies," "ordinances," "resolutions," "rules," "regulations," "adopted," "RELATE TO," "classification," "recycled water," and "NEUTRAL WATER."

2. The interrogatory seeks information that is equally available to the propounding party.

3. The interrogatory seeks information that is irrelevant and not calculated to lead to the discovery of admissible evidence.

4. The interrogatory seeks information that is protected from disclosure by the attorney-client privilege and/or the attorney work-product doctrine.

5. The interrogatory seeks information this is protected from disclosure by the deliberative-process privilege.

6. The interrogatory assumes facts not in evidence.

Subject to and without waiving the foregoing objections, Respondent responds as follows:

- November 14, 2007 Basin Production Percentage Methodology; and
- December 5, 2007 "Board Probability Analysis Formula to Assist in Setting the Annual BPP."

SPECIAL INTERROGATORY NO. 10:

Identify any and all policies, ordinances, resolutions, rules and/or regulations YOU have adopted that RELATE TO the classification of water produced by DESALTERS as "Supplemental Sources" under Section 31.5(c)(l) of the OCWD ACT.

RESPONSE TO SPECIAL INTERROGATORY NO. 10:

Respondent objects to this interrogatory on the following grounds:

1. The interrogatory is vague and ambiguous in its use of the terms "policies," "ordinances," "resolutions," "rules," "regulations," "adopted," "RELATE TO," "classification," "water produced by," and "DESALTERS."

2. The interrogatory seeks information that is equally available to the propounding party.

3. The interrogatory seeks information that is irrelevant and not calculated to lead to the discovery of admissible evidence.

4. The interrogatory seeks information that is protected from disclosure by the attorney-client privilege and/or the attorney work-product doctrine.

5. The interrogatory seeks information this is protected from disclosure by the deliberative-process privilege.

6. The interrogatory assumes facts not in evidence.

Subject to and without waiving the foregoing objections, Respondent responds as follows:

None.

Dated: August 14, 2017

RUTAN & TUCKER, LLP
JOEL D. KUPERBERG
MARK J. AUSTIN
JEREMY N. JUNGREIS
MORGAN L. GALLAGHER

By: _____
Mark J. Austin
Attorneys for Defendant and Respondent
ORANGE COUNTY WATER DISTRICT

VERIFICATION

STATE OF CALIFORNIA, COUNTY OF LOS ANGELES

I have read the foregoing **RESPONDENT ORANGE COUNTY WATER DISTRICT'S SUPPLEMENTAL RESPONSES TO FIRST SET OF SPECIAL INTERROGATORIES PROPOUNDED BY PETITIONER IRVINE RANCH WATER DISTRICT**, and I know its contents.

I am the Executive Director of Engineering and Water Resources for the Orange County Water District ("OCWD"), which is a party to this action. I am authorized to make this verification for and on OCWD's behalf, and I make this verification for that reason. To the best of my knowledge and/or information, the matters stated in the foregoing document are true.

Executed on August 18, 2017, at Fountain Valley, California.

I declare under penalty of perjury under the laws of the State of California that the foregoing is true and correct.

John C Kennedy

John Kennedy

PROOF OF SERVICE

(Irvine Ranch Water District v. Orange County Water District, et al.,
LASC Case No. BS 168278

STATE OF CALIFORNIA, COUNTY OF ORANGE

I am employed by the law office of Rutan & Tucker, LLP in the County of Orange, State of California. I am over the age of 18 and not a party to the within action. My business address is 611 Anton Boulevard, Suite 1400, Costa Mesa, California 92626-1931.

On August 18, 2017, I served on the interested parties in said action the within:

RESPONDENT ORANGE COUNTY WATER DISTRICT'S SUPPLEMENTAL RESPONSES TO FIRST SET OF SPECIAL INTERROGATORIES PROPOUNDED BY PETITIONER IRVINE RANCH WATER DISTRICT

as stated below:

SEE ATTACHED SERVICE LIST

☐ (BY E-MAIL) by transmitting a true copy of the foregoing document(s) to the e-mail addresses set forth on the attached service list.

☒ (BY MAIL) by placing a true copy thereof in a sealed envelope addressed as shown on the attached service list.

In the course of my employment with Rutan & Tucker, LLP, I have, through first-hand personal observation, become readily familiar with Rutan & Tucker, LLP's practice of collection and processing correspondence for mailing with the United States Postal Service. Under that practice, I deposited such envelope in an out-box for collection by other personnel of Rutan & Tucker, LLP, and for ultimate posting and placement with the U.S. Postal Service on that same day in the ordinary course of business. If the customary business practices of Rutan & Tucker, LLP with regard to collection and processing of correspondence and mailing were followed, and I am confident that they were, such envelope was posted and placed in the United States mail at Costa Mesa, California, that same date. I am aware that on motion of party served, service is presumed invalid if postal cancellation date or postage meter date is more than one day after date of deposit for mailing in affidavit.

Executed on August 18, 2017, at Costa Mesa, California.

I declare under penalty of perjury under the laws of the State of California that the foregoing is true and correct.

Valerie Bloom
(Type or print name)

Valerie Bloom
(Signature)

SERVICE LIST

Edward J. Casey, Esq. Roger A. Cerda, Esq. Clynton Namuo, Esq. ALSTON & BIRD LLP 333 South Hope Street Sixteenth Floor Los Angeles, CA 90071-1410 Emails: ed.casey@alston.com roger.cerda@alston.com clynton.namuo@alston.com	*Attorneys for Plaintiff and Petitioner IRVINE RANCH WATER DISTRICT*
Gregory J. Newmark, Esq. Shiraz D. Tangri, Esq. MEYERS, NAVE, RIBACK, SILVER & WILSON 707 Wilshire Boulevard 24th Floor Los Angeles, CA 90017 Emails: gnewmark@meyersnave.com stangri@meyersnave.com	*Attorneys for Defendant, Respondent and Cross-Complainant EAST ORANGE COUNTY WATER DISTRICT*
Arthur Kidman, Esq. Andrew B. Gagen, Esq. KIDMAN LAW LLP 2030 Main Street Suite 1300 Irvine, CA 92614 Emails: akidman@kidmanlaw.com agagen@kidmanlaw.com	*Attorneys for Defendant, Respondent and Cross-Complainant YORBA LINDA WATER DISTRICT*
Louis C. Klein, Esq. Benjamin S. Tragish, Esq. FOLEY & MANSFIELD, LLP 300 South Grand Avenue Suite 2800 Los Angeles, CA 90071 Emails: lklein@foleymansfield.com btragish@foleymansfield.com	*Attorneys for Defendant, Respondent and Cross-Complainant MESA WATER DISTRICT*

Alison M. Kott, Assistant City Attorney Daniel J. Payne, Deputy City Attorney ANAHEIM CITY ATTORNEY'S OFFICE 200 South Anaheim Boulevard Suite 356 Anaheim, CA 92805 Emails: akott@anaheim.net dpayne@anaheim.net	*Attorneys for Defendant, Respondent, Real Party in Interest and Cross-Complainant CITY OF ANAHEIM*
Jeffrey V. Dunn, Esq. Wendy Y. Wang, Esq. BEST BEST & KRIEGER LLP 18101 Von Karman Avenue Suite 1000 Irvine, CA 92612 Emails: jeffrey.dunn@bbklaw.com wendy.wang@bbklaw.com	*Attorneys for Defendant, Respondent, Real Party in Interest and Cross-Complainant CITY OF ANAHEIM*
Scott S. Slater, Esq. Diane C. De Felice, Esq. Amy M. Steinfeld, Esq. BROWNSTEIN HYATT FARBER SCHRECK, LLP 2049 Century Park East Suite 3550 Los Angeles, CA 90067 Emails: sslater@bhfs.com ddefelice@bhfs.com asteinfeld@bhfs.com	*Attorneys for Defendant, Respondent and Cross-Complainant, GOLDEN STATE WATER COMPANY [Party Interested In The Matter Of Orange County Water District Resolution No. 16-4-37]*
James L. Markman, Esq. B. Tilden Kim, Esq. Stephen D. Lee, Esq. RICHARDS, WATSON & GERSHON 355 South Grand Avenue 40th Floor Los Angeles, CA 90071-3101 Emails: jmarkman@rwglaw.com tkim@rwglaw.com slee@rwglaw.com	*Attorneys for Defendant, Respondent and Cross-Complainant, CITY OF BUENA PARK*

2014-2015

ENGINEER'S REPORT ON THE GROUNDWATER CONDITIONS, WATER SUPPLY AND BASIN UTILIZATION IN THE ORANGE COUNTY WATER DISTRICT

FEBRUARY 2016

Exhibit No. 4
Witness: Wei Xu
Date: 10/10/17
Christianne Lee Fong, CSR 7559

SINCE 1933

ORANGE COUNTY WATER DISTRICT

ORANGE COUNTY'S GROUNDWATER AUTHORITY

February 17, 2016

Michael R. Markus
General Manager
Orange County Water District
Post Office Box 8300
Fountain Valley, CA 92728-8300

Dear Mr. Markus:

In accordance with Section 26 of the District Act, the 2014-2015 Engineer's Report on the Groundwater Conditions, Water Supply and Basin Utilization in the District is hereby submitted.

Precipitation for the water year July 1, 2014 through June 30, 2015 within the District's boundaries averaged 8.2 inches, which was sixty one percent of the long-term average rainfall. Santa Ana River flow past Prado Dam for the water year totaled 102,090 acre-feet, which was forty five percent of the 30-year average flow. Flow past the District's spreading grounds (including any flow from the Santiago Creek) that was lost to the Pacific Ocean totaled 3,230 acre-feet.

Total water demands within the District for the 2014-2015 water year were 425,349 acre-feet (excluding water used for groundwater replenishment and barrier maintenance). Supplemental water used for groundwater replenishment and barrier maintenance during the water year totaled 60,870 acre-feet (excludes any available In-Lieu Program water). Groundwater production within the basin for the water year totaled 305,259 acre-feet (includes any available In-Lieu Program water) which was an eight percent decrease from the prior water year.

The accumulated basin overdraft increased from 342,000 acre-feet on June 30, 2014 to 381,000 acre-feet on June 30, 2015 using the three-layer approach and new baseline full condition for the basin. Under the provisions of Section 27 of the District Act, a portion of the Replenishment Assessment for the 2016-2017 water year could be equal to an amount necessary to purchase up to 170,000 acre-feet of replenishment water.

Very truly yours,

Chris S. Olsen
Director of Engineering

Lo Tan
Senior Engineer

PO Box 8300
Fountain Valley, CA 92728-8300

18700 Ward Street
Fountain Valley, CA 92708

(714) 378-3200
(714) 378-3373 fax

www.ocwd.com

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EXECUTIVE SUMMARY

Total water demands within Orange County Water District (OCWD) were 425,349 acre-feet (AF) for the 2014-15 water year (beginning on July 1, 2014 and ending on June 30, 2015). Groundwater production for the water year totaled 305,259 AF including any available In-Lieu Program water and excluding MWD Groundwater Storage Program extractions. A total of 60,870 AF of supplemental water was used for the purpose of groundwater replenishment and barrier maintenance.

For the water year which ended on June 30, 2015, the "annual overdraft" (annual basin storage decrease without supplemental replenishment water) was 153,000 AF and the annual basin storage including the use of supplemental replenishment water decreased by 39,000 AF. The accumulated overdraft on June 30, 2015 was 381,000 AF. Precipitation within the basin was 61 percent of normal rainfall during the water year, totaling 8.20 inches.

Based on the groundwater basin conditions for the water year ending on June 30, 2015, OCWD may purchase up to 170,000 AF of water for groundwater replenishment during the ensuing water year, beginning on July 1, 2016, pursuant to the District Act.

ACKNOWLEDGMENTS

A number of public and private entities contributed data used in this report including:

City of Anaheim
City of Buena Park
East Orange County Water District
City of Fountain Valley
City of Fullerton
City of Garden Grove
Golden State Water Company
City of Huntington Beach
Irvine Ranch Water District
City of La Palma
Mesa Water District
Metropolitan Water District of Southern California
Municipal Water District of Orange County
City of Newport Beach
City of Orange
County of Orange, Public Works Department
Orange County Sanitation District
City of Santa Ana
Santa Ana Watershed Project Authority
City of Seal Beach
Serrano Water District
City of Tustin
United States Geological Survey
City of Westminster
Yorba Linda Water District

The cooperation received from all agencies is gratefully acknowledged.

This report is based on the 2014-15 Basic Data Report which is placed on file at the office of OCWD in Fountain Valley.

GLOSSARY OF ACRONYMS

AF	Acre-feet
AWPF	Advanced Water Purification Facility
BEA	Basin Equity Assessment
BPP	Basin Production Percentage
CPTP	Coastal Pumping Transfer Program
CUP	Conjunctive Use Program
DRWF	Dyer Road Well Field
GAP	Green Acres Project
GWRS	Groundwater Replenishment System
HB	Huntington Beach
IDP	Irvine Desalter Project
IRWD	Irvine Ranch Water District
MF	Microfiltration
mg/L	Milligrams per Liter
MBI	Mid-Basin Injection
MGD	Million Gallons per Day
MSL	Mean Sea Level
MWD	Metropolitan Water District of Southern California
MWDOC	Municipal Water District of Orange County
MWRF	Mesa Water Reliability Facility
$N0_3$	Nitrate
O&M	Operation and Maintenance
OCSD	Orange County Sanitation District
OCWD	Orange County Water District
RA	Replenishment Assessment
RO	Reverse Osmosis
RTS	Readiness-to-Serve
SAR	Santa Ana River
SWP	State Water Project
TDS	Total Dissolved Solids
UV	Ultraviolet
WRD	Water Replenishment District of Southern California
WSM	Basin Water Supply Management Program

PART I: GROUNDWATER CONDITIONS

Section 25 of the OCWD Act requires that OCWD order an annual investigation to report on the groundwater conditions within the District's boundaries. A summary of the groundwater conditions for the water year covering July 1, 2014 to June 30, 2015 is as follows.

GROUNDWATER CONDITIONS
2014-15 SUMMARY OF FINDINGS

1. Groundwater production (including the In-Lieu Program) totaled 305,259 acre-feet (AF) for the 2014-15 water year excluding extractions from the Metropolitan Water District of Southern California (MWD) Groundwater Storage Program.

2. Groundwater stored in the basin decreased by 39,000 AF for the 2014-15 water year.

3. Accumulated Overdraft[1] on June 30, 2015 was 381,000 AF.[2]

4. Annual Overdraft was 153,000 AF for the 2014-15 water year.

5. Average Annual Overdraft[3] for the immediate past five water years (2010-11 through 2014-15) was 132,000 AF.

6. Projected Annual Overdraft[3] for the current 2015-16 water year is 137,750 AF.

7. Projected Annual Overdraft[3] for the ensuing 2016-17 water year is 138,000 AF.

8. Projected Accumulated Overdraft[2] on June 30, 2016 is 374,000 AF assuming average hydrological conditions.

9. Under the provisions of Section 27 of the District Act, a portion of the 2016-17 Replenishment Assessment (RA) could be equal to an amount necessary to purchase up to 170,000 AF of replenishment water.[4]

[1] *Accumulated overdraft was calculated using the OCWD's three-layer storage change methodology adopted on March 21, 2007 and the associated new benchmark for full-basin condition. Water year 2005-06 was the first year this methodology was used. Refer to other portions within this section for additional explanation.*

[2] *Water from the Metropolitan Water District of Southern California Long-Term Groundwater Storage Program was included as part of the total stored water in determining the basin's accumulated overdraft.*

[3] *Annual overdraft is defined in the District Act as "annual basin storage decrease without supplemental replenishment water."*

[4] *Determined by adding the five-year annual overdraft (132,000 AF) to one-tenth of the accumulated overdraft (381,000 AF) which results in the following:*
132,000 AF + [(381,000 AF) x 0.10] = 170,100 AF (or 170,000 AF when rounded).

BASIN HYDROLOGY

Groundwater conditions in the Orange County groundwater basin are influenced by the natural hydrologic conditions of rainfall, capture and recharge of Santa Ana River (SAR) and Santiago Creek stream flows, natural infiltration of surface water, and the transmissive capacity of the basin. The basin is also influenced by groundwater extraction and injection through wells, use of imported water for groundwater replenishment, wastewater reclamation and water conservation efforts and activities throughout OCWD's service area.

The water year beginning on July 1, 2014, yielded an average of 8.20 inches of rainfall within OCWD's boundaries, which is approximately 61 percent of the long-term annual average of 13.40 inches. Rainfall data within OCWD's boundaries was provided by the Orange County Public Works for precipitation stations number 5, 61, 96, 121, 163, 165, 173, 219, 222 and 229. The previous year (2013-14) had rainfall equaling 4.52 inches which was also less than the long-term average rainfall. The average seasonal rainfall in the OCWD service area for the five-year period (from July 1, 2010 through June 30, 2015) was 9.47 inches, and below average rainfall in the watershed tends to lead to lower flows in the SAR reaching Orange County. Stream flow in the SAR measured downstream of Prado Dam for water year 2014-15 totaled 102,090 AF which was approximately 45 percent of the 30-year flow average of 225,582 AF.

GROUNDWATER PRODUCTION

Groundwater production from wells within OCWD for the 2014-15 water year totaled 305,259 AF (excluding In-Lieu Program water, MWD Groundwater Storage Program extractions, and any groundwater used for the Talbert Barrier): 302,634 AF for non-irrigation and 2,625 AF for irrigation uses. The term "irrigation" used in the District Act and herein refers to irrigation for agricultural, horticultural or floricultural crops and for pasture grown for commercial purposes.

OCWD's In-Lieu Program replaces groundwater supplies with imported water to reduce groundwater pumping. During the 2014-15 water year, In-Lieu Program water was not available for purchase from MWD. Annual groundwater production and In-Lieu quantities within OCWD for the period 1965-66 through 2014-15 are presented in Figure 1 and Table 1.

Groundwater production for 2014-15 for the major groundwater producers is summarized in Appendix 1. Groundwater production for all producers exceeding 25 AF per year for non-irrigation and irrigation purposes is presented in Appendices 2 and 3, respectively.

FIGURE 1. Groundwater Production

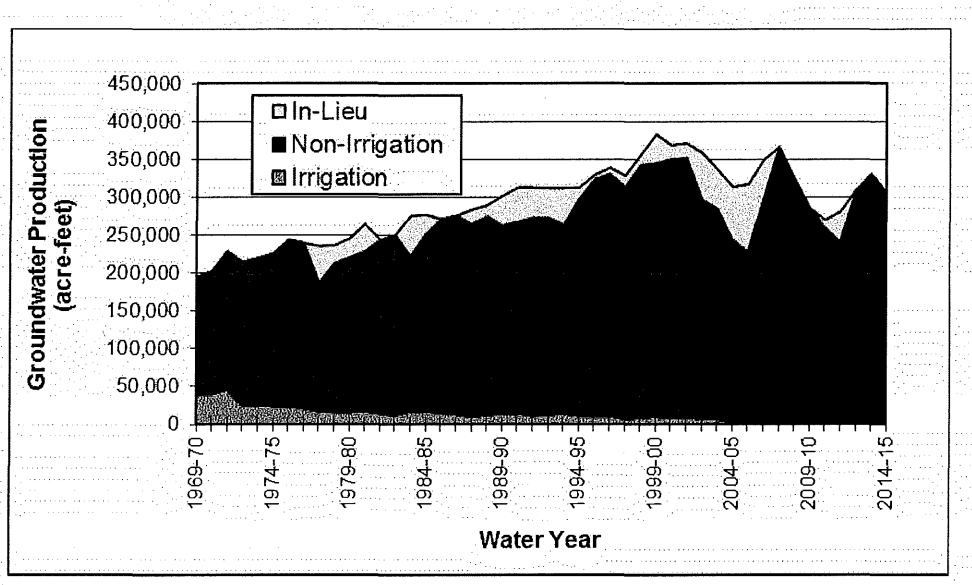


TABLE 1. Historical Groundwater Production Within OCWD

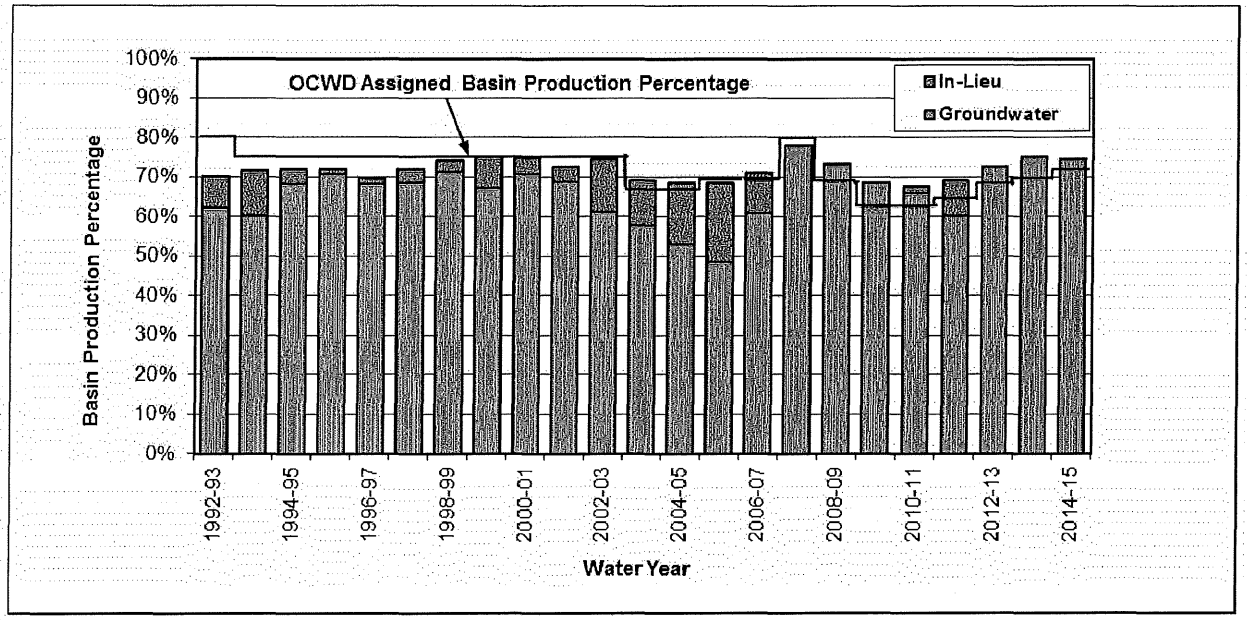
Water Year Jul 1-Jun 30	Groundwater Production (AF)	In-Lieu Program (AF)	Water Year Jul 1-Jun 30	Groundwater Production (AF)	In-Lieu Program (AF)
1965-66	182,172	-	1990-91	266,745	44,588
1966-67	169,375	-	1991-92	271,224	39,789
1967-68	193,656	-	1992-93	273,587	38,900
1968-69	178,798	-	1993-94	264,159	48,134
1969-70	194,379	-	1994-95	298,217	15,622
1970-71	203,923	-	1995-96	324,111	5,542
1971-72	229,048	-	1996-97	331,406	7,883
1972-73	214,983	-	1997-98	313,805	15,096
1973-74	218,863	-	1998-99	342,823	13,352
1974-75	225,597	-	1999-00	345,362	38,007
1975-76	245,456	-	2000-01	350,385	18,640
1976-77	243,511	-	2001-02	352,113	19,473
1977-78	188,407	48,290	2002-03	297,191	61,463
1978-79	213,290	23,792	2003-04	284,621	52,168
1979-80	221,453	24,861	2004-05	244,370	69,617
1980-81	228,943	36,373	2005-06	228,159	89,216
1981-82	244,184	-	2006-07	299,118	50,740
1982-83	249,548	-	2007-08	366,185	-
1983-84	223,207	52,822	2008-09	324,147	-
1984-85	252,070	25,198	2009-10	285,575	-
1985-86	270,932	-	2010-11	259,861	10,435
1986-87	276,354	-	2011-12	241,082	40,564
1987-88	265,226	18,856	2012-13	309,295	-
1988-89	275,077	15,022	2013-14	330,782	-
1989-90	261,190	38,961	2014-15	305,259	-

BASIN PRODUCTION PERCENTAGE

The Basin Production Percentage (BPP) is defined in the District Act as "*...the ratio that all water to be produced from groundwater supplies within the district bears to all water to be produced by persons and operators within the district from supplemental sources as well as from groundwater within the district.*" The BPP applies only to water producers that utilize more than 25 AF of groundwater per water year. Water producers that use 25 AF or less from the groundwater basin are excluded from the production percentage limitation.

The BPP for the 2014-15 water year was established at 72.0 percent by the OCWD Board of Directors. The overall BPP achieved within OCWD for non-irrigation use in the 2014-15 water year was 74.6 percent. The achieved pumping is greater than 72.0 percent primarily due to several water quality projects that are given a Basin Equity Assessment (BEA) exemption to pump groundwater above the BPP. The production percentage achieved by each major producer for non-irrigation use is presented in Appendix 1. Historical assigned and achieved BPPs are illustrated below in Figure 2.

FIGURE 2. Groundwater BPP



GROUNDWATER LEVELS

Groundwater levels in the Orange County groundwater basin are shown on Plate 1. Groundwater level data used to prepare this plate were collected during late June and early July 2015 from over 500 production and monitoring wells screened within the principal aquifer system (approximately 300 to 1,200 feet deep), from which over 90% of

basin pumping occurs. The groundwater elevation contours range from 30 to 90 feet below mean sea level in the coastal area of the basin due to pumping. A general indicator of changing basin levels is the location of the zero (0) mean sea level (MSL) elevation contour line each year (MSL elevations are referenced to Vertical Datum NGVD 29). The zero contour line moved seaward (ranging from 0.05 to 2.66 miles) when compared to its alignment the prior year, indicating an increase in groundwater levels in the principal aquifer system.

Plate 2 shows the change in groundwater levels from June 2014 to June 2015 for the principal aquifer system. Throughout most of the basin, groundwater levels in June 2015 were higher than those in June 2014.

Below is a general overview of the change in groundwater levels from June 2014 to June 2015 for the three primary aquifer systems of the basin.

Shallow Aquifer System :

In the shallow aquifer, groundwater levels declined throughout most of the basin from June 2014 to June 2015. The groundwater level decline was approximately 5 to 10 feet in the Forebay area of the basin (north of the 5 Freeway) due to reduced SAR flows and reduced natural recharge for the fourth consecutive year. The Forebay areas exhibiting this shallow aquifer groundwater level decline included the areas of Anaheim, Fullerton, Orange, Tustin, and Irvine. In addition to reduced natural recharge along the mountainfront areas of the basin, managed or artificial recharge for the OCWD spreading grounds in the Anaheim and Orange Forebay areas was somewhat reduced also at 190,205 AF for water year 2014-15. Although this total managed recharge for water year 2014-15 represented a 10.3% increase from the even drier water year 2013-14, it still was approximately 13% less than the average over the last 20 years.

The groundwater level decline was smaller at approximately 1 to 5 feet in the central portion of the basin and only one foot or less in the west Orange County area and near the boundary with Los Angeles County. Since groundwater levels declined in the Forebay areas but remained stable or had a subtle rise near the county line, this indicates that the gradient was slightly flatter in the shallow aquifer in June 2015 compared to June 2014. Therefore, groundwater outflow to the Central Basin may have been less than the prior water year.

In the greater coastal area away from the Talbert Barrier, shallow aquifer groundwater levels declined 1 to 5 feet similar to the central portion of the basin. However, near the Talbert Barrier, shallow aquifer groundwater levels rose by approximately 5 to 25 feet because the June 2014 comparison period represented an anomalously low temporary condition in this vicinity due to the barrier being offline during June 2014 (GWRS shutdown due to Initial Expansion construction activities). Once the barrier went back

online in July 2014, shallow aquifer groundwater levels recovered quickly and thus protective groundwater elevations were maintained sufficiently above mean sea level for the majority of water year 2014-15 in the Talbert Barrier area to prevent seawater intrusion.

Two other small areas experienced a rise in shallow aquifer groundwater levels from June 2014 to June 2015 and included: 1) a rise of 2 to 5 feet in the immediate vicinity of Anaheim Lake and Kraemer, Miller, and Miraloma basins due to June 2014 groundwater levels being anomalously low (aforementioned GWRS June 2014 shutdown), and 2) a rise of 20 feet along Santiago Creek due to negligible Santiago Creek recharge during May-June 2014 and approximately 400 AF of Santiago Creek recharge during May-June 2015. Both of these shallow aquifer groundwater level rises were localized and not widespread.

Principal Aquifer System :

In the principal aquifer, groundwater levels rose throughout the majority of the basin from June 2014 to June 2015, except in the fringes of the basin in close proximity to the mountain front areas where levels dropped one to 10 feet due to the lack of rainfall and natural recharge.

For the rest of the basin, the rise in principal aquifer groundwater levels was likely due to the reduction in groundwater production during water year 2014-15, especially during the last two months of the water year. As mentioned above, groundwater production was 23% less in May-June 2015 than the same two-month period in 2014.

In the Anaheim/Fullerton Forebay area, the rise in principal aquifer groundwater levels was approximately 5 to 10 feet. In the Orange Forebay area, the rise was larger at approximately 10 to 30 feet, indicating a more pronounced effect of the aforementioned pumping reduction because there is a higher density of production wells in this area as compared to the Anaheim/Fullerton area.

Principal aquifer groundwater levels rose approximately 10 to 15 feet within the central portion of the basin and 15 to 20 feet in the west Orange County area. Across the county line in Long Beach and Lakewood, Principal aquifer groundwater levels rose as much as 20 and 40 feet, respectively. The greater rise in principal aquifer groundwater levels in Los Angeles County relative to Orange County indicates that the gradient towards Los Angeles County was flatter and thus the groundwater outflow was likely less than the prior water year.

In the immediate vicinity of the Talbert Barrier, principal aquifer groundwater levels rose 15 to 40 feet, but this rise was localized and due to the barrier being offline the prior June which caused principal aquifer groundwater levels to be temporarily and anomalously low during June 2014. For the larger coastal area away from the Talbert Barrier, principal

aquifer groundwater levels rose approximately 10 to 15 feet similar to the central portion of the basin, except in the Mesa Water District and Irvine Ranch Water District (IRWD) Dyer Road Well Field (DRWF) areas where the rise was approximately 10 to 30 feet.

In the vicinity area of the Irvine Desalter Project (IDP) wells, the rise in principal aquifer groundwater levels was approximately 1 to 5 feet. The rise was smaller in this area likely because the reduced pumping was partially offset by the lack of natural recharge along the Santa Ana Mountains (fourth consecutive dry year). In the north Irvine area near the Santa Ana mountainfront, principal aquifer groundwater levels declined approximately 8 feet.

Deep Aquifer System :

In the deep aquifer, groundwater levels rose across the majority of the basin similar to but somewhat less than in the principal aquifer. Similar to the principal aquifer, deep aquifer groundwater levels experienced a subtle decline closer to the mountainfront fringe areas of the basin. Deep aquifer groundwater levels declined 1 to 5 feet in the Forebay areas of Anaheim, Orange, Tustin, and Irvine.

Deep aquifer groundwater levels rose approximately 1 to 8 feet in the central portion of the basin and approximately 10 to 13 feet in the west Orange County area. Across the county line in Long Beach and Lakewood, deep aquifer groundwater levels rose approximately 12 to 16 feet. The slightly larger rise in the Long Beach and Lakewood areas indicates that the gradient and groundwater outflow across the county line in the deep aquifer was likely somewhat less than the prior water year.

COASTAL GROUNDWATER CONDITIONS

The coastal portion of the groundwater basin, essentially that area within five miles of the coast, is sensitive to seawater intrusion potential and seasonal effects on production well capacity due to lower groundwater levels. Coastal groundwater levels are affected by groundwater production, overall groundwater storage in the basin, and, to a somewhat lesser extent, injection at the Talbert and Alamitos barriers.

Coastal groundwater production for water year 2014-15 totaled 102,023 AF which includes Fountain Valley, Huntington Beach (HB), IRWD DRWF and Deep Aquifer Treatment System wells, Mesa Water District, Newport Beach, OCWD deep wells in Fountain Valley, Seal Beach, and Westminster. The coastal groundwater production for water year 2014-15 was approximately the same (400 AF less) as the prior water year. The 2% increase in the BPP for water year 2014-15 was thus offset by reduced demand. Also, the Coastal Pumping Transfer Program (CPTP) implemented during water year 2013-14 was repeated in water year 2014-15, although the participating producers and total amount of shifted pumping differed somewhat.

During water year 2014-15, CPTP under-pumping totaled 5,453 AF from only two coastal producers (HB and Mesa Water District), with HB accounting for the majority at 3,455 AF of under-pumping. The CPTP over-pumping during water year 2014-15 was only 3,569 AF and fell short of the goal to balance with the under-pumping primarily because a couple of the large inland over-pumpers (e.g., Anaheim and Buena Park) could not participate due to their MWD CUP pumping during water year 2014-15.

The primary goal of the CPTP over the last two years was to raise coastal water levels and thereby reduce the potential for seawater intrusion, especially in the Sunset Gap area where there currently is no injection barrier. Hence, HB had the largest under-pumping amount during both water year 2013-14 and water year 2014-15. A secondary goal of the CPTP was to reduce underflow to the Central Basin of Los Angeles County.

Talbert Barrier injection totaled 36,489 AF for water year 2014-15, representing an increase of 14% from the prior water year's total of 31,906 AF. The injection increase during water year 2014-15 was necessary to restore protective elevations seaward of the barrier immediately following the planned 26-day shutdown of GWRS Advanced Water Purification Facility (AWPF) at the end of the prior water year (June 2014), especially during low-basin conditions.

At a key OCWD monitoring well M26 located near Adams Avenue seaward of the barrier, shallow aquifer groundwater levels had declined to 12 feet below mean sea level by the start of water year 2014-15 due to the aforementioned shutdown, but then rose sharply during July 2015 when injection commenced. A nine-day shutdown of AWPF in October temporarily caused shallow aquifer groundwater levels at M26 to decline before steadily rising above mean sea level and reaching protective elevations in December 2014 and then remained at those protective elevations for the second half of the water year. The increased injection helped to reach and maintain these protective levels even though the accumulated overdraft increased during water year 2014-15 primarily due to a lack of natural and managed recharge in the Forebay.

Talbert Barrier injection consisted of nearly 100% (99.95%) GWRS recycled water and 0.05% (18 AF) of imported potable water from the MWD OC-44 connection. During normal operating conditions throughout the water year, barrier injection was 100 percent GWRS water. The MWD potable water was only used to keep the barrier pipeline full or to maintain a small amount of injection during brief intermittent plant shutdowns.

At the Alamitos Barrier, the OCWD portion of injection totaled 2,236 AF for water year 2014-15, which was very similar to the prior water year but somewhat higher than past years. The higher injection total over the last two years has been an operational attempt to achieve protective elevations near the barrier under relatively low basin conditions. The injection total included all sources of water (93% imported and 7% recycled for water year

2014-15) but only represents OCWD's share, which is less than half of the total injection based on the location of the barrier wells that lie within both Los Angeles and Orange counties. Typically, Alamitos Barrier injection is an approximately 50/50 blend of imported and recycled water. The recycled portion was much lower the last two years due to two extended shutdowns of the Leo J. Van der Lans treatment plant in water year 2013-14 and frequent shutdowns during water year 2014-15 related to problems encountered during startup testing and commissioning of the plant expansion.

During water year 2014-15, monthly groundwater production in the coastal area generally followed the demand curve even though coastal pumping was reduced due to participation in the CPTP. Coastal production was relatively high at greater than 10,000 AF per month during the summer months July through September of 2014, declined to less than 7,000 AF per month during the winter months, then rose back up during the spring to above 9,000 AF in June 2015. However, pumping from IRWD's Deep Aquifer Treatment System wells did not follow the demand curve and was nearly constant year-round in order to baseload their colored water treatment plant. Also, groundwater pumping from Seal Beach wells was relatively constant year-round during water year 2014-15 and was even slightly reduced during the summer months of July and August of 2014 likely due to under-pumping for the CPTP.

Coastal groundwater levels expressed a typical seasonal pattern during water year 2014-15 that was consistent with the typical seasonal variation in coastal pumping. The seasonal pattern in coastal groundwater levels for water year 2014-15 was as follows: 1) declined during the summer to their lowest point of the year in September 2014, 2) rose during the fall and winter months, reaching a peak in March 2015, and 3) declined during the spring and early summer from April through June 2015.

Coastal groundwater levels in the shallow aquifer followed the general seasonal trend described above, but with a seasonal fluctuation of only 5 feet from winter to summer. This dampened response is typical because of the lack of pumping from the shallow aquifer. The discussion that follows pertains exclusively to the principal aquifer where the majority of coastal pumping occurs.

Coastal groundwater levels in the principal aquifer at the beginning of the water year in July 2014 were relatively low compared to the last few years due to the drought and relatively low basin storage conditions, but the groundwater level decline during the summer months from July to September 2014 was relatively mild. Principal aquifer groundwater levels declined only 5 to 10 feet in the Seal Beach, HB, and Fountain Valley areas and 10 to 20 feet in the Mesa Water District and IRWD DRWF areas. These summer declines were relatively mild due to the aforementioned CPTP in which select coastal producers under-pumped, especially since the majority of the under-pumping was during the summer months. Coastal groundwater levels in the principal aquifer reached their lowest point of the water year in September 2014, ranging from approximately 75 feet

below MSL in the Seal Beach and HB areas to as low as 120 feet below MSL in the Mesa Water District and IRWD DRWF areas where coastal pumping was more concentrated. These lows were approximately 10 to 20 feet lower than the lows from the prior water year.

From October 2014 to March 2015, groundwater levels in the principal aquifer rose sharply by 35 to 40 feet throughout the majority of the coastal area and 45 feet in the IRWD DRWF area. The increase in groundwater levels was primarily due to less groundwater pumping during these winter/fall months when water demand was lower and also because of the CPTP which reduced coastal pumping by over 5,000 AF throughout the course of water year 2014-15 as was described above. The March 2015 coastal groundwater levels in the principal aquifer represented the annual high for water year 2014-15, and ranged from 40 feet below MSL in the Seal Beach and HB areas to approximately 80 feet below MSL in the Mesa Water District and IRWD DRWD areas. These highs were approximately 5 to 15 feet lower than the analogous highs of the prior water year.

From April through June 2015, coastal groundwater levels in the principal aquifer declined only mildly due to significantly reduced pumping during the last two months of the water year. Pumping throughout the basin during May and June of 2015 was 23% lower than those same two months of the prior water year because of late season rain in May 2015 and the state-mandated 25% water cutbacks which were announced in May and officially began in June 2015. The mild decline in coastal groundwater levels in the principal aquifer was only 10 feet throughout most of the coastal area and 15 feet in the IRWD DRWF area.

Because the decline was so mild from April through June 2015, groundwater levels in the principal aquifer ended the year in June 215 approximately 15 to 20 feet higher than at the end of the prior water year throughout the majority of the coastal area. However, near the west end of the Talbert Barrier in Huntington Beach, principal aquifer groundwater levels at the end of June 2015 were as much as 30 to 40 feet higher than in June 2014 due to the aforementioned Talbert Barrier shutdown during June 2014 which caused groundwater levels to be anomalously low that month in that immediate vicinity.

Based on the principal aquifer water level patterns described above for water year 2014-15, the moderate amount of seasonal variation from high to low has become more typical since 2008. Principal aquifer levels varied seasonally by approximately 35 feet in the Seal Beach and HB areas, and 40 to 45 feet in the Mesa Water District and IRWD DRWF areas, respectively. The seasonal fluctuation was slightly greater in the Mesa Water District and IRWD DRWF areas due to the larger number and denser distribution of production wells as compared to the HB and Seal Beach areas. In the Mesa Water District and IRWD DRWF areas, the 40 to 45-foot seasonal fluctuation was similar to last year as well as most years since 2008. Prior to 2008, principal aquifer levels in the Mesa Water District and IRWD

DRWF areas fluctuated seasonally by as much as 80 to 100 feet when IRWD and other producers were participating in the MWD Seasonal Shift Program.

ANNUAL OVERDRAFT

Annual groundwater basin overdraft, as defined in the District Act, "*...is the quantity by which production of groundwater supplies exceeds natural replenishment of groundwater supplies during a water year.*" This difference between extraction and replenishment can be estimated by determining the change in volume of groundwater in storage that would have occurred had supplemental water not been used for any groundwater recharge purpose, including seawater intrusion protection, advanced water reclamation and the In-Lieu Program.

For the 2014-15 water year, it is estimated that the volume of groundwater in storage decreased by 39,000 AF. Approximately 114,061 AF of water was supplied to the basin as follows: 1) directly from the percolation or injection of purchased imported water from the Colorado River and State Water Project (SWP), 2) use of recycled water to supplement purchased imported water in the Alamitos seawater intrusion barrier, and 3) use of GWRS recycled water. Therefore, the annual overdraft was 153,000 AF for the 2014-15 water year. For the five-year period from July 1, 2010 to June 30, 2015, an annual average of approximately 120,000 AF of supplemental water and recycled water was percolated or injected into the underground basin for replenishment or used directly in place of pumping groundwater (i.e., In-Lieu Program). The average annual overdraft during the same five-year period was approximately 132,000 AF.

GROUNDWATER BASIN ACCUMULATED OVERDRAFT

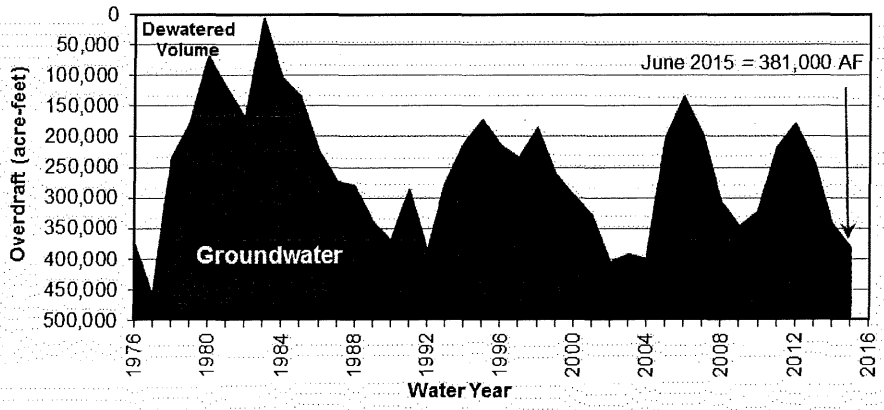
The accumulated overdraft, as defined in the District Act, is the quantity of water needed to be replaced at OCWD's intake area to prevent landward movement of ocean water into the fresh groundwater body. Landward movement of ocean water can be prevented if groundwater levels near the coast are several feet above sea level. Groundwater levels along the coast are related to the volume of water stored in the intake area, water pumped from the entire basin and the pattern or location of pumping. However, the Talbert and Alamitos seawater intrusion control projects have been implemented to prevent landward movement of ocean water into the fresh groundwater body. Due to the operation of seawater intrusion barrier facilities, there is no longer a direct correlation between accumulated overdraft and controlling seawater intrusion. These facilities allow greater utilization of the storage capacity of the groundwater basin. OCWD is also dedicated to maximizing its replenishment capabilities by actively negotiating with the U.S. Army Corps of Engineers to increase its water conservation program behind Prado Dam and implementing a Long-Term Facilities Plan to evaluate cost-effective improvements to its groundwater recharge capabilities.

In February 2007, OCWD staff completed a report entitled "Evaluation of Orange County Groundwater Basin Storage and Operational Strategy." This report presented a new methodology that had been developed, tested, and documented for calculating accumulated overdraft and storage change based on a three aquifer layer approach. Furthermore, the report provided the basis for calculating accumulated overdraft using a new full-basin benchmark that was developed for each of the three aquifer layers, which in effect replaces the traditional single-layer full benchmark of 1969.

The annual analysis of basin storage change and accumulated overdraft for water year 2014-15 has been completed. Based on the three-layer methodology, an accumulated overdraft of 381,000 AF was calculated for the water year ending June 30, 2015. The accumulated overdraft for the prior water year ending June 30, 2014 was 342,000 AF (also calculated using the three-layer storage method). Therefore, an annual decrease of 39,000 AF (reported earlier herein this report) in stored groundwater was calculated as the difference between the June 2014 and June 2015 accumulated overdrafts.

Figure 3 shows the accumulated basin overdraft quantities for the period 1976 through 2015.

FIGURE 3. Accumulated Basin Overdraft



The accumulated overdraft for the current water year ending on June 30, 2016 is projected to be 374,000 AF assuming slightly-below average hydrology. The annual overdraft is estimated to be 137,750 AF. This quantity is based on assumed annual groundwater production of approximately 281,750 AF for the current water year (including groundwater pumping within the BPP, In-Lieu Program water, groundwater pumped above the BPP from water quality improvement projects and MWD Groundwater Storage Program extractions) and that natural replenishment (including captured SAR flows and incidental recharge) is estimated to be approximately 144,000 AF for the basin under slightly-below average rainfall conditions. In addition, GWRS production is assumed to be 103,000 AF due to the Initial Expansion.

Projected annual overdraft for the ensuing water year (2016-17) is estimated to be 138,000 AF. This estimate is based on the assumption that total annual groundwater production for the ensuing water year will be 294,000 AF, a figure that is based upon an assumed BPP of 75 percent and includes 22,000 AF of production above the BPP from water quality improvement projects (discussed further in the subsequent section entitled Recommended Basin Production Percentage). The natural replenishment is estimated to be 156,000 AF (average of last five years) under below-average rainfall conditions, and the GWRS production is assumed to be 103,000 AF due to the Initial Expansion.

OCWD, MWD, the Municipal Water District of Orange County (MWDOC) and participating producers approved the funding agreement for the MWD Long-Term Groundwater Storage Program on June 25, 2003. This conjunctive use program (also informally referred to as MWD CUP) provides for MWD to store up to 66,000 AF in the OCWD groundwater basin to be pumped (less basin losses) by participating producers in place of receiving imported supplies during water shortage events. A compensation package from MWD was included in the agreement to build eight new groundwater production wells, improvements to the seawater intrusion barrier, construction of the Diemer Bypass Pipeline and an annual administrative fee. The preferred means to store water in the MWD storage account has been through the In-Lieu deliveries to participating groundwater producers. Water into the MWD storage account has also been conducted through direct replenishment utilizing OCWD Forebay recharge basins. During water year 2014-15, MWD did not store any water into the MWD CUP storage account. However, OCWD purchased 10,000 AF of stored water from the MWD CUP account. In any event, the water stored or extracted by MWD is considered to be MWD supply and not groundwater production. During water year 2014-15, 12,917 AF were pumped from pumped from the MWD CUP account by the participating groundwater producers. The annual quantities and cumulative totals of MWD water stored since the inception of the program are shown in Appendix 4. It is important to note that the reported quantities do not include pumping extractions from the account or basin losses.

REPLENISHMENT RECOMMENDATION

Section 27(b) of the District Act states the following:

"The total of the replenishment assessment levied in any year shall not exceed an amount of money found to be necessary to purchase sufficient water to replenish the average annual overdraft for the immediate past five water years plus an additional amount of water sufficient to eliminate over a period of not less than 10 years nor more than 20 years, the accumulated overdraft, plus an amount of money to pay the costs of initiating, carrying on, and completing any of the powers, projects and purposes for which this district is organized."

Based upon Section 27(b), that portion of the RA that is used for water purchases for the ensuing water year 2016-17 is limited to the amount needed to purchase 170,000 AF as calculated below:

Five-year (7/1/2010 through 6/30/2015) Average Annual Overdraft* = 132,000 AF
Accumulated Overdraft (End of Water Year 2014-15) = 381,000 AF
Assumed Time Period to Eliminate Accumulated Overdraft = 10 years
Potential Water Purchase Amount: 133,000 AF + (381,000 AF/10 years) = 170,100 AF (use 170,000 AF)

**Referred to as the Average Annual Overdraft in Section 27(b) of the District Act.*

Table 2 presents the proposed 2016-17 budget for water purchases, which shows the proposed quantity of purchased water (67,000 AF) being significantly less than the prescribed limit of 170,000 AF as allowed for under the provisions of Section 27(b) of the District Act.

TABLE 2. 2016-17 Budget for Water Purchases

Water Source	AF	Rate ($/AF)*	Total Cost ($)
Alamitos Barrier	2,000	$1,048.00	$ 2,096,000
MWD Untreated Non-interruptible Water	65,000	$605.00	$39,325,000
Water Purchases Sub-total	67,000	—	$41,421,000
Applicable Charges			**Total Cost ($)**
MWDOC Surcharge (8-year average)	—	—	$ 0
MWD/MWDOC Capacity Charge	—	—	$ 1,000,000
MWD/MWDOC RTS Charge	—	—	$ 700,000
Additional Charges Sub-total	—	—	$ 1,700,000
TOTAL WATER PURCHASES COST	67,000	—	$43,121,000

* Rates include required MWDOC Capacity and Readiness to Serve (RTS) charges where appropriate.

RECOMMENDED BASIN PRODUCTION PERCENTAGE

In December 2002, OCWD approved a basin management approach for determining the BPP for future water years. The management approach is based upon the development of a base amount of groundwater production the basin can annually sustain utilizing dependable water supplies OCWD expects to receive. It is a policy for OCWD to provide an estimate of the BPP each January for the following fiscal year to assist the groundwater producers in the preparation of their annual budgets.

A BPP ranging from 72 percent to 80 percent is currently being proposed for the ensuing water year 2016-17. Analysis of the groundwater basin's projected accumulated overdraft, the available supplies to the basin (assuming below-average hydrology) and the projected pumping demands indicate that this level of pumping could potentially be sustained for 2016-17 without detriment to the basin.

A BPP of 75 percent corresponds to approximately 294,000 AF of groundwater production which includes 22,000 AF of groundwater production above the BPP to account for several groundwater quality enhancement projects (see description below).

In order to achieve water quality objectives in the groundwater basin, it is estimated for the ensuing water year 2016-17 that additional production of approximately 22,000 AF (above the BPP) will be undertaken by the City of Tustin, City of Garden Grove, Mesa Water District and IRWD. These agencies need the additional pumping allowance in order to accommodate groundwater quality improvement projects. As in prior years, production above the BPP from these projects would be partially or fully exempt from the BEA as a result of the benefit provided to the basin by removing poor-quality groundwater and treating it for beneficial use.

In March 2016, staff will review with the OCWD Board of Directors the basis and the assumptions made for the proposed BPP and receive any direction on the matter. In April 2016, staff will again apprise the OCWD Board of Directors on the status of the aforementioned conditions. If the estimates of basin supplies in the current or ensuing year are substantially different than those contained in the respective conditions, a revised BPP may then be recommended.

PART II: WATER SUPPLY AND BASIN UTILIZATION

Section 31.5 of the District Act requires an investigation and annual report setting forth the following information related to water supply and basin utilization within the OCWD service area, together with other information as OCWD may desire:

WATER SUPPLY AND BASIN UTILIZATION 2014-15 SUMMARY OF FINDINGS

1. Water usage from all supplemental sources totaled 159,373 AF for the 2014-15 water year including any available In-Lieu Program water (none for 2014-15).

2. Water usage from recycled water produced from within OCWD including the GWRS totaled 98,057 AF for the 2014-15 water year.

3. Water demands within OCWD totaled 425,349 AF for the 2014-15 water year.

4. Estimated demands for groundwater for the ensuing 2016-17 water year are 294,000 AF.

SUPPLEMENTAL WATER

Supplemental water is used by water agencies within OCWD's boundary to augment groundwater supplies in satisfying their user demands and by OCWD to recharge the groundwater basin. Supplemental water, as defined in Section 31.5 of the District Act, is any water that originates from outside the SAR watershed (comprised of an area of 2,081 square miles) with the exception of water that originates within the portion of the Santiago Creek watershed that lies upstream of Villa Park Dam which is counted as supplemental water. It is important to note that the Santiago Creek watershed lies entirely within the SAR watershed. Sources of supplemental water typically include imported deliveries from MWD and diversions from Irvine Lake/Santiago Reservoir (i.e., Santiago Creek) that are conveyed to users within OCWD boundaries. MWD deliveries originate from either the Colorado River or the SWP. In addition, supplemental water would also include deliveries from within the SAR watershed that involve water exchanges (i.e., releasing a quantity of water that originates from within the SAR watershed while importing an equal quantity of supplemental water to replace it).

Non-local waters are defined, for the purposes of this report, as waters purchased from agencies outside of OCWD's boundary for use within OCWD. Non-local waters include supplemental water and water deliveries purchased by OCWD where the water source is located within the SAR watershed. Water deliveries to OCWD from the Arlington Desalter in Riverside and the San Bernardino Valley Municipal Water District's High Groundwater Mitigation Project are considered non-local waters. Both projects involve pumping (and treatment in Arlington's case) and release of groundwater from the SAR upstream groundwater basins to OCWD via the SAR for groundwater replenishment at OCWD Forebay recharge facilities. For the purpose of being consistent with previous Engineer's Reports and to present information in a concise manner, non-local water deliveries that are purchased and used by OCWD for groundwater replenishment are included in the supplemental water totals in this report.

Recycled wastewater produced and used within OCWD is considered, for the purposes of this report, as neither non-local water nor supplemental water (sometimes referred to as neutral water). Therefore, recycled water that originates from within OCWD is reported separately from supplemental water totals. However, recycled water used in the Alamitos Barrier is supplied by Water Replenishment District of Southern California (WRD) and originated from outside the SAR watershed, and, as such, is categorized as supplemental water.

Water agencies utilizing supplemental water are listed in Appendix 1. As summarized in Table 3, the use of supplemental water in OCWD's service area during 2014-15 water year totaled 159,373 AF of which 98,502 AF resulted from the direct use by water agencies and 60,871 AF (including any available In-Lieu Program water) were used for groundwater

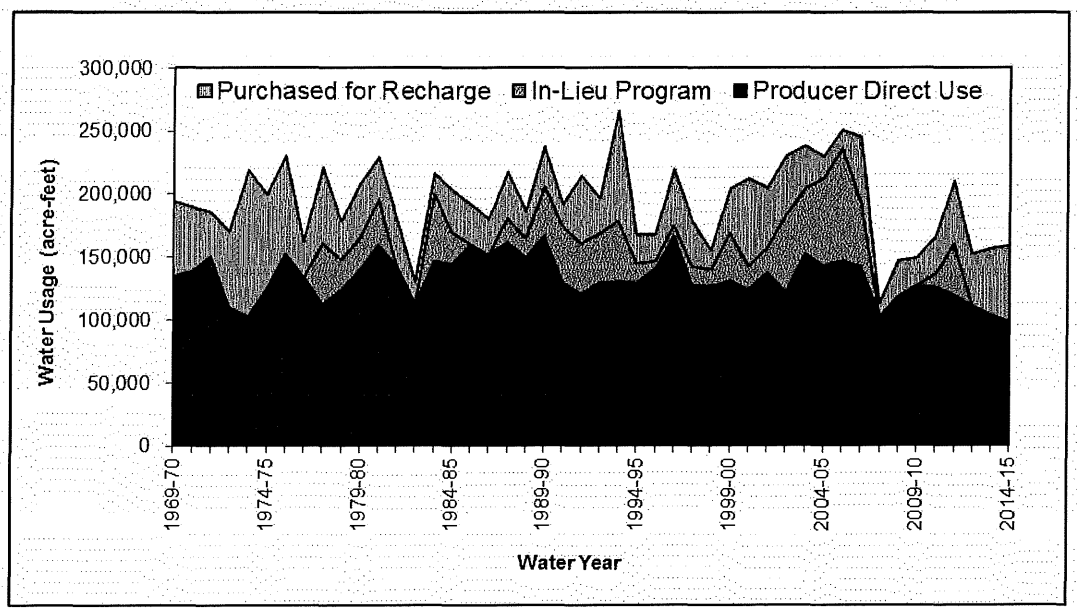
replenishment purposes. The supplemental water used by water agencies included 98,502 AF for municipal and industrial use and zero AF for agricultural purposes. Historical supplemental water usage for the 2014-15 water year and earlier is illustrated in Figure 4. The GWRS delivered recycled water to OCWD Forebay recharge basins and the Talbert seawater intrusion barrier throughout the 2014-15 water year. A breakdown of non-local water purchases by OCWD for 1995-96 through 2014-15 is presented in Appendix 4.

TABLE 3. 2014-15 Supplemental Water Usage

Direct Agency Use	AF
Imported Water[1]	95,973
Santiago Creek Native Water	2,529
Subtotal	**98,502**
Groundwater Replenishment (Purchased)	**AF**
In-Lieu Program[2]	0
Forebay Recharge[3]	48,617
Alamitos Barrier[4]	2,236
Talbert Barrier	18
Stored Water from MWD CUP Storage Account[3]	10,000
Subtotal	**60,871**
TOTAL	**159,373**

[1] *Includes extractions from MWD Groundwater Storage Program.*
[2] *Any amount reported herein includes water received by OCWD's groundwater producers as In-Lieu water.*
[3] *Full service rate untreated water.*
[4] *Total combines imported and recycled water deliveries.*

FIGURE 4. Historical Supplemental Water Usage



Recycled water use within OCWD is presented in Table 4 (excluding WRD-supplied recycled water to the Alamitos Barrier because this water is categorized as supplemental water and already included in the total amount reported in Table 3). The major uses of recycled water are groundwater replenishment (including Kraemer, Miller and Miraloma recharge basins and Talbert Barrier injection wells) and supply water for irrigation and industrial users.

TABLE 4. 2014-15 Recycled Water Usage

Groundwater Replenishment		Water Usage (AF)
GWRS AWPF (for Talbert Barrier)		36,471
GWRS AWPF (for Recharge Basins)[1]		39,688
	Subtotal	**76,159**
GWRS AWPF (for Mid-Basin Injection)		**310**
	Subtotal	**76,469**
Irrigation and Industrial		**Water Usage (AF)**
IRWD[2]		16,957
OCWD (Green Acres Project)[3]		4,631
	Subtotal	**21,588**
	TOTAL	**98,057**

[1]Excludes 64 AF delivered to City of Anaheim Canyon Power Plant and Anaheim Regional Transportation Intermodal Center (ARTIC).
[2]Recycled water used within the portion of OCWD that lies within IRWD's boundaries (excludes OCWD/IRWD intertie water deliveries to the Green Acres Project).
[3]Excludes deliveries to the Orange County Sanitation District (OCSD) and includes IRWD/OCWD Intertie deliveries to the Green Acres Project.

AVAILABILITY OF SUPPLEMENTAL REPLENISHMENT WATER

MWD provided untreated full service water supplies to its groundwater-basin agencies during the water year 2014-15 in spite of a record-low allocation of State Project Water. The availability of supplemental water from MWD to recharge the groundwater basin in the coming water year will be reduced due to the drought conditions.

WATER DEMANDS

During the 2014-15 water year, the total water demands within OCWD's service area were 425,349 AF. Total demands include the use of groundwater, MWD In-Lieu Program water, imported water, Santiago Creek native water and recycled water. Total demands exclude any groundwater, supplemental water and recycled water used by OCWD for groundwater recharge (such as the GWRS recycled water), and water conservation credits given to groundwater producers for their conservation efforts.

Water demands for 2014-15 and projected water demands for 2015-16 and 2016-17 are summarized in Table 5. The water demands for the current year 2015-16 were determined by assessing the data that is presently available and projecting that data to develop the total annual demands for the current year. The water demands for the ensuing year 2016-17 are based on the projections provided by the retail water agencies within OCWD's service area. Long-term projections are presented in Figure 5.

WATER DEMANDS FORECAST

OCWD participates with MWDOC and retail groundwater producers to predict future demands in OCWD's service area. Each groundwater producer projected its total water demands to the year 2035. These projections include the effect of local water conservation efforts. Figure 5 illustrates the historical and the projected water demands for OCWD's service area to the year 2035.

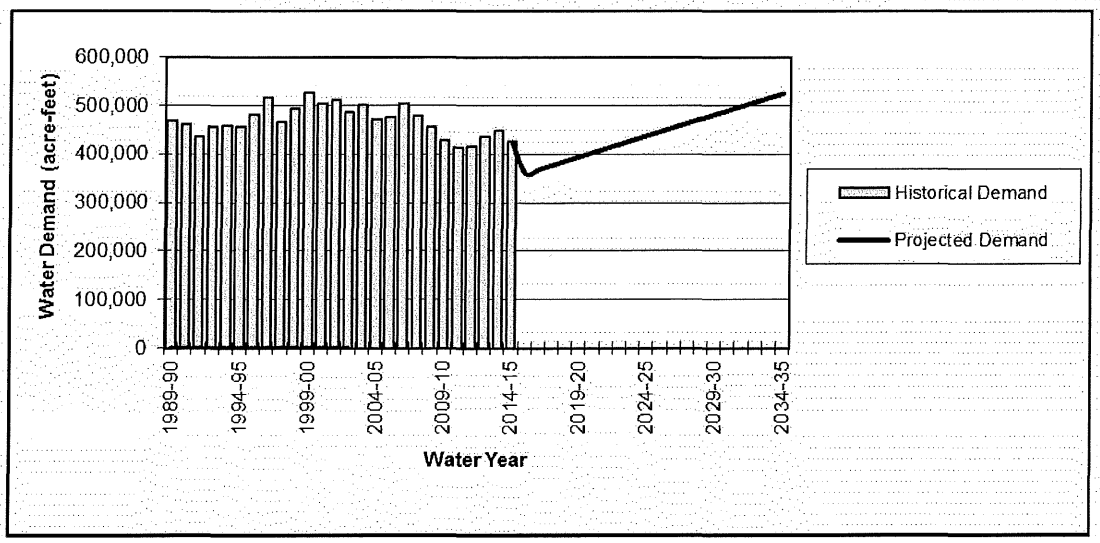
Population within OCWD's service area is expected to increase from the current 2.28 million people (based on Census 2010 demographic data) to approximately 2.7 million people by the year 2035. This population growth is expected to increase water demands from the current 425,349 AF per year to 525,000 AF per year in 2035 (a water demand projection that takes into consideration future water conservation savings). In an effort to support increasing water demands, OCWD will look to increase basin production by operating the existing GWRS, maximizing the current AWPF production capacity, capturing more SAR storm flows, expanding the production of GWRS to its ultimate capacity (with the assumption that additional wastewater flows are available), purchasing imported supplies for groundwater recharge whenever supplies are available, developing other local recycled water supplies for replenishment purposes and expanding recharge facilities.

TABLE 5. Water Demands Within OCWD

	Ground-water[1]	Imported Water[2,3]	Santiago Creek Native Water[3]	Recycled Water[4]	Total
2014-15					
Non-Irrigation	302,634	95,973	2,529	-	401,136
Irrigation	2,625	-	-	21,588	24,213
Total	**305,259**	**95,973**	**2,529**	**21,588**	**425,349**
2015-16 (Current Year)[5]					
Non-Irrigation	279,250	44,750	2,500	-	326,500
Irrigation	2,500	-	-	21,000	23,500
Total	**281,750**	**44,750**	**2,500**	**21,000**	**350,000**
2016-17 (Ensuing Year)[5]					
Non-Irrigation	291,500	61,500	2,500	-	355,500
Irrigation	2,500	-	-	22,000	24,500
Total	**294,000**	**61,500**	**2,500**	**22,000**	**380,000**

[1] *Includes In-Lieu Program water, if available.*
[2] *Excludes water conservation credits and imported water used for groundwater replenishment.*
[3] *"Imported Water" and "Santiago Creek Native Water" are both counted as supplemental water.*
[4] *Excludes recycled water injected into the groundwater basin for seawater intrusion protection. Includes recycled water from IRWD and OCWD's Green Acres Project (excluding OCSD's usage).*
[5] *Water demands are estimated by OCWD assuming average hydrology.*

FIGURE 5. Water Demands Projections



ADVANCED WASTEWATER RECLAMATION

Groundwater, supplemental water and local surface water have historically been the primary water sources within OCWD. In recent decades, wastewater reclamation has increasingly become a significant source of additional water. Purified recycled wastewater has been produced by OCWD for use as injection water in the Talbert Barrier and as percolation water in Kraemer, Miller and Miraloma recharge basins. OCWD and IRWD recycle wastewater at their respective treatment plants for irrigation and industrial uses.

The GWRS is an advanced wastewater reclamation project jointly-funded by OCWD and the Orange County Sanitation District (OCSD). The project was operational in January 2008. The advanced treatment processes utilized in the GWRS consist of microfiltration (MF) followed by reverse osmosis (RO) membranes and ultraviolet (UV) light disinfection in combination with hydrogen peroxide. For water year 2014-15, the GWRS treated wastewater from the OCSD to drinking water standards and delivered 76,469 AF of purified water for direct injection into the Talbert seawater intrusion barrier and percolation into the OCWD groundwater basin via recharge basins and Mid-Basin Injection (MBI) well.

For water year 2014-15, OCWD and IRWD recycled water deliveries for landscape irrigation and industrial uses in Fountain Valley, Costa Mesa, HB, Newport Beach, Santa Ana and IRWD's service area totaled 21,588 AF.

WRD placed the 3-MGD Alamitos Barrier Recycled Water Project, known as the Leo J. Vander Lans Water Treatment Facility, into service in October 2005. This project supplies highly treated recycled water to the Alamitos Barrier. The Leo J. Vander Lans advanced wastewater treatment facility located in Long Beach utilizes the treatment processes of MF, RO and UV light disinfection. This project is intended to replace up to 50 percent of the imported water used to supply the Alamitos Barrier with recycled water. The project operated for eight of twelve months during the water year 2014-15. For 2014-15, the project supplied 151 AF of recycled water to the Alamitos Barrier, which represented 7 percent of the barrier's supply that OCWD is responsible for payment. Recycled water deliveries from the Leo J. Vander Lans plant to the Orange County portion of the Alamitos Barrier are classified as supplemental water because this recycled water originates from outside the SAR watershed. It is noteworthy to mention that the Leo J. Vander Lans Water Treatment Facility is presently under expansion in an effort to increase its treatment capacity.

WATER QUALITY

OCWD maintains a comprehensive groundwater protection policy that includes water quality monitoring, removal of contaminants, regulatory agency support, toxic residuals

removal and hazardous waste management. In addition, OCWD provides water quality information to regulatory agencies, other water agencies and the general public. In order to meet the current and future water quality testing requirements, OCWD operates the Advanced Water Quality Assurance Laboratory at the Fountain Valley campus. The laboratory houses approximately 30 chemists and laboratory technicians, 12 water quality monitoring personnel and all the analytical instruments that are needed to perform more than 400,000 analyses of approximately 20,000 water samples taken each water year. The laboratory supports the extensive water quality testing requirements for the GWRS.

When blended together by the major agencies within OCWD's service area, the blended groundwater (without treatment) and treated supplemental water for 2014-15 is determined to have a flow-weighted average of 496 milligrams per liter (mg/L) of total dissolved solids (TDS) which is greater than the average TDS concentration of 482 mg/L reported for the prior year (2013-14). The average groundwater TDS concentration for the basin for 2014-15 is 452 mg/L (compared to 456 mg/L reported for 2013-14), ranging from a low of 220 mg/L in Seal Beach to a high of approximately 660 mg/L in certain inland areas.

Average concentrations of TDS, nitrate ($N0_3$) and hardness for groundwater and groundwater combined with supplemental water supplied by agencies within OCWD's service area during the 2014-15 water year are summarized in Table 6. These concentrations were determined from groundwater and supplemental water analyses and from production reports submitted to and filed with OCWD by each water agency. The City of Tustin and IRWD have active groundwater treatment projects that help to reduce certain constituents reported in Table 6 in their groundwater supply prior to service to their customers (see note 6 for detailed explanation).

WATER RESOURCES DATA

A summary of water resources data within OCWD for the 2014-15 water year and the previous year (2013-14) is included in Appendix 5.

TABLE 6. 2014-15 Water Quality Summary

City/Agency	Groundwater[1,7]			Delivered Blend[1,2,7]		
	TDS[3]	NO_3-N[4]	Hard-ness[5]	TDS[3]	NO_3-N[4]	Hard-ness[5]
Anaheim	584	2.9	322	597	2.2	315
Buena Park	410	1.4	248	466	1.0	260
East Orange County Water District	606	4.0	342	606	4.0	342
Fountain Valley	410	1.2	240	410	1.2	240
Fullerton	520	2.8	268	554	2.0	276
Garden Grove	564	4.0	340	582	3.0	328
Golden State Water Company	408	1.6	230	466	1.2	246
Huntington Beach	362	0.4	170	472	0.3	221
Irvine Ranch Water District[6]	364*	1.0*	138*	387*	1.0*	151*
La Palma	292	ND[8]	146	292	ND[8]	146
Mesa Water District	342	0.4	106	375	0.4	128
Newport Beach	300	1.4	151	393	1.1	191
Orange	489	2.3	286	532	1.6	289
Santa Ana	405	2.0	232	460	1.6	248
Seal Beach	220	ND[8]	74	309	ND[8]	122
Serrano Water District	642	2.8	346	648	2.0	341
Tustin[6]	518*	4.1*	266*	548*	3.1*	274*
Westminster	358	1.3	226	429	1.0	244
Yorba Linda Water District	652	2.1	338	645	1.4	323
Weighted Average[7]	**452**	**2.0**	**236**	**496**	**1.5**	**251**

[1] *All groundwater results (alone or blend) are for untreated groundwater (see note 6 below). Units are reported in mg/L.*

[2] *Delivered blend includes untreated groundwater and treated imported MWD water (i.e., blend of Colorado River water and State Project water as measured at the MWD Diemer Plant), except Serrano Water District, which blends with treated Santiago Reservoir water. Units are reported in mg/L. Annual average water qualities for MWD and Santiago Reservoir (Irvine Lake) for 2014-15 are as follows:*

MWD Water Quality			Santiago Reservoir Water Quality		
TDS	=	632 mg/L	TDS	=	662 mg/L
NO_3-N	=	0.2 mg/L	NO_3-N	=	0.0 mg/L
Hardness (as $CaCO_3$)	=	295 mg/L	Hardness (as $CaCO_3$)	=	328 mg/L

[3] *Secondary Drinking Water Standards for TDS are as follows:*

500 mg/L = recommended limit
1,000 mg/L = upper limit

[4] *Primary Drinking Water Standard for nitrate NO_3-N (i.e., nitrate expressed as nitrogen) is 10 mg/L.*

[5] *Hardness is reported as mg/L of $CaCO_3$. General classifications of hard and soft water are within the following concentration ranges:*

0-75 mg/L	=	soft	150-300 mg/L	=	hard
75-150 mg/L	=	moderately hard	300 and up mg/L	=	very hard

[6] *Agencies with active groundwater quality improvement projects that treat for one or more of the constituents listed in the table. The results shown herein for "groundwater" and "delivered blend" reflect results from untreated groundwater. Water quality constituents that are marked with an asterisk (*) are reduced prior to delivery to customers.*

[7] *All water quality results are flow-weighted averages based on groundwater and imported water delivered to each agency.*

[8] *ND = not detected. Nitrate (expressed as NO_3-N) analytical detection limit for OCWD Advanced Water Quality Assurance Laboratory is 0.1 mg/L.*

PART III: WATER PRODUCTION COSTS FOR ENSUING YEAR (2016-17)

Section 31.5 of the District Act requires that costs of producing groundwater and obtaining supplemental water be evaluated annually. These costs vary for each groundwater producer and depend on many factors. Although these variations in cost are recognized, it is necessary for the purpose of this report to arrive at figures representing the average cost of producing groundwater and purchasing supplemental water.

ENSUING YEAR (2016-17) WATER PRODUCTION COSTS SUMMARY OF FINDINGS

1. Cost for producing water from the groundwater basin within OCWD including a replenishment assessment for 2016-17 is estimated to be $598.00 per acre-foot.

2. Cost of treated, non-interruptible supplemental water for 2016-17 is estimated to be $1,037.00 per acre-foot.

GROUNDWATER PRODUCTION COSTS FOR NON-IRRIGATION USE

Cost for producing an acre-foot of groundwater in the ensuing 2016-17 water year has been estimated for a potable water well for a large groundwater producer (i.e., a city water department, water district) in OCWD's service area. Operations and maintenance (O&M) and energy costs were determined using the cost information provided by nineteen large groundwater producers from a survey conducted by OCWD in fall 2015. The capital cost component was derived using the available actual project cost data for eight production wells constructed in 2008 under the MWD Long-Term Groundwater Storage Program and adjusted to present values using Engineering News-Record Construction Cost Index. Appendix 6 contains several of the key design characteristics for eight wells that were constructed under the MWD's program. The OCWD RA used in the determination of groundwater production cost is the average estimate of the proposed RA for 2016-17.

The estimated cost for groundwater production for a large groundwater producing entity such as a city water department or a water district is presented in Table 7. The total cost to produce an acre-foot of groundwater within OCWD in the ensuing 2016-17 water year is estimated to be $598 per acre-foot. Based on the responses to the aforementioned survey, the flow-weighted average (based upon the quantity of groundwater pumped) for energy cost equaled $71 per AF. Operation and Maintenance (O&M) costs ranged from $7 to $176 per acre-foot with a median cost of approximately $64 per acre-foot. Elements that influence these costs include load factors and variations in groundwater levels. Recently drilled wells are generally deeper than those drilled decades ago. From the aforementioned survey, the average load factor which indicates the percent-of-use of an extraction facility equaled 56 percent.

TABLE 7. Estimated 2016-17 Groundwater Production Costs

Cost Item	Non-Irrigation Use	
	Annual Cost ($)	Cost per AF ($/AF)
Energy	184,600[1]	71[2]
RA	1,045,200[1]	402[3]
Total Production Costs	1,229,800	473
Capital	159,700[4]	61[4]
O&M	166,400[1]	64[2]
Total Other Costs	326,100	125
Total Cost to Producers	1,555,900	598

[1] *Based upon an annual average production of 2,600 AF per production well.*
[2] *Based on survey of major agencies within OCWD's service area, non-irrigation groundwater users.*
[3] *Average estimate of the proposed RA for 2016-17.*
[4] *Based on 2008 average cost for design and construction of a production well (excluding land cost) under the MWD Long-Term Groundwater Storage Program (cost amortized over 30 years at 5 percent interest) and adjusted to 2015 dollars using Engineering News-Record Construction Cost Index for Los Angeles area. Typical design parameters are listed in Appendix 6.*

COST OF SUPPLEMENTAL WATER

Supplemental water is supplied to OCWD's service area by MWD. MWD delivers both treated and untreated water as either a non-interruptible supply or an interruptible supply. As a result, there are several categories of water available from MWD. The categories most applicable for purposes of this report are 1) uninterruptible (i.e., firm) treated water, which is referred to as "full service water," and 2) uninterruptible untreated water. Treated water is used directly by various groundwater producers for municipal and industrial purposes, while untreated water is used by OCWD to support higher groundwater production. Table 8 shows the estimated cost for the MWD uninterruptible treated water (full service water) cost for the ensuing 2016-17 water year. Figure 6 illustrates the historical supplemental water costs along with the historical groundwater production costs. A comparison of estimated costs for groundwater versus supplemental water (non-irrigation use) during the ensuing water year 2016-17 is summarized in Table 9 and also in Figure 6. Values used in Figure 6 are presented in tabular form in Appendix 7.

TABLE 8. Estimated 2016-17 Supplemental Water Cost[1]

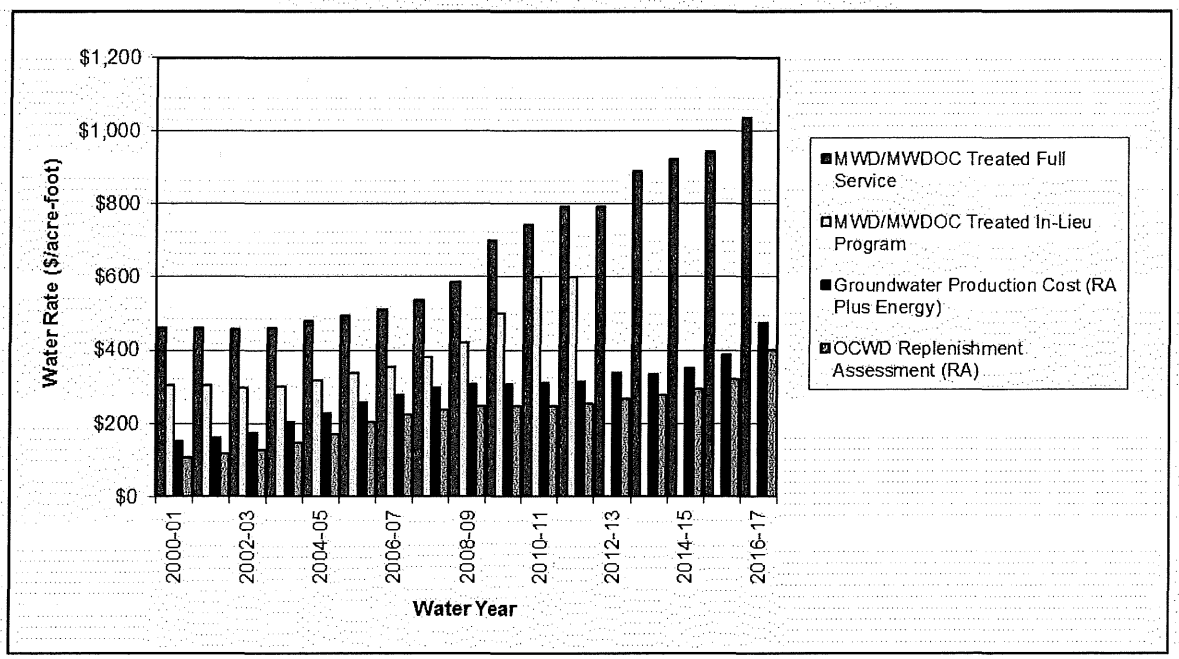
Rate and Charge Components	Treated Water Rate ($/AF)
Firm Deliveries	**Full Service Water**
MWD Supply Rate (MWDOC Melded Rate)	156.00
MWD System Access Rate	263.00
MWD System Power Rate	144.00
MWD Water Stewardship Rate	41.00
MWD Treatment Surcharge	353.00
MWD RTS and Capacity Charges[2]	80.00
Total	**1,037.00**

[1] *Rates are an average of calendar year 2016 and proposed calendar year 2017. Supplemental water costs for MWD's member agencies (i.e., Anaheim, Fullerton and Santa Ana) are not reported herein due to the variability among these agencies on water supply allocations between MWD's Tier 1 and Tier 2.*

[2] *Readiness-to-Serve (RTS) and Capacity Charges have been converted to an approximate cost per acre-foot, but are not normally reported in terms of unit cost.*

Cost components for supplemental treated and untreated water are listed in Table 8. Beyond the normally expected water supply, treatment and power charges, there are several other charges. The System Access charge is for costs associated with the conveyance and distribution system, including capital and O&M costs. The Water Stewardship charge is used to support MWD's financial commitment to conservation,

FIGURE 6. Adopted and Projected Water Rates for Non-Irrigation Use[1]



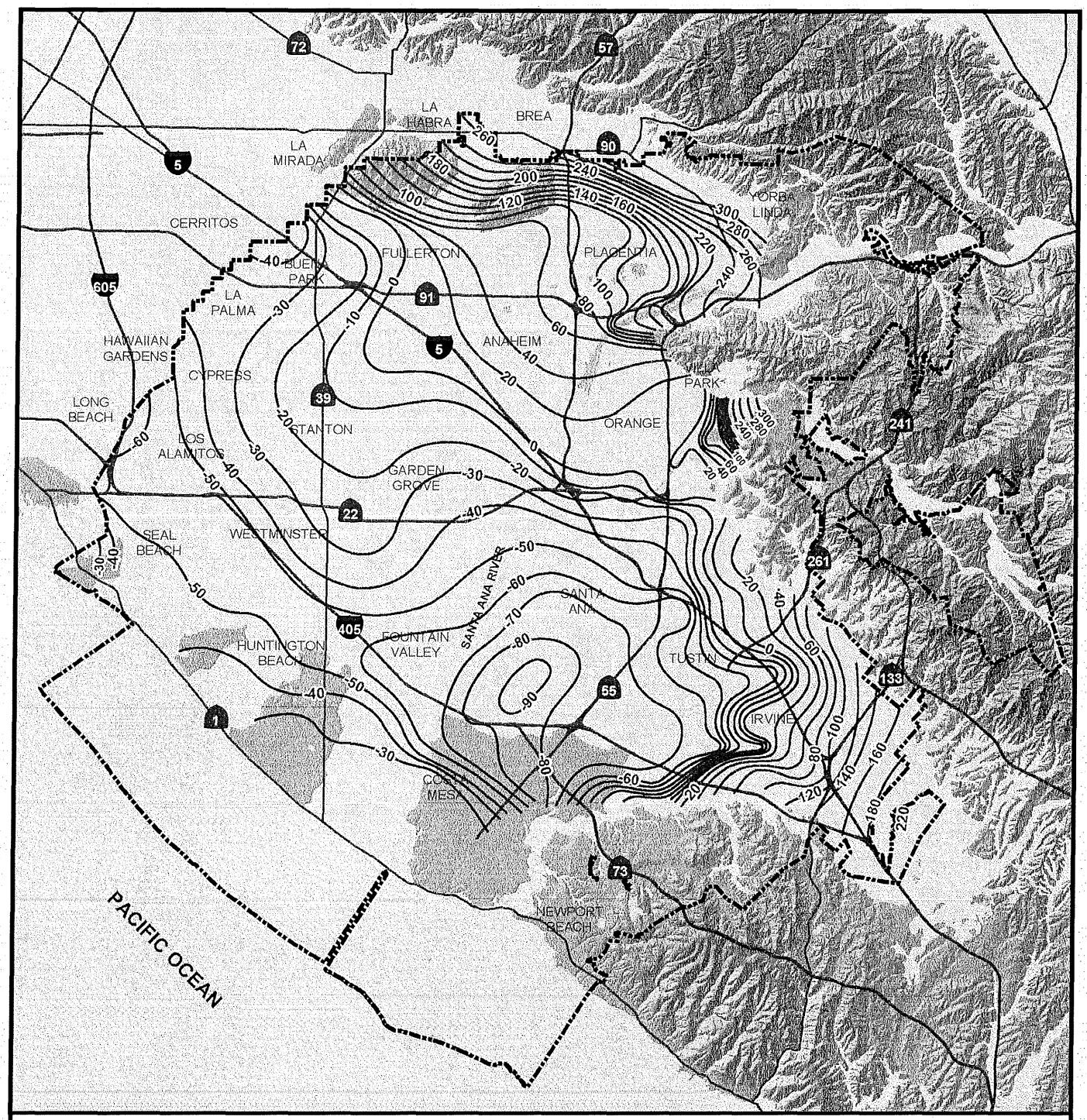
[1] *Refer to Appendix 7 for actual values used in Figure 6.*

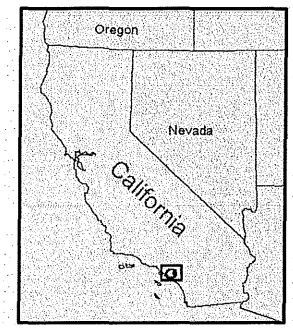
TABLE 9. Estimated 2016-17 Water Production Cost Comparison

Non-Irrigation Use	Groundwater Cost ($/AF)	Supplemental Water Cost ($/AF)
Fixed Cost	61.00[1]	1,037.00[3]
Variable Cost	537.00[2]	-[3]
Total	**598.00**	**1,037.00**

[1] *Capital cost.*
[2] *Cost for energy, O&M and proposed RA.*
[3] *Delineation of fixed and variable costs is not available.*

water recycling, groundwater recovery and other water management programs approved by MWD. MWD uses the Capacity Charge to recover its cost for use of peaking capacity within its distribution system. The Readiness-to-Serve (RTS) charge is to recover MWD's cost associated with providing standby and peak conveyance capacity and system emergency storage capacity.





Estimated Groundwater Elevations Within The Principal Aquifer Feet above Mean Sea Level* (ft MSL)

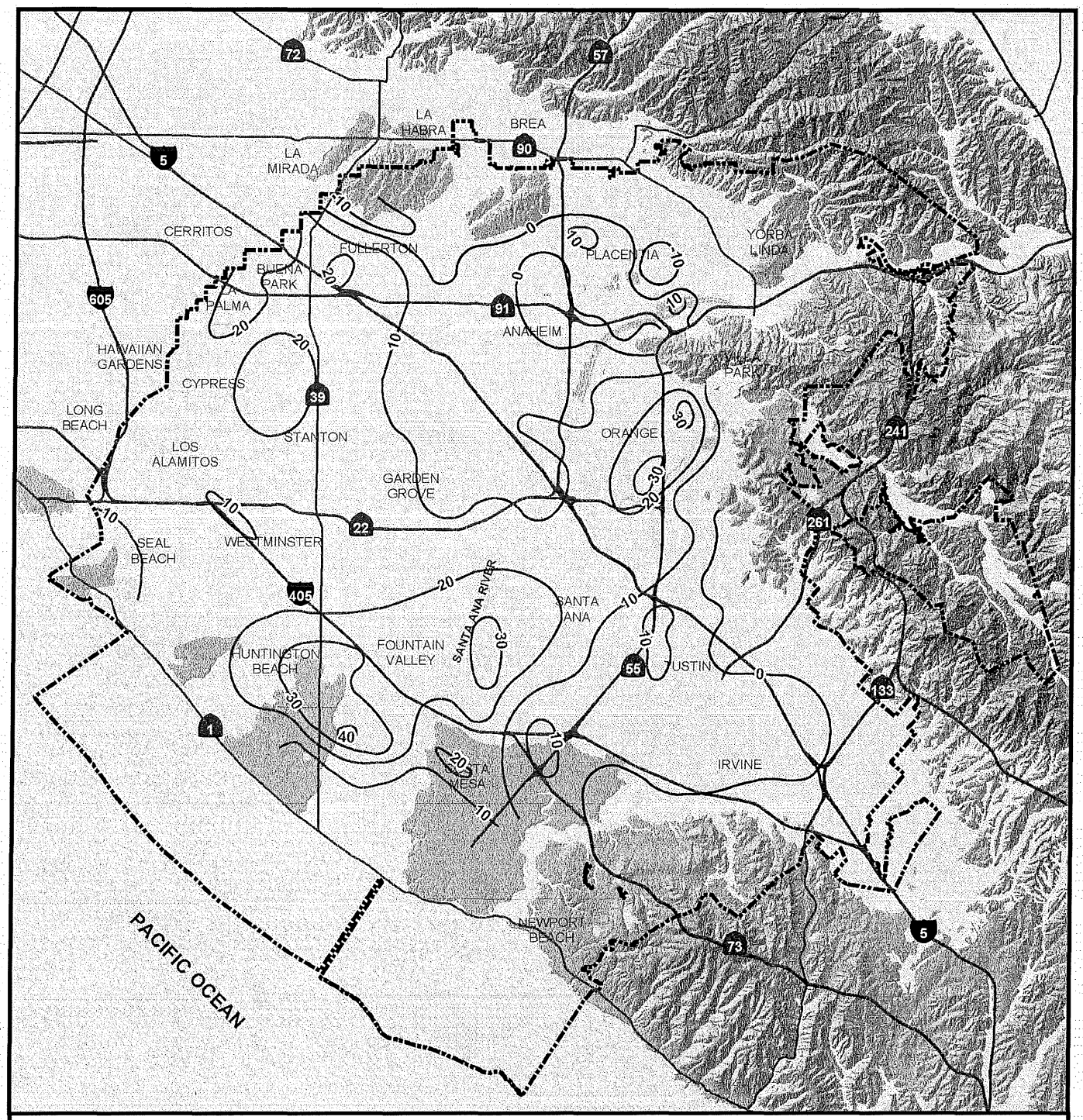
- -90 to -10
- 0
- 20 to 300
- Recharge Facility Areas
- Freeways / Highways
- Rivers / Streams
- Orange County Water District
- Water Bodies

PLATE 1
GROUNDWATER CONTOUR MAP
JUNE 2015

0 1 2 4 Miles

N W E S

*NOTE: MSL elevations are referenced to Vertical Datum NGVD 29



Estimated Groundwater Elevation Changes Within The Principal Aquifer (Feet)

- -10
- 0
- 10 to 40
- Recharge Facility Areas
- Freeways / Highways
- Rivers / Streams
- Orange County Water District
- Water Bodies

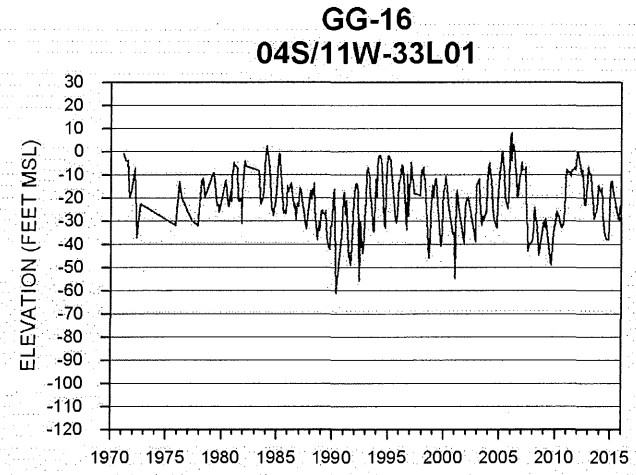
PLATE 2
CHANGE IN GROUNDWATER LEVEL FROM JUNE 2014 TO JUNE 2015

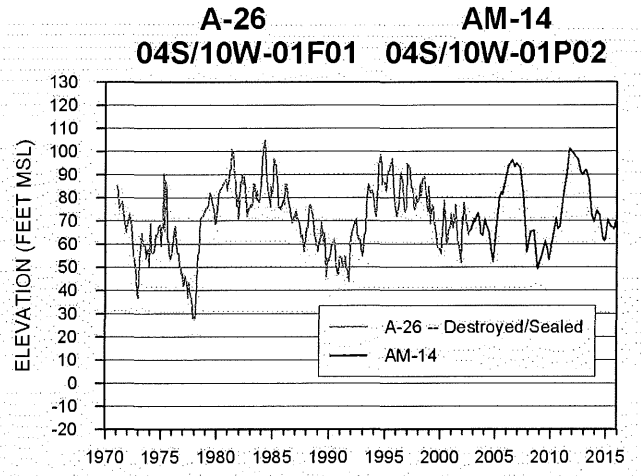
0 1 2 4 Miles

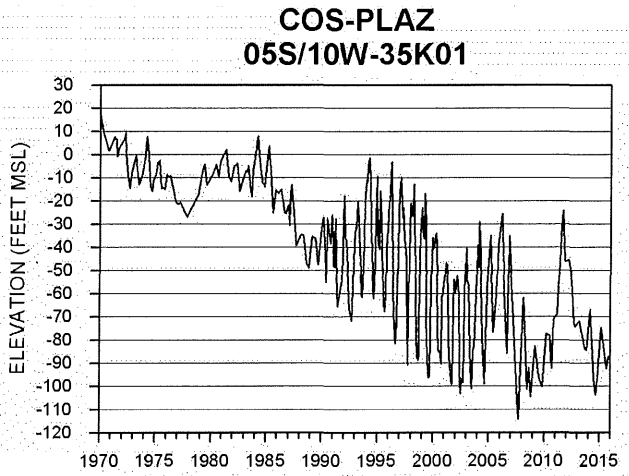
N W E S

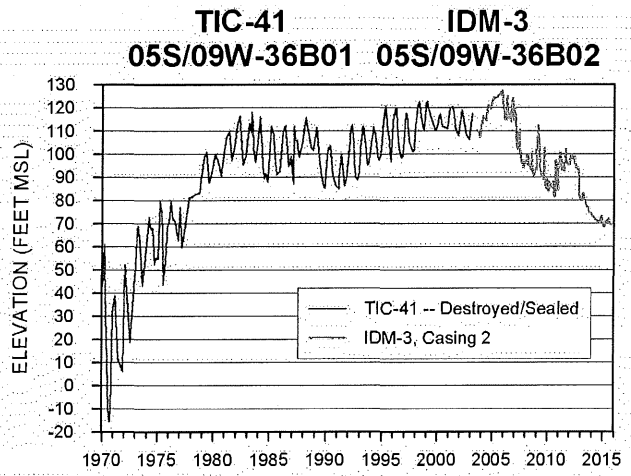
PLATE 3
KEY WELL GROUNDWATER ELEVATION TRENDS

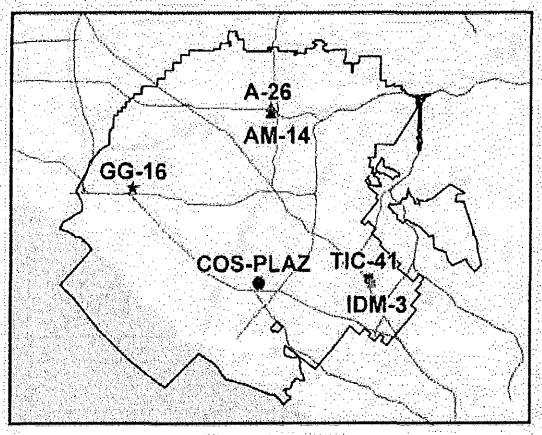
Measured water level elevations in feet relative to mean sea level











APPENDIX 1. Water Production Data 2014-15

Groundwater Producer	Groundwater (AF)				Supplemental Water (AF)				(AF)	Actual BPP
	Non-Irrigation [1]		Irrigation Pumping	Total	Non-Irrigation [1]		Irrigation Deliveries	Total	Grand Total	Non-Irrigation [1] Only
	Pumping	In-Lieu Program [2]			Deliveries	Conservation Credit [3]				
Anaheim, City of [7]	44,689.5	-	-	44,689.5	16,842.3	237.5	-	17,079.8	61,769.3	72.3%
Buena Park, City of [7]	9,808.8	-	-	9,808.8	3,620.4	25.5	-	3,645.9	13,454.7	72.9%
East Orange County Water District	889.5	-	-	889.5	7.3	3.4	-	10.7	900.2	98.8%
County of Orange	99.6	-	-	99.6	110.8	-	-	110.8	210.4	47.3%
Fountain Valley, City of	9,417.5	-	-	9,417.5	2.1	26.8	-	28.9	9,446.4	99.7%
Fullerton, City of	18,939.4	-	10.8	18,950.2	8,297.8	34.9	-	8,332.7	27,282.9	69.4%
Garden Grove, City of [4,7]	17,421.4	-	-	17,421.4	6,640.2	51.3	-	6,691.5	24,112.9	72.2%
Golden State Water Company [7]	18,027.5	-	-	18,027.5	6,659.8	113.3	-	6,773.1	24,800.6	72.7%
Huntington Beach, City of	16,603.9	-	-	16,603.9	11,147.1	108.6	-	11,255.7	27,859.6	59.6%
Irvine Ranch Water District [4, 5]	49,455.5	-	1,040.3	50,495.8	4,399.5	738.6	-	5,138.1	55,633.9	90.6%
La Palma, City of	1,939.6	-	-	1,939.6	0.2	8.4	-	8.6	1,948.2	99.6%
Mesa Water District [4]	15,653.1	-	-	15,653.1	1,998.4	63.8	-	2,062.2	17,715.3	88.4%
Newport Beach, City of	11,208.1	-	-	11,208.1	4,336.4	22.6	-	4,359.0	15,567.1	72.0%
Orange, City of [5]	20,372.9	-	-	20,372.9	8,784.4	80.3	-	8,864.7	29,237.6	69.7%
Orange County Water District [6]	239.6	-	-	239.6	-	-	-	0.0	239.6	100.0%
Santa Ana, City of [7]	26,343.0	-	-	26,343.0	10,304.8	74.4	-	10,379.2	36,722.2	71.7%
Seal Beach, City of	2,736.8	-	-	2,736.8	752.1	5.2	-	757.3	3,494.1	78.3%
Serrano Water District [5]	2,056.3	-	-	2,056.3	771.1	3.5	-	774.6	2,830.9	72.6%
Tustin, City of [4]	8,202.5	-	-	8,202.5	2,913.5	49.4	-	2,962.9	11,165.4	73.5%
Westminster, City of [7]	8,370.5	-	-	8,370.5	3,250.9	44.8	-	3,295.7	11,666.2	71.8%
Yorba Linda Water District[7]	12,297.3	-	20.4	12,317.7	7,662.8	39.5	-	7,702.3	20,020.0	61.5%
Total Major Groundwater Producers	294,772.3	0.0	1,071.5	295,843.8	98,501.9	1,731.8	0.0	100,233.7	396,077.5	74.6%
Other Producers	6,601.2	-	1,553.1	8,154.3	0.0	0.0	0.0	0.0	8,154.3	
Exempt Well Production	1,261.0	-	-	1,261.0	0.0	0.0	0.0	0.0	1,261.0	
Total Amount	302,634.5	0.0	2,624.6	305,259.1	98,501.9	1,731.8	0.0	100,233.7	405,492.8	
Basin Production Percentage (includes non-irrigation deliveries, but excludes water conservation credits)										75.0%

[1] *Water classed as being used for purposes other than commercial agriculture.*

[2] *Imported MWD water purchased for domestic use to offset groundwater pumping.*

[3] *Accounts for only those credits allowed for under the program initiated on September 20, 1995.*

[4] *Agencies that participate in a groundwater water quality improvement project.*

[5] *Agencies that can receive Santiago Creek native water above Villa Park Dam that are conveyed to users within OCWD. Such water, if delivered, is included within the classification of "Supplemental Water" as defined in the District Act.*

[6] *Groundwater quantity reported herein is that quantity used by OCWD for purposes other than seawater intrusion barrier maintenance.*

[7] *These agencies participated in the MWD Long-Term Groundwater Storage Program for which groundwater was extracted and accounted for as supplemental water.*

APPENDIX 2. 2014-15[1] Groundwater Production — Non-Irrigation Use Production Over 25 Acre-feet

PRODUCER	AF	PRODUCER	AF
Alta Vista Country Club	411.5	Mesa Verde Country Club	350.2
Anaheim Cemetery	47.7	Mesa Water District	15,653.1
Anaheim, City of	44,689.5	Midway City Mutual Water Company	151.7
Buena Park, City of	9,808.8	Mile Square Golf Course	101.6
Canyon RV Park	122.3	Navy Golf Course	490.1
County of Orange	99.6	Newport Beach, City of	11,208.1
Cypress GC LLC/Cypress Golf Club	67.9	Newport Beach Golf Course	119.3
Danone Waters of North America	338.9	Orange, City of	20,372.9
Donovan Golf Course Management	214.9	Orange County Water District	239.6
Eastlake Village HOA	54.7	Page Avenue Mutual Water Company	57.9
East Orange County Water District	889.5	River View Golf	252.9
Eastside Water Association	210.1	Santa Ana, City of	26,343.0
Fairhaven Memorial Park	181.2	Santa Ana Country Club	326.6
Forest Lawn Memorial Park	207.8	Seal Beach, City of	2,736.8
Fountain Valley, City of	9,417.5	Sequoia Management Services, LL	620.5
Fullerton, City of	18,939.4	Serrano Water District	2,056.3
Garden Grove, City of	17,421.4	South Coast Shores HOA	55.9
Golden State Water Company	18,027.5	South Midway City Water Company	76.9
Hargis and Associates, Inc.	36.6	The Boeing Company	199.3
Huntington Beach, City of	16,603.9	The Good Shepherd Cemetery	66.8
Hynes Estates, Inc.	59.8	The Lakes Master Association	54.8
Irvine Ranch Water District	49,455.5	Tustin, City of	8,202.5
Knott's Berry Farm	250.6	Westminster, City of	8,370.5
La Palma, City of	1,939.6	Westminster Memorial Park	278.9
Lockheed Martin Corporation	41.3	Yorba Linda Country Club	435.7
Los Alamitos Race Course	235.5	Yorba Linda Water District	12,297.3
Melrose Abbey Funeral Center	30.5	**Total**	**301,136.9**

[1]*Water year begins on July 1.*

APPENDIX 3. 2014-15[1] Groundwater Production — Irrigation Use Production Over 25 Acre-feet

PRODUCER	AF
Berumen Farms, Inc.	44.2
F.S. Nursery c/o Southern CA Edison	44.5
Irvine Ranch Water District	1,040.3
Orange County Produce	899.4
Roy Pursche	403.8
Village Nurseries	137.3
Total	**2,569.5**

[1] *Water year begins on July 1.*

APPENDIX 4. Non - Local Water Purchased by OCWD for Water Years 1995-96 through 2014-15

	Water Exchange		Talbert Barrier		Forebay Recharge		In-Lieu Program		Basin Water	SAR Upstream GW Projects		TOTAL
	Western Mun. WD	Alamitos Barrier	FV[1] OC32A	MCWD OC44B	Forebay Recharge	CUP[2] Recharge	CUP[2] In-Lieu Delivery	In-Lieu Purch.	Supply Mgmt. Program[3]	Arlington Desalter	San Bernard. Valley Mun.WD	
Water Year	Purch. AF	Purch. AF	Purch. AF	Purch. AF	Purch. AF	Delivery AF	Delivery AF	Purch. AF	Purch. AF	Purch. AF	Purch. AF	Purch. AF
1995-96	888.2	1,691.6	-	-	15,278.7	-	-	5,542.4	-	2,770.6	-	26,171.5
1996-97	2958.0	1,885.5	-	-	33,742.7	-	-	7,883.0	-	6,176.2	-	52,645.4
1997-98	701.8	1,613.8	-	-	19,029.4	-	-	-	27,674.9	2,516.9	-	51,536.8
1998-99	996.1	1,493.6	-	-	10,371.5	-	-	-	13,351.9	2,351.3	-	28,564.4
1999-00	-	1,873.6	-	-	28,478.1	-	-	24,726.0	13,280.8	4,994.6	-	73,353.1
2000-01	-	1,672.5	941.7	-	59,138.4	-	-	11,191.0	7,449.0	5,177.9	2,787.6	88,358.1
2001-02	2,990.3	2,282.2	2,673.0	-	30,092.6	-	-	19,472.4	-	5,819.8	4,296.4	67,626.7
2002-03	3,471.4	1,448.7	1,540.1	-	35,755.1	-	-	25,631.0	35,832.0	4,924.7	-	108,603.0
2003-04	3,605.0	1,938.3	1,703.3	3,380.6	14,832.0	2,462.7	2,479.6	49,688.8	-	4,087.3	-	84,177.6
2004-05	-	1,914.9	2,451.8	8,368.6	3,810.8	-	15,021.1	54,596.1	-	567.5	-	86,730.8
2005-06	-	833.0[4]	1,079.9	5,431.1	7,256.7	-	15,452.9	73,763.1[5]	-	-	-	103,816.7
2006-07	1,745.0	534.1[4]	143.9	7,394.7	42,173.0	-	14,427.3	36,313.0	-	227.6	-	102,958.6
2007-08	2,882.4	1,505.7[4]	-	4,581.4	-	-	-	-	-	1,266.6	-	10,236.1
2008-09	3,663.5	2,094.2[4]	-	4,140.3	18,100.0	-	-	-	-	428.2	-	28,426.2
2009-10	-	1,321.9[4]	-	176.9	20,535.7	-	-	-	-	106.2	-	22,140.7
2010-11	-	1,689.1[4]	-	100.5	11,038.6	16,500.0	-	10,435.4	-	-	-	39,763.6
2011-12	-	1,198.7[4]	-	1.9	41,230.8	7,709.6	9,719.9	30,843.6	-	-	-	90,704.5
2012-13	-	1,721.8[4]	-	3.7	24,356.1	15,570.8	-	-	-	-	-	41,652.4
2013-14	-	2,370.2[4]	-	6.2	50,700.5	-	-	-	-	-	-	53,076.9
2014-15	-	2,236.3[4]	-	17.7	48,616.8		-	-	-	-	-	60,870.8[6]
Total	23,901.7	33,319.7	10,533.7	33,603.6	514,537.5	42,243.1	57,100.8	350,085.8	97,588.6	41,415.4	7,084.0	1,221,413.9[6]

[1] Includes only imported water and excludes groundwater deliveries from Fountain Valley to OCWD.
[2] "CUP" is the multi-agency conjunctive use program (known as the MWD Long-Term Groundwater Storage Program or MWD CUP). Basin losses are not taken into account.
[3] Known as Basin Water Supply Management Program (WSM) water. WSM program was terminated on December 31, 2003.
[4] Includes both MWD imported deliveries and supplemental recycled water deliveries.
[5] Includes 16,000 AF of 2005-06 MWD Supplemental Storage Program (i.e., "Super In-Lieu") water that was received as In-Lieu by the groundwater producers.
[6] Includes purchase of 10,000 AF of stored water from MWD CUP storage account at full-service untreated water rate.

APPENDIX 5. 2014-15 Water Resources Summary

	2014-2015 Water Year (AF)	2013-2014 Water Year (AF)	Change from last year to this year
SUMMARY OF BASIN CONDITIONS			
BASIN SUPPLIES			
Water Purchases from MWD (excludes In-Lieu)	48,727	50,701	(1,974)
Water into MWD Storage Account (excludes In-Lieu)	0	0	0
SAR & Santiago Creek Flows	107,506	92,164	15,342
GWRS AWPF Water to Forebay Recharge Basins	39,688	34,263	5,425
GWRS AWPF Water to Mid-Basin Injection	310	0	310
GWRS AWPF Water to Talbert Barrier	36,471	31,906*	4,565
Imported Water to Talbert Barrier (OC-44 & Fountain Valley)	18	6	12
Alamitos Barrier	2,236	2,370	(134)
Incidental Recharge	49,936	31,867*	18,069
Evaporation from Recharge Facilities	(2,904)	(2,407)	(497)
SAR Flow Lost to Pacific Ocean	(3,230)	(500)	(2,730)
Water Storage Change in Recharge Facilities[1]	(418)	1,829	(2,247)
Total Groundwater Recharge	**279,176**	**238,510**	**40,666**
WATER PRODUCTION			
Groundwater Production	305,259	330,782	(25,523)
MWD Storage Program Extractions	12,917	7,730	5,187
Total Groundwater Production	**318,176**	**338,512**	**(20,336)**
BASIN STATUS			
Change in Groundwater Storage	(39,000)	(100,000)*	61,000
Change in Groundwater Storage excluding MWD Stored Water	(26,083)	(92,062)*	65,979
Accumulated Overdraft (AOD)	(381,000)	(342,000)*	(39,000)
AOD without MWD Storage Program Water	(397,440)	(381,958)*	(15,482)
IN-LIEU WATER			
OCWD In-Lieu Purchases	0	0	0
MWD In-Lieu Storage	0	0	0
Total In-Lieu	0	0	0
OTHER KEY INFORMATION			
1. Imported Deliveries to Producers (less MWD withdrawal)[2]	81,212	96,054	(14,842)
2. Total Dissolved Solids of SAR below Prado Dam (mg/L)	640	668	(28)
3. Total Nitrogen of SAR below Prado Dam (mg/L)	3.8	4.3	(0.5)
4. Total GWRS AWPF Production[3]	76,534	66,163	10,371
5. Green Acres Project	4,631	5,071	(440)
6. Base Flow of Santa Ana River	63,756	64,530*	(774)
7. Year-end Storage behind Prado Dam	1	0	1
8. Year-end Storage in Recharge Facilities	9,733	10,151	(418)
9. Total Artificial Recharge (percolation plus barriers)	229,240	206,670*	22,570
10. Rainfall Measured at OCWD Field Headquarters (inches)	9.27	5.14	4.13
11. Annual Mean Temperature at Santa Ana Fire Station (°F)	69.3	67.5	1.8

[1] *A negative value for "Change in Recharge Facilities Storage" translates into a positive value (i.e., increase in basin supply) when performing a summation of "Total Basin Supply" (with the reverse also holding true).*
[2] *Santiago Creek Native and In-Lieu water are included (excludes imported water used for groundwater replenishment).*
[3] *Total includes deliveries to recharge basins, Talbert Barrier, MBI, Anaheim Canyon Power Plant and ARTIC.*
**These values have been revised and were provided to OCWD after the publication of the 2013-2014 Engineer's Report.*

APPENDIX 6. Typical Groundwater Extraction Facility Characteristics

PARAMETER	CHARACTERISTICS
Water System Pressure	62 psi
Load (Use) Factor	63%
Design Flow Rate	2,563 gpm
Annual Production	2,600 AF
Bowl Efficiency (minimum)	84%
Motor Horsepower	325 hp
Type Motor	Electric
Well Casing Diameters	16 – 20 inches
Type of Pump	Vertical Turbine
Depth of Well	1,052 feet
Depth of Bowls	278 feet
Total Dynamic Head	325 feet
Estimated Life	30 years
Annual Cost of Facilities[1]	$159,700

[1] 2015 cost was based on a 2008 cost with an interest rate of 5 percent amortized over a 30-year period and excluding the cost for land. The 2008 cost was adjusted to 2015 dollars using Engineering News-Record Construction Cost Index for Los Angeles area.

APPENDIX 7. Values Used in Figure 6 For Water Rates for Non-Irrigation Use

Water Year	RA ($/AF)	Estimated Groundwater Production Cost[1,2] ($/AF)	MWD Treated Interruptible Rate (In-Lieu Program)[2,3] ($/AF)	MWD Treated Non-Interruptible Rate (Full Service)[2,3] ($/AF)
1985-86	32	85	181	225
1986-87	32	91	187	231
1987-88	32	91	187	231
1988-89	42	105	187	231
1989-90	45	119	136	231
1990-91	48	91	137	232
1991-92	51	100	156	263
1992-93	60	116	206	325
1993-94	67.5	124	257	389
1994-95	88	145	279	416
1995-96	85	140	294	440
1996-97	88	140	303	448
1997-98	91	141	303	455
1998-99	94	143	303	458
1999-00	100	150	303	459
2000-01	107	150	303	459
2001-02	117	162	303	459
2002-03	127	176	299	455
2003-04	149	203	301	460
2004-05	172	229	318	479
2005-06	205	258	337	494
2006-07	223	278	354	510
2007-08	237	296	382	538
2008-09	249	307	420	586
2009-10	249	308	436 & 558	701
2010-11	249	310	601	744
2011-12	254	315	601	794
2012-13	266	330	-[5]	794
2013-14	276	334	-[5]	890
2014-15	294	349	-[5]	923
2015-16	322	386	-[5]	942
2016-17	402[3]	473	-[5]	1,037[4]

[1] *Includes RA plus energy cost to produce groundwater.*
[2] *Rate is rounded.*
[3] *Rate is proposed.*
[4] *Rate is estimated.*
[5] *This rate is no longer available because MWD terminated the Replenishment Program.*

2015-2016

ENGINEER'S REPORT ON

GROUNDWATER CONDITIONS,

WATER SUPPLY AND BASIN UTILIZATION

IN THE

ORANGE COUNTY WATER DISTRICT

FEBRUARY 2017

Exhibit No. 42
Witness: John Kennedy
Date: 10/12/17
Christianne Lee Fong, CSR 7559

SINCE 1933

ORANGE COUNTY WATER DISTRICT

ORANGE COUNTY'S GROUNDWATER AUTHORITY

February 15, 2017

Michael R. Markus
General Manager
Orange County Water District
Post Office Box 8300
Fountain Valley, CA 92728-8300

Dear Mr. Markus:

In accordance with Section 26 of the District Act, the 2015-2016 Engineer's Report on the Groundwater Conditions, Water Supply and Basin Utilization in the District is hereby submitted.

Precipitation for the water year July 1, 2015 through June 30, 2016 within the District's boundaries averaged 8.4 inches, which was sixty two percent of the long-term average rainfall. Santa Ana River flow past Prado Dam for the water year totaled 113,780 acre-feet which was fifty one percent of the 30-year average flow. Flow past the District's spreading grounds (including any flow from the Santiago Creek) that was lost to the Pacific Ocean totaled 610 acre-feet.

Total water demands within the District for the 2015-2016 water year were 367,402 acre-feet (excluding water used for groundwater replenishment and barrier maintenance). Supplemental water used for groundwater replenishment and barrier maintenance during the water year totaled 47,524 acre-feet (excludes any available In-Lieu Program water). Groundwater production within the basin for the water year totaled 277,090 acre-feet (includes any available In-Lieu Program water) which was a nine percent decrease from the prior water year.

The accumulated basin overdraft decreased from 381,000 acre-feet on June 30, 2015 to 379,000 acre-feet on June 30, 2016 using the three-layer approach and the new benchmark for full-basin conditions. Under the provisions of Section 27 of the District Act, a portion of the Replenishment Assessment for the 2017-2018 water year could be equal to an amount necessary to purchase up to 198,000 acre-feet of replenishment water.

Very truly yours,

Chris S. Olsen
Director of Engineering

Lo Tan
Senior Engineer

PO Box 8300
Fountain Valley, CA 92728-8300

18700 Ward Street
Fountain Valley, CA 92708

(714) 378-3200
(714) 378-3373 fax

www.ocwd.com

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EXECUTIVE SUMMARY

Total water demands within Orange County Water District (OCWD) were 367,402 acre-feet (AF) for the 2015-16 water year (beginning on July 1, 2015 and ending on June 30, 2016). This is the lowest figure for total water demands since 1982 which was caused by the State's emergency drought regulations. Groundwater production for the water year totaled 277,090 AF including any available In-Lieu Program water and excluding MWD Groundwater Storage Program extractions. A total of 47,524 AF of supplemental water was used for the purpose of groundwater replenishment and barrier maintenance.

For the water year which ended on June 30, 2016, the "annual overdraft" (annual basin storage decrease without supplemental replenishment water) was 141,000 AF. The accumulated overdraft decreased from 381,000 AF on June 30, 2015 to 379,000 AF on June 30, 2016. Precipitation within the basin was 62 percent of the long-term average during the water year, totaling 8.40 inches.

Based on the groundwater basin conditions for the water year ending on June 30, 2016, OCWD may purchase up to 198,000 AF of water for groundwater replenishment during the ensuing water year, beginning on July 1, 2017, pursuant to the District Act.

ACKNOWLEDGMENTS

A number of public and private entities contributed data used in this report including:

City of Anaheim
City of Buena Park
East Orange County Water District
City of Fountain Valley
City of Fullerton
City of Garden Grove
Golden State Water Company
City of Huntington Beach
Irvine Ranch Water District
City of La Palma
Mesa Water District
Metropolitan Water District of Southern California
Municipal Water District of Orange County
City of Newport Beach
City of Orange
County of Orange, Public Works Department
Orange County Sanitation District
City of Santa Ana
Santa Ana Watershed Project Authority
City of Seal Beach
Serrano Water District
City of Tustin
United States Geological Survey
City of Westminster
Yorba Linda Water District

The cooperation received from all agencies is gratefully acknowledged.

This report is based on the 2015-16 Basic Data Report which is placed on file at the office of OCWD in Fountain Valley.

GLOSSARY OF ACRONYMS

AF	Acre-feet
AWPF	Advanced Water Purification Facility
BEA	Basin Equity Assessment
BPP	Basin Production Percentage
CPTP	Coastal Pumping Transfer Program
CUP	Conjunctive Use Program
DATS	Deep Aquifer Treatment System
DRWF	Dyer Road Well Field
GAP	Green Acres Project
GWRS	Groundwater Replenishment System
IDP	Irvine Desalter Project
IRWD	Irvine Ranch Water District
MF	Microfiltration
mg/L	Milligrams per Liter
MBI	Mid-Basin Injection
MGD	Million Gallons per Day
MSL	Mean Sea Level
MWD	Metropolitan Water District of Southern California
MWDOC	Municipal Water District of Orange County
NO_3	Nitrate
O&M	Operation and Maintenance
OCSD	Orange County Sanitation District
OCWD	Orange County Water District
RA	Replenishment Assessment
RO	Reverse Osmosis
RTS	Readiness-to-Serve
SAR	Santa Ana River
SWP	State Water Project
TDS	Total Dissolved Solids
UV	Ultraviolet
WRD	Water Replenishment District of Southern California
WSM	Basin Water Supply Management Program

PART I: GROUNDWATER CONDITIONS

Section 25 of the OCWD Act requires that OCWD order an annual investigation to report on the groundwater conditions within the District's boundaries. A summary of the groundwater conditions for the water year covering July 1, 2015 to June 30, 2016 is as follows.

GROUNDWATER CONDITIONS
2015-16 SUMMARY OF FINDINGS

1. Groundwater production (including the In-Lieu Program) totaled 277,090 acre-feet (AF) for the 2015-16 water year excluding extractions from the Metropolitan Water District of Southern California (MWD) Groundwater Storage Program.

2. Groundwater stored in the basin increased by 2,000 AF for the 2015-16 water year.

3. Accumulated Overdraft[1] on June 30, 2016 was 379,000 AF.[2]

4. Annual Overdraft was 141,000 AF for the 2015-16 water year.

5. Average Annual Overdraft[3] for the immediate past five water years (2011-12 through 2015-16) was 160,000 AF.

6. Projected Annual Overdraft[3] for the current 2016-17 water year is 85,000 AF.

7. Projected Annual Overdraft[3] for the ensuing 2017-18 water year is 148,000 AF.

8. Projected Accumulated Overdraft[2] on June 30, 2017 is 320,000 AF.

9. Under the provisions of Section 27 of the District Act, a portion of the 2017-18 Replenishment Assessment (RA) could be equal to an amount necessary to purchase up to 198,000 AF of replenishment water.[4]

[1] *Accumulated overdraft was calculated using OCWD's three-layer storage change methodology adopted on March 21, 2007 and the associated new benchmark for full-basin conditions. Water year 2005-06 was the first year this methodology was used. Additional explanation can be found in the report on "Evaluation of Orange County Groundwater Basin Storage and Operational Strategy" by OCWD in 2007.*

[2] *Water from the Metropolitan Water District of Southern California Long-Term Groundwater Storage Program was included as part of the total stored water in determining the basin's accumulated overdraft.*

[3] *Annual overdraft is defined in the District Act as "annual basin storage decrease without supplemental replenishment water."*

[4] *Determined by adding the five-year annual overdraft (160,000 AF) to one-tenth of the accumulated overdraft (379,000 AF) which results in the following:*
160,000 AF + [(379,000 AF) x 0.10] = 197,900 AF (or 198,000 AF when rounded).

BASIN HYDROLOGY

Groundwater conditions in the Orange County groundwater basin are influenced by the natural hydrologic conditions of rainfall, capture and recharge of Santa Ana River (SAR) and Santiago Creek stream flows, natural infiltration of surface water, and the transmissive capacity of the basin. The basin is also influenced by groundwater extraction and injection through wells, use of imported water for groundwater replenishment, wastewater reclamation and water conservation efforts and activities throughout OCWD's service area.

The water year beginning on July 1, 2015, yielded an average of 8.40 inches of rainfall within OCWD's boundaries, which is approximately 62 percent of the long-term annual average of 13.40 inches. Rainfall data within OCWD's boundaries was provided by the Orange County Public Works for precipitation stations number 5, 61, 88, 96, 121, 163, 165, 169, 173, 219 and 229. The previous water year (2014-15) had rainfall equaling 8.20 inches which was also less than the long-term average rainfall. The average seasonal rainfall in the OCWD service area for the five-year period (from July 1, 2011 through June 30, 2016) was 9.07 inches, and below average rainfall in the watershed tends to lead to lower flows in the SAR reaching Orange County. Stream flow in the SAR measured downstream of Prado Dam for water year 2015-16 totaled 113,780 AF which was approximately 51 percent of the 30-year flow average of 223,362 AF.

GROUNDWATER PRODUCTION

Groundwater production from wells within OCWD for the 2015-16 water year totaled 277,090 AF (excluding In-Lieu Program water, MWD Groundwater Storage Program extractions, and any groundwater used for the Talbert Barrier): 275,042 AF for non-irrigation and 2,048 AF for irrigation uses. The term "irrigation" used in the District Act and herein refers to irrigation for agricultural, horticultural or floricultural crops and for pasture grown for commercial purposes.

OCWD's In-Lieu Program replaces groundwater supplies with imported water to reduce groundwater pumping. During the 2015-16 water year, In-Lieu Program water was not available for purchase from MWD. Annual groundwater production and In-Lieu quantities within OCWD for the period 1966-67 through 2015-16 are presented in Figure 1 and Table 1.

Groundwater production for 2015-16 for the major groundwater producers is summarized in Appendix 1. Groundwater production for all producers exceeding 25 AF per year for non-irrigation and irrigation purposes is presented in Appendices 2 and 3, respectively.

FIGURE 1. Groundwater Production

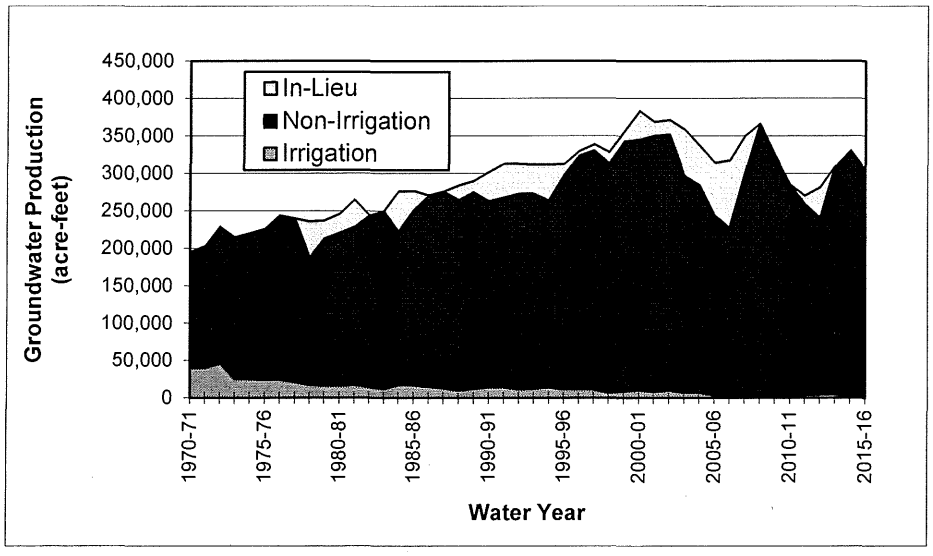


TABLE 1. Historical Groundwater Production Within OCWD

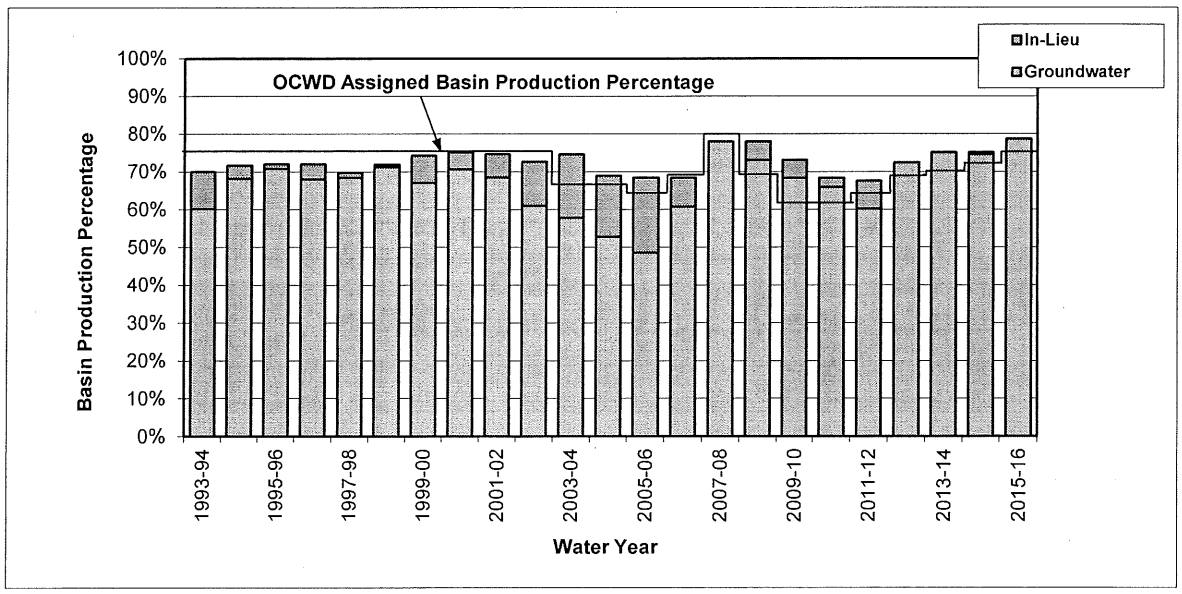
Water Year Jul 1-Jun 30	Groundwater Production (AF)	In-Lieu Program (AF)	Water Year Jul 1-Jun 30	Groundwater Production (AF)	In-Lieu Program (AF)
1966-67	169,375	-	1991-92	271,224	39,789
1967-68	193,656	-	1992-93	273,587	38,900
1968-69	178,798	-	1993-94	264,159	48,134
1969-70	194,379	-	1994-95	298,217	15,622
1970-71	203,923	-	1995-96	324,111	5,542
1971-72	229,048	-	1996-97	331,406	7,883
1972-73	214,983	-	1997-98	313,805	15,096
1973-74	218,863	-	1998-99	342,823	13,352
1974-75	225,597	-	1999-00	345,362	38,007
1975-76	245,456	-	2000-01	350,385	18,640
1976-77	243,511	-	2001-02	352,113	19,473
1977-78	188,407	48,290	2002-03	297,191	61,463
1978-79	213,290	23,792	2003-04	284,621	52,168
1979-80	221,453	24,861	2004-05	244,370	69,617
1980-81	228,943	36,373	2005-06	228,159	89,216
1981-82	244,184	-	2006-07	299,118	50,740
1982-83	249,548	-	2007-08	366,185	-
1983-84	223,207	52,822	2008-09	324,147	-
1984-85	252,070	25,198	2009-10	285,575	-
1985-86	270,932	-	2010-11	259,861	10,435
1986-87	276,354	-	2011-12	241,082	40,564
1987-88	265,226	18,856	2012-13	309,295	-
1988-89	275,077	15,022	2013-14	330,782	-
1989-90	261,190	38,961	2014-15	305,259	-
1990-91	266,745	44,588	2015-16	277,090	-

BASIN PRODUCTION PERCENTAGE

The Basin Production Percentage (BPP) is defined in the District Act as "*...the ratio that all water to be produced from groundwater supplies within the district bears to all water to be produced by persons and operators within the district from supplemental sources as well as from groundwater within the district.*" The BPP applies only to water producers that utilize more than 25 AF of groundwater per water year. Water producers that use 25 AF or less from the groundwater basin are excluded from the production percentage limitation.

The BPP for the 2015-16 water year was established at 75.0 percent by the OCWD Board of Directors. The overall BPP achieved within OCWD for non-irrigation use in the 2015-16 water year was 78.7 percent. The achieved pumping is greater than 75.0 percent primarily due to additional extraction from several water quality projects that are given a Basin Equity Assessment (BEA) exemption to pump groundwater above the BPP. The production percentage achieved by each major producer for non-irrigation use is presented in Appendix 1. Historical assigned and achieved BPPs are illustrated below in Figure 2.

FIGURE 2. Groundwater BPP



GROUNDWATER LEVELS

Groundwater levels in the Orange County groundwater basin are shown on Plate 1. Groundwater level data used to prepare this plate were collected during late June and early July 2016 from over 500 production and monitoring wells screened within the

principal aquifer system (approximately 300 to 1,200 feet deep), from which over 90% of basin pumping occurs. The groundwater elevation contours range from 30 to 90 feet below mean sea level in the coastal area of the basin due to pumping. A general indicator of changing basin levels is the location of the zero (0) mean sea level (MSL) elevation contour line each year (MSL elevations are referenced to Vertical Datum NGVD 29). The zero contour line moved slightly landward (ranging from 0.01 to 0.30 miles) when compared to its alignment the prior year, indicating a small decrease in groundwater levels in the principal aquifer system.

Plate 2 shows the change in groundwater levels from June 2015 to June 2016 for the principal aquifer system. In the principal aquifer, groundwater levels rose in most of the Forebay area but dropped slightly throughout the larger Pressure area of the basin.

Below is a general overview of the change in groundwater levels from June 2015 to June 2016 for the three primary aquifer systems of the basin.

Shallow Aquifer System :

In the shallow aquifer, groundwater levels dropped slightly throughout most of the basin from June 2015 to June 2016 except in the Forebay areas of Anaheim and Fullerton where groundwater levels experienced a moderate rise despite the fifth consecutive year of drought conditions. The maximum groundwater level rise was approximately 15 feet surrounding Kraemer-Miller-Miraloma Basins due to increased Groundwater Replenishment System (GWRS) recharge in those basins resulting from the GWRS Initial Expansion which went online one month prior to the start of water year 2015-16. In fact, GWRS recharge in these three basins during water year 2015-16 was 65,229 AF, significantly more than the 39,688 AF recharged during the prior water year.

Shallow aquifer groundwater levels rose approximately 10 feet along the Santa Ana River (SAR) in the Anaheim Forebay and approximately 5 feet in the Fullerton area slightly further away from the OCWD recharge facilities.

In the Orange Forebay area, shallow aquifer groundwater levels dropped 5 to 10 feet, likely due to the lack of incidental recharge from the adjacent mountain-front areas since Santiago Basin and Santiago Creek had similar recharge totals as the prior water year.

Overall, OCWD managed recharged in the Forebay area totaled 219,690 AF from all sources (GWRS, imported water and SAR) during water year 2015-16. Although it was a dry year and rainfall was slightly less than the prior year, this represented a 15.5% recharge increase from the prior water year and was approximately equal to the 20-year average.

In the Irvine area, shallow aquifer groundwater levels declined slightly from 1 to 3 feet.

This gradual decline has been continuing for the last five years of drought as incidental recharge from the Santa Ana Mountains is insufficient to offset pumping from the Irvine Sub-basin.

The groundwater level decline was only 1 to 2 feet throughout most of the Pressure area, i.e., in the central portion of the basin, the coastal area, and in the west Orange County area near the boundary with Los Angeles County.

The Talbert Barrier area was the one exception in the coastal area where shallow aquifer groundwater levels rose slightly (1 to 5 feet) from June 2015 to June 2016. This rise was likely the result of increased barrier injection into the shallower aquifers susceptible to seawater intrusion during the ongoing low-basin conditions. Despite the relatively high accumulated overdraft in the basin, barrier injection operations were able to maintain protective groundwater elevations sufficiently above MSL seaward of the barrier for the majority of water year 2015-16 to prevent seawater intrusion.

Principal Aquifer System :

In the principal aquifer, groundwater levels rose in most of the Forebay area but dropped slightly throughout the larger Pressure area of the basin, somewhat similar to but slightly more pronounced than in the shallow aquifer described above.

Principal aquifer groundwater levels rose in the Anaheim, Fullerton, and Orange Forebay areas, with a maximum rise of approximately 10 to 15 feet in the immediate vicinity of the OCWD recharge facilities in both Anaheim and Orange. In the greater Forebay area farther away from the OCWD recharge facilities, the groundwater level rise was less at approximately 5 to 10 feet.

For the rest of the basin, the mild to moderate decline in principal aquifer groundwater levels was likely due to a basin pumping increase of 9% during the last two months of the water year in May and June of 2016 coinciding with the period when groundwater levels were measured for preparing the annual groundwater contour maps and storage calculation. Annual basin pumping was 7.9% less during water year 2015-16 as compared to the previous water year due to the state-mandated 25% water use reduction. However, the water use restrictions were relaxed during May and June of 2016, during which time pumping increased somewhat.

Principal aquifer groundwater levels dropped approximately 5 to 10 feet throughout the western half of the Pressure area (e.g., Buena Park, Garden Grove, Westminster, Huntington Beach, and Los Alamitos), but the decline was somewhat larger at approximately 15 feet in Seal Beach and across the county line in Long Beach. The greater decline in Principal aquifer groundwater levels in Long Beach relative to west-central Orange County indicated that the gradient towards Los Angeles County was slightly

steeper in June 2016 than in June 2015 and thus the groundwater outflow during water year 2015-16 may have been more than the prior water year.

In the immediate vicinity of the Talbert Barrier, principal aquifer groundwater levels dropped approximately 10 to 20 feet, which was nearly double the decline throughout the greater coastal area. This larger decline was relatively localized and likely due to deliberately reducing Talbert Barrier injection into the deeper main aquifer zone for replenishing the basin so as to maximize barrier injection into the shallower aquifer zones susceptible to seawater intrusion during the ongoing low-basin conditions. Northeast of the Talbert Barrier, principal aquifer groundwater levels in the IRWD Dyer Road Well Field (DRWF) area only declined 1 to 2 feet from June 2015 to June 2016.

In the Irvine area in the vicinity of the Irvine Desalter Project (IDP) wells, the decline in principal aquifer groundwater levels was approximately 5 to 10 feet. As was discussed for the shallow aquifer, the gradual decline in principal aquifer groundwater levels in the Irvine area has been occurring for the past five years as the lack of incidental or natural recharge from the Santa Ana Mountains has been insufficient to keep pace with pumping from the principal aquifer within the Irvine Sub-basin (IDP wells and IRWD wells 21 and 22). Despite the progressively lower groundwater levels in the Irvine Sub-basin, the groundwater gradient and flow direction is still westerly from the Irvine Sub-basin out into the main portion of the basin. However, if the declining trend continues for several more years, the gradient could eventually reverse such that groundwater flow would be from the main basin into the Irvine Sub-basin as historically occurred during the high agricultural pumping years of The Irvine Company.

Deep Aquifer System :

In the deep aquifer, groundwater level changes from June 2015 to June 2016 were very similar to those in the principal aquifer but more subtle in some areas. Deep aquifer groundwater levels rose 10 to 15 feet in the Forebay area near the OCWD recharge facilities and had a lesser rise of 5 to 10 feet in the rest of the Forebay area farther away from the recharge facilities.

In the Irvine area, deep aquifer groundwater levels had a mild decline of 2 to 3 feet in the vicinity of the IDP wells that pump from the principal aquifer. Farther west, deep aquifer groundwater levels rose 3 to 5 feet towards the 55 Freeway as well as farther west in Santa Ana in the vicinity of the IRWD Deep Aquifer Treatment System (DATS) wells.

Deep aquifer groundwater levels declined approximately 5 to 10 feet in the western half of the Pressure area (west of SAR in the west-central portion of the basin) and approximately 15 feet in Seal Beach and across the county line in Long Beach. The slightly larger decline in the Long Beach area as compared to the west-central portion of Orange County indicated a slightly steeper gradient and thus groundwater outflow across the county line

in the deep aquifer during water year 2015-16 may have been more than the prior water year.

COASTAL GROUNDWATER CONDITIONS

The coastal portion of the groundwater basin, essentially that area within five miles of the coast, is sensitive to seawater intrusion potential and seasonal effects on production well capacity due to lower groundwater levels. Coastal groundwater levels are affected by groundwater production, overall groundwater storage in the basin, and, to a somewhat lesser extent, injection at the Talbert and Alamitos barriers.

Coastal groundwater production for water year 2015-16 totaled 95,879 AF (includes Fountain Valley, Huntington Beach, IRWD DRWF and DATS wells, Mesa Water, Newport Beach, OCWD deep wells in Fountain Valley, Seal Beach, and Westminster). The coastal groundwater production for water year 2015-16 was 6% less than the prior water year despite a 3% increase in the BPP to 75%. The Coastal Pumping Transfer Program (CPTP) implemented during water years 2013-14 and 2014-15 was not continued during water year 2015-16. Therefore, the coastal pumping reduction during water year 2015-16 was solely due to reduced demand stemming from the state-mandated water use restrictions.

Talbert Barrier injection totaled 35,233 AF for water year 2015-16, representing a decrease of 3.4% from the prior water year. Although basin accumulated overdraft was still relatively high during water year 2015-16, the reduction in coastal pumping discussed above led to a slight reduction in the required amount of injection necessary to maintain protective elevations seaward of the barrier. Also, additional injection was required during the prior water year to recover from a one-month GWRS shutdown during June 2014.

A key OCWD monitoring well M26 is located near Adams Avenue seaward of the barrier. Shallow aquifer groundwater levels of monitoring well M26 had declined to 12 feet below mean sea level at the start of previous water year (2014-15) due to the aforementioned GWRS shutdown, but then steadily rose thereafter, eventually rising back above MSL and reaching protective elevations of approximately 3 feet above MSL during the second half of water year 2014-15 due to increased injection during those months. During water year 2015-16, groundwater levels in the shallow aquifer at M26 were stably maintained at or slightly above protective elevations throughout the year.

Talbert Barrier injection consisted of nearly 100% (99.98%) GWRS recycled water and 0.02% (7 AF) of imported potable water from the MWD OC-44 connection during water year 2015-16. During normal operating conditions throughout the water year, barrier injection was 100% GWRS water. The MWD potable water was only used to keep the barrier pipeline full and pressurized during brief intermittent plant shutdowns.

At the Alamitos Barrier, the OCWD portion of injection totaled 2,399 AF for water year 2015-16, which was slightly higher than past years. The higher injection total was an operational attempt to achieve protective elevations near the barrier under relatively low basin conditions. The injection total included all sources of water (81% imported and 19% recycled for water year 2015-16) but only represents OCWD's share, which is less than half of the total injection based on the location of the barrier wells that lie within both Los Angeles and Orange counties. A supply goal of Alamitos Barrier injection has been an approximately 50/50 blend of imported and recycled water. However, the recycled portion was lower the last three years because of Leo J. Van der Lans treatment plant shutdowns related to the plant expansion construction activities.

During water year 2015-16, monthly groundwater production in the coastal area had less overall seasonal fluctuation from the winter to summer months than in recent years likely due to the state-mandated water use restrictions that were proportionally more impactful during the warm summer months limiting outdoor water usage (e.g., landscape irrigation). Coastal production was approximately 9,000 AF per month during the summer months and approximately 7,000 AF per month during the winter months.

Pumping from the IRWD DRWF did follow more of a typical demand curve during water year 2015-16, but pumping from IRWD DATS wells was nearly constant year-round. In contrast, pumping from Mesa Water wells 6 and 11 into Mesa's colored water treatment plant (also known as Mesa Water Reliability Facility) was seasonally variable with very low monthly pumping from December 2015 through March 2016 and greater pumping the rest of the water year during the warmer months. However, pumping from the Mesa Water clear wells was nearly constant year-round during water year 2015-16. Huntington Beach pumping also had very little seasonal fluctuation, while Seal Beach pumping had a reversed seasonal trend in which pumping was less during the summer months than in the winter months.

ANNUAL OVERDRAFT

Annual groundwater basin overdraft, as defined in the District Act, is the quantity by which production of groundwater supplies exceeds natural replenishment of groundwater supplies during a water year. This difference between extraction and replenishment can be estimated by determining the change in volume of groundwater in storage that would have occurred had supplemental and recycled water not been used for any groundwater recharge purpose, including seawater intrusion protection, advanced water reclamation and the In-Lieu Program.

For the 2015-16 water year, it is estimated that the volume of groundwater in storage increased by 2,000 AF. Approximately 143,000 AF of water was supplied to the basin as follows: 1) directly from the percolation or injection of purchased imported water from the Colorado River and State Water Project (SWP), 2) use of recycled water to supplement

purchased imported water in the Alamitos seawater intrusion barrier, and 3) use of GWRS recycled water. Therefore, the annual overdraft was 141,000 AF for the 2015-16 water year. For the five-year period from July 1, 2010 to June 30, 2015, an annual average of approximately 128,000 AF of supplemental water and recycled water was percolated or injected into the underground basin for replenishment or used directly in place of pumping groundwater (i.e., In-Lieu Program). The average annual overdraft during the same five-year period was approximately 160,000 AF.

GROUNDWATER BASIN ACCUMULATED OVERDRAFT

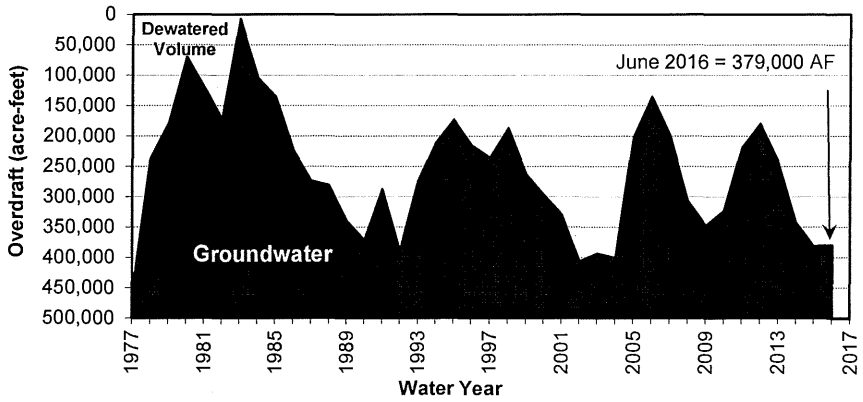
The accumulated overdraft, as defined in the District Act, is the quantity of water needed to be replaced at OCWD's intake area to prevent landward movement of ocean water into the fresh groundwater body. Landward movement of ocean water can be prevented if groundwater levels near the coast are several feet above sea level. Groundwater levels along the coast are related to the volume of water stored in the intake area, water pumped from the entire basin and the pattern or location of pumping. However, the Talbert and Alamitos seawater intrusion control projects have been implemented to prevent landward movement of ocean water into the fresh groundwater body. Due to the operation of seawater intrusion barrier facilities, there is no longer a direct correlation between accumulated overdraft and controlling seawater intrusion. These facilities allow greater utilization of the storage capacity of the groundwater basin. OCWD is also dedicated to maximizing its replenishment capabilities by actively negotiating with the U.S. Army Corps of Engineers to increase its water conservation program behind Prado Dam and implementing a Long-Term Facilities Plan to evaluate cost-effective improvements to its groundwater recharge capabilities.

In February 2007, OCWD staff completed a report entitled "Evaluation of Orange County Groundwater Basin Storage and Operational Strategy." This report presented a new methodology that had been developed, tested, and documented for calculating accumulated overdraft and storage change based on a three aquifer layer approach. Furthermore, the report provided the basis for calculating accumulated overdraft using a new full-basin benchmark that was developed for each of the three aquifer layers, which in effect replaces the traditional single-layer full benchmark of 1969.

The annual analysis of basin storage change and accumulated overdraft for water year 2015-16 has been completed. Based on the three-layer methodology, an accumulated overdraft of 379,000 AF was calculated for the water year ending June 30, 2016. The accumulated overdraft for the prior water year ending June 30, 2015 was 381,000 AF (also calculated using the three-layer storage method). Therefore, an annual increase of 2,000 AF (reported earlier herein this report) in stored groundwater was calculated as the difference between the June 2015 and June 2016 accumulated overdrafts.

Figure 3 shows the accumulated basin overdraft quantities for the period 1977 through 2016.

FIGURE 3. Accumulated Basin Overdraft



The accumulated overdraft for the current water year ending on June 30, 2017 is projected to be 320,000 AF. The annual overdraft is estimated to be 85,000 AF. This quantity is based on assumed annual groundwater production of approximately 298,000 AF for the current water year (including groundwater pumping within the BPP, In-Lieu Program water, groundwater pumped above the BPP from water quality improvement projects and MWD Groundwater Storage Program extractions) and that natural replenishment (including captured SAR flows and incidental recharge) is estimated to be approximately 213,000 AF for the basin under slightly-below average rainfall conditions. In addition, GWRS production is assumed to reach 95,000 AF.

Projected annual overdraft for the ensuing water year (2017-18) is estimated to be 148,000 AF. This estimate is based on the assumption that total annual groundwater production for the ensuing water year will be 303,000 AF, a figure that is based upon an assumed BPP of 75 percent and includes 22,000 AF of production above the BPP from water quality improvement projects (discussed further in the subsequent section entitled Recommended Basin Production Percentage). The natural replenishment is estimated to be 155,000 AF (average of last five years) under below-average rainfall conditions, and the GWRS production is assumed to reach 103,000 AF.

OCWD, MWD, the Municipal Water District of Orange County (MWDOC) and participating producers approved the funding agreement for the MWD Long-Term Groundwater Storage Program on June 25, 2003. This conjunctive use program (also informally referred to as MWD CUP) provides for MWD to store up to 66,000 AF in the

OCWD groundwater basin to be pumped (less basin losses) by participating producers in place of receiving imported supplies during water shortage events. A compensation package from MWD was included in the agreement to build eight new groundwater production wells, improvements to the seawater intrusion barrier, construction of the Diemer Bypass Pipeline and an annual administrative fee. The preferred means to store water in the MWD storage account has been through the In-Lieu deliveries to participating groundwater producers. Water into the MWD storage account has also been conducted through direct replenishment utilizing OCWD Forebay recharge basins. During water year 2015-16, MWD did not store any water into the MWD CUP storage account. In any event, the water stored or extracted by MWD is considered to be MWD supply and not groundwater production. During water year 2015-16, 16,212 AF were extracted from the MWD CUP account by the participating groundwater producers. The annual quantities and cumulative totals of MWD water stored since the inception of the program are shown in Appendix 4. It is important to note that the reported quantities do not include pumping extractions from the account or basin losses.

REPLENISHMENT RECOMMENDATION

Section 27(b) of the District Act states the following:

"The total of the replenishment assessment levied in any year shall not exceed an amount of money found to be necessary to purchase sufficient water to replenish the average annual overdraft for the immediate past five water years plus an additional amount of water sufficient to eliminate over a period of not less than 10 years nor more than 20 years, the accumulated overdraft, plus an amount of money to pay the costs of initiating, carrying on, and completing any of the powers, projects and purposes for which this district is organized."

Based upon Section 27(b), that portion of the RA that is used for water purchases for the ensuing water year 2017-18 is limited to the amount needed to purchase 198,000 AF as calculated below:

Five-year (7/1/2011 through 6/30/2016) Average Annual Overdraft*	= 160,000 AF
Accumulated Overdraft (End of Water Year 2015-16)	= 379,000 AF
Assumed Time Period to Eliminate Accumulated Overdraft	= 10 years
Potential Water Purchase Amount: 160,000 AF + (379,000 AF/10 years)	= 197,900 AF (use 198,000 AF)

**Referred to as the Average Annual Overdraft in Section 27(b) of the District Act.*

Table 2 presents the proposed 2017-18 budget for water purchases, which shows the proposed quantity of purchased water (67,000 AF) being significantly less than the prescribed limit of 198,000 AF as allowed for under the provisions of Section 27(b) of the District Act.

TABLE 2. 2017-18 Budget for Water Purchases

Water Source	AF	Rate ($/AF)*	Total Cost ($)
Alamitos Barrier	2,000	$1,112.00	$ 2,224,000
MWD Untreated Non-interruptible Water	65,000	$680.50	$44,232,500
Water Purchases Sub-total	67,000	—	$46,456,500
Applicable Charges			**Total Cost ($)**
MWDOC Surcharge	—	—	$ 400,000
MWD/MWDOC Capacity Charge	—	—	$ 900,000
MWD/MWDOC RTS Charge	—	—	$ 1,920,000
Additional Charges Sub-total	—	—	$ 3,220,000
TOTAL WATER PURCHASES COST	67,000	—	$49,676,500

* Rates include required MWDOC Capacity and Readiness to Serve (RTS) charges where appropriate.

RECOMMENDED BASIN PRODUCTION PERCENTAGE

In December 2002, OCWD approved a basin management approach for determining the BPP for future water years. The management approach is based upon the development of a base amount of groundwater production the basin can annually sustain utilizing dependable water supplies OCWD expects to receive. It is a policy for OCWD to provide an estimate of the BPP each January for the following fiscal year to assist the groundwater producers in the preparation of their annual budgets.

A BPP of 75 percent is currently being proposed for the ensuing water year 2017-18. Analysis of the groundwater basin's projected accumulated overdraft, the available supplies to the basin (assuming below-average hydrology) and the projected pumping demands indicate that this level of pumping could potentially be sustained for 2017-18 without detriment to the basin.

A BPP of 75 percent corresponds to approximately 303,000 AF of groundwater production which includes 22,000 AF of groundwater production above the BPP to account for several groundwater quality enhancement projects (see description below).

In order to achieve water quality objectives in the groundwater basin, it is estimated for the ensuing water year 2017-18 that additional production of approximately 22,000 AF (above the BPP) will be undertaken by the City of Tustin, City of Garden Grove, Mesa Water District and IRWD. These agencies need the additional pumping allowance in order to accommodate groundwater quality improvement projects. As in prior years, production above the BPP from these projects would be partially or fully exempt from the BEA as a result of the benefit provided to the basin by removing poor-quality groundwater and treating it for beneficial use.

In March 2017, staff will review with the OCWD Board of Directors the basis and the assumptions made for the proposed BPP and receive any direction on the matter. In April 2017, staff will again apprise the OCWD Board of Directors on the status of the aforementioned conditions. If the estimates of basin supplies in the current or ensuing year are substantially different than those contained in the respective conditions, a revised BPP may then be recommended.

PART II: WATER SUPPLY AND BASIN UTILIZATION

Section 31.5 of the District Act requires an investigation and annual report setting forth the following information related to water supply and basin utilization within the OCWD service area, together with other information as OCWD may desire:

WATER SUPPLY AND BASIN UTILIZATION 2015-16 SUMMARY OF FINDINGS

1. Water usage from all supplemental sources totaled 118,149 AF for the 2015-16 water year including any available In-Lieu Program water (none for 2015-16).

2. Water usage from recycled water produced from within OCWD including the GWRS totaled 121,788 AF for the 2015-16 water year.

3. Water demands within OCWD totaled 367,402 AF for the 2015-16 water year.

4. Estimated demands for groundwater for the ensuing 2017-18 water year are 303,000 AF.

SUPPLEMENTAL WATER

Supplemental water is used by water agencies within OCWD's boundary to augment groundwater supplies in satisfying their user demands and by OCWD to recharge the groundwater basin. Supplemental water, as defined in Section 31.5 of the District Act, is any water that originates from outside the SAR watershed (comprised of an area of 2,081 square miles) with the exception of water that originates within the portion of the Santiago Creek watershed that lies upstream of Villa Park Dam which is counted as supplemental water. It is important to note that the Santiago Creek watershed lies entirely within the SAR watershed. Sources of supplemental water typically include imported deliveries from MWD and diversions from Irvine Lake/Santiago Reservoir (i.e., Santiago Creek) that are conveyed to users within OCWD boundaries. MWD deliveries originate from either the Colorado River or the SWP. In addition, supplemental water would also include deliveries from within the SAR watershed that involve water exchanges (i.e., releasing a quantity of water that originates from within the SAR watershed while importing an equal quantity of supplemental water to replace it).

Non-local waters are defined, for the purposes of this report, as waters purchased from agencies outside of OCWD's boundary for use within OCWD. Non-local waters include supplemental water and water deliveries purchased by OCWD where the water source is located within the SAR watershed. Water deliveries to OCWD from the Arlington Desalter in Riverside and the San Bernardino Valley Municipal Water District's High Groundwater Mitigation Project are considered non-local waters. Both projects involve pumping (and treatment in Arlington's case) and release of groundwater from the SAR upstream groundwater basins to OCWD via the SAR for groundwater replenishment at OCWD Forebay recharge facilities. For the purpose of being consistent with previous Engineer's Reports and to present information in a concise manner, non-local water deliveries that are purchased and used by OCWD for groundwater replenishment are included in the supplemental water totals in this report.

Recycled wastewater produced and used within OCWD is considered, for the purposes of this report, as neither non-local water nor supplemental water (sometimes referred to as neutral water). Therefore, recycled water that originates from within OCWD is reported separately from supplemental water totals. However, recycled water used in the Alamitos Barrier is supplied by Water Replenishment District of Southern California (WRD) and originated from outside the SAR watershed, and, as such, is categorized as supplemental water.

Water agencies utilizing supplemental water are listed in Appendix 1. As summarized in Table 3, the use of supplemental water in OCWD's service area during 2015-16 water year totaled 118,149 AF of which 70,625 AF resulted from the direct use by water agencies and 47,524 AF (including any available In-Lieu Program water) were used for groundwater

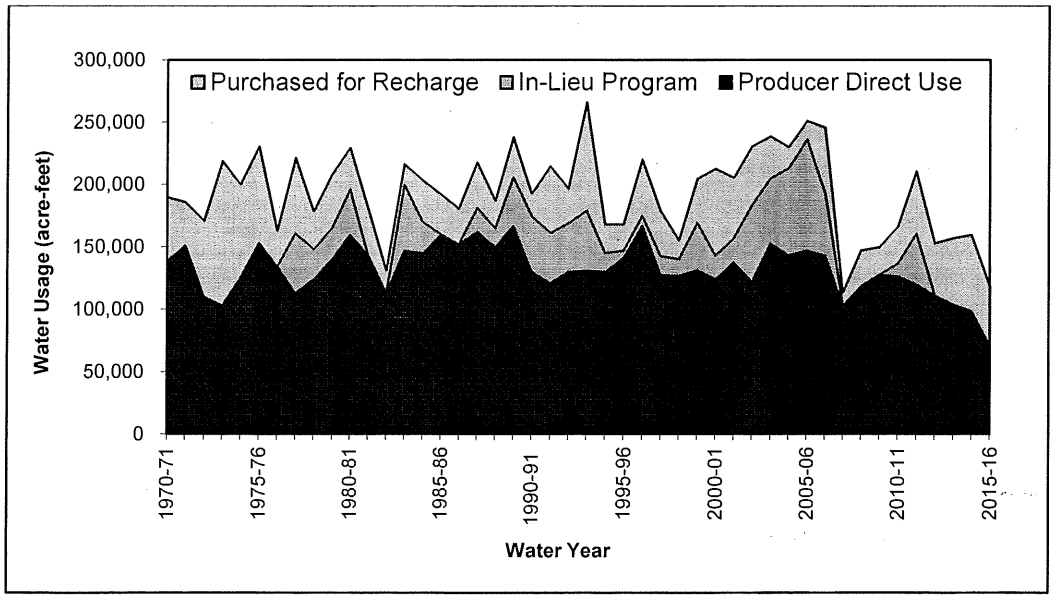
replenishment purposes. The supplemental water used by water agencies included 70,625 AF for municipal and industrial use and zero AF for agricultural purposes. Historical supplemental water usage is illustrated in Figure 4. The GWRS delivered recycled water to OCWD Forebay recharge basins and the Talbert seawater intrusion barrier throughout the 2015-16 water year. A breakdown of non-local water purchases by OCWD for 1996-97 through 2015-16 is presented in Appendix 4.

TABLE 3. 2015-16 Supplemental Water Usage

Direct Agency Use	AF
Imported Water[1]	67,735
Santiago Creek Native Water	2,890
Subtotal	**70,625**
Groundwater Replenishment (Purchased)	**AF**
In-Lieu Program[2]	0
Forebay Recharge[3]	45,118
Alamitos Barrier[4]	2,399
Talbert Barrier	7
Subtotal	**47,524**
TOTAL	**118,149**

[1]*Includes extractions from MWD Groundwater Storage Program.*
[2]*Any amount reported herein includes water received by OCWD's groundwater producers as In-Lieu water.*
[3]*Full service rate untreated water.*
[4]*Total combines imported and recycled water deliveries.*

FIGURE 4. Historical Supplemental Water Usage



Recycled water use within OCWD is presented in Table 4 (excluding WRD-supplied recycled water to the Alamitos Barrier because this water is categorized as supplemental water and already included in the total amount reported in Table 3). The major uses of recycled water are groundwater replenishment (including Kraemer, Miller and Miraloma recharge basins and Talbert Barrier injection wells) and supply water for irrigation and industrial users.

TABLE 4. 2015-16 Recycled Water Usage

Groundwater Replenishment	Water Usage (AF)
GWRS AWPF (for Talbert Barrier)	35,226
GWRS AWPF (for Recharge Basins)[1]	65,296
GWRS AWPF (for Mid-Basin Injection)	1,579
Subtotal	**102,101**
Irrigation	**Water Usage (AF)**
IRWD[2]	15,606
OCWD (Green Acres Project)[3]	4,081
Subtotal	**19,687**
TOTAL	**121,788**

[1]Includes 67 AF of GWRS recycled water delivered to City of Anaheim Canyon Power Plant and Anaheim Regional Transportation Intermodal Center (ARTIC).
[2]Recycled water used within the portion of OCWD that lies within IRWD's boundaries (excludes OCWD/IRWD intertie water deliveries to the Green Acres Project).
[3]Excludes deliveries to the Orange County Sanitation District and includes IRWD/OCWD Intertie deliveries to the Green Acres Project.

AVAILABILITY OF SUPPLEMENTAL REPLENISHMENT WATER

MWD provided untreated full service water supplies to its groundwater-basin agencies during the water year 2015-16 in spite of a low allocation of State Project Water. The availability of supplemental water from MWD to recharge the groundwater basin in the ensuing water year is likely as MWD is anticipating a normal allocation of State Project Water.

WATER DEMANDS

During the 2015-16 water year, the total water demands within OCWD's service area were 367,402 AF. This is the lowest figure for total water demands since 1982 which was caused by the State's emergency drought regulations. Total demands include the use of groundwater, MWD In-Lieu Program water, imported water, Santiago Creek native water and recycled water. Total demands exclude any groundwater, supplemental water and recycled water (such as the GWRS recycled water) used by OCWD for groundwater

recharge and water conservation credits given to groundwater producers for their conservation efforts.

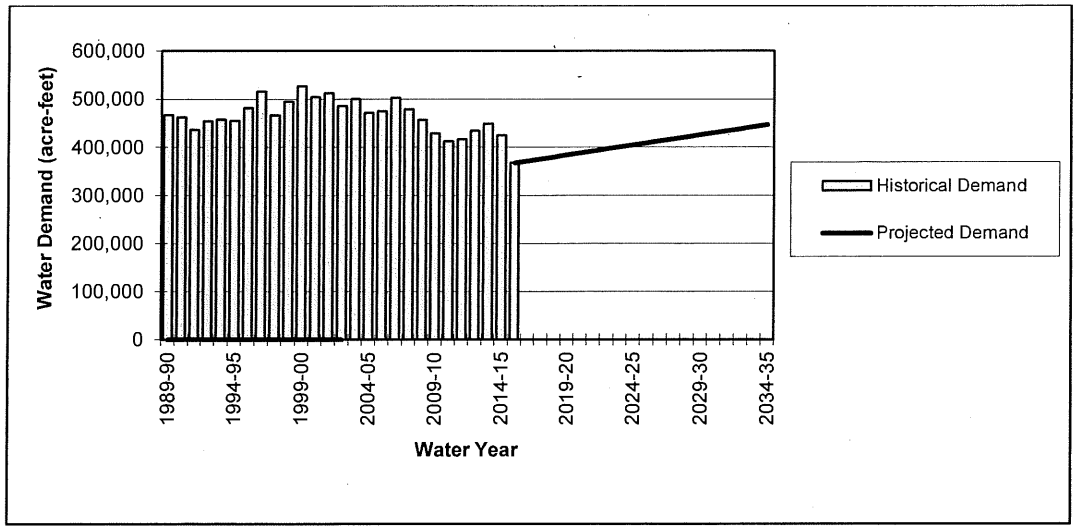
Water demands for 2015-16 and projected water demands for 2016-17 and 2017-18 are summarized in Table 5. The water demands for the current year 2016-17 were determined by assessing the data that is presently available for the first half of the water year and projecting that data to develop the total annual demands. The water demands for the ensuing year 2017-18 are based on the projections provided by the retail water agencies within OCWD's service area. Long-term projections are presented in Figure 5.

TABLE 5. Water Demands Within OCWD

	Ground-water[1]	Imported Water[2,3]	Santiago Creek Native Water[3]	Recycled Water[4]	Total
2015-16					
Non-Irrigation	275,042	67,735	2,890	-	345,667
Irrigation	2,048	-	-	19,687	21,735
Total	**277,090**	**67,735**	**2,890**	**19,687**	**367,402**
2016-17 (Current Year)[5]					
Non-Irrigation	288,000	67,200	2,800	-	358,000
Irrigation	2,000	-	-	20,000	22,000
Total	**290,000**	**67,200**	**2,800**	**20,000**	**380,000**
2017-18 (Ensuing Year)[5]					
Non-Irrigation	301,000	69,200	2,800	-	373,000
Irrigation	2,000	-	-	20,000	22,000
Total	**303,000**	**69,200**	**2,800**	**20,000**	**395,000**

[1] *Includes In-Lieu Program water, if available.*
[2] *Excludes water conservation credits and imported water used for groundwater replenishment.*
[3] *"Imported Water" and "Santiago Creek Native Water" are both counted as supplemental water.*
[4] *Excludes GWRS recycled water recharged into the groundwater basin. Includes recycled water from IRWD and OCWD's Green Acres Project (excluding OCSD's usage).*
[5] *Water demands are estimated by OCWD assuming average hydrology.*

FIGURE 5. Water Demand Projections



WATER DEMAND FORECAST

OCWD participates with MWDOC and retail groundwater producers to predict future demands in OCWD's service area. Each groundwater producer projected its total water demands to the year 2035. These projections include the effect of local water conservation efforts. Figure 5 illustrates the historical and the projected water demands for OCWD's service area to the year 2035.

Population within OCWD's service area is expected to increase from the current 2.28 million people (based on Census 2010 demographic data) to approximately 2.6 million people by the year 2035. This population growth is expected to increase water demands from the current 367,402 AF per year to 447,000 AF per year in 2035 (a water demand projection that takes into consideration future water conservation savings). In an effort to support increasing water demands, OCWD will look to increase basin production by operating the existing GWRS, maximizing the current AWPF production capacity, capturing more SAR storm flows, expanding the production of GWRS to its ultimate capacity (with the assumption that additional wastewater flows are available), purchasing imported supplies for groundwater recharge whenever supplies are available, developing other local recycled water supplies for replenishment purposes and expanding recharge facilities.

ADVANCED WASTEWATER RECLAMATION

Groundwater, supplemental water and local surface water have historically been the primary water sources within OCWD. In recent decades, wastewater reclamation has

increasingly become a significant source of additional water. Purified recycled water has been produced by OCWD for use as injection water in the Talbert Barrier and as percolation water in Kraemer, Miller and Miraloma recharge basins. OCWD and IRWD also recycle wastewater at their respective treatment plants for irrigation and industrial uses.

The GWRS is an advanced wastewater reclamation project jointly-funded by OCWD and the Orange County Sanitation District (OCSD). The project was operational in January 2008. The advanced treatment processes utilized in the GWRS consist of microfiltration (MF) followed by reverse osmosis (RO) membranes and ultraviolet (UV) light disinfection in combination with hydrogen peroxide. For water year 2015-16, the GWRS treated wastewater from the OCSD to drinking water standards and delivered 102,034 AF of purified water for direct injection into the Talbert seawater intrusion barrier and percolation into the OCWD groundwater basin via recharge basins and mid-basin injection (MBI) well.

For water year 2015-16, OCWD and IRWD recycled water deliveries for landscape irrigation and industrial uses in Fountain Valley, Costa Mesa, Huntington Beach, Newport Beach, Santa Ana and IRWD's service area within OCWD totaled 19,687 AF.

WRD operates a 3-MGD Alamitos Barrier Recycled Water Project, known as the Leo J. Vander Lans Water Treatment Facility. This project supplies highly treated recycled water to the Alamitos Barrier. The Leo J. Vander Lans advanced wastewater treatment facility located in Long Beach utilizes the treatment processes of MF, RO and UV light disinfection. Currently undergoing an expansion to 8 MGD, this project is ultimately intended to replace most of the imported water used to supply the Alamitos Barrier with purified recycled water. The project operated for eleven months during the water year 2015-16 and supplied 452 AF of purified recycled water to the Alamitos Barrier, which represented 19 percent of the barrier's supply that OCWD is responsible for payment. Recycled water deliveries from the Leo J. Vander Lans plant to the Orange County portion of the Alamitos Barrier are classified as supplemental water because this recycled water originates from outside the SAR watershed. It is noteworthy to mention that the Leo J. Vander Lans Water Treatment Facility is presently under expansion in an effort to increase its treatment capacity.

WATER QUALITY

OCWD maintains a comprehensive groundwater protection policy that includes water quality monitoring, removal of contaminants, regulatory agency support, toxic residuals removal and hazardous waste management. In addition, OCWD provides water quality information to regulatory agencies, other water agencies and the general public. In order to meet the current and future water quality testing requirements, OCWD operates the Advanced Water Quality Assurance Laboratory at the Fountain Valley campus. The

laboratory houses approximately 30 chemists and laboratory technicians, 12 water quality monitoring personnel and all the analytical instruments that are needed to perform more than 400,000 analyses of approximately 20,000 water samples taken each water year. The laboratory supports the extensive water quality testing requirements for the GWRS.

When blended together by the major agencies within OCWD's service area, the blended groundwater (without treatment) and treated supplemental water for 2015-16 was determined to have a flow-weighted average of 489 milligrams per liter (mg/L) of total dissolved solids (TDS) which is less than the average TDS concentration of 496 mg/L reported for the prior year (2014-15). The average groundwater TDS concentration for the basin for 2015-16 was 449 mg/L (compared to 452 mg/L reported for 2014-15), ranging from a low of 222 mg/L in Seal Beach to a high of approximately 711 mg/L in certain inland areas.

Average concentrations of TDS, nitrate (NO_3) and hardness for groundwater and groundwater combined with supplemental water supplied by agencies within OCWD's service area during the 2015-16 water year are summarized in Table 6. These concentrations were determined from groundwater and supplemental water analyses and from production reports submitted to and filed with OCWD by each water agency. The City of Tustin and IRWD have active groundwater treatment projects that help to reduce certain constituents reported in Table 6 in their groundwater supply prior to service to their customers (see note 6 for detailed explanation).

WATER RESOURCES DATA

A summary of water resources data within OCWD for the 2015-16 water year and the previous water year (2014-15) is included in Appendix 5.

TABLE 6. 2015-16 Water Quality Summary

City/Agency	Groundwater[1,7]			Delivered Blend[1,2,7]		
	TDS[3]	NO_3-N[4]	Hardness[5]	TDS[3]	NO_3-N[4]	Hardness[5]
Anaheim	584	2.9	323	599	2.2	317
Buena Park	422	1.4	262	470	1.2	269
East Orange County Water District	606	4.3	342	617	3.2	329
Fountain Valley	431	1.4	249	486	1.1	260
Fullerton	482	2.4	252	523	1.9	263
Garden Grove	528	3.6	320	556	2.9	315
Golden State Water Company	419	1.8	236	471	1.4	250
Huntington Beach	337	0.2	172	414	0.3	203
Irvine Ranch Water District[6]	352*	0.8*	129*	356*	0.8*	131*
La Palma	295	ND[8]	148	397	ND[8]	190
Mesa Water District	333	0.4	113	338	0.4	116
Newport Beach	268	1.4	134	362	1.1	174
Orange	464	2.0	269	513	1.6	276
Santa Ana	401	2.1	239	455	1.7	252
Seal Beach	222	ND[8]	81	356	ND[8]	148
Serrano Water District	711	3.2	374	710	1.9	361
Tustin[6]	698*	7.0*	384*	690*	5.8*	369*
Westminster	362	1.3	233	421	1.1	246
Yorba Linda Water District	686	1.7	344	675	1.3	330
Weighted Average[7]	**449**	**1.9**	**237**	**489**	**1.6**	**249**

[1] *All groundwater results (alone or blend) are for untreated groundwater (see note 6 below). Units are reported in mg/L.*

[2] *Delivered blend includes untreated groundwater and treated imported MWD water (i.e., blend of Colorado River water and State Project water as measured at the MWD Diemer Plant), except Serrano Water District, which blends with treated Santiago Reservoir water. Units are reported in mg/L. Annual average water qualities for MWD and Santiago Reservoir (Irvine Lake) for 2015-16 are as follows:*

MWD Water Quality			Santiago Reservoir Water Quality		
TDS	=	648 mg/L	TDS	=	709 mg/L
NO_3-N	=	0.2 mg/L	NO_3-N	=	ND mg/L
Hardness (as $CaCO_3$)	=	295 mg/L	Hardness (as $CaCO_3$)	=	343 mg/L

[3] *Secondary Drinking Water Standards for TDS are as follows:*

500 mg/L = recommended limit
1,000 mg/L = upper limit

[4] *Primary Drinking Water Standard for nitrate NO_3-N (i.e., nitrate expressed as nitrogen) is 10 mg/L.*

[5] *Hardness is reported as mg/L of $CaCO_3$. General classifications of hard and soft water are within the following concentration ranges:*

0-75 mg/L	=	soft	150-300 mg/L	=	hard
75-150 mg/L	=	moderately hard	300 and up mg/L	=	very hard

[6] *Agencies with active groundwater quality improvement projects that treat for one or more of the constituents listed in the table. The results shown herein for "groundwater" and "delivered blend" reflect results from untreated groundwater. Water quality constituents that are marked with an asterisk (*) are reduced prior to delivery to customers.*

[7] *All water quality results are flow-weighted averages based on groundwater and imported water delivered to each agency.*

[8] *ND = not detected. Nitrate (expressed as NO_3-N) analytical detection limit for OCWD Advanced Water Quality Assurance Laboratory is 0.1 mg/L.*

PART III: WATER PRODUCTION COSTS FOR ENSUING WATER YEAR (2017-18)

Section 31.5 of the District Act requires that costs of producing groundwater and obtaining supplemental water be evaluated annually. These costs vary for each groundwater producer and depend on many factors. Although these variations in cost are recognized, it is necessary for the purpose of this report to arrive at figures representing the average cost of producing groundwater and purchasing supplemental water.

ENSUING WATER YEAR (2017-18) WATER PRODUCTION COSTS SUMMARY OF FINDINGS

1. Cost for producing water from the groundwater basin within OCWD including a replenishment assessment for 2017-18 is estimated to be $647.00 per acre-foot.

2. Cost of treated, non-interruptible supplemental water for 2017-18 is estimated to be $1,077.00 per acre-foot.

GROUNDWATER PRODUCTION COSTS FOR NON-IRRIGATION USE

Cost for producing an acre-foot of groundwater in the ensuing 2017-18 water year has been estimated for a potable water well for a large groundwater producer (i.e., a city water department, water district) in OCWD's service area. Operations and maintenance (O&M) and energy costs were determined using the cost information provided by nineteen large groundwater producers from a survey conducted by OCWD in fall 2016. The capital cost component was derived using the available actual project cost data for eight production wells constructed in 2008 under the MWD Long-Term Groundwater Storage Program and adjusted to present values using Engineering News-Record Construction Cost Index. Appendix 6 contains several of the key design characteristics for eight wells that were constructed under the MWD's program. The OCWD RA used in the determination of groundwater production cost is the proposed RA for 2017-18.

The estimated cost for groundwater production for a large groundwater producing entity such as a city water department or a water district is presented in Table 7. The total cost to produce an acre-foot of groundwater within OCWD in the ensuing 2017-18 water year is estimated to be $647 per acre-foot. Based on the responses to the aforementioned survey, the flow-weighted average (based upon the quantity of groundwater pumped) for energy cost equaled $68 per AF. Operation and Maintenance (O&M) costs ranged from $32 to $279 per acre-foot with a median cost of approximately $72 per acre-foot. Elements that influence these costs include load factors and variations in groundwater levels. Recently drilled wells are generally deeper than those drilled decades ago. From the aforementioned survey, the average load factor which indicates the percent-of-use of an extraction facility equaled 50 percent.

TABLE 7. Estimated 2017-18 Groundwater Production Costs

Cost Item	Non-Irrigation Use	
	Annual Cost ($)	Cost per AF ($/AF)
Energy	176,800[1]	68[2]
RA	1,157,000[1]	445[3]
Total Production Costs	1,333,800	513
Capital	161,200[4]	62[4]
O&M	187,200[1]	72[2]
Total Other Costs	348,400	134
Total Cost to Producers	1,682,200	647

[1] *Based upon an annual average production of 2,600 AF per production well.*
[2] *Based on survey of major agencies within OCWD's service area, non-irrigation groundwater users.*
[3] *Proposed RA for 2017-18.*
[4] *Based on 2008 average cost for design and construction of a production well (excluding land cost) under the MWD Long-Term Groundwater Storage Program (cost amortized over 30 years at 5 percent interest) and adjusted to 2016 dollars using Engineering News-Record Construction Cost Index for Los Angeles area. Typical design parameters are listed in Appendix 6.*

COST OF SUPPLEMENTAL WATER

Supplemental water is supplied to OCWD's service area by MWD. MWD delivers both treated and untreated water as either a non-interruptible supply or an interruptible supply. As a result, there are several categories of water available from MWD. The categories most applicable for purposes of this report are 1) uninterruptible (i.e., firm) treated water, which is referred to as "full service water," and 2) uninterruptible untreated water. Treated water is purchased and used directly by various groundwater producers for municipal and industrial purposes, while untreated water is purchased and recharged into the basin by OCWD to support higher groundwater production. Table 8 shows the estimated cost for the MWD uninterruptible treated water (full service water) cost for the ensuing 2017-18 water year. Figure 6 illustrates the historical supplemental water costs along with the historical groundwater production costs. A comparison of estimated costs for groundwater versus supplemental water (non-irrigation use) during the ensuing water year 2017-18 is summarized in Table 9 and also in Figure 6. Values used in Figure 6 are presented in tabular form in Appendix 7.

TABLE 8. Estimated 2017-18 Supplemental Water Cost[1]

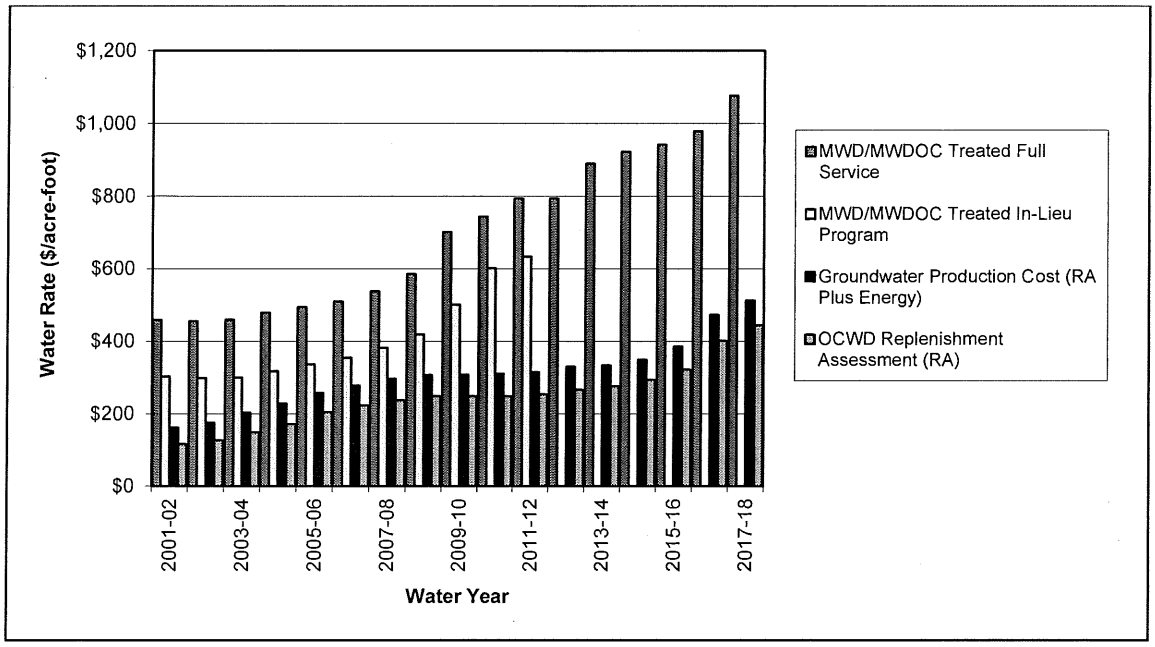
Rate and Charge Components	Treated Water Rate ($/AF)
Firm Deliveries	**Full Service Water**
MWD Supply Rate (MWDOC Melded Rate)	205.00
MWD System Access Rate	294.00
MWD System Power Rate	128.00
MWD Water Stewardship Rate	53.50
MWD Treatment Surcharge	316.50
MWD RTS and Capacity Charges[2]	80.00
Total	**1,077.00**

[1] *Rates are an average of calendar year 2017 and proposed calendar year 2018. Supplemental water costs for MWD's member agencies (i.e., Anaheim, Fullerton and Santa Ana) are not reported herein due to the variability among these agencies on water supply allocations between MWD's Tier 1 and Tier 2.*

[2] *Readiness-to-Serve (RTS) and Capacity Charges have been converted to an approximate cost per acre-foot, but are not normally reported in terms of unit cost.*

Cost components for supplemental treated and untreated water are listed in Table 8. Beyond the normally expected water supply, treatment and power charges, there are several other charges. The System Access charge is for costs associated with the conveyance and distribution system, including capital and O&M costs. The Water Stewardship charge is used to support MWD's financial commitment to conservation,

FIGURE 6. Adopted and Projected Water Rates for Non-Irrigation Use[1]



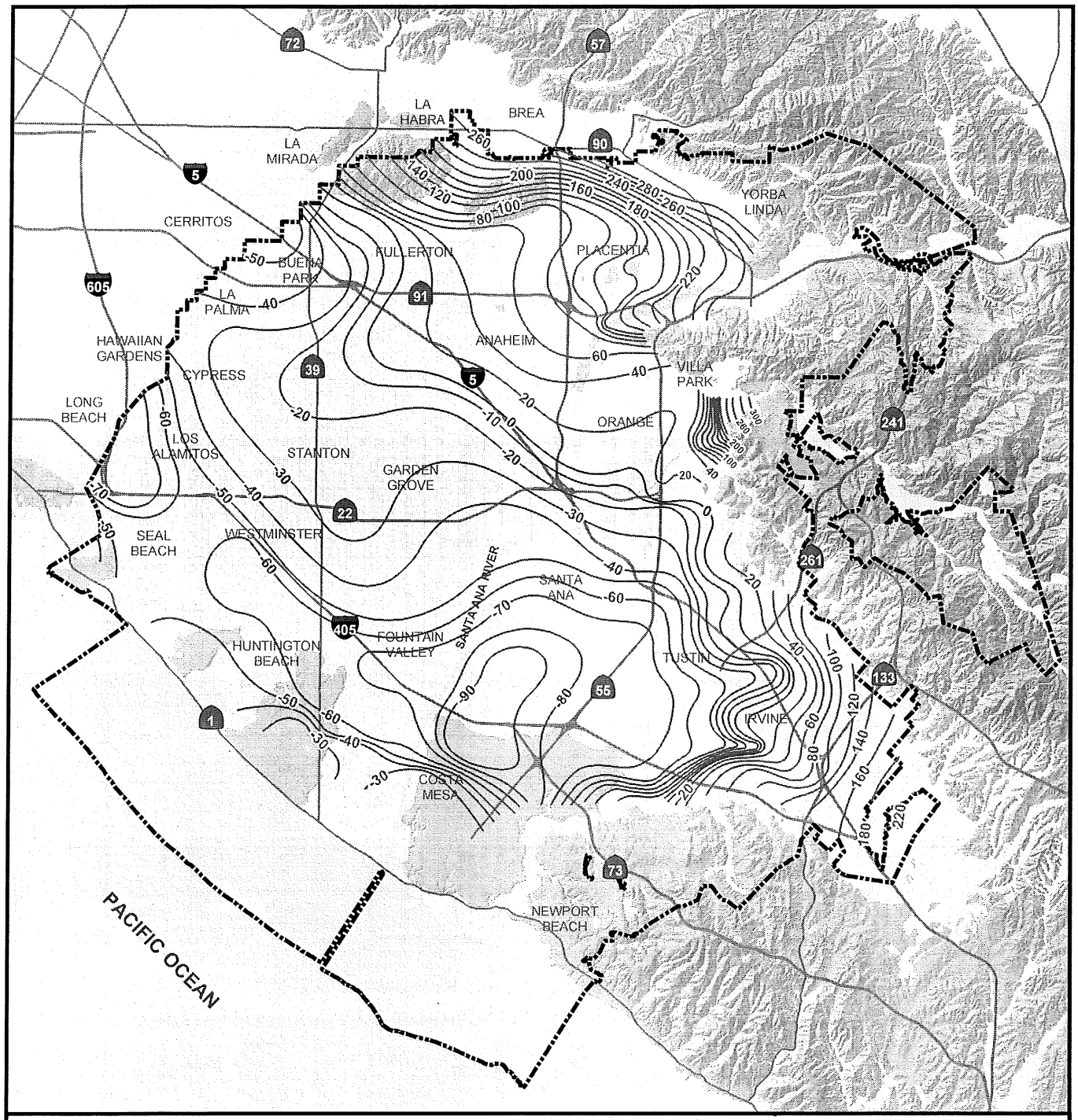
[1] *Refer to Appendix 7 for actual values used in Figure 6.*

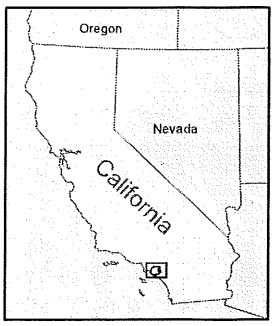
TABLE 9. Estimated 2017-18 Water Production Cost Comparison

Non-Irrigation Use	Groundwater Cost ($/AF)	Supplemental Water Cost ($/AF)
Fixed Cost	62.00[1]	1,077.00[3]
Variable Cost	585.00[2]	-[3]
Total	**647.00**	**1,077.00**

[1] *Capital cost.*
[2] *Cost for energy, O&M and proposed RA.*
[3] *Delineation of fixed and variable costs is not available.*

water recycling, groundwater recovery and other water management programs approved by MWD. MWD uses the Capacity Charge to recover its cost for use of peaking capacity within its distribution system. The Readiness-to-Serve (RTS) charge is to recover MWD's cost associated with providing standby and peak conveyance capacity and system emergency storage capacity.





Estimated Groundwater Elevations Within The Principal Aquifer Feet above Mean Sea Level* (ft MSL)

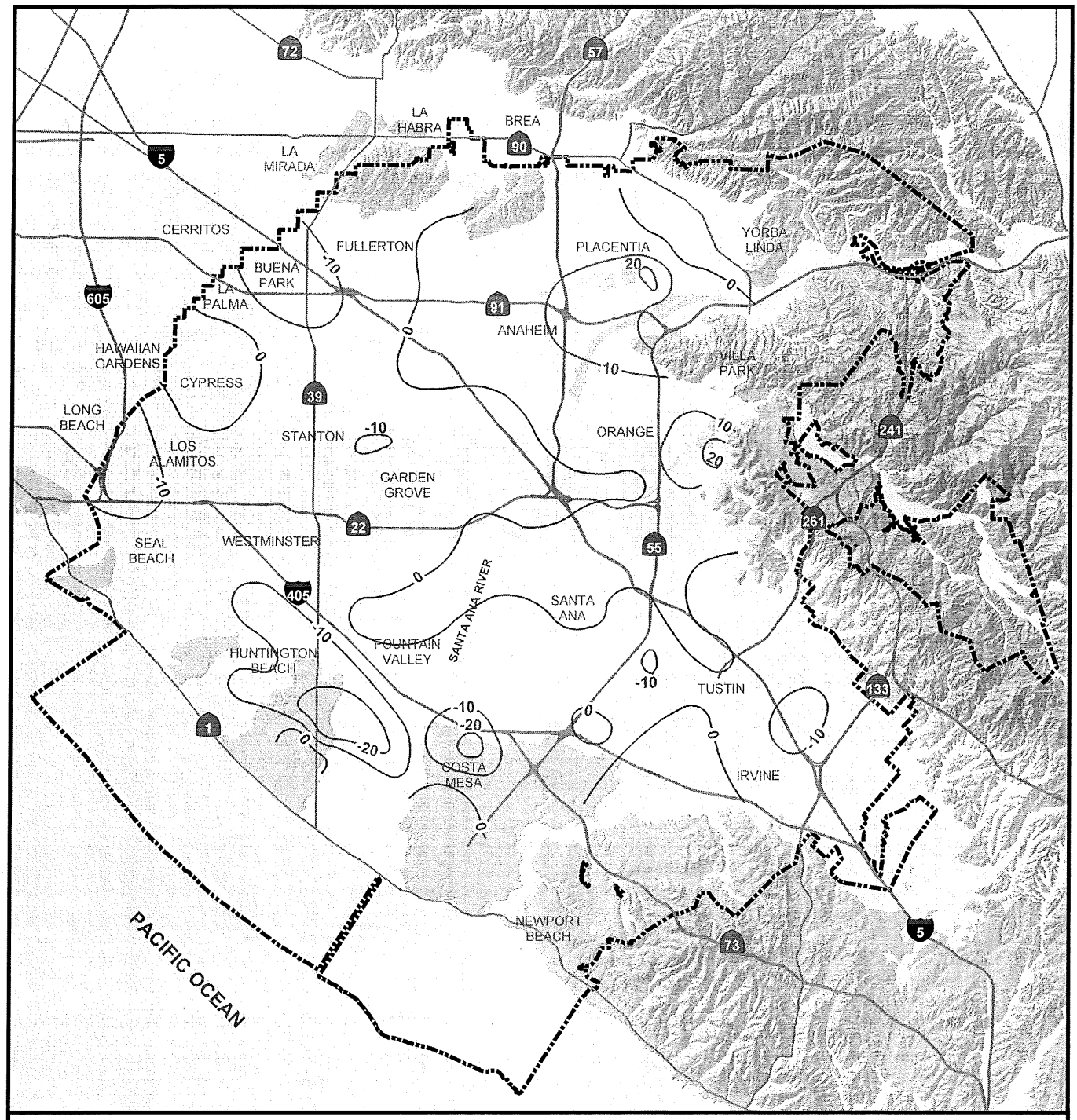
- -90 to -10
- 0
- 20 to 300
- Recharge Facility Areas
- Freeways / Highways
- Rivers / Streams
- Orange County Water District
- Water Bodies

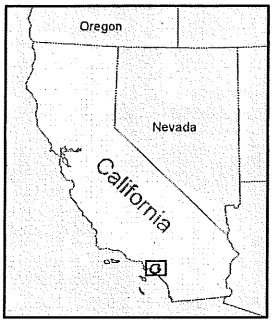
PLATE 1
GROUNDWATER CONTOUR MAP
JUNE 2016

0 1 2 4 Miles

N W E S

*NOTE: MSL elevations are referenced to Vertical Datum NGVD 29





Estimated Groundwater Elevation Changes Within The Principal Aquifer (Feet)

- -20 to -10
- 0
- 10 to 20
- Recharge Facility Areas
- Freeways / Highways
- Rivers / Streams
- Orange County Water District
- Water Bodies

PLATE 2
CHANGE IN GROUNDWATER LEVEL FROM JUNE 2015 TO JUNE 2016

0 1 2 4 Miles

N W E S

PLATE 3
KEY WELL GROUNDWATER ELEVATION TRENDS

Measured water level elevations in feet relative to mean sea level

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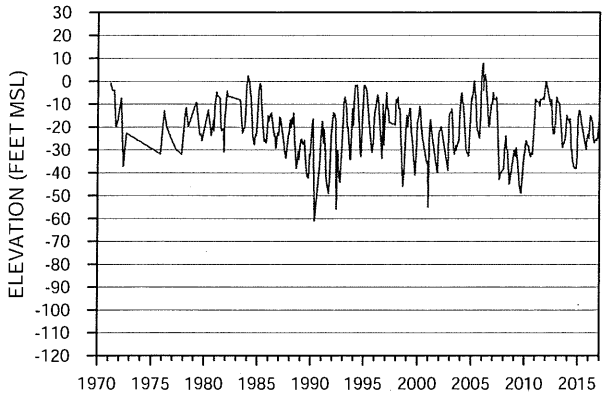
04S/11W-33L01



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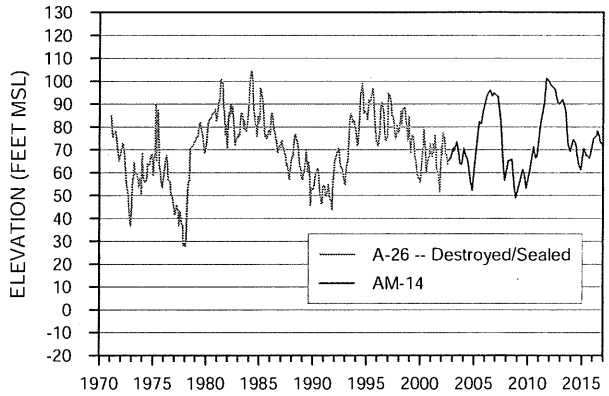
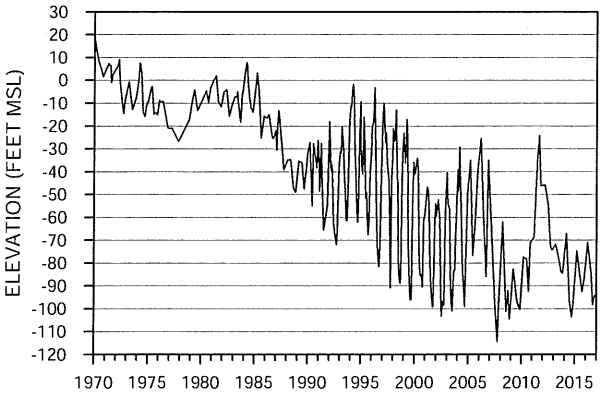


COS-PLAZ
05S/10W-35K01



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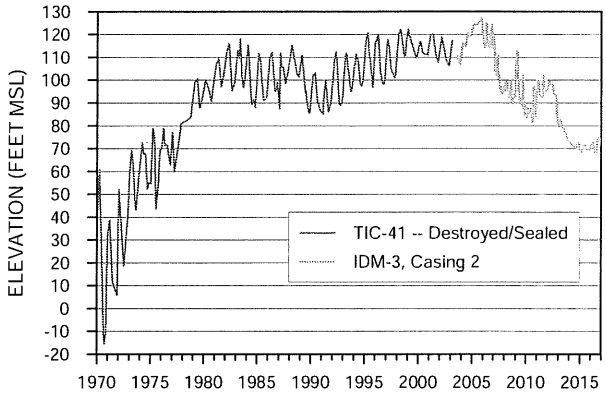
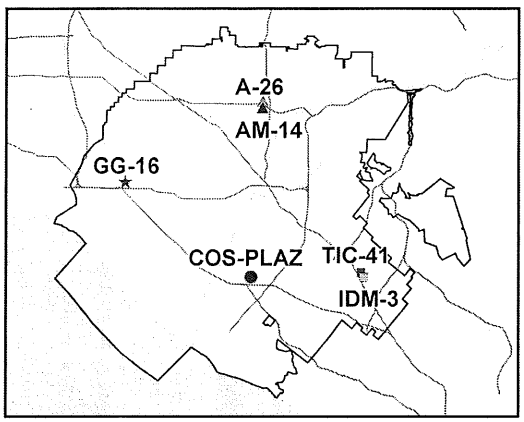
05S/09W-36B01 **05S/09W-36B02**





APPENDIX 1. Water Production Data 2015-16

Groundwater Producer	Groundwater (AF)				Supplemental Water (AF)				(AF)	Actual BPP
	Non-Irrigation [1]		Irrigation Pumping	Total	Non-Irrigation [1]		Irrigation Deliveries	Total	Grand Total	Non-Irrigation [1] Only
	Pumping	CUP [2]			Deliveries	Conservation Credit [3]				
Anaheim, City of [7]	43,018.2	2,029.3	-	40,988.9	13,409.0	253.8	-	13,662.8	54,651.7	75.0%
Buena Park, City of [7]	11,104.3	2,217.2	-	8,887.1	2,932.9	29.2	-	2,962.1	11,849.2	75.0%
East Orange County Water District	468.7	-	-	468.7	172.1	3.9	-	176.0	644.7	72.7%
County of Orange	135.1	-	-	135.1	54.5	-	-	54.5	189.6	71.3%
Fountain Valley, City of	5,961.8	-	-	5,961.8	1,984.7	33.3	-	2,018.0	7,979.8	74.7%
Fullerton, City of	17,537.8	-	8.0	17,545.8	5,848.9	45.1	-	5,894.0	23,439.8	74.8%
Garden Grove, City of [4,7]	18,216.6	2,040.8	-	16,175.8	5,341.9	63.9	-	5,405.8	21,581.6	75.0%
Golden State Water Company [7]	17,630.8	1,770.0	-	15,860.8	5,197.2	132.0	-	5,329.2	21,190.0	74.9%
Huntington Beach, City of	18,667.6	-	-	18,667.6	6,059.8	127.1	-	6,186.9	24,854.5	75.1%
Irvine Ranch Water District [4, 5]	45,463.1	-	933.0	46,396.1	510.4	857.0	-	1,367.4	47,763.5	97.1%
La Palma, City of	1,223.7	-	-	1,223.7	490.5	9.9	-	500.4	1,724.1	71.0%
Mesa Water District [4]	14,786.1	-	68.4	14,854.5	206.0	67.4	-	273.4	15,127.9	98.2%
Newport Beach, City of	9,589.0	-	-	9,589.0	3,036.2	30.9	-	3,067.1	12,656.1	75.8%
Orange, City of [5]	17,375.9	-	-	17,375.9	6,158.5	92.2	-	6,250.7	23,626.6	73.5%
Orange County Water District [6]	96.9	-	-	96.9	-	-	-	0.0	96.9	100.0%
Santa Ana, City of [7]	29,269.2	4,523.9	-	24,745.3	8,182.9	83.3	-	8,266.2	33,011.5	75.0%
Seal Beach, City of	2,187.8	-	-	2,187.8	1,032.7	7.8	-	1,040.5	3,228.3	67.8%
Serrano Water District [5]	1,210.6	-	-	1,210.6	853.7	5.4	-	859.1	2,069.7	58.5%
Tustin, City of [4]	7,702.3	-	-	7,702.3	1,553.7	55.6	-	1,609.3	9,311.6	82.7%
Westminster, City of [7]	9,785.4	2,059.3	-	7,726.1	2,518.1	57.3	-	2,575.4	10,301.5	75.0%
Yorba Linda Water District[7]	12,360.1	1,571.5	7.4	10,796.0	5,081.2	52.0	-	5,133.2	15,929.2	67.8%
Total Major Groundwater Producers	283,791.0	16,212.0	1,016.8	268,595.8	70,624.9	2,007.1	0.0	72,632.0	341,227.8	78.7%
Other Producers	6,623.0	-	1,031.0	7,654.0	0.0	0.0	0.0	0.0	7,654.0	
Exempt Well Production	840.2	-	-	840.2	0.0	0.0	0.0	0.0	840.2	
Total Amount	291,254.2	16,212.0	2,047.8	277,090.0	70,624.9	2,007.1	0.0	72,632.0	349,722.0	
Basin Production Percentage (includes non-irrigation deliveries, but excludes water conservation credits)										79.1%

[1] *Water classed as being used for purposes other than commercial agriculture.*

[2] *Additional groundwater extraction in response to MWD's CUP pumping.*

[3] *Accounts for only those credits allowed for under the program initiated on September 20, 1995.*

[4] *Agencies that participate in a groundwater water quality improvement project.*

[5] *Agencies that can receive Santiago Creek native water above Villa Park Dam that are conveyed to users within OCWD. Such water, if delivered, is included within the classification of "Supplemental Water" as defined in the District Act.*

[6] *Groundwater quantity reported herein is that quantity used by OCWD for purposes other than seawater intrusion barrier maintenance.*

[7] *These agencies participated in the MWD Long-Term Groundwater Storage Program for which groundwater was extracted and accounted for as supplemental water.*

APPENDIX 2. 2015-16 Groundwater Production — Non-Irrigation Use Production Over 25 Acre-feet

PRODUCER	AF	PRODUCER	AF
Alta Vista Country Club	385.4	Mesa Verde Country Club	347.9
Anaheim Cemetery	43.8	Mesa Water District	14,786.1
Anaheim, City of *	43,018.2	Midway City Mutual Water Company	145.2
Angelica Textile Services – Plant 10	30.0	Mile Square Golf Course	92.3
Buena Park, City of *	11,104.3	Navy Golf Course	516.0
Canyon RV Park	110.2	Newport Beach Golf Course	82.3
Coca Cola North America	212.2	Newport Beach, City of	9,589.0
County of Orange	135.1	Orange County Cemetery District	68.2
Cypress GC LLC/Cypress Golf Club	55.8	Orange County Water District	63.1
Donovan Golf Course Management	257.4	Orange, City of	17,375.9
DS Services of America, Inc.	352.1	Page Avenue Mutual Water Company	39.3
East Orange County Water District	468.7	R.J. Noble Company	29.3
Eastlake Village HOA	83.0	Riverview Golf	195.7
Eastside Water Association	193.9	Santa Ana Country Club	225.2
Fairhaven Memorial Park	160.3	Santa Ana, City of *	29,269.2
Forest Lawn Memorial Park	242.4	Seal Beach, City of	2,187.8
Fountain Valley, City of	5,961.8	Sequoia Management Services, LL	533.2
Fullerton, City of	17,537.8	Serrano Water District	1,210.6
Garden Grove, City of *	18,216.6	South Coast Chores HOC c/o Optima	66.4
Golden State Water Company *	17,630.8	South Midway City Water Company	79.6
Hargis and Associates, Inc.	69.5	The Boeing Company	270.4
Huntington Beach, City of	18,667.6	The Good Shepherd Cemetery	69.4
Hynes Estates, Inc.	53.0	The Lakes Master Association	105.2
Irvine Ranch Water District	45,463.1	Tustin, City of	7,702.3
Knott's Berry Farm	300.5	Westminster, City of *	9,785.4
La Palma, City of	1,223.7	Westminster Memorial Park	324.8
Lockheed Martin Corporation	32.5	Yorba Linda Country Club	324.1
Los Alamitos Race Course	291.1	Yorba Linda Water District *	12,360.1
Melrose Abbey Funeral Center	40.8	**Total**	**290,185.7**

** These agencies extracted additional groundwater in response to MWD's CUP pumping.*

APPENDIX 3. 2015-16[1] Groundwater Production — Irrigation Use Production Over 25 Acre-feet

PRODUCER	AF
Berumen Farms, Inc.	36.2
F.S. Nursery c/o Southern CA Edison	44.4
Irvine Ranch Water District	933.0
Mesa Water District	68.4
Orange County Produce	623.6
Roy Pursche	147.8
Village Nurseries	130.5
Total	**1,983.9**

[1] *Water year begins on July 1.*

APPENDIX 4. Non - Local Water Purchased by OCWD for Water Years 1996-97 through 2015-16

	Water Exchange		Talbert Barrier		Forebay Recharge		In-Lieu Program		Basin Water	SAR Upstream GW Projects		TOTAL
	Western Mun. WD	Alamitos Barrier	FV[1] OC32A	MCWD OC44B	Forebay Recharge	CUP[2] Recharge	CUP[2] In-Lieu Delivery	In-Lieu	Supply Mgmt. Program[3]	Arlington Desalter	San Bernard. Valley Mun.WD	
Water Year	Purch. AF	Purch. AF	Purch. AF	Purch. AF	Purch. AF	Delivery AF	Delivery AF	Purch. AF	Purch. AF	Purch. AF	Purch. AF	Purch. AF
1996-97	2958.0	1,885.5	-	-	33,742.7	-	-	7,883.0	-	6,176.2	-	52,645.4
1997-98	701.8	1,613.8	-	-	19,029.4	-	-	-	27,674.9	2,516.9	-	51,536.8
1998-99	996.1	1,493.6	-	-	10,371.5	-	-	-	13,351.9	2,351.3	-	28,564.4
1999-00	-	1,873.6	-	-	28,478.1	-	-	24,726.0	13,280.8	4,994.6	-	73,353.1
2000-01	-	1,672.5	941.7	-	59,138.4	-	-	11,191.0	7,449.0	5,177.9	2,787.6	88,358.1
2001-02	2,990.3	2,282.2	2,673.0	-	30,092.6	-	-	19,472.4	-	5,819.8	4,296.4	67,626.7
2002-03	3,471.4	1,448.7	1,540.1	-	35,755.1	-	-	25,631.0	35,832.0	4,924.7	-	108,603.0
2003-04	3,605.0	1,938.3	1,703.3	3,380.6	14,832.0	2,462.7	2,479.6	49,688.8	-	4,087.3	-	84,177.6
2004-05	-	1,914.9	2,451.8	8,368.6	3,810.8	-	15,021.1	54,596.1	-	567.5	-	86,730.8
2005-06	-	833.0[4]	1,079.9	5,431.1	7,256.7	-	15,452.9	73,763.1[5]	-	-	-	103,816.7
2006-07	1,745.0	534.1[4]	143.9	7,394.7	42,173.0	-	14,427.3	36,313.0	-	227.6	-	102,958.6
2007-08	2,882.4	1,505.7[4]	-	4,581.4	-	-	-	-	-	1,266.6	-	10,236.1
2008-09	3,663.5	2,094.2[4]	-	4,140.3	18,100.0	-	-	-	-	428.2	-	28,426.2
2009-10	-	1,321.9[4]	-	176.9	20,535.7	-	-	-	-	106.2	-	22,140.7
2010-11	-	1,689.1[4]	-	100.5	11,038.6	16,500.0	-	10,435.4	-	-	-	39,763.6
2011-12	-	1,198.7[4]	-	1.9	41,230.8	7,709.6	9,719.9	30,843.6	-	-	-	90,704.5
2012-13	-	1,721.8[4]	-	3.7	24,356.1	15,570.8	-	-	-	-	-	41,652.4
2013-14	-	2,370.2[4]	-	6.2	50,700.5	-	-	-	-	-	-	53,076.9
2014-15	-	2,236.3[4]	-	17.7	48,616.8	-	-	-	-	-	-	60,870.8[6]
2015-16	-	2,398.9[4]	-	7.0	45,118.0	-	-	-	-	-	-	47,523.9
Total	23,013.5	34,027.0	10,533.7	33,610.6	544,376.8	42,243.1	57,100.8	344,543.4	97,588.6	38,644.8	7,084.0	1,195,242.4[6]

[1] Includes only imported water and excludes groundwater deliveries from Fountain Valley to OCWD.

[2] "CUP" is the multi-agency conjunctive use program (known as the MWD Long-Term Groundwater Storage Program or MWD CUP). Basin losses are not taken into account.

[3] Known as Basin Water Supply Management Program (WSM) water. WSM program was terminated on December 31, 2003.

[4] Includes both MWD imported deliveries and supplemental recycled water deliveries.

[5] Includes 16,000 AF of 2005-06 MWD Supplemental Storage Program (i.e., "Super In-Lieu") water that was received as In-Lieu by the groundwater producers.

[6] Includes purchase of 10,000 AF of stored water from MWD CUP storage account at full-service untreated water rate in water year 2014-15.

APPENDIX 5. 2015-16 Water Resources Summary

	2015-2016 Water Year (AF)	2014-2015 Water Year (AF)	Change from last year to this year
SUMMARY OF BASIN CONDITIONS			
BASIN SUPPLIES			
Water Purchases from MWD (excludes In-Lieu)	45,118	48,727	(3,609)
Water into MWD Storage Account (excludes In-Lieu)	0	0	0
SAR and Santiago Creek Flows[1]	113,203	107,924	5,279
GWRS AWPF Water to Forebay Recharge Basins	65,229	39,688	25,541
GWRS AWPF Water to Mid-Basin Injection	1,579	310	1,269
GWRS AWPF Water to Talbert Barrier	35,226	36,471	(1,245)
Imported Water to Talbert Barrier (OC-44 & Fountain Valley)	7	18	(11)
Alamitos Barrier	2,399	2,236	163
Incidental Recharge	36,401	49,936	(13,535)
Evaporation from Recharge Facilities	(3,250)	(2,904)	(346)
SAR Flow Lost to Pacific Ocean	(610)	(3,230)	2,620
Total Groundwater Recharge	**295,302**	**279,176**	**16,126**
WATER PRODUCTION			
Groundwater Production	277,090	305,259	(28,169)
MWD Storage Program Extractions	16,212	12,917	3,295
Total Groundwater Production	**293,302**	**318,176**	**(25,030)**
BASIN STATUS			
Change in Groundwater Storage	2,000	(39,000)	41,000
Change in Groundwater Storage excluding MWD Stored Water	18,212	(26,083)	44,295
Accumulated Overdraft (AOD)	(379,000)	(381,000)	2,000
AOD without MWD Storage Program Water	(379,177)	(397,440)	18,263
IN-LIEU WATER			
OCWD In-Lieu Purchases	0	0	0
MWD In-Lieu Storage	0	0	0
Total In-Lieu	0	0	0
OTHER KEY INFORMATION			
1. Imported Deliveries to Producers (less MWD withdrawal)[2]	54,413	81,212	(26,799)
2. Total Dissolved Solids of SAR below Prado Dam (mg/L)	578	640	(62)
3. Total Nitrogen of SAR below Prado Dam (mg/L)	3.8	3.8	0
4. Total GWRS AWPF Production[3]	102,101	76,534	25,567
5. Green Acres Project	4,081	4,319*	(238)
6. Base Flow of Santa Ana River	69,101	63,756	5,345
7. Year-end Storage behind Prado Dam	5	1	4
8. Year-end Storage in Recharge Facilities	10,841	9,733	1,108
9. Total Artificial Recharge (percolation plus barriers)	258,902	229,240	29,662
10. Rainfall Measured at OCWD Field Headquarters (inches)	8.47	9.27	(0.8)
11. Annual Mean Temperature at Santa Ana Fire Station (°F)	68.3	69.3	(1)

[1] *Accounts for storage to/from recharge facilities.*
[2] *Santiago Creek Native and In-Lieu water are included (excludes imported water used for groundwater replenishment).*
[3] *Total includes deliveries to recharge basins, Talbert Barrier, MBI, Anaheim Canyon Power Plant and ARTIC.*
**These values have been revised and were provided to OCWD after the publication of the 2014-2015 Engineer's Report.*

APPENDIX 6. Typical Groundwater Extraction Facility Characteristics

PARAMETER	CHARACTERISTICS
Water System Pressure	62 psi
Load (Use) Factor	63%
Design Flow Rate	2,563 gpm
Annual Production	2,600 AF
Bowl Efficiency (minimum)	84%
Motor Horsepower	325 hp
Type Motor	Electric
Well Casing Diameters	16 – 20 inches
Type of Pump	Vertical Turbine
Depth of Well	1,052 feet
Depth of Bowls	278 feet
Total Dynamic Head	325 feet
Estimated Life	30 years
Annual Cost of Facilities[1]	$161,200

[1] 2016 cost was based on a 2008 cost with an interest rate of 5 percent amortized over a 30-year period and excluding the cost for land. The 2008 cost was adjusted to 2016 dollars using Engineering News-Record Construction Cost Index for Los Angeles area.

APPENDIX 7. Values Used in Figure 6 For Water Rates for Non-Irrigation Use

Water Year	RA ($/AF)	Estimated Groundwater Production Cost[1,2] ($/AF)	MWD Treated Interruptible Rate (In-Lieu Program)[2,3] ($/AF)	MWD Treated Non-Interruptible Rate (Full Service)[2,3] ($/AF)
1985-86	32	85	181	225
1986-87	32	91	187	231
1987-88	32	91	187	231
1988-89	42	105	187	231
1989-90	45	119	136	231
1990-91	48	91	137	232
1991-92	51	100	156	263
1992-93	60	116	206	325
1993-94	67.5	124	257	389
1994-95	88	145	279	416
1995-96	85	140	294	440
1996-97	88	140	303	448
1997-98	91	141	303	455
1998-99	94	143	303	458
1999-00	100	150	303	459
2000-01	107	150	303	459
2001-02	117	162	303	459
2002-03	127	176	299	455
2003-04	149	203	301	460
2004-05	172	229	318	479
2005-06	205	258	337	494
2006-07	223	278	354	510
2007-08	237	296	382	538
2008-09	249	307	420	586
2009-10	249	308	501[4]	701
2010-11	249	310	602[4]	744
2011-12	254	315	633[4]	794
2012-13	266	330	-[5]	794
2013-14	276	334	-[5]	890
2014-15	294	349	-[5]	923
2015-16	322	386	-[5]	942
2016-17	402	473	-[5]	979
2017-18	445	513	-[5]	1,077[4]

[1] *Includes RA plus energy cost to produce groundwater.*
[2] *Rate is rounded.*
[3] *Rate is proposed.*
[4] *Rate is estimated.*
[5] *This rate is no longer available because MWD terminated the Replenishment Program.*

AGENDA ITEM SUBMITTAL

MEETING DATE: January 21, 1998

TO: Board of Directors

FROM: William R. Mills Jr.

Staff Contact: J. Van Haun / M. Leyes

Budgeted: n/a
Program/Line Item No. n/a
Cost Estimate: n/a

General Counsel Approval: n/a
Engineers/Feasibility Report Approved: n/a
CEQA Compliance: n/a

SUBJECT: AMENDMENT OF ORANGE COUNTY WATER DISTRICT ACT

SUMMARY

As part of the recent Seasonal Shift workshop, the OCWD Board took action to create a new class of water referred to as "Neutral Water". This will require an amendment to the Orange County Water District Act which must be approved by the California State Legislature. With this new ""Neutral Water" category in place, the OCWD Board will have more discretion over classification of water supplies in calculating the Basin Production Percentage.

RECOMMENDED ACTION

Approve amendment of the Orange County Water District Act to give the OCWD Board more discretion over classification of water supplies in calculating the Basin Production Percentage, and authorize OCWD staff to recruit an author to carry the proposed legislation.

DISCUSSION/ANALYSIS

The Board of Directors has expressed strong interest in asserting more influence over the Seasonal Shift program offered by Metropolitan Water District (MWD) to individual groundwater producers. The issue has been discussed by the groundwater producers at several meetings and by the OCWD Board of Directors at two workshops. A District-wide program is being developed with the input of all affected producers and MWD.

It may be necessary, depending on the outcome of the discussions on Seasonal Shift, to amend the Orange County Water District Act (Act) to give the OCWD Board of Directors more authority and discretion over seasonal variations in groundwater production. The attached amendment is intended to authorize the OCWD Board to classify certain water supplies for the purpose of calculating the Basin Production Percentage (BPP). The amendment would create the category of "Neutral Water", which could be excluded from the BPP calculations for each agency, and, subsequently, the Basin Equity Assessment (BEA). The exact language is on the first page (last paragraph, underlined) of the attachment to this submittal.

Legislative amendments were required to be submitted to the office of Legislative Counsel in Sacramento by January 16th. Staff arranged to have an assembly office submit the language for proper drafting and formatting. Before the Bill introduction deadline of February 20, 1998, OCWD staff will secure an author and prepare any additional amendments required by the final Seasonal Shift program developed and approved by the OCWD Board of Directors.

PRIOR RELEVANT ACTION(S)

n/a

PROPOSED AMENDMENT TO ORANGE COUNTY WATER DISTRICT ACT JANUARY 14, 1998

An Act to amend Section 31.5 of the Orange County Water District Act (Chapter 924 of the Statutes of 1933), relating to water.

After subsection (c) (2), ADD subsection (c) (3) to Section 31.5 – (New text is underlined):

Section 31.5. Basin equity assessments; production requirements and limitations

(a) Basin equity assessments, as well as production requirements and limitations on persons and operators within the district, are declared to be in furtherance of district activities in the protection of water supplies for users within the district which are necessary for the public health, welfare, and safety of the people of this state. The basin equity assessments, as well as the production requirements and limitations provided for in this act, are authorized to be levied upon, and applied to, all persons and producers within the district for the benefit of all who rely directly or indirectly upon the groundwater supplies of the district.

(b) The basin equity assessments levied pursuant to this act against all persons and operators within the district may be uniform or nonuniform in amount, as determined by the board of directors of the district, in order to effectuate the goals and purposes of the district. The proceeds of the basin equity assessments levied and collected shall be used to equalize the cost of water to all persons and operators within the district and to acquire water to replenish the groundwater supplies of the district.

(c) As used in this act:

(1) "Supplemental sources" means reclaimed water and sources of water outside the watershed of the Santa Ana River, excepting that portion of that watershed on and along Santiago Creek upstream of the downstream toe of the slope of the Villa Park Flood Control Dam, such as, but not limited to, water produced from the Metropolitan Water District of Southern California.

(2) "Basin production percentage" means the ratio that all water to be produced from groundwater supplies within the district bears to all water to be produced by persons and operators within the district from supplemental sources as well as from groundwater within the district during the ensuing water year.

(3) "Neutral Water" means water which is produced from neither supplemental nor groundwater sources and is therefore not used in computing the basin equity assessment. If the Board of Directors finds that it is necessary for the protection of groundwater supplies for users within the district, it may declare certain supplemental sources of water as either groundwater or neutral water for purpose of computing the basin equity assessment.

(d) The district shall annually order an investigation and report to be prepared by an engineer or engineers employed by the district. The investigation and report shall set forth all of the following information, together with such other information as the district may desire, relating to the preceding water year:

(1) Amount of water produced by persons and operators from groundwater within the district.

(2) Amount of water produced by persons and operators from supplemental sources.

(3) Amount of water produced by persons and operators from all other sources.

(4) Condition of groundwater supplies within the district.

(5) Information as to the probable availability of water from supplemental sources during the next succeeding fiscal year.

(6) The cost of producing water from groundwater within the district, including any replenishment assessment of the district.

(7) The cost of water produced within the district from supplemental sources.

(e) (1) On the second Wednesday in February of each year, the engineering investigation and report shall be delivered to the secretary of the district.

(2) The secretary shall publish, pursuant to Section 6061 of the Government Code, a notice of the receipt of the report and of the public hearing to be held on the date of a meeting of the board of directors in March, in a newspaper of general circulation printed and published within the district, at least 10 days prior to the date at which the public hearing regarding water supplies within the district shall be held.

(3) The notice, among other information which the district may provide, shall include an invitation to all persons or operators within the district to call at the offices of the district to examine the engineering investigation and report.

(4) The board of directors shall hold on the date of a meeting of the board in March of each year, a public hearing at which time any person or operator within the district or any person interested in the amounts and source from which all persons and operators produce their total supply of water as well as the estimated difference in the cost of water produced from groundwater within the district or supplemental sources, may in person, or by representative, appear and be heard.

(f) (1) On the date of a meeting of the board of directors in April of each year, the board of directors shall hold a public hearing for the purpose of determining the need and desirability of levying basin equity assessments and the amounts thereof, as well as the need for establishing production requirements and limitations and the extent of those

requirements and limitations as to each person or operator within the district for the ensuing water year.

(2) In computing and fixing the amount of any basin equity assessment for any person or operator within the district, the board may allow a percent not to exceed 10 percent, as shall be determined by the board of directors of the district, for delinquencies.

(3) Notice of the proposed hearing shall be published in the district pursuant to Section 6061 of the Government Code at least 10 days prior to the date set for the hearing.

(4) The notice shall set forth all of the following:

(A) That a report regarding water supplies within the district has been prepared.

(B) The date, time, and place of the proposed hearing.

(C) The board shall consider at the hearing the need and desirability of levying basin equity assessments and the amounts of those assessments, as well as establishing production requirements and limitations, on persons and operators within the district for the ensuing water year and surcharges in connection those requirements and limitations.

(D) An invitation to all persons and operators to appear at the public hearing and be heard in regard to any of the foregoing matters.

(g) (1) At the hearing, the board shall hear, take, and receive all competent evidence presented and offered in regard to the need for basin equity assessments, production requirements and limitations in general, and specifically, the extent of those requirements or limitations as to each person or operator within the district, the amount of the basin equity assessment which shall be levied against each person and operator for all purposes other than irrigation at uniform or nonuniform rates and may be levied against each person and operator for irrigation purposes at uniform or nonuniform rates for the ensuing water year and the amount of surcharges for production in excess of the basin production limitations.

(2) Subsequent to the hearing, the board may, by adopting a resolution upon the vote of eight members of the board, find and determine for the ensuing water year as follows:

(A) The estimated total amount of water to be produced by all persons and operators within the district from the groundwater within the district and the estimated amount to be produced by persons and operators from supplemental sources.

(B) The basin production percentage.

(C) That a basin equity assessment and production requirement and limitation from groundwater within the district are necessary for the protection of the water supply of the district.

(D) The surcharge, in an amount to be determined in the discretion of the board, for production in excess of the production limitations.

(E) The amount of the basin equity assessment to be levied against each person and operator in a dollar amount per acre-foot of water produced from the groundwater supply for all purposes other than irrigation, which need not be uniform as to each person or operator within the district, and that the amount is reasonable.

(F) The amount of the basin equity assessment to be levied against each person and operator in a dollar amount per acre-foot of water produced from the groundwater supply for irrigation purposes, which need not be uniform as to each person or operator within the district, and that the amount is reasonable.

(G) Production requirements or limitations and the surcharge for production in excess of the basin production limitations on persons and operators within the district shall be applicable during the ensuing water year. The requirements and limitations shall be on the amount of groundwater produced by those persons and operators expressed in a percentage of overall water produced or obtained by those persons or operators from groundwater within the district and from supplemental sources.

(H) That during the ensuing water year, upon the district giving published notice pursuant to Section 6061 of the Government Code in a newspaper of general circulation printed and published within the district at least 10 days prior to such a hearing, a subsequent public hearing may be held to modify the basin production percentage, any basin equity assessment, any production requirement or limitation, or the surcharge for production in excess of the production limitation established by the district. The modifications, if any, shall be effective on the date established by the board and the district. The district shall give notice of the modification 10 days prior to the effective date of the modification pursuant to subdivision (e).

(h) (1) The board may exclude all persons and operators who produced 25 acre-feet or less of water from groundwater within the district during the ensuing water year from the levy of the basin equity assessment and the production requirements and limitations.

(2) All findings and determinations made by the board pursuant to this section are final, conclusive, and binding upon all persons and parties.

(i) (1) The district shall thereafter, and in any event prior to July 1 in each year, give notice to each person or operator within the district. The notice shall include all of the following information:

(A) The amount of the basin equity assessment levied against that person or operator per acre-foot of water produced for purposes other than irrigation and the amount of the basin equity assessment levied against that person or operator per acre-foot of water produced for irrigation purposes.

(B) The basin production percentage.

(C) The production requirement or limitation upon the person or operator.

(D) The amount of surcharge imposed for production in excess of the basin production limitations.

(2) The notice required by this subdivision and the notice of any subsequent modifications may be sent by post card or by other first-class mail with postage prepaid by the district.

(j) (1) Each person or operator within the district not excluded from levy of a basin equity assessment and the production requirements and limitations, shall file with the district, on or before the 30th day of September of each year, a basin equity assessment report in the form prescribed by the district setting forth the total amounts of water produced from groundwater within the district and from supplemental sources during the preceding water year by the person or operator. The statement shall be verified by a written declaration under penalty of perjury.

(2) If the person or operator has been required by the district to produce, or has in fact produced, more water from groundwater within the district than the equivalent of the basin production percentage determined by the district, that person or operator shall pay to the district, on or before September 30, an amount determined by the number of acre-feet of water which the person or operator has produced from groundwater within the district in excess of the acre-foot equivalent of the basin production percentage multiplied by the basin equity assessment rate applicable to that person or operator, plus the amount of surcharge due for production in excess of the production limitations.

(3) If a person or operator, pursuant to the requirement the district, has produced from groundwater within the district less than of the equivalent of the basin production percentage, the person or operator, on or before the 30th day of November, shall be paid by the district from the basin equity assessment fund an amount determined by the number of acre-feet by which the production of the person or operator from groundwater as required by the district is less than the acre-foot equivalent of the basin production percentage multiplied by the basin equity assessment rate applicable to that person or operator, or if the production of the person or operator from groundwater is more than the production required by the district and less than the equivalent of the basin equity production percentage, then the person or operator shall be paid by the district an amount determined by the number of acre-feet by which the actual production of the person or operator from groundwater is less than the acre-foot equivalent of the basin production percentage multiplied by the basin equity assessment applicable to that person or operator.

(k) If any person or operator fails to pay, when due, the applicable basin equity assessment or surcharge due for production in excess of the production limitations, the district shall charge interest on the delinquent amount at the rate of 1 percent each month or fraction thereof for which the amount remains delinquent. Should any person or operator within the district fail to file a basin equity assessment report on or before the 30th day of September of any year, the district shall, in addition to charging interest, assess a penalty charge against that person or operator in the amount of 10 percent of the amount found by the district to be due.

(l) (1) The district may, from time to time, require other reports from persons and operators as necessary and desirable in the application of the basin equity assessment procedures.

(2) Upon good cause shown, an amendment to any report required under this section may be filed or a correction of any report may be made within six months after the date the report was filed with the district.

REVISED

AGENDA ITEM SUBMITTAL

MEETING DATE: March 18, 1998

TO: Board of Directors

FROM: William R. Mills Jr.

Staff Contact: J. Van Haun / M. Leyes

Budgeted: n/a
Program/Line Item No. n/a
Cost Estimate: n/a

General Counsel Approval: n/a
Engineers/Feasibility Report Approved: n/a
CEQA Compliance: n/a

SUBJECT: AMENDMENT OF ORANGE COUNTY WATER DISTRICT ACT

SUMMARY

On February 4 the Board approved a set of amendments to the OCWD Act. After discussion with the Groundwater Producers, it is recommended that provisions creating a class of "Neutral Water" and allowing a monthly Basin Production Percentage be dropped from AB 1812 (Ackerman), and to add a clarification that reclaimed water is not supplemental water.

RECOMMENDED ACTION

Direct staff to request the author of AB 1812 (Ackerman) to delete the proposed amendments to the District Act that would create a new class of "Neutral Water" and the ability to set a monthly Basin Production Percentage (BPP).

DISCUSSION/ANALYSIS

On February 4 the Board approved a set of amendments to the OCWD Act to be submitted to the California Legislature to delete several obsolete provisions, to allow the Basin Production Percentage (BPP) to be set on a monthly or seasonal basis, and to create a new class of "Neutral Water" for the purpose of calculating the BPP and BEA. These amendments are intended to grant the Board more control over the negative impacts on the basin of the MWDSC Seasonal Shift program. A bill was introduced by Assemblyman Dick Ackerman (R-Fullerton) at our request. The bill is AB 1812.

After a series of meetings with the Groundwater Producers to discuss the Seasonal Shift program, the producers have agreed to a program to mitigate for Seasonal Shift impacts by directing a small portion of the MWD payment to a mitigation fund managed by OCWD. A resolution for this will be presented to the OCWD Board in the near future. It is the consensus of the producers that the "Neutral Water" provision is likely to cause significant concern and opposition to AB 1812. By changing the other amendment giving the Board authority to adopt a monthly or seasonal BPP to seasonal

(not monthly), the bill should be more acceptable to the producers and should neutralize any objections.

Staff also recommends that AB 1812 be further amended to clarify the status of reclaimed water in the calculation of the BPP and BEA. This would be accomplished by adding a clarification that reclaimed water is not supplemental water

It is recommended that Assemblyman Ackerman be requested to delete the proposed "Neutral Water" amendment and the ability to set a monthly BPP, but to proceed with the other amendments as adopted by the OCWD Board on February 4 (see attached).

PRIOR RELEVANT ACTION(S)

2/4/98 M98-47 - Authorize staff to proceed with District Act amendments

3-18-11.bod-Change

MINUTES OF REGULAR MEETING AND PUBLIC HEARINGS
BOARD OF DIRECTORS, ORANGE COUNTY WATER DISTRICT
March 18, 1998, 7:00 p.m.

Vice President Quist called to order the regular meeting of the Orange County Water District Board of Directors on March 18, 1998 at 7:00 p.m. in the Boardroom at the District office, and Director Kraemer led the Pledge of Allegiance to the Flag. Directors and staff in attendance were:

Directors

Philip L. Anthony
Kathryn L. Barr
John V. Fonley
Lawrence P. Kraemer Jr.
George Osborne
Langdon W. Owen
Irv Pickler
Bud Quist

Directors absent

Wes Bannister
Daniel E. Griset

Staff

William R. Mills Jr., General Manager
Clark Ide, District General Counsel
Janice Durant, Assistant District Secretary
Steven Conklin, Andrew Czorny,
Bruce Dosier, Barbara Heatherly,
Roy Herndon, John Kennedy, Mark Leyes,
Craig Miller, Martin Rigby,
Timothy Talbert, Yvonne Shen,
Stephanie Strohman, James Van Haun,
Michael Wehner, Ron Wildermuth,
Nira Yamachika

Others present included

Joan Irvine Smith
Alden G. Pearce - Loeb & Loeb
Fred Bockmiller, Diana Leach - Mesa Consolidated Water District
Richard Bell, Greg Heiertz - Irvine Ranch Water District
Carl Scanlin - Yorba Linda Water District
Keith Lyon, Matt Stone - Municipal Water District of Orange County
Eddie Rigdon - Metropolitan Water District
Eric Leung, City of Anaheim
Gary Veeh - City of Tustin
Thom Coughran - City of Santa Ana
Wayne Osborne - City of Fountain Valley
Jeff Renna - City of Huntington Beach
Gary Heffelfinger - City of Westminster
Stephen Hart - River View Golf Course
Patrick Scanlon - Southern California Water Co.
Bill Everest - Boyle Engineering
Ralph Phraner - Hydro Science & Technology, Inc.
Zeki Kayiran - AKM

VISITOR PARTICIPATION

Vice President Quist moved Visitor Participation to the top of tonight's Agenda and Mrs. Joan Irvine Smith discussed matters pertaining to the Dyer Road Well Field. Mrs. Smith also invited the Board to attend the opening of an art exhibition entitled "A Silent Testament" to be held at The Bowers Museum from March 25 at 6:30 p.m.

PUBLIC HEARINGS

1. Continued Public Hearing Re OCWD 1998-99 Budget

Vice President Quist called to order the continued Public Hearing on the OCWD budget for fiscal year 1998-99. General Manager William R. Mills Jr. reviewed the proposed 1998-99 budget composed of operating expenses of $49.7 million and estimated 1998-99 operating revenue of $49.2 million. He stated that the Administration and Finance Issues Committee, at its March 12 meeting, reviewed funding alternatives for this year's Capital Improvement Program (CIP) totaling $17.3 million and recommended that the District issue commercial paper to finance eight months of the CIP, during which time a capital projects funding program will be developed as part of the OCWD Master Plan Study. Mr. Mills recommended a $10 million commercial paper issuance which he stated would likely fund about nine months of this year's CIP. District Treasurer Andrew Czorny noted that a revised resolution approving the 1998-99 budget had been distributed which he stated more clearly delineates the amounts allocated to the five District funds established under the District Act. Vice President Quist then opened the Public Hearing for comments, and, there being no persons present wishing to express comments, the Hearing was closed and following actions were taken.

MOTION NO. 98-70
AUTHORIZING ISSUANCE OF COMMERCIAL PAPER IN THE AMOUNT OF $10 MILLION TO FINANCE A PORTION OF THE FISCAL YEAR 1998-99 CAPITAL IMPROVEMENT PROGRAM

Upon motion by Director Anthony, duly seconded and carried, issuance of commercial paper in the amount of $10 million is hereby authorized for the purpose of funding a portion of the 1998-99 Capital Improvement Program in the total amount of $17,300,000.

RESOLUTION NO. 98-3-39
APPROVING AND ADOPTING FISCAL YEAR 1998-99 BUDGET

WHEREAS, pursuant to Resolution No. 98-2-24 adopted February 18, 1998, this Board adopted an interim Budget for the Orange County Water District for fiscal year 1998-99; and

WHEREAS, the OCWD General Manager has presented and the OCWD Board has reviewed the proposed OCWD Budget for fiscal year 1998-99;

NOW, THEREFORE, the Board of Directors of the Orange County Water District does hereby resolve as follows:

Section 1: That the 1998-99 beginning balance cash carryover for the OCWD General Fund, estimated at $5,400,000; and the total OCWD General Fund Revenue Budget for fiscal year 1998-99, estimated at $22,776,000; and the total OCWD General Fund Expenditure Budget for fiscal year 1998-99, estimated at $18,150,000, is hereby approved and adopted. That of said General Fund Budget, the 1998-99 year-end balance is estimated to be $10,025,000. The recommended level of the General Fund Operating Reserve is $9,075,000 which represents six months of the General Fund expense budget. The estimated level of funding for the General Fund Operating Reserve is $7,026,000. Additionally, pursuant to section 17.1 of the District Act, Appropriation for Contingencies in the amount of $3,000,000 is allocated to cover expenditures that have not been provided for or that have been insufficiently provided for or for unappropriated requirements.

Section 2: That the 1998-99 beginning balance cash carryover for the OCWD Capital Projects Fund, estimated at $17,300,000; and the total OCWD Capital Projects Fund Revenue and Other Financing Sources Budget for fiscal year 1998-99 estimated at $23,041,000; and the total OCWD Capital Projects Fund Expenditure Budget for fiscal year 1998-99, estimated at $17,300,000, is hereby approved and adopted. That of said Capital Projects Fund Budget, the 1998-99 year-end balance is estimated at $23,041,000. The recommended level of the Capital Projects Fund Operating Reserve is $8,650,000 which represents six months of the Capital Projects Fund expense budget. The estimated level of funding for the Capital Projects Fund Operating Reserve is $8,141,000. Additionally, designated for Capital Replacement totals $14,900,000 in accordance with the Board approved recommendation that ten percent of the District infrastructure value be designated in an infrastructure replacement account.

Section 3: That the 1998-99 beginning balance cash carryover for the OCWD Replenishment Fund, estimated at $11,900,000; and the total OCWD Replenishment Fund Revenue Budget for fiscal year 1998-99 estimated at $6,485,000; and the total OCWD Replenishment Fund Expenditure Budget for fiscal year 1998-99 estimated at $8,700,000 is hereby approved and adopted. That of said Replenishment Fund Budget, the 1998-99 year-end balance is estimated at $9,685,000. The recommended level of the Replenishment Fund Operating Reserve is $4,350,000 which represents six months of the Replenishment Fund expense budget. The estimated level of funding for the Replenishment Fund Operating Reserve is $5,684,000. Additionally, appropriations for Toxic Cleanup Reserve Account totals $4,000,000, in accordance with the Board approved recommendation that funds be set aside if and when the basin or a portion of the basin becomes threatened by contamination.

Section 4: That the OCWD Basin Equity Fund is a self-balancing, zero-balance fund.

Section 5: That the 1998-99 beginning balance cash carryover for the OCWD Debt Service Fund, estimated at $19,400,000; and the total OCWD Debt Service Fund Revenue Budget for fiscal year 1998-99 estimated at $14,200,000; and the total OCWD Debt Service Fund Expenditure Budget for fiscal year 1998-99 estimated at $22,900,000 is hereby approved and adopted. That of said Debt Service Fund Budget, the 1998-99 year-end balance is estimated at $10,700,000 with Debt Service Reserve totaling $10,700,000, comprising restricted reserves with fiscal agent and the remaining principal payments on the Commercial Paper Program.

Section 6: Each of the items set forth, determined, approved and adopted in Sections 1 through 5 hereof shall be subject to 1) necessary adjustments when final detailed computation of expenditures and revenues for the 1997-98 fiscal year are available; and 2) necessary adjustments when final determinations of the total ad valorem tax revenues available to the District are known. Items in Sections 3 through 5 are subject to necessary adjustment after completion of the replenishment assessment and basin equity assessment procedures required by the District Act.

Section 7: The encumbrances as of February 28, 1998 are hereby transferred and made a part of the 1998-99 Budget.

Section 8: Transfers and revisions as between line items and categories and within line items with respect to the appropriations set forth in the Budget heretofore adopted, may be made by the General Manager of the District at Board approved limits at such time as within his discretion such transfer becomes necessary and proper.

Section 9: This resolution supersedes and replaces Resolution No. 98-2-24.

2. Public Hearing on Engineer's Report on Groundwater Conditions, Water Supply and Basin Utilization

Vice President Quist called to order the Public Hearing on the 1996-97 Engineer's Report on Groundwater Conditions, Water Supply and Basin Utilization. Associate General Manager Steven Conklin reviewed the Report findings which he stated indicate little change in basin water levels from the previous year's report. He noted total groundwater production of 331,406 acre-feet (AF) and an average annual overdraft of 36,936 AF. Mr. Conklin stated that, based upon the report findings, staff intends to recommend establishment of a Basin Production Percentage of 75%, and a Replenishment Assessment of $94/AF for "Other than Irrigation" and $47/AF for "Irrigation."

Vice President Quist opened the Hearing for public comment and the following persons addressed the Board requesting clarification of certain information contained in the Engineer's Report: Mesa Consolidated Water District Director Fred Bockmiller and City of Santa Ana representative Thom Coughlin. There being no further questions, staff was requested to research the issues presented and provide clarification prior to the April 15 meeting. The Hearing was then closed upon the following action.

MOTION NO. 98-71
CLOSING PUBLIC HEARING TO CONSIDER ENGINEER'S REPORT ON GROUNDWATER CONDITIONS, WATER SUPPLY AND BASIN UTILIZATION

Upon motion by Director Osborne, seconded by Director Kraemer and carried, the Public Hearing on the Engineer's Report on Groundwater Conditions, Water Supply and Basin Utilization is hereby closed.

3. Public Hearing to Consider Exemption from Replenishment and Basin Equity Assessments by River View Golf Course

Vice President Quist called to order the Public Hearing to consider exemption from the Replenishment Assessment (RA) and Basin Equity Assessment (BEA) for River View Golf Course (RVGC). District Hydrogeologist Roy Herndon reported that the RVGC petitioned for exemption from the RA/BEA on the basis that its well's water quality is impacted from volatile organic compound (VOC) contamination that resulted from an upgradient source. He stated that the well is presently used solely for golf course irrigation but had been used for potable supply prior to the VOC degradation. Mr. Herndon provided an in-depth overview of staff's investigation to determine the exemption eligibility of the well in accordance with the criteria set forth in the District Act, and presented staff's recommendation that only groundwater unsuitable for potable use should be eligible for a partial BEA exemption in the amount of $50/AF, representing treatment costs.

Vice President Quist opened the Hearing for public comment and RVGC owner Stephen Hart requested Board consideration of a 100 percent exemption from BEA and a 50 percent exemption from the RA. City of Santa Ana representative Thom Coughlin expressed concern over the use of contaminated water for irrigation, and District staff explained the science behind removal of the contaminants upon pumping of the water. Following discussion, Vice President Quist closed the Hearing and the Board took action as follows.

Upon motion by Director Owen, seconded by Director Osborne, the following resolution was unanimously adopted.

RESOLUTION NO. 98-3-40
DETERMINING WATER PRODUCED FROM WATER PRODUCING FACILITY NO. 1-02-3A (RIVER VIEW GOLF COURSE) TO BE UNSUITABLE FOR DOMESTIC PURPOSES, AND EXEMPTING WATER PRODUCED FROM SAID FACILITY FROM THE LEVY OF A PORTION OF THE BASIN EQUITY ASSESSMENT

WHEREAS, the River View Golf Course has filed with the Board of Directors of the Orange County Water District its verified petition requesting that Water Production Facility No. 1-02-3-A be exempted from the levy of the replenishment and basin equity assessments pursuant to Section 38.1 of the Orange County Water District Act; and

WHEREAS, the General Manager of the District has caused an investigation to be made for the purpose of determining whether the water produced by such facility is suitable or unsuitable for domestic or agricultural purposes, whether the water produced will have no adverse effects on the groundwater supplies of the District, and whether the production of water from such facility will have a beneficial effect on the quality of the water supplies of the District, and a report thereon has been filed with the Board of Directors; and

WHEREAS, the Board of Directors, upon the filing of such report, fixed March 18, 1998, as the time of said hearing and thereupon caused notice of the public hearing to be published as provided in Section 38.1 of said Act; and

WHEREAS, the notice as required by law has been given and a public hearing for the purpose of determining the need for exemption of water produced from said water producing facility from levy of the replenishment and basin equity assessments has been held this 18th day of March, 1998, and all persons have been permitted an opportunity to be heard respecting this matter;

NOW, THEREFORE, BE IT HEREBY RESOLVED, that this hearing be and the same is hereby closed and, after consideration, the Board of Directors of the Orange County Water District does hereby:

Section 1: Find and determine that the water produced from River View Golf Course water production facility No. 1-02-3-A is unsuitable for domestic use without treatment, that the production of water from said facility will have an adverse effect on the groundwater supplies of the District, and that the production of water from said facility will have a beneficial effect on the quality of the water supplies of the District.

Section 2: The production of water from Water Production Facility No. 1-02-3-A is exempt from payment of a portion of the Basin Equity Assessment as provided in the Orange County Water District Act, Section 38.1(d)(2).

Section 3: The amount of the exemption from payment of the Basin Equity Assessment is $50 per acre-foot based on the benefits to the District and costs to the well owner.

Section 4: River View Golf Course, as the owner of Water Production Facility No. 1-02-3-A, shall file the water production statements provided for in Section 29 of the Orange County Water District Act.

Section 5: This exemption is subject to review, modification, and cancellation pursuant to District Act Section 38.1(f) through (i).

4. Public Hearing to Consider Exemption of City of Tustin Water Producing Facilities from Payment of the Basin Equity Assessment

Vice President Quist opened the public hearing to consider exemption of the City of Tustin Water Producing Facilities from payment of the basin equity assessment (BEA). District Hydrogeologist Roy Herndon recalled that, in accordance with the 1992 agreement regarding the Seventeenth Street Desalter Project, Tustin has requested a BEA exemption for groundwater produced for this project. In addition, he stated that Tustin has also requested a BEA exemption for groundwater produced for its Nitrate Removal Demonstration Project. Mr. Herndon reported that staff has determined that the elevated total dissolved solids (TDS) and nitrate concentrations in the groundwater produced by all five production wells supplying the projects cause the groundwater to be unsuitable for potable use without treatment, and he

advised that staff finds that the projects meet the exemption criteria set forth in the District Act. He explained the method for determining the amount of BEA exemption after which Vice President Quist opened the Hearing for public comment. City of Tustin representative Gary Veeh expressed his appreciation to staff for their help with the projects and, there being no other persons wishing to address the Board, Vice President Quist declared the Hearing closed.

Upon motion by Director Pickler, seconded by Director Owen, the following resolution was unanimously adopted.

RESOLUTION NO. 98-3-41
CLOSING THE HEARING, DETERMINING WATER PRODUCED FROM CITY OF TUSTIN WATER PRODUCING FACILITIES TO BE UNSUITABLE FOR DOMESTIC OR AGRICULTURAL PURPOSES, AND EXEMPTING WATER PRODUCED FROM SUCH FACILITIES FROM PAYMENT OF ALL OR A PORTION OF THE BASIN EQUITY ASSESSMENT

WHEREAS, the City of Tustin has filed with the Board of Directors of the Orange County Water District its verified petition requesting that Water Production Facilities Nos. 102-232-22-A, 102-232-22-B, 102-25-11-A, 62-082-9-F, and 62-08-7-A be exempted from payment of all or a portion of the basin equity assessment pursuant to Section 38.1 of the Orange County Water District Act; and

WHEREAS, the General Manager of the District has caused an investigation to be made for the purpose of determining whether the water produced by said facilities is suitable or unsuitable for domestic or agricultural purposes and whether the production of water from such facility will have a beneficial effect on the quality of the water supplies of the District, and a report thereon has been filed with the Board of Directors; and

WHEREAS, the Board of Directors, upon the filing of such report, fixed March 18, 1998, as the time of said hearing and thereupon caused notice of the public hearing to be published as provided in Section 38.1 of said Act; and

WHEREAS, the notice as required by law has been given and a public hearing for the purpose of determining the need for exemption of water produced from said water producing facility from payment of all or a portion of the basin equity assessment has been held this 18th day of March, 1998, and all persons have been permitted an opportunity to be heard respecting this matter;

NOW, THEREFORE, BE IT HEREBY RESOLVED, that this hearing be and the same is hereby closed and, after consideration, the Board of Directors of the Orange County Water District does hereby find and determine:

Section 1: That the water produced from City of Tustin Water Production Facilities Nos. 102-232-22-A, 102-232-22-B, 102-25-11-A, 62-082-9-F, and 62-08-7-A is unsuitable for domestic or agricultural use without treatment, and that the production of water from said facilities will have a beneficial effect on the quality of the water supplies of the District.

Section 2: The production of water from Water Production Facilities Nos. 102-232-22-A, 102-232-22-B, 102-25-11-A, 62-082-9-F, and 62-08-7-A is exempt from payment of the Basin Equity Assessment to offset the cost of treatment required to effectively utilize the impaired quality water, as provided in the February 1998 OCWD Staff Report.

Section 3: The production of water from such facilities is further exempted from the levy of any remaining basin equity assessment until the City's capital investment in said facilities is repaid, in order to encourage production and beneficial use of impaired quality water, as set forth in such Staff Report.

Section 4: The City of Tustin, as the owner of such water production facilities, shall file the water production statements provided for in Section 29 of the Orange County Water District Act.

Section 5: This exemption is subject to review, modification and cancellation pursuant to District Act Section 38.1(f) through (i).

CONSENT CALENDAR

The Consent Calendar was approved upon motion by Director Fonley, seconded by Director Anthony and carried, as follows.

1. Minutes

MOTION NO. 98-72
MINUTES OF BOARD MEETINGS APPROVED AS MAILED

The Minutes of the regular Board meetings held February 18 and March 4, and Special Board Meeting held February 21, 1998 are hereby approved as mailed.

2. Treasurer's Report

MOTION NO. 98-73
APPROVING FINANCIAL DATA AND AUTHORIZING PAYMENT OF BILLS

Payment of bills for the period February 24 through March 9, 1998 is hereby authorized/ratified as follows: $742,438.82 from the General Fund; $1,182,842.39 from the Water Reserve Fund; and $25,377.74 from the Debt Service Fund.

3. Employment Status Report

MOTION NO. 98-74
RECEIVING AND FILING EMPLOYMENT STATUS REPORT

The Employment Status Report for the month of February 1998 is hereby received and filed.

4. Attendance at Association of California Water Agencies Spring Conference, May 6-8

MOTION NO. 98-75
AUTHORIZING ATTENDANCE AT ACWA SPRING CONFERENCE

Directors and such members of the District staff as approved by the General Manager are hereby authorized to attend the Association of California Water Agencies Spring Conference on May 6-8 in Monterey, with all expenses in connection therewith to be paid from the General Fund of the District.

5. Groundwater (Guardian) Foundation Membership

MOTION NO. 98-76
AUTHORIZING RENEWAL OF MEMBERSHIP IN GROUNDWATER (GUARDIAN) FOUNDATION MEMBERSHIP

Membership in the Groundwater Foundation, founder of the Groundwater Guardian Program to which the District belongs, is hereby approved and payment of 1998 dues in the amount of $60 is hereby authorized.

6. *PCL v. SAWPA* - Settlement Agreement and Mutual Release Orange County Superior Court Case No. 783895

RESOLUTION NO. 98-3-42
APPROVING SETTLEMENT AGREEMENT AND MUTUAL RELEASE OF PCL CIVIL CONSTRUCTORS, INC. V. SANTA ANA WATERSHED PROJECT AUTHORITY, ET AL (ORANGE COUNTY SUPERIOR COURT CASE NO. 783895)

WHEREAS, the Orange County Water District, as a member of the Santa Ana Watershed Project Authority (SAWPA), is a defendant in a lawsuit entitled *PCL Civil Constructors, Inc. v. Santa Ana Watershed Project Authority, et al.* (Action) filed by PCL Civil Constructors, Inc., for contract disputes relating to the construction of the Regional Tertiary Project Rapid Infiltration/Extraction Project (RIX) Site Facilities Project, SAWPA Project Agreement 11, to which OCWD is not a party; and

WHEREAS, pursuant to Resolution No. 97-11-144 adopted November 12, 1997, the OCWD Board of Directors ratified tender of the defense of such litigation to SAWPA; and

WHEREAS, District General Counsel has presented and recommended approval of a Settlement Agreement and Mutual Release in the above Action providing for the following: 1) Release by SAWPA of liquidated damages in the amount of $460,000; 2) Payment of the sum of $260,017.61 to PCL representing the remainder of the Stop Notice Withhold after payment to Tesco Controls, Inc., pursuant to the settlement of litigation in the Tesco Stop Notice action, and 3) payment of the sum of $1,640,000 as consideration for the compromise of PCL's claims in the Action;

NOW, THEREFORE, the Board of Directors of the Orange County Water District does hereby approve and authorize execution of the hereinabove described Settlement Agreement and Mutual Release and, upon approval as to form, authorizes its execution of behalf of the District by the President or Vice President and General Manager or District Secretary.

7. Consent to Common Use Agreement with Foothill/Eastern Transportation Corridor Agency on OCWD Monitoring Well MCAS-3 Easement

RESOLUTION NO. 98-3-43
APPROVING CONSENT TO COMMON USE AGREEMENT WITH
FOOTHILL/EASTERN TRANSPORTATION CORRIDOR AGENCY
ON OCWD MONITORING WELL MCAS-3 EASEMENT

WHEREAS, pursuant to Resolution No. 88-12-197 adopted December 14, 1988, OCWD accepted an Easement from The Irvine Company for monitoring Well No. MCAS-3 for TCE monitoring purposes; and

WHEREAS, the Foothill/Eastern Transportation Corridor Agency (TCA) has presented and District staff recommends approval of the Consent to Common Use Agreement (Crossing No. 4101) Parcel 300267-17 providing for access by TCA to said easement area for Well No. MCAS-3 which is now located on a portion of the TCA Right-of-way;

NOW, THEREFORE, the Board of Directors of the Orange county Water District does hereby accept and authorize execution and recordation of the hereinabove described Consent to Common Use Agreement and, upon approval as to form by District General Counsel, authorizes its execution by the President or Vice President and General Manager or District Secretary.

8. Renewal of Task Order for Washington, DC Representative James F. McConnell

RESOLUTION NO. 98-3-44
AUTHORIZING ISSUANCE OF TASK ORDER FOR WASHINGTON, DC
REPRESENTATIVE JAMES F. MCCONNELL

RESOLVED, that issuance of a Task Order in the amount of $42,000 is hereby authorized to James F. McConnell for continued professional services as OCWD's Washington DC representative during fiscal year 1998-99.

9. Application for Federal and State Disaster Assistance Re "El Nino 98" Flood Damage

RESOLUTION NO. 98-3-45
AUTHORIZING FILING OF APPLICATION FOR FEDERAL EMERGENCY MANAGEMENT AGENCY AND STATE OFFICE OF EMERGENCY SERVICES PUBLIC ASSISTANCE FUNDS FOR DAMAGES SUSTAINED FROM EL NINO '98 FLOODING

WHEREAS, the Orange County Water District is a political subdivision duly organized and existing under and pursuant to the Constitution and laws of the State of California, and

WHEREAS, the President of the United States has declared a major disaster in Orange County due to recent flooding from the "El Nino 98 floods" thereby making the District eligible to apply for Federal Emergency Management Agency (FEMA) and the State of California Governor's Office of Emergency Services (OES) public assistance funds for damages sustained from the flooding;

NOW, THEREFORE, the Board of Directors of the Orange County Water District does hereby resolve as follows:

Section 1: Any one of the following is designated as an Agent for the District and as such is authorized to execute for, and on behalf of the Orange County Water District, the application and to file it in the OES for the purpose of obtaining certain federal financial assistance under P.L. 93-288 as amended by the Robert T. Stafford Disaster Relief and Emergency Assistance Act of 1988, and/or state financial assistance under the Natural Disaster Assistance Act: General Manger William R. Mills Jr., Associate General Manager Steven R. Conklin, and Associate General Manager James Van Haun.

Section 2: Any one of the aforementioned Agents is further authorized to provide the OES all assurances and agreements required for all matters pertaining to such State disaster assistance

ITEMS RECOMMENDED FOR CONSENT CALENDAR APPROVAL AT MARCH 11, 1998 WATER ISSUES COMMITTEE/BOARD OF DIRECTORS MEETING

1. Operational Agreement for OCWD/IRWD Green Acres Intertie and Outfall Connection

RESOLUTION NO. 98-3-46
APPROVING OPERATIONAL AGREEMENT FOR OCWD/IRWD GREEN ACRES INTERTIE AND OUTFALL CONNECTION

WHEREAS, pursuant to Resolutions Nos. 96-7-118, 96-9-148, and 96-12-189 adopted July 17,1996, September 18, 1996, and December 18, 1996, respectively, OCWD entered into an agreement with the City of Newport Beach and the Irvine Ranch Water District providing for construction of an intertie between an OCWD Green Acres Phase 2 pipeline (GAP 2) and IRWD's Michelson Water Reclamation Plant, and detailing various agreements regarding implementation of the Wetlands Water Supply Project (WWSP) proposed by IRWD; and

WHEREAS, pursuant to Resolution Nos. 93-5-74 and 96-12-195 adopted May 5, 1993 and December 18, 1996, respectively, OCWD entered into a revised agreement with the County Sanitation Districts of Orange County pursuant to which CSDOC commits to accept from OCWD at least 4.2 million gallons per day of reclaimed water on an annual average basis during the period from October 1 through March 31 for a period of 15 years, and pursuant to which OCWD warrants that the average annual demand for reclaimed water at CSDOC will be approximately 4.5 mgd; and

WHEREAS, the WWSP Agreement further provides for the development of a long-term "no discharge" scenario, including, if determined to be feasible by the parties hereto, construction of a connection between GAP2 and CSDOC's ocean outfall (Outfall Connection); and

WHEREAS, CSDOC approved the construction of the Outfall Connection subject to the development of an operating agreement; and

WHEREAS, construction of GAP 2, the Intertie, and the Outfall Connection are underway or complete and the Water Issues Committee of this Board has recommended approval of the Agreement for Operation of Green Acres Project Intertie and Outfall Connection by and between OCWD, CSDOC No. 1, IRWD, and the City of Newport Beach.

NOW, THEREFORE, the Board of Directors of the Orange County Water district does hereby approve the within referenced Agreement for Operation of the Green Acres Project Intertie and Outfall Connection with the County Sanitation Districts of Orange County, Irvine Ranch Water District and the City of Newport Beach, and, upon approval as to form by District General Counsel, authorizes its execution on behalf of OCWD by the President or Vice President and General Manager or District Secretary.

2. Change Order to Task Order for Engineering Services-Talbert Barrier Injection System Cathodic Protection Improvements

MOTION NO. 98-77
AUTHORIZING CHANGE ORDER NO. 1 TO HARPER AND ASSOCIATES TASK ORDER FOR ADDITIONAL ENGINEERING SERVICES FOR CATHODIC PROECTION IMPROVMENTS FOR THE TALBERT BARRIER INJECTION SYSTEM

Issuance of Change Order No. 1 is hereby authorized to Harper and Associates, Inc. Task Order No. 972854, providing for a $3,900 increase for additional engineering services during construction of cathodic protection improvements for the Talbert Barrier Injection System.

3. Recharge Water Distribution Study for the Santa Ana River Water Quality and Health (SARWQH) Study

RESOLUTION NO. 98-3-47
AUTHORIZING ISSUANCE OF TASK ORDER TO BOYLE ENGINEERING CORPORATION FOR SARWQH BUFFER AREA DEFINTION STUDY

RESOLVED, that issuance of a Task Order in amount not to exceed $54,624 for fiscal year 1998-99 is authorized to Boyle Engineering Corporation for the Santa Ana River Water Quality Health (SARWQH) Buffer Area Definition Study.

4. Inclusion of Pipeline Costs and Budget Transfer for Conjunctive Use Well Program Agreement with City of Buena Park (Larwin Well)

MOTION NO. 98-78
AUTHORIZING REIMBURSEMENT OF PIPELINE-RELATED COSTS FOR CITY OF BUENA PARK LARWIN WELL

Payment of invoiced pipeline-related costs in the approximate amount of $190,000 under the City of Buena Park Larwin Well Conjunctive Use Well Construction Program Agreement approved under Resolution No. 93-8-127 adopted August 4, 1993, is hereby authorized, with no change in the maximum $1 million funding amount; and a transfer of $475,353 from Water Reserve Fund Reserves/Contingencies to Account No. 901-7062-940.60-01 for fiscal year 1998-99 is authorized.

ITEMS RECOMMENDED FOR CONSENT CALENDAR APPROVAL AT MARCH 12, 1998 ADMINISTRATION AND FINANCE ISSUES COMMITTEE/BOARD OF DIRECTORS MEETING

1. Financial reports

MOTION NO. 98-79
RECEIVING AND FILING FINANCIAL REPORTS

The following financial reports for the period ending January 31, 1998 are hereby received and filed: 1) Revenue and Reimbursement Summaries; 2) Wells Fargo Bank Trust Account Interest Disbursement; 3) Project Summary; 4) Notes Receivable; 5) Conjunctive use Program Status; 6) Long Term Debt; 7) Cash Comparison; and 8) Projected Six-month Cash Disbursement.

2. Credit Universe

MOTION NO. 98-80
RECEIVING AND FILING REVISED CREDIT UNIVERSE

The revised Credit Universe dated March 2, 1998 is hereby received and filed.

3. Reauthorization of Fund Transfer and Issuance of Purchase Order to VWR Scientific for Purchase of Lab Furniture for the Laboratory Remodel Project

RESOLUTION NO. 98-3-48
AUTHORIZING ISSUANCE OF PURCHASE ORDER TO VWR SCIENTIFIC
FOR FURNITURE FOR LABORATORY REMODEL PROJECT,
AND REAUTHORIZING TRANSFER OF FUNDS

RESOLVED, that issuance of a Purchase Order is hereby authorized to VWR Scientific in the amount of $120,934.05, including tax and shipping, for the purchase and installation of laboratory furniture for the Laboratory Remodel Project being constructed under Contract No. WF-21-97-3 (Water Production Workshop); and a transfer of funds in the amount of $225,000 from Water Reserves Fund Reserves and Contingencies to Program 901-7063-800.60-01, previously authorized under Resolution No. 97-10-140 adopted October 15, 1997, is hereby reauthorized for fiscal year 1998-99.

4. Amended One-Year Limited Term Employment agreement for NWRI Administrative Assistant Lucy Segura

RESOLUTION NO. 98-3-49
APPROVING AND AUTHORIZING EXECUTION OF
EMPLOYMENT AGREEMENT WITH LUCY SEGURA

WHEREAS, Lucy Segura (formerly Lucy Bravo), has been employed by OCWD as an Administrative Assistant providing administrative services to the Executive Director of the National Water Research Institute under one-year, limited-term employment agreements since April 1993; and

WHEREAS, an agreement for continuation of Ms. Segura's employment for an additional one-year period was approved by this Board pursuant to Resolution No. 98-2-30 adopted February 18, 1998, which the District staff has subsequently advised reflected an incorrect salary, and has therefor presented and recommended approval of a corrected agreement;

NOW, THEREFORE, the Board of Directors of the Orange County Water District does hereby resolve as follows:

Section 1: The corrected Limited Term Employment Agreement with Lucy Segura to provide administrative services to the National Water Research Institute for a one-year term commencing February 14, 1998 is approved as presented.

Section 2: This Resolution supersedes and replaces Resolution No. 98-2-30.

5. Establishment of Cost of Living Adjustment (COLA) for Fiscal Year 1998-99

MOTION NO. 98-81
ESTABLISHING COST OF LIVING ADJUSTMENT FOR FISCAL YEAR 1998-99

A one percent cost of living increase is hereby established for fiscal year 1998-99 to be applied April 1, 1998 for all regular employees, exclusive of Executive Management, and the Districtwide salary ranges are hereby adjusted accordingly.

6. Request for Proposals for Institutional Investment Advisory & Custody Services

MOTION NO. 98-82
AUTHORIZING ISSUANCE OF REQUEST FOR PROPOSALS TO QUALIFIED INSTITUTIONS FOR INSTITUTIONAL ADVISORY AND CUSTODY SERVICES

Issuance of a Request for Proposals to qualified institutions for institutional advisory and custody services is hereby authorized.

7. Selection of External Auditor

RESOLUTION NO. 98-3-50
ACCEPTING THE PROPOSAL OF CONRAD & ASSOCIATES TO SERVE AS THE OCWD EXTERNAL AUDIT FIRM, AND AUTHORIZING ISSUANCE OF TASK ORDER TO PERFORM AUDIT EXAMINATION OF OCWD GENERAL PURPOSE FINANCIAL STATEMENTS AND RETIREMENT TRUST FOR EMPLOYEES OF OCWD

RESOLVED, that the proposal of Conrad & Associates in the amount of $61,200 to serve as the OCWD external audit firm to perform the audit examination of the OCWD General Purpose Financial Statements and the Retirement Trust for Employees of OCWD for a three-year period ending February 29, 2000, is hereby accepted; and issuance of a Task Order is authorized to Conrad & Associates in the amount of $19,800 to conduct the annual financial systems and managerial audits of OCWD Fiscal Year 1997-98 and the Employees' Retirement Fund records for the calendar year 1997.

8. Permit to Mike Raahauge for Pheasant Hunting at Prado Basin

RESOLUTION NO. 98-3-51
APPROVING AND AUTHORIZING EXECUTION OF PERMIT TO MIKE RAAHAUGE FOR PHEASANT HUNTING ON DISTRICT PROPERTY AT PRADO BASIN

WHEREAS, the Administration and Finance Issues Committee of this Board has recommended issuance of a Permit to Mike Raahauge, dba Mike Raahauge Shooting Enterprises, to continue to use certain District Prado lands for a pheasant hunting concession, the raising of game birds, hunter safety classes, operation of dog kennels, and for non-exclusive use of the clubhouse and roads, during the period commencing April 1, 1998 and terminating March 31, 1999 at a base rent of $100 per month and $50 per month for the dog kennels, plus $2,400 per month in months when pheasant hunting is conducted on the property;

NOW, THEREFORE, the Board of Directors of the Orange County Water District does hereby approve said Permit to Mike Raahauge as presented, and, upon approval as to form by District General Counsel, authorizes its execution by the President or Vice President and General Manager or District Secretary.

9. Amendment to Warner Basin Fishing Concession Lease

RESOLUTION NO. 98-3-51A
APPROVING AND AUTHORIZING EXECUTION OF AMENDMENT TO LEASE FOR WARNER BASIN FISHING CONCESSION

WHEREAS, pursuant to Resolution No. 98-1-16 adopted January 21, 1998, the Warner Basin fishing concession lease was assigned to Douglas C. and Patsy Ann Elliott and Billy W. and Melinda Sue Andrews; and

WHEREAS, the Administration and Finance Issues Committee of this Board has recommended approval of the Lessee's request that OCWD participate in construction of new restrooms on the lease site by providing for a rent credit for such construction to a maximum amount of $10,000; and

WHEREAS, Amendment No. 2 to said lease, providing for such rent credit, has been prepared and presented to this Board for approval;

NOW, THEREFORE, the Orange County Water District Board of Directors does hereby approve and authorize execution of Amendment 2 to the Warner Basin fishing concession lease and, upon approval as to form by District General Counsel, authorizes execution of said amendment on behalf of the District by the President or Vice President and General Manager or District Secretary.

10. Statement of Investment Policy

RESOLUTION NO. 98-3-52
ADOPTING 1998-99 STATEMENT OF INVESTMENT POLICY

RESOLVED, that the following OCWD Statement of Investment Policy is hereby adopted for fiscal year 1998-99.

ORANGE COUNTY WATER DISTRICT
STATEMENT OF INVESTMENT POLICY

Fiscal Year 1998-99

California Government Code Section 53636 requires that the District Treasurer render to the Board of Directors an annual Statement of Investment Policy. What follows is such a statement for the Fiscal Year 1998-99.

For the 1998-99 Fiscal Year, the OCWD Treasurer will maintain and invest both restricted and unrestricted fund balances within the designated Board funds according to California Government Code Section 53600 and the more restrictive Board-approved Schedule of Permitted Investments. Each of these Board-designated funds has different and separate cash flows and requirements; however, the common link is the need for moneys to be available upon demand. The District's Investment Portfolio, therefore, will consist of short-term securities through the end of the fiscal year. Our goal over the next fiscal year is to retain the safety of investment principal while earning satisfactory yield.

The District's bond proceeds will be subject to more restrictive covenants as defined in the permitted investment section of each bond issuance document. These funds are subject to arbitrage regulations, and arbitrage liability calculations are performed on these investments. The maturities on the bond proceed investments will be longer than the District's unrestricted investments to match cash flow requirements.

Safety

Preservation of investment capital is the primary focus of the District's investment approach. Our primary investment instrument continues to be government securities, including, but not limited to, United States treasury notes, treasury bills, treasury bonds, and obligations of United States Government agencies. In addition, when circumstances warrant such investments, our portfolio may include banker's acceptances, negotiable certificates of deposit of national or state-chartered banks, and state or federal thrifts, commercial paper, repurchase agreements, medium-term corporate notes, and collateralized time deposits. The District will transact business with Board-approved banks, savings and loans, and registered investment security dealers. The District will investigate all institutions that wish to do business with the District to determine if they are adequately capitalized. We do not intend to invest in financial futures contracts, financial options contracts, or speculate on interest rate changes. Investments will be laddered out to match cash flow requirements.

Liquidity

Second in importance to the preservation of capital is liquidity, the ability to easily trade or sell securities in the portfolio. We currently hold and shall continue to hold United States obligations that are actively traded in the securities market. We shall avoid investing funds in securities such as derivatives or non-negotiable certificates of deposit, which do not have an available secondary market. Cash flow will be the foremost consideration in the determination of liquidity of investments, the coordination of investment income and maturities with the expected cash requirements of the District. We shall structure our investment maturities in a manner that daily cash requirements may always be met without the necessity of liquidating investments prior to their maturity. To enhance our short-term liquidity, we shall invest a portion of our operational funds in overnight repurchase agreements and/or managed treasury funds.

Yield

Although investment yield is the most visible result of any investment program, achievement of a high yield must be considered secondary to the safety of the investment portfolio. While continuing to maintain appropriate levels of safety and liquidity, we shall make every effort to obtain the highest possible yield on our portfolio. In order to achieve a satisfactory yield, we intend to purchase government securities and hold them for the foreseeable future. In some cases, market fluctuations may provide the District the opportunity to increase the yield through the sale of one security and the reinvestment of the sale of one security. When it is the District Treasurer's opinion that such transactions will benefit the District portfolio, we may sell securities prior to their maturity. However, securities will not be sold solely for the purpose of interest rate speculation.

11. Portfolio Holdings Report

MOTION NO. 98-82A
RECEIVING AND FILING PORTFOLIO HOLDINGS REPORT

The Porfolio Holdings Report as of March 11, 1998 is hereby received and filed.

12. Award of Task Order for Part-time Health and Safety Consulting Services

RESOLUTION NO. 98-3-52A
AWARDING TASK ORDER TO DRUCKER HEALTH & SAFETY MANAGEMENT FOR PART TIME HEALTH AND SAFETY CONSULTING SERVICES

RESOLVED, that issuance of a Task Order is authorized to Drucker Health & Safety Management in an amount not to exceed $22,500 for part-time health and safety consulting services for a three-month period.

13. Professional Services Fees - Pillsbury, Madison & Sutro

RESOLUTION NO. 98-3-52B
AUTHORIZING ISSUANCE OF TASK ORDER TO PILLSBURY MADISON & SUTRO FOR SPECIAL COUNSEL SERVICES

RESOLVED, that issuance of a Task Order is authorized to Pillsbury Madison & Sutro in the amount of 100,000 for special counsel services for fiscal year 1998-99.

MATTERS FOR CONSIDERATION

1. Public Facilities Corporation Meeting held March 18, 1998: Issuance of Tax and Revenue Anticipation Note

District Treasurer Andrew Czorny recalled that the District reauthorizes a Tax and Revenue Anticipation Note annually to its Public Facilities Corporation in support of the District's commercial paper program. He advised that the current level of outstanding commercial paper is $12.2 million, which he stated will be reduced by $5 million during the 1998-99 fiscal year in accordance with the District policy to make $5 million commercial payments to repay the outstanding water purchase debt. Mr. Czorny presented staff's recommendation for a $35 million capacity for the current fiscal year, instead of the $40 million requested in the Agenda submittal, which he stated will give the District the ability to fund a portion of the Capital Improvement Program in accordance with the action taken by the Board earlier in tonight's meeting. The following action was then taken.

Upon motion by Director Pickler, seconded by Director Anthony, the following resolution was unanimously adopted.

RESOLUTION NO. 98-3-53
AUTHORIZING THE EXECUTION AND DELIVERY OF A TAX AND REVENUE ANTICIPATION NOTE TO SUPPORT THE EXISTING ORANGE COUNTY WATER DISTRICT COMMERCIAL PAPER PROGRAM

WHEREAS, the Board of Directors of the Orange County Water District (the "District"), a political subdivision duly organized and existing under and pursuant to the Constitution and laws of the State of California (the "State") has entered into a commercial paper program through the OCWD Public Facilities Corporation (the "Corporation"); and

WHEREAS, to implement the commercial paper program, the Board of Directors of the Corporation has adopted a resolution (the "Corporation Resolution") providing for the execution and delivery of Orange County Water District Commercial Paper Notes (the "Commercial Paper Notes"); and

WHEREAS, in order to secure the Commercial Paper Notes, the District has issued in fiscal year 1997-98 tax and revenue anticipation notes in the aggregate principal amount of $33,000,000 (the "Prior Note"), pursuant to Article 7.6 (commencing with Section 53850) of Chapter 4, Part 1, Division 2, Title 5 of the California Government Code on the terms set forth herein; and

WHEREAS, in order to continue the commercial paper program, it is desirable to issue a tax and revenue anticipation note to replace the existing 1997-1998 Tax and Revenue Anticipation Notes;

NOW, THEREFORE, the Board of Directors of the Orange County Water District does hereby resolve as follows:

Section 1: Definitions. Unless the context otherwise requires, the terms defined in this Section shall have the meanings herein specified.

"Authorizing Law" means Article 7.6, Chapter 4, Part 1, Division 2, Title 5 of the California Government Code.

"Chief Financial Officer" shall mean the duly appointed Chief Financial Officer of the District.

"Code" shall mean the Internal Revenue Code of 1986, as amended, and the Regulations promulgated thereunder.

"Commercial Paper Notes" means Certificates issued pursuant to Resolution No. C-94-4-12 of the OCWD Public Facilities Corporation, adopted on April 20, 1994.

"Corporation" means the OCWD Public Facilities Corporation.

"District" means the Orange County Water District.

"Installment Purchase Agreement" means the Installment Purchase Agreement, dated as of July 1, 1993, by and between the Corporation and the District as amended and supplemented from time to time.

"Net Revenues" means Net Revenues as defined in the Installment Purchase Agreement.

"Notes" means the Tax and Revenue Anticipation Notes to be issued hereunder.

"Parity Obligations" means Bonds and Contracts, as defined in the Installment Purchase Agreement.

"Regulations" means the income tax regulations promulgated or proposed by the Department of the Treasury pursuant to the Code from time to time, including temporary regulations, to the extent applicable.

"Trustee" means First Trust of California, National Association.

Section 2: Issuance of the Notes; Amount: Terms: Interest Rate: Place of Payment.

Pursuant to the Authorizing Law, the Notes shall be issued in an aggregate principal amount which, when added to the interest payable thereon, will not exceed 85 percent of the estimated amount of the then uncollected taxes, income, revenue, cash receipts, and other moneys of the District which will be available for the payment of the Commercial Paper Notes and the interest thereon. A certificate of the Chief Financial Officer certifying to such effect, to be kept on file at the District office, shall be completed by the Chief Financial Officer on or prior and as a condition to, the delivery of the Notes. The Notes shall be designated "Orange County Water District 1998-1999 Tax and Revenue Anticipation Notes" and shall be dated the date of issuance thereof. The Notes shall be payable at the office of the District at such times and in such amounts as set forth in the Notes. The Notes shall mature and be payable no later than 15 months after its date of issuance. The Notes shall bear a rate of interest which shall be determined on a daily basis and shall be a rate which when multiplied by the principal amount of such Notes outstanding on such day will be equal to interest accruing with respect to the Commercial Paper Notes outstanding on such day and shall be payable in accordance with the form of the Notes.

The Notes shall be prepayable in whole or in part on any day on which the Corporation notifies the District that principal with respect to the Notes is due and payable and that the District declines to cause additional Notes to be sold to repay such maturing Notes.

Section 3: Execution of the Notes. The President, First Vice President or Second Vice President is hereby authorized and directed to sign the Notes, by such officer's manual, printed, lithographed or facsimile signatures.

Section 4: Form of the Notes. The Notes shall be issued in substantially the form set forth in "Exhibit A", attached hereto (and on file at the District office) and incorporated herein and may be issued in typewritten form.

Section 5: Notes Non-Callable. The Notes is not subject to call and redemption prior to the maturity date thereof, except as set forth in Section 2 hereof.

Section 6: Security for the Notes; Pledge of Net Revenues. As security for the payment of the principal of and interest on the Notes, the District hereby pledges the Net Revenues of the District on a parity with payment of Parity Obligations of the District. The District hereby acknowledges that the Notes shall constitute "Bonds" for purposes of the Installment Purchase Agreement.

Section 7: Certified Copies. The District Secretary shall provide a certified copy of this document to the Chief Financial Officer who shall take such action as shall be necessary to assure compliance by the District with the terms and conditions hereof. The District Secretary shall further provide a certified copy of this document to the Trustee.

Section 8: Cancellation of Prior Note. The Notes shall be executed and delivered simultaneously with the cancellation of the existing Prior Note.

Section 9: Effective Date. This resolution shall take effect immediately.

2. Amendment of the Orange County Water District Act

General Manager William R. Mills Jr. recalled that, at its February 4 meeting, the Board approved submission of a set of District Act amendments to the California Legislature (AB 1812). He stated that after discussion of the amendments with the Producers, staff recommends deletion of the proposed amendments creating a class of "neutral water" and allowing a "monthly" Basin Production Percentage (BPP). Mr. Mills advised that the Seasonal Shift Program has been discussed with the Producers and staff is prepared to negotiate agreements with individual Producers and the Metropolitan Water District to implement a program to mitigate for Seasonal Shift impacts. He further stated that it is the consensus of the producers that the "Neutral Water" provision is likely to cause significant concern and opposition to AB 1812. Mr. Mills also requested that AB 1812 be further amended to clarify the status of reclaimed water in the calculation of the BPP and the Basin Equity Assessment (BEA) by adding a statement that reclaimed water is not supplemental water for purposes of calculating the BPP and BEA. A lengthy discussion ensued over the need to modify the Act to clarify the status of reclaimed water and it was agreed that the Act would remain silent on this issue.

MOTION NO. 98-83
AUTHORIZING STAFF TO REQUEST AUTHOR OF AB1812 TO DELETE PROPOSED AMENDMENT CREATING A NEW CLASS OF NEUTRAL WATER AND THE ABILITY TO SET A MONTHLY BASIN PRODUCTION PERCENTAGE

Upon motion by Director Owen, seconded by Quist and carried, staff is hereby authorized to request the author of AB 1812, (Assemblyman Dick Ackerman) to delete the proposed amendment that would create a new class of "Neutral Water" and the ability to set a monthly Basin Production Percentage.

COMMITTEE REPORTS

1. Water Issues Committee

General Manager Mills reported on the Water Issues Committee meeting held March 11, 1998. He advised that the Committee requested that he and President Griset meet and discuss the Chino Desalter Project with the Chino Basin Municipal Water District.

2. Administration and Finance Issues Committee

Director Pickler reported on the Administration and Finance Issues Committee meeting held March 12, 1998.

A. 1998-99 Capital Improvement Program (CIP) Funding

Discussion of this item took place earlier in the meeting during the discussion of the 1998-99 Budget.

B. Conjunctive Use Well Loan Program Analysis

Director Pickler reported that the Committee discussed the limited benefits to OCWD of the Conjunctive Use Well Construction Loan Program and recommended that a moratorium be placed on accepting new conjunctive use well projects until staff completes discussions regarding modification of the Program with the Groundwater Producers and the Board adopts a modified Program Policy. City of Fountain Valley Public Works Director Wayne Osborne advised that Fountain Valley has had an application under consideration for several months and requested special consideration of Fountain Valley's project. City of Westminster representative Gary Effelfinger indicated likewise and also requested special consideration of his City's project. District Hydrogeologist Roy Herndon confirmed that both cities' agreements are close to finalization, and the following action was taken.

MOTION NO. 98-84
PLACING MORATORIUM ON ACCEPTANCE OF
NEW CONJUNCTIVE USE WELL CONSTRUCTION PROGRAM PROJECTS

Upon motion by Director Pickler, seconded by Director Owen and carried, a moratorium is hereby placed on acceptance of new conjunctive use well construction projects without a Board-approved agreement currently in place, with the exception of the wells proposed by the Cities of Fountain Valley and Westminster, until such time as staff completes discussions regarding modification of the Program with the Groundwater Producers and the Board adopts a modified policy.

3. Executive Committee

Vice President Quist reported on the Executive Committee meeting held March 13, 1998.

4. Joint CSDOC/OCWD Groundwater Replenishment System Committee

Director Pickler reported on the Groundwater Replenishment System Committee meeting held March 13, 1998 and Director Owen requested that staff review project cost and rate allocations.

GENERAL MANAGER'S REPORT

General Manager Mills reported on and discussed with the Board the following matters:

1. Basin Cleaning Device videotape that was distributed to each Board member.

2. Legislation being introduced by Congressman Calvert for the use of federal funds for removal of *arrundo donex.*

INFORMATIONAL ITEMS

1. General Manager's Report for January 1998

There was no discussion of this item, which was distributed prior to tonight's meeting.

2. Monthly Activity Report of District Projects

There was no discussion on this item, which was included with the Agenda packets.

3. Update re SAWPA activities

Director Osborne reported on recent Santa Ana Watershed Project Activities activities.

ADJOURNMENT

There being no further business to come before the Board the meeting adjourned at 9:45 p.m.

Janice Durant, Assistant District Secretary

Bud Quist, Vice President

Assembly Bill No. 1140

CHAPTER 29

An act to amend Sections 21043 and 21045 of the Public Contract Code, and to amend Sections 2.1, 12, 29, and 31.5 of the Orange County Water District Act (Chapter 924 of the Statutes of 1933), relating to water, and declaring the urgency thereof, to take effect immediately.

[Approved by Governor June 27, 1995. Filed with Secretary of State June 28, 1995.]

LEGISLATIVE COUNSEL'S DIGEST

AB 1140, Morrissey. Orange County Water District.

(1) The Orange County Water District Act requires each operator of a water producing facility to file a water production statement each year on or before January 31 for the preceding July to December reporting period and on or before July 31 for the preceding January to June reporting period. The act requires the district, if the operator fails to file the statement, to assess a specified penalty. The act defines the term "supplemental sources" for the purposes of the act to include reclaimed water. The act provides for the election of directors for the district.

This bill would, instead, require each operator to file the water production statement on or before the last day of February and on or before the last day of August of each year for the preceding applicable reporting period. The bill would delete reclaimed water from the definition of "supplemental sources." The bill would conform certain election provisions with the Uniform District Election Law. The bill would make other technical and clarifying changes in the act.

(2) The act requires all groundwater storage by an entity other than the district to be conducted pursuant to a groundwater storage agreement between that entity and the district.

The bill would provide that a groundwater storage agreement may include provisions that provide for the waiver of prescribed assessments on stored water that is extracted pursuant to that agreement.

(3) Existing law requires a person to whom the district awards a contract to enter into a performance bond, as prescribed.

This bill would, instead, require the board to require a performance bond on a contract awarded as a result of advertising for bids, as prescribed, and would authorize the general manager of the district to require a performance bond on a contract awarded without advertising for bids.

(4) This bill would declare that it is to take effect immediately as an urgency statute.

The people of the State of California do enact as follows:

SECTION 1. Section 21043 of the Public Contract Code is amended to read:

21043. (a) Contracts may be let or work undertaken without advertising for bids in an emergency.

(b) In case of an emergency, if notice for bids to let contracts will not be given, the board of directors shall comply with Chapter 2.5 (commencing with Section 22050).

SEC. 2. Section 21045 of the Public Contract Code is amended to read:

21045. (a) The district shall require a person to whom the district awards a contract as a result of advertising for bids to enter into a bond, with good and sufficient sureties, to be approved by the board, payable to the district for its use, for at least 25 percent of the amount of the estimated contract price, conditioned for the faithful performance of the contract.

(b) The general manager of the district may require a person to whom the district awards a contract without advertising for bids to enter into a bond in accordance with subdivision (a).

(c) The work shall be done under the direction and to the satisfaction of the district engineer, and be subject to approval by the board.

SEC. 3. Section 2.1 of the Orange County Water District Act (Chapter 924 of the Statutes of 1933) is amended to read:

Sec. 2.1. (a) All groundwater storage by an entity other than the district shall be conducted pursuant to a groundwater storage agreement between that entity and the district.

(b) Use of the groundwater basin within the district for the purpose of replenishing and managing the groundwater supplies of the district shall have priority over the use of the groundwater basin for storage of water.

(c) The groundwater storage agreement shall be limited to public and private entities distributing water to consumers for domestic, municipal, industrial, and agricultural use within their boundaries, which are located wholly or partially within the district, except that, where the primary benefits accrue to persons or property within the district, the agreement may include other public and private entities, including, but not limited to, the Metropolitan Water District of Southern California and the Department of Water Resources.

(d) The groundwater storage agreement may include provisions that provide for the waiver of replenishment assessments or basin equity assessments, or both, on stored water that is extracted pursuant to the agreement.

(e) In allocating the use of the groundwater basin storage space, the district shall consider and protect the quality of the groundwater and the reasonable water supply needs of the district. The district shall impose such limitations on the quality of the water to be stored as shall be necessary to protect the quality of the groundwater in the district.

(f) The district shall include written findings supporting its conclusions in its record of consideration of a proposed groundwater storage agreement.

SEC. 4. Section 12 of the Orange County Water District Act (Chapter 924 of the Statutes of 1933) is amended to read:

Sec. 12. (a) An election shall be held on the first Tuesday after the first Monday in November of each even-numbered year, in those divisions of 1 to 7, inclusive, at which directors for the district shall be elected to fill the offices of the directors whose terms of office shall expire at noon on the first Friday in December, in accordance with the Uniform District Election Law (Part 4 (commencing with Section 10500) of Division 10 of the Elections Code).

(b) In Divisions 8, 9, and 10 of the district, the governing body of the city comprising each such division shall appoint the director to represent the division upon the board of directors, to serve a four-year term that expires at the same time as the terms of office of those elected directors whose terms of office expire that year. The terms of office of directors representing Divisions 8, 9, and 10 shall expire at noon on December 6, 1996. A director representing Division 8, 9, or 10 may be removed at any time and without cause by the majority vote of the appointing governing body.

(c) Vacancies occurring in any elective office shall be filled pursuant to Section 1780 of the Government Code. If the vacancy is that of an appointed director, the appointing body shall appoint a successor.

(d) Each director shall execute an official bond in an amount fixed by the board of directors that equals or exceeds one thousand dollars ($1,000). The bonds shall be filed with the secretary of the board of directors.

(e) In lieu of requiring each director to execute an official bond pursuant to subdivision (d), the district may provide fidelity insurance through master or blanket bonds, or other insurance approved by the board of directors.

(f) Premiums for bonds required by this act shall constitute a proper charge against the district.

SEC. 5. Section 29 of the Orange County Water District Act (Chapter 924 of the Statutes of 1933) is amended to read:

Sec. 29. (a) (1) Each operator of a water-producing facility within the district, until the facility has been permanently abandoned, shall file with the district, on or before the last day of

February and on or before the 31st day of August of each year, a statement setting forth all of the following:

(A) The total production in acre-feet of water for the preceding six month period of January to June, inclusive, or July to December, inclusive, as applicable.

(B) A general description or number locating each water-producing facility.

(C) The method or basis of the computation of water production.

(2) If no water has been produced from the water-producing facility during the reporting period, a statement shall be filed as provided for herein stating that no water has been produced during that period.

(3) A statement shall be verified by a written declaration that it is made under the penalties of perjury.

(4) The replenishment assessment and the additional replenishment assessment are payable to the district on or before the last date on which the water production statements are to be filed and are computed by multiplying the production in acre-feet of water as disclosed in the statement, by the replenishment assessment rate and the additional replenishment assessment rate.

(5) When an operator has permanently abandoned a water-producing facility, the operator shall give written notice of the abandonment to the district.

(b) If any operator of a water-producing facility fails to pay the replenishment assessments when due, the district shall charge interest on the delinquent amount of the replenishment assessments at the rate of 1 percent each month or fraction thereof that the replenishment assessments remain delinquent.

(c) (1) If any operator of a water-producing facility fails to file the water production statement on or before the last day of February or on or before the 31st day of August of each year, for the applicable reporting period, the district shall, in addition to charging interest as provided in this section, assess against the operator a penalty charge, in an amount of 10 percent of the amount due the district.

(2) Paragraph (1), as amended in the first year of the 1995–96 Regular Session of the Legislature, applies to any operator of a water producing facility that fails to file a required water production statement on or after the effective date of those amendments, and to any operator that failed to file a required water production statement on or before July 31, 1994, for the preceding January to June, inclusive.

(d) The board of directors may, at the time of fixing the replenishment assessment rate and additional replenishment assessment rate, provide by resolution that the operator of any water-producing facility with a discharge opening not greater than two inches in diameter and that does not provide domestic or irrigation water for an area in excess of one acre may pay a fixed

amount as the operator's replenishment assessment and additional replenishment assessment, in lieu of filing a sworn statement regarding groundwater production.

SEC. 6. Section 31.5 of the Orange County Water District Act (Chapter 924 of the Statutes of 1933) is amended to read:

Sec. 31.5. (a) Basin equity assessments and production requirements and limitations on persons and operators within the district are declared to be in furtherance of district activities in the protection of water supplies for users within the district which are necessary for the public health, welfare, and safety of the people of this state. The basin equity assessments and the production requirements and limitations provided for in this act may be imposed upon, and applied to, all persons and producers within the district for the benefit of all who rely directly or indirectly upon the groundwater supplies of the district.

(b) The basin equity assessments imposed pursuant to this act against all persons and operators within the district may be uniform or nonuniform in amount, as determined by the board of directors of the district, in order to effectuate the goals and purposes of the district. The proceeds of the basin equity assessments imposed and collected shall be used to equalize the cost of water to all persons and operators within the district and to acquire water to replenish the groundwater supplies of the district.

(c) As used in this act:

(1) "Supplemental sources" means sources of water outside the watershed of the Santa Ana River, excepting that portion of that watershed on and along Santiago Creek upstream of the downstream toe of the slope of the Villa Park Flood Control Dam, such as, but not limited to, water produced from the Metropolitan Water District of Southern California.

(2) "Basin production percentage" means the ratio that all water to be produced from groundwater supplies within the district bears to all water to be produced by persons and operators within the district from supplemental sources and from groundwater within the district during the ensuing water year.

(d) The district shall annually order an engineer employed by the district to prepare an investigation and report. The investigation and report shall set forth all of the following information, together with other information requested by the district, relating to the preceding water year:

(1) Amount of water produced by persons and operators from groundwater within the district.

(2) Amount of water produced by persons and operators from supplemental sources.

(3) Amount of water produced by persons and operators from all other sources.

(4) Condition of groundwater supplies within the district.

(5) Information as to the probable availability of water from supplemental sources during the next succeeding fiscal year.

(6) The cost of producing water from groundwater within the district, including any replenishment assessment of the district.

(7) The cost of water produced within the district from supplemental sources.

(e) (1) On the second Wednesday in February of each year, the engineering investigation and report shall be delivered to the secretary of the district.

(2) The secretary shall publish, pursuant to Section 6061 of the Government Code, a notice of the receipt of the report and of the public hearing to be held on the date of a meeting of the board of directors in March, in a newspaper of general circulation printed and published within the district, at least 10 days prior to the date at which the public hearing regarding water supplies within the district is to be held.

(3) The notice, among any other information that the district may provide, shall include an invitation to all persons or operators within the district to call at the offices of the district to examine the engineering investigation and report.

(4) The board of directors shall hold on the date of a meeting of the board in March of each year, a public hearing at which a person or operator within the district, or any person interested in the amounts and source from which all persons and operators produce their total supply of water, as well as the estimated difference in the cost of water produced from groundwater within the district or supplemental sources, may appear and be heard, in person or by representative.

(f) (1) On the date of a meeting of the board of directors in April of each year, the board of directors shall hold a public hearing to determine the need and desirability of imposing basin equity assessments and the amounts thereof, the need for establishing production requirements and limitations, and the extent of those requirements and limitations as to each person or operator within the district for the ensuing water year.

(2) In computing and fixing the amount of any basin equity assessment for any person or operator within the district, the board may allow a percentage for delinquencies, not to exceed 10 percent, as determined by the board.

(3) Notice of the proposed hearing shall be published in the district pursuant to Section 6061 of the Government Code at least 10 days prior to the date set for the hearing.

(4) The notice shall set forth all of the following:

(A) That a report regarding water supplies within the district has been prepared.

(B) The date, time, and place of the proposed hearing.

(C) A statement that the board will consider at the hearing the need and desirability of imposing basin equity assessments and the amounts of those assessments, as well as establishing production requirements and limitations, on persons and operators within the district for the ensuing water year and surcharges in connection with those requirements and limitations.

(D) An invitation to all persons and operators to appear at the public hearing and be heard in regard to any of the foregoing matters.

(g) (1) At the hearing, the board shall hear, take, and receive all competent evidence presented regarding the need for basin equity assessments, production requirements and limitations in general, and specifically, the extent of those requirements or limitations as to each person or operator within the district, the amount of the basin equity assessment which shall be imposed upon each person and operator for all purposes other than irrigation at uniform or nonuniform rates and may be imposed upon each person and operator for irrigation purposes at uniform or nonuniform rates for the ensuing water year, and the amount of surcharges for production in excess of the basin production limitations.

(2) After the hearing, the board may, by a resolution adopted by a vote of not less than eight members of the board, find and determine for the ensuing water year all of the following:

(A) The estimated total amount of water to be produced by all persons and operators within the district from the groundwater within the district and the estimated amount to be produced by persons and operators from supplemental sources.

(B) The basin production percentage.

(C) That a basin equity assessment and production requirement and limitation from groundwater within the district are necessary for the protection of the water supply of the district.

(D) The surcharge, in an amount to be determined in the discretion of the board, for production in excess of the production limitations.

(E) The amount of the basin equity assessment to be imposed upon each person and operator in a dollar amount per acre-foot of water produced from the groundwater supply for all purposes other than irrigation, which need not be uniform as to each person or operator within the district, and that the amount is reasonable.

(F) The amount of the basin equity assessment to be imposed upon each person and operator in a dollar amount per acre-foot of water produced from the groundwater supply for irrigation purposes, which need not be uniform as to each person or operator within the district, and that the amount is reasonable.

(G) Production requirements or limitations and the surcharge for production in excess of the basin production limitations on persons and operators within the district that will apply during the ensuing water year. The requirements and limitations shall be on the amount

of groundwater produced by those persons and operators expressed in a percentage of overall water produced or obtained by those persons or operators from groundwater within the district and from supplemental sources.

(H) That during the ensuing water year, upon the district giving published notice pursuant to Section 6061 of the Government Code in a newspaper of general circulation printed and published within the district at least 10 days prior to such a hearing, a subsequent public hearing may be held to modify the basin production percentage, any basin equity assessment, any production requirement or limitation, or the surcharge for production in excess of the production limitation established by the district. A modification, if any, shall be effective on the date established by the board and the district. The district shall give notice of the modification 10 days prior to the effective date of the modification pursuant to subdivision (e).

(h) (1) The board may exclude all persons and operators who produced 25 acre-feet or less of water from groundwater within the district during the ensuing water year from the imposition of the basin equity assessment and the production requirements and limitations.

(2) All findings and determinations made by the board pursuant to this section are final, conclusive, and binding upon all persons and parties.

(i) (1) The district shall thereafter, and in any event prior to July 1 in each year, give notice to each person or operator within the district. The notice shall include all of the following information:

(A) The amount of the basin equity assessment imposed upon that person or operator per acre-foot of water produced for purposes other than irrigation and the amount of the basin equity assessment imposed upon that person or operator per acre-foot of water produced for irrigation purposes.

(B) The basin production percentage.

(C) The production requirement or limitation upon the person or operator.

(D) The amount of surcharge imposed for production in excess of the basin production limitations.

(2) The notice required by this subdivision and the notice of any subsequent modifications may be sent by postcard or by other first-class mail with postage prepaid by the district.

(j) (1) Each person or operator within the district not excluded from the imposition of a basin equity assessment and the production requirements and limitations, shall file with the district, on or before the 30th day of September of each year, a basin equity assessment report in the form prescribed by the district setting forth the total amounts of water produced from groundwater within the district and from supplemental sources during the preceding water year by the

person or operator. The statement shall be verified by a written declaration under penalty of perjury.

(2) If the person or operator has been required by the district to produce, or has in fact produced, more water from groundwater within the district than the equivalent of the basin production percentage determined by the district, that person or operator shall pay to the district, on or before September 30, an amount determined by the number of acre-feet of water which the person or operator has produced from groundwater within the district in excess of the acre-foot equivalent of the basin production percentage multiplied by the basin equity assessment rate applicable to that person or operator, plus the amount of surcharge due for production in excess of the production limitations.

(3) (A) If a person or operator, pursuant to the requirement of the district, has produced from groundwater within the district less than of the equivalent of the basin production percentage, the district shall pay the person or operator, on or before the 30th day of November, from the basin equity assessment fund, an amount determined by the number of acre-feet by which the production of the person or operator from groundwater as required by the district is less than the acre-foot equivalent of the basin production percentage multiplied by the basin equity assessment rate applicable to that person or operator.

(B) If the production of the person or operator from groundwater is more than the production required by the district and less than the equivalent of the basin equity production percentage, then the district shall pay the person or operator an amount determined by the number of acre-feet by which the actual production of the person or operator from groundwater is less than the acre-foot equivalent of the basin production percentage multiplied by the basin equity assessment applicable to that person or operator.

(k) If any person or operator fails to pay, when due, the applicable basin equity assessment or surcharge due for production in excess of the production limitations, the district shall charge interest on the delinquent amount at the rate of 1 percent each month or fraction thereof for which the amount remains delinquent. Should any person or operator within the district fail to file a basin equity assessment report on or before the 30th day of September of any year, the district shall, in addition to charging interest, assess a penalty charge against that person or operator in the amount of 10 percent of the amount found by the district to be due.

(*l*) (1) The district may require other reports from persons and operators as necessary and desirable in the application of the basin equity assessment procedures.

(2) Upon good cause shown, an amendment to any report required under this section may be filed, or a correction of any report

may be made, within six months after the date the report was filed with the district.

SEC. 7. This act is an urgency statute necessary for the immediate preservation of the public peace, health, or safety within the meaning of Article IV of the Constitution and shall go into immediate effect. The facts constituting the necessity are:

In order to implement, as soon as possible, certain changes affecting the administration of the Orange County Water District, it is necessary for this act to take effect immediately.

O

SINCE 1933

ORANGE COUNTY WATER DISTRICT

ORANGE COUNTY'S GROUNDWATER AUTHORITY

March 23, 2016

Mr. David Voorhees
Big Canyon Country Club
One Big Canyon Drive
Newport Beach, CA 92660

Re: Green Acres Project letters dated February 1 & 29, 2016

Dear Mr. Voorhees:

Orange County Water District (OCWD) received your letters dated February 1 and February 29, 2016, regarding Big Canyon Country Club's (BCCC) use of Green Acres Project (GAP) water and concerns about OCWD continuing to produce GAP water and the potential for future price increases. OCWD understands that BCCC uses approximately 180 to 370 acre-feet of GAP water annually to irrigate its property and has been doing so since the late 1990s. OCWD recognizes and appreciates the significant investments made by BCCC to utilize GAP water and conserve potable water supplies. OCWD further understands that these investments were made under the assumption that GAP water would continue to be available for a long time. The cooperation and partnership between OCWD, BCCC, and the City of Newport Beach have been unique and a benefit to each party as well as the general public.

As with any conversion to recycled water, there are costs associated with modifying infrastructure and there are also benefits. With the recent mandatory California State cutbacks on water consumption, businesses like BCCC realize a major benefit in that the water use cutbacks don't apply to recycled water and BCCC is able to continue irrigating at its normal frequency without restrictions. Additionally, since its inception, the end-user cost to purchase GAP recycled water in the City of Newport Beach has been at least 20% less expensive than potable rates.

PO Box 8300
Fountain Valley, CA 92728-8300
18700 Ward Street
Fountain Valley, CA 92708
(714) 378-3200
(714) 378-3373 fax
www.ocwd.com

Part of the reason the discount on GAP water has existed is that the GAP program is being subsidized by all of the nineteen cities and retail water districts within the OCWD service territory (Producers). The revenue from the GAP program has not been able to match the operation, maintenance, and debt service expenses and thus has required subsidy from other OCWD revenue sources. The original GAP agreements between OCWD and Retail Agencies, such as the City of Newport Beach, specified certain rates for OCWD sales to Retailers and Retailer sales to end-users. OCWD is considering a policy change that will increase the sales rate of GAP water from OCWD to Retailers to reflect the actual production and distribution costs to provide the water. Setting the GAP sales rate equal to its expenses would be consistent with the OCWD Board adopted policy to sell Groundwater Replenishment System (GWRS) water at a rate equal to the cost to provide that water. Based upon preliminary calculations, the proposed OCWD GAP rate will not exceed the rate currently charged by most Retailers to their respective end-users. OCWD will advise the Retail Agencies to examine their GAP water rates and ensure consistency with their policies governing potable water rates. It is expected that the Retailers will establish a recycled water rate that is still discounted from their potable rates.

OCWD is aware of a relatively recent change in the City of Newport Beach's rate for GAP water. The City lowered the GAP rate to match the City's expenses for providing the recycled water resource. OCWD agrees with this strategy and is seeking to adjust its own sales rate to match its expenses for providing recycled water. As stated earlier, Producers that do not participate in the GAP program have been subsidizing it. While the GAP program does provide some benefit to all of the Producers, there is an alternative water recycling program at OCWD that provides a greater benefit to the entire Producer group. OCWD also produces highly purified recycled water with the GWRS. If OCWD were to cease the GAP program, all of the currently available wastewater supplies from the Orange County Sanitation District could be treated through the GWRS thereby not increasing discharges to the ocean.

OCWD recognizes there are appropriate and beneficial uses for the lower quality water produced through the GAP program. In general, the feedback received by OCWD staff from the OCWD Board and Producers has been to continue use of the GAP program, allow expansion of its demand up to the current treatment and distribution limits in order to reduce unit costs, and to produce enough revenue through GAP sales to meet the GAP program's expenses. Additionally, staff has been encouraged to study changes in the treatment technology that could reduce production expenses and produce a higher water quality effluent.

An additional concern for OCWD is that the annual subsidy from the Metropolitan Water District, as part of their Local Resource Program, to the GAP program will be ending in October 2016. The loss of this subsidy will further reduce GAP revenues. The proposed new GAP rate between OCWD and the Retailers will adjust for the loss of this subsidy and is still expected to be discounted from the Retailer potable rates.

If the proposed OCWD rate change is approved, the accounting for GAP expenses will be published annually by OCWD. OCWD has received multiple awards for its accounting practices and is confident that appropriate costs are being included. The GAP treatment plant and distribution system are separate from other OCWD facilities with dedicated electrical, flow, and chemical metering devices.

The OCWD Board of Directors will be discussing these GAP issues again at a future Board Meeting. Staff will notify you in advance of this meeting so that, if so desired, you may attend and speak on BCCC's behalf. Please contact Mr. Ben Smith at (714) 378-3211 or bsmith@ocwd.com if you would like to meet and/or discuss these issues further.

Sincerely,

Michael R. Markus, P.E., D.WRE, BCEE, F.ASCE
General Manager

cc: OCWD Board of Directors

Agenda Item # 11

AGENDA ITEM SUBMITTAL

Meeting Date: August 8, 2007

To: Water Issues Cte
Board of Directors

From: M. Wehner

Staff Contact: S. Deshmukh

Budgeted: N/A
Budgeted Amount: N/A
Cost Estimate: N/A
Funding Source: N/A

Program/Line Item No.: N/A
General Counsel Approval: N/A
Engineers/Feasibility Report Approved: N/A
CEQA Compliance: N/A

Subject: GREEN ACRES PROJECT – FUTURE DIRECTION

SUMMARY

Staff has completed a white paper evaluating options for the future of the GAP project and will present the findings to the Board. The paper is included in the staff report. Alternatives have been developed which range from expanding to partnering, and possibly abandoning the project. Staff recommends proceeding with the alternative that continues to provide recycled water, but to replace the treatment process with excess microfiltration treatment capacity available from the Groundwater (GWR) System.

Attachment(s): Green Acres Project – Future Direction dated July 2007

RECOMMENDATION

Agendize for August 15 Board meeting:

1. Direct staff to work towards using GWR System microfiltration capacity to provide recycled water for existing GAP users.
2. Notify OCSD to explore a new source of recycled water after January 2012.
3. Renegotiate Retailer Agreements when they reach the end of their term.
4. Evaluate staff headcount increase in Water Production in 2009.

DISCUSSION/ANALYSIS

The Green Acres Project (GAP) was constructed in 1991 to create a new alternative water supply for the Cities of Fountain Valley, Huntington Beach, Costa Mesa, Santa Ana, and Newport Beach. The program consisted of construction of a recycled water treatment plant and associated pipelines to convey the recycled water. The treated water provides recycled water for landscape irrigation at parks, schools, and golf courses, as well as, for industrial uses. A flowchart of the project is attached. Located along the coast, the project reduces coastal groundwater pumping benefiting the District's seawater intrusion prevention efforts. This drought proof supply generates a new source of water for the area and promotes the idea of conservation.

While there are benefits of GAP, there have been concerns as well. They include treatment challenges, long-term debt payments, and operational inefficiencies.

This paper was developed to examine those concerns and develop alternatives and a recommendation on how to proceed. The paper includes chapters on the history, institutional arrangements, financial information, issues and concerns, alternatives, and recommendations.

Five alternatives are presented. These include:

1. Maintaining the existing system,
2. Abandoning the entire project,
3. Options to expand the existing partnership with IRWD,
4. Using GWR System treatment, and
5. Using deep well water to supply users.

Water recycling for irrigation and industrial purposes is an important component of the water resource picture for the Orange County Water District (OCWD). While there have been issues, the recommendation is to continue to provide recycled water but to do so in the most cost effective manner possible. The alternative to use Groundwater Replenishment (GWR) treatment processes will produce the lowest cost water. This involves using the excess microfiltration capacity to provide water to the GAP system while still utilizing ancillary GAP facilities. Based on the cost analysis, this alternative is the least costly for the District and increases operational efficiencies for Water Production staff.

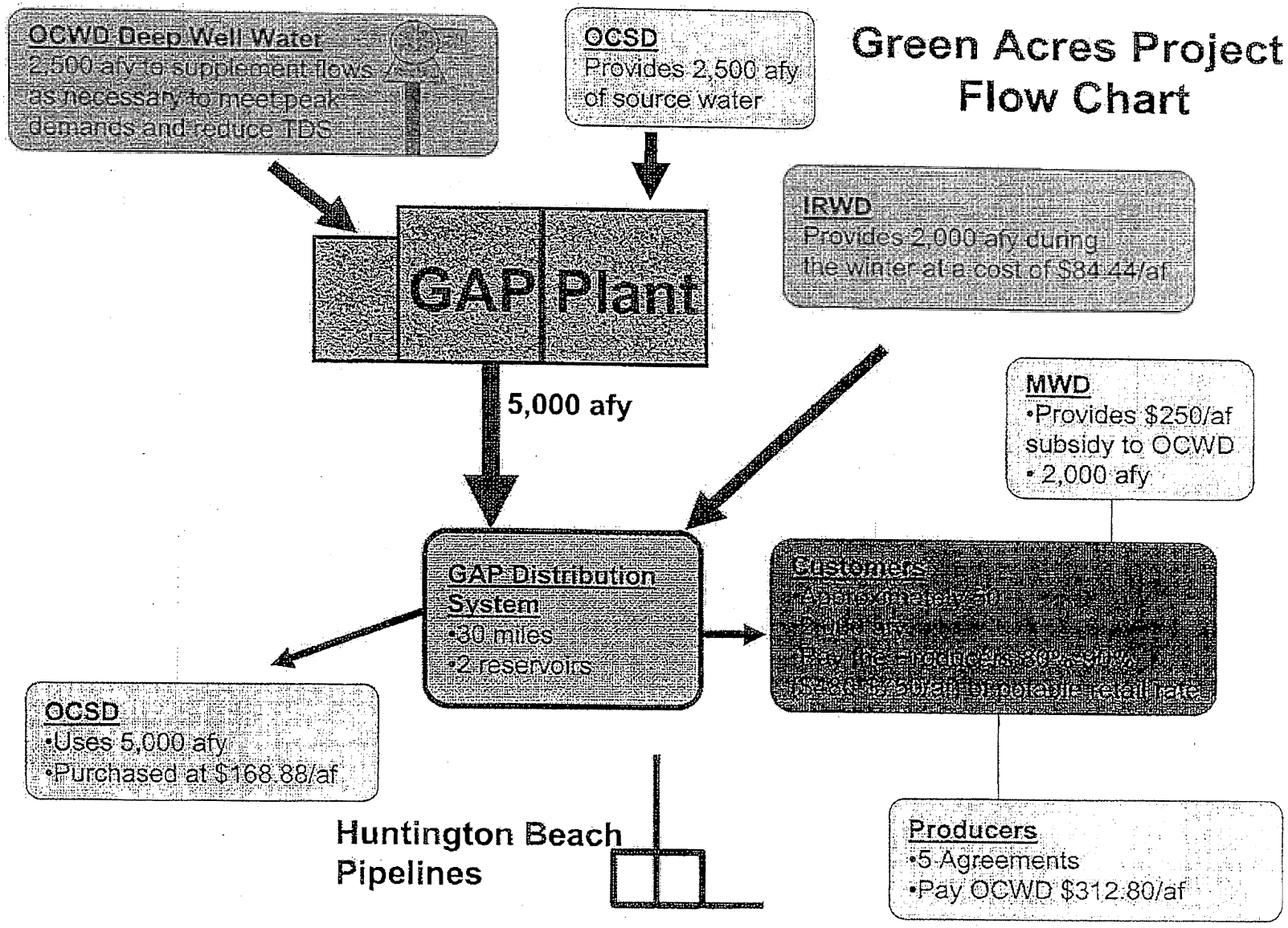
This alternative would entail a staged approach to using microfiltration (MF) as the main treatment step. As the GWR System plant starts up and operates in regular mode, Water Production staff can begin introducing MF water into the GAP system. If at any point, this option requires increased costs (compared to the current operation), the process can be revaluated.

This approach will require regulatory approval though the Regional Water Quality Control Board and California Department of Public Health. It is anticipated that this should not be a challenge as MF water has been used for GAP previously.

Aside from operational changes, OCWD may want to consider "renegotiating" the retailer agreements with the four retailers. Each agreement is very similar to the others in content, which means they all should be renegotiated at the same time as a group.

PRIOR RELEVANT BOARD ACTION(S) N/A

Green Acres Project Flow Chart



Orange County Water District

Green Acres Project – Future Direction
July 2007

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EXECUTIVE SUMMARY

The Green Acres Project (GAP) was constructed in 1991 to create a new alternative water supply for the Cities of Fountain Valley, Huntington Beach, Costa Mesa, Santa Ana, and Newport Beach. The program consisted of construction of a recycled water treatment plant and associated pipelines to convey the recycled water. The treated water provides recycled water for landscape irrigation at parks, schools, and golf courses as well as for industrial uses. Located along the coast, the project reduces coastal groundwater pumping benefiting the District's seawater intrusion prevention efforts. This drought proof supply generates a new source of water for the area and promotes the idea of conservation.

While there are benefits of GAP, there have been challenges as well. They include treatment challenges, long-term debt payments, and operational inefficiencies.

This paper was developed to examine those concerns and develop alternatives and a recommendation on how to proceed. The paper includes chapters on the history, institutional arrangements, financial information, issues and concerns, alternatives, and recommendations.

Five alternatives are presented. These include:

1. maintaining the existing system,
2. abandoning the entire project,
3. options to expand the existing partnership with IRWD,
4. using GWR system treatment, and
5. using deep well water to supply users rather than reclaimed water.

Water recycling for irrigation and industrial purposes is an important component of the water resource picture for the Orange County Water District (OCWD). While there have been issues, the recommendation is to continue to provide recycled water but to do so in the cost effective manner. The alternative to use Groundwater Replenishment (GWR) treatment processes will produce the lowest cost water. This involves using the excess microfiltration capacity to provide water to the GAP system while still utilizing ancillary GAP distribution facilities. Based on the cost analysis, this alternative is the least costly for the District and increases operational efficiencies of Water Production staff.

As the GWR System plant starts up and operates in regular mode, Water Production staff can begin introducing MF water into the GAP system. If at any point, this option requires increased costs (compared to the current operation), the process can be revaluated. This would occur as source water is available from OCSD.

This approach will require regulatory approval though the Regional Water Quality Control Board and California Department of Public Health. It is anticipated that this should not be a challenge as MF water has been used for GAP previously.

Aside from operational changes, OCWD may want to consider "renegotiating" the retailer agreements with the four retailers. Each agreement is very similar to the others in content, which means they all should be renegotiated at the same time as a group.

1 HISTORY

The Green Acres Project (GAP) was constructed in 1991 to create a new alternative water supply for the Cities of Fountain Valley, Huntington Beach, Costa Mesa, Santa Ana, and Newport Beach. The program consisted of construction of a recycled water treatment plant and associated pipelines to convey the recycled water. There is approximately 30 miles of pipeline ranging from 6- to 42-inches in diameter. A six million gallon reservoir was also purchased from the City of Santa Ana to provide additional storage. The treated water provides recycled water for landscape irrigation at parks, schools, and golf courses as well as for industrial uses. Located along the coast, the project also reduces coastal groundwater pumping benefiting the District's seawater intrusion prevention efforts. Figure 1-1 illustrates the location of the pipelines, users, and GAP treatment plant.

1.1 CHRONOLOGY

Completion of the first phase of GAP was in 1991. This included the construction of the treatment plant and the first phases of the pipeline distribution system. Additional milestones for the project include the following:

1975 Orange County Water District (OCWD) conducts feasibility study of reclaimed water use in Fountain Valley area.

1977 State issues water recycling mandate.

1978 The Green Acres Project (GAP) Facilities Plan describes an ultimate project costing $26 million and delivering 12,000 acre-feet per year (afy). A Clean Water Grant is expected to pay 87.5 percent of eligible costs.

1979 OCWD Board certifies final EIR for GAP in March 1979. Recycled water projects are eliminated from the Clean Water Grant eligibility. OCWD begins exploring alternatives for building GAP.

1981 GAP Pre-Design Feasibility Study describes a phased project with an initial phase producing 2,700 afy and costing $6 million. The ultimate project is reduced to 5,300 acre-feet (af) and use of some Water Factory 21 treatment facilities is planned in order to contain costs.

1984 OCWD authorizes a 10 percent design report, which describes a phased project initially producing 7.5 million gallons-per-day (mgd), expandable to 15 mgd, and alternative pipeline routes.

1986 Final design of treatment plant, transmission pipelines and end-user hookups is complete.

1987 Engineering cost analysis reveals a construction range of $16.3 to $17.9 million. Least costly alternatives assume some facilities shared with Water Factory 21.

1988 Constructibility analysis is performed on existing plans and specifications. Staff is authorized to revise original plans and specifications to allow for GAP treatment separate from Water Factory 21, to include a closed-loop

distribution system, and to serve additional users. Demolition of on-site seawater desalter foundation begins, in preparation of site for GAP treatment plant, two million gallon reservoir, and effluent pump station.

1989 Distribution pipeline system is modified to allow for eventual expansion into Newport Beach and Huntington Beach. Contract is awarded for 7.5-mgd treatment facility, two million gallon reservoir, and effluent pump station.

1990 Contract is awarded for Reach 1 of distribution pipeline, serving Fountain Valley.

1991 Contracts are awarded for Reach 2 (Santa Ana) and Reach 3 (Costa Mesa) of distribution pipeline. The first delivery of GAP water is piped to Mile Square Park in Fountain Valley in September.

1992 Metropolitan Water District of Southern California's Local Resources Projects Program subsidy is increased from $75 to $154 per acre-foot (/af). OCWD submits application to State Water Resources Control Board (SWRCB) for $20 million low-interest loan for Phase 2 expansion. GAP water is piped to toilets and urinals in OCWD's headquarters, the first single-story public building to use recycled water for this purpose.

1993 Twelve end users have been connected to the GAP, with a total demand of 2,700 acre-feet per year (afy).

1995 The Santa Ana Reservoir was purchased by OCWD from City of Santa Ana for $5 million in January.

1999 Phase II pipeline to Newport Beach was completed in January 1999.

1.2 PLANT DESCRIPTION

The GAP is a wastewater reclamation project that is owned and operated by the OCWD. The treatment plant was commissioned in October 1991. GAP consists of a 7.5 mgd direct filtration treatment plant, 12.67 mgd chlorine contact chamber, 1.35 million gallon clear well and 10,500 gallons per minute (gpm) pump station located at OCWD in Fountain Valley; and a six million gallon reservoir and 7,000 gpm pump station located in Santa Ana.

The GAP is normally supplied with Orange County Sanitation District (OCSD) secondary effluent. Due to events such as peak system demands, high salinity in the treated water, and high turbidity in the influent to the GAP Plant, large amounts of supplemental water from groundwater sources is routinely pumped into the system. Table 1-1 provides information on the GAP plant capacity and the various sources of supplies.

TABLE 1-1: GAP PLANT CAPACITY

PROJECT WATER SUPPLY	SOURCE OF SUPPLY	CAPACITY (MGD)
GAP treatment plant (tertiary filtered and disinfected)	Secondary effluent from OCSD Plant 1	7.5 (nominal) 9.5 (peak)
Well water	Deep Well Groundwater	6.0
Total		15.5 (peak)

The rapid mix/flocculation process at GAP has the function to mix the plant influent water with alum or specialized polymers for coagulation and flocculation for the removals of phosphorus and suspended solids. There are two rapid mix chambers in series and each chamber contains a rapid mixer. Influent water enters chambers 1 and 2 and is discharged to the flocculation basin through an adjustable weir. The flocculation process provides for the mixing of coagulant in the removal of influent impurities by forming flocculation particles. Two flocculation basins are provided for the agglomeration of suspended particles. The flocculators are the walking-beam units that operate with an up-and-down motion by a single variable speed. There are thirty two redwood paddles on each flocculator.

Following flocculation, the water flows by gravity to the filtration process. Four gravity filters are utilized in the GAP plant. The size of each filter is 440 square feet. The filter media is dual media consisting of anthracite (24 inches deep) and sand (12 inches deep). The typical hydraulic loading rates (HLR) range from 3- to 5-gpm/square foot. During the operation of the plant, the observed filter run time ranges from 48 hours to less than 10 hours. The filter backwashing system utilizes air scour and the backwashing rate is approximately 15 gpm/square foot. The HLR to the filters vary due to the quality of influent water and the limits on the electrical conductivity (an indication of the total dissolved solids) level of final effluent water.

The final effluent from the four dual-media gravity filters is conveyed by gravity to the chlorine contact chamber. The filtered water is injected with a sodium hypochlorite solution located at a point where the filtered water enters the chlorine contact chamber. Chlorine residual analyzers monitor the contact chamber effluent residual and the high pressure pump effluent residual. There is the capability to inject sodium hypochlorite in the influent line.

In terms of compliance with regulatory standards, the GAP recycled water meets the California Water Recycling Criteria, Section 60301.230 (Disinfected Tertiary Recycled Water). OCWD is the holder of the California Regional Water Quality Control Board (Santa Ana Region) permit for the GAP Project, which was reissued on October 25, 2002.

1.3 DISTRIBUTION SYSTEM

The GAP serves approximately 50 user sites (some with multiple meters) with a combined annual water demand of approximately 7,000 to 7,500 afy. The user

sites are located in Costa Mesa, Fountain Valley, Huntington Beach, Newport Beach and Santa Ana. The distribution system of GAP serves the landscape irrigation needs of parks, schools, golf courses, greenbelts, bike trails, commercial frontage, street medians and cemetery. There are approximately 30 miles of pipelines currently in service ranging in size from 42 inches to 6 inches in diameter. The GAP distribution network is illustrated on Figure 1-1. It is important to note the GAP also supplies water for industrial uses such as cooling and process wash down.

1.4 FUTURE EXPANSION AVAILABILITY

OCWD owns a section of unused GAP pipelines in the central portion of the City of Huntington Beach. These pipelines are currently being leased by the City of Huntington Beach for potable and nonpotable uses. Before any GAP service could commence in this area, several additional miles of GAP pipeline would need to be constructed and the end-user sites retrofitted.

1.5 BENEFITS

Water produced by the GAP reduces groundwater pumping activities along the coast. By providing a source of recycled water, GAP is very beneficial to the coast and, in essence, reduces the need for any producer(s) to construct new production wells along the coast.

The GAP system brings awareness to the importance and the reliability of local water resources. In order to meet the areas water demands, the local groundwater supplies are supplemented with imported water supplies from the State Water Project and the Colorado River Aqueduct. GAP provides a steady source of recycled water which is independent of the drought conditions in southern California and along the California and Colorado aqueducts.

1.5.1 REDUCTION IN COASTAL PUMPING

The coastal portion of the groundwater basin, essentially that area within five miles of the coast, is sensitive to lower groundwater levels due to seawater intrusion potential and seasonal pumping patterns. Coastal groundwater levels are affected by groundwater production, overall groundwater storage in the basin, and to a lesser extent, injection at the Talbert and Alamitos Barrier.

With a treatment plant and distribution system located in Fountain Valley and other coastal cities, the use of recycled water reduces groundwater pumped in this coastal area. Cities that use GAP water reduce their total demand used in the BPP calculation which results in a reduction in pumping. The specifics are detailed in the Financial Information chapter (Chapter 3).

1.5.2 DROUGHT-PROOF SUPPLY

The GAP water supply can be consistently produced in both wet and dry years. The GAP system provides a secure water supply to its users. By providing a drought-

proof supply of water, the GAP enables OCWD to better manage its groundwater basin especially along the coast.

1.5.3 PROMOTING CONSERVATION

Many water users don't require potable quality sources. The GAP project promotes conserving and reusing wastewater while reducing demand on potable supplies.

2 INSTITUTIONAL ARRANGEMENTS

The GAP involves the participation of various agencies. The institutional arrangement and commitments are described below. A graphical description of the institutional arrangements is provided in Figure 2.1.

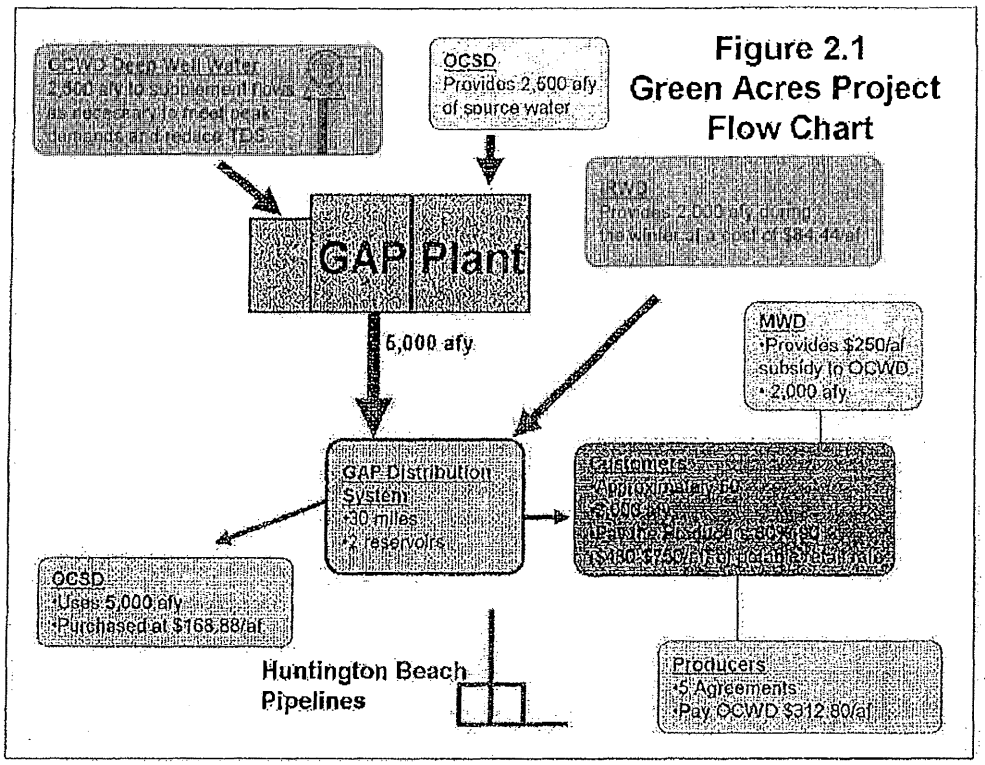


Figure 2.1
Green Acres Project
Flow Chart

2.1 ORANGE COUNTY SANITATION DISTRICT

The District has enjoyed a long successful relationship with the Orange County Sanitation District (OCSD) in providing reclaimed water for the area. OCSD has provided secondary treated wastewater to the District since 1975. This source water has been used to supply Water Factor 21, GAP, and now the Groundwater Replenishment (GWR) System. Staffs from the two agencies meet monthly to coordinate operations.

In November 2002, the two agencies executed the Joint Exercise of Powers Agreement for the Development, Operation and Maintenance of the Groundwater Replenishment System and the Green Acres Project agreement (see Appendix A for excerpt from agreement). The agreement generally provides for OCSD to provide source water for the GWR System and GAP. Paragraph 46.3 of the agreement also calls for the OCWD to provide 4.2 mgd of GAP supplies to OCSD for their treatment processes until January 15, 2012. This date also coincides approximately with a previous arrangement between IRWD, City of

Newport Beach, and OCWD whereby IRWD provides reclaimed water to supply the GAP system during the winter months.

OCSD has been receiving approximately 5,000 afy of GAP water. An approximately $6.0 million OCSD project to construct a closed loop cooling system to recirculate water used in their treatment processes has been developed. The project would allow OCSD to reduce their GAP demands to approximately 500 afy. From a water resources perspective, this project would free-up approximately 4,500 afy of reclaimed water that could be used in the OCWD service territory to reduce, by an equal amount necessary, MWD imported supplies to meet local water demands. Spending $6.0 million to create an additional 4,500 afy of local water supplies is very economical. However, this project was recently removed from the OCSD long-term capital projects program due to budget cuts.

2.2 RETAILERS

The District has entered into retailer agreements with the following Producers:

City of Santa Ana

City of Newport Beach

City of Fountain Valley

Mesa Consolidated Water District

City of Huntington Beach

The retailer agreements acknowledge that the use of reclaimed water for landscape irrigation is of mutual benefit to OCWD and the retailer in fulfilling their joint responsibilities for the conservation of water resources in accordance with Sections 13550 and 13551 of the California Water Code. The construction responsibilities are outlined in the document. The agreement requires the retailer to purchase the Project Water from OCWD, at the point of its metered connection, for an amount not to exceed eighty percent (80%) of the "area groundwater cost." The "area groundwater cost" shall be the same as the fixed and variable costs of groundwater production as calculated in the most recent OCWD Engineer's Report. The agreement also states that the governing body of the retailer shall establish the rate for the resale of Project Water to each Project Customer, in an amount not to exceed eighty percent (80%) (or 90% within the MCWD service area) of the "potable water" rate established by retailer.

These 25 year agreements include other requirements addressing water quality and pressure standards. The agreements' initial term is 25 years (which ends as early as 2013 and as late as 2016). If OCWD wanted to renegotiate or terminate the agreements, it would have to notify the retailer in writing "at least four years prior to expiration of the initial term" (Section 9.2 in most agreements).

The cost of GAP water to the Producers is 80 percent of the total cost to pump groundwater which is $312.80/af for FY 2006-07. The cost to pump groundwater

is annually established in the District's Engineers Report. Figures from the report are shown below in Table 2-1.

TABLE 2-1: DETERMINATION OF GAP WATER COST TO PRODUCERS

ITEM	UNIT COST
Replenishment Assessment	$223/af
Well energy cost based upon survey of all Producers	$56/af
Well O&M cost based upon survey of all Producers	$65/af
Capital component – estimated unit cost of constructing a well	$47/af
Total Cost	$391/af
80% of total cost	$312.80/af

2.2.1 NEWPORT BEACH, SANTA ANA, MESA CONSOLIDATED WATER DISTRICT

OCWD executed agreements with the cities of Newport Beach, Santa Ana and Mesa Consolidated Water District between 1988 and 1991.

2.2.2 FOUNTAIN VALLEY

While Fountain Valley's agreement with OCWD is relatively similar to the other cities' agreements, there are a few users who have replaced their groundwater pumping directly with reclaimed water. These users, located within the Green Acres service area boundaries and within the service boundaries of the retailer, were not served potable water by Fountain Valley for their landscape irrigation uses, and relied exclusively upon their own private groundwater production to satisfy their landscape irrigation demands. The end user agreement states that these groundwater customers shall agree not to produce groundwater in excess of 20% of its total landscape irrigation demands, and purchase GAP water from Fountain Valley and use GAP water in lieu of groundwater for landscape irrigation purposes. In consideration for purchasing and using Project Water in lieu of groundwater, the retailer agreed to sell the water to each customer at a rate that approximates the customers cost to irrigate using their onsite groundwater production and storage facilities.

2.2.3 HUNTINGTON BEACH

While an agreement with Huntington Beach was executed in 1991, only one user exists in their city. A series of pipelines was constructed in their city as a possible expansion was anticipated. However, a transmission line to these pipes was never constructed. Currently, the City of Huntington Beach is using these pipelines to convey potable and non-potable water supplies to various sites.

2.3 IRVINE RANCH WATER DISTRICT

The District entered into an agreement with the Irvine Ranch Water District (IRWD) and the City Of Newport Beach in 1996 (Appendix B) to receive excess IRWD reclaimed water into the GAP system during the winter months. IRWD had excess reclaimed water supplies during the winter when water demands in

their system decline. IRWD was unable to obtain a permit to discharge this water into the Upper Newport Bay and would have been forced to discharge the water into the OCSD sewer system at considerable expenses.

This agreement established construction of a Phase II pipeline which extended the GAP distribution system further into Newport Beach. This construction included an intertie so that IRWD could introduce IRWD recycled water from their Michelson plant into the GAP distribution system. The District could then receive this water and purchase it. The rate was established at 50 percent of the rate OCWD would sell GAP water to OCSD. The current purchase price is $84.44/af. While purchasing IRWD reclaimed water, the GAP treatment plant is shut down to accommodate treatment plant repair and maintenance. The water is generally purchased from November to March.

The term of the agreement expires in 2011. At that time, IRWD and OCWD may negotiate to continue the terms of the agreement.

2.4 END USERS AGREEMENTS

The end user agreements were established between the cities and the users of the recycled water. OCWD would sign the agreements in the capacity of as acknowledging consent to their execution. The agreement would establish the maximum flow a user could take from the city or water district and pressure requirements. The price of water was established as 80 percent of the potable rate. All of these agreements have expired and the users continue to pay for the water through the city's billing system as outlined in the agreement.

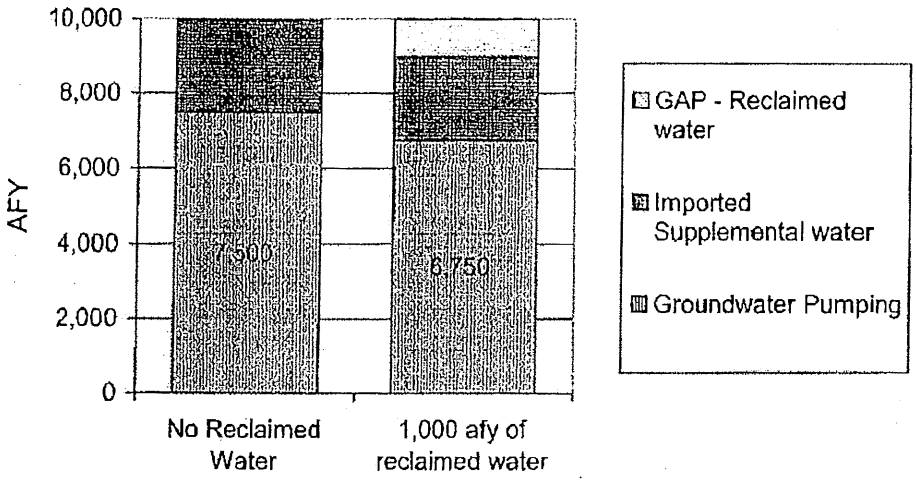
2.5 BPP IMPACT/OCWD ACT

GAP water received by the Producers is considered "neutral" water per the District Act. The water is not considered groundwater or imported supplemental water for purposes of calculating the Producers annual Basin Production Percentage (BPP). The net effect is that the Producer pumps less groundwater when using reclaimed water supplies to meet their water demands.

Figure 2-1 demonstrates the impacts of using reclaimed water (1,000 afy) for a hypothetical producer who has 10,000 afy of total water demands. The figure assumes the BPP is 75 percent. As shown, if no reclaimed water is taken, allowable pumping is 7,500 afy (75% BPP x 10,000 afy of total water demands). However, if 1,000 afy of reclaimed water is used, allowable pumping is 6,750 (10,000 afy -1,000 afy x 75%).

The cost of the GAP reclaimed water is relatively low. However, the producer also has their allowable groundwater pumping reduced.

FIGURE 2-1: BPP IMPACTS OF USING RECLAIMED WATER



An alternative pricing policy would have reclaimed water replace the amount of imported supplement water used and not reduce the amount of groundwater pumped. This could be an option if the retailer agreement terms were renegotiated.

2.6 STATE LOANS

Two loans from the State Water Resources Control Board have been received to assist funding the construction of GAP. The first loan was for $2.0 million at an interest rate of 3.3 percent. Annual debt payments are $177,932 until 2010. Approximately $516,000 of principle remains outstanding.

A second loan of $4.29 million at an interest rate of 2.8 percent was also obtained. The annual debt payments are $290,331 until 2017. Approximately $2.8 million of principle remains outstanding on this loan. If the District were to discontinue operating the GAP system, it is possible the State could require payment of the remaining principle amounts for both loans.

2.7 MWD LRP AGREEMENT

OCWD receives a subsidy of $250 per acre-foot on water produced and delivered through the GAP. This subsidy is administered through the Local Resources Program (LRP) from Metropolitan Water District of Southern California (MWD). A significant portion of the recycled water from the GAP is also delivered to the OCSD for various in-plant uses. However, these deliveries, about 5,000 afy, do not replace an existing demand or prevent a new demand on Metropolitan and, therefore, are not eligible for the subsidy. Typically during the winter, the recycled water purchased from IRWD through the intertie with the Newport Beach pipeline is used to satisfy system demands. During this time, the GAP treatment plant is taken out of service for maintenance and repairs.

Recycled Water deliveries made through the OCWD/IRWD intertie to serve users is considered eligible for LRP funds. OCWD currently blends groundwater with GAP water produced by the tertiary plant to control water quality standards and to supplement volume during high demand periods.. Groundwater is ineligible for payment under LRP.

3 FINANCIAL INFORMATION

The Green Acres Project tertiary water is produced in Fountain Valley by OCWD. The distribution system extends into 5 cities (Fountain Valley, Santa Ana, Costa Mesa, Huntington Beach and Newport Beach). OCWD has established end user agreements with each of the recycled water users. These agreements established that the cities would collect the water rates and in turn pay OCWD for total volume used. OCWD and OCSD have a separate agreement (see Appendix A) in place in which OCSD would pay OCWD direct. OCWD pays IRWD direct for water purchased through the OCWD/ IRWD intertie.

3.1 SALES / REVENUE STRUCTURE

OCWD invoices six customers monthly for water usage. OCWD expects approximately $2 million of revenue from recycled water sales in the current fiscal year. Table 3.1 shows amounts of GAP water purchased and revenue received from the 6 agencies in FY 2005-06.

TABLE 3-1: GAP REVENUE BY AGENCY (FY 2005-06)

AGENCY	GAP WATER PURCHASED (AF)	REVENUE
OCSD	5,058	$833,339
Fountain Valley	967	$352,881
MCWD	705	$217,175
Newport Beach	248	$82,490
Santa Ana	155	$51,430
Huntington Beach	0	$0
Total	7,133	$1,537,317

3.1.1 RATE STRUCTURE

Table 3.2 contains a list of the previous year's rates (FY 2006-07) for the cities, agencies, and groundwater producers. These rates are established every fiscal year and are generally calculated by multiplying 80 percent to the cost of producing groundwater.

TABLE 3-2: GAP RATES BY AGENCY (FY 2006-07)

AGENCY	COST
Orange County Sanitation District	$168.88
City of Fountain Valley	$312.80
Mile Square Park	$404.09
Mile Square Golf Course	$362.25
City of Santa Ana	$312.80
Mesa Consolidated Water District	$312.80
City of Newport Beach	$312.80
City of Huntington Beach	$312.80

The rate used for OCSD is calculated in accordance with the Joint Operating Agreement between OCWD and the OCSD. It was re-established in 2002 at $150 per acre-foot and adjusted each year with the Consumer Price Index.

Mile Square Park and Mile Square Golf Course have separate fees as they are reducing demand on dedicated irrigation wells and not City potable supplies. They still pay through the City of Fountain Valley like other end users.

The cities currently have a minor incentive to use GAP. Table 3-3 illustrates a comparison of producer costs with and without GAP supplies. The example uses a hypothetical demand of 10,000 afy assuming a 75% BPP. Due to the BPP formula employed by OCWD, if no GAP supplies were provided, that demand would be split between the groundwater basin and imported supplies based on the BPP. Therefore, 75% of that demand would be additionally pumped from the basin and 25% would be purchased through MWD.

TABLE 3-3: PRODUCER GAP VS NO GAP WATER SUPPLY COST EXAMPLE

Producer
Assumed BPP = 75%

Total Water Demands Assumed	**10,000 afy**			

Without GAP

Supply Source	Amount	Unit Cost		Total Cost
MWD/MWDOC Supplies	2,500 afy	$500	/af	$1,250,000
Groundwater Pumping (RA, Elec)	7,500 afy	$297	/af	$2,227,500
Total	10,000 afy			$3,477,500
	Melded Unit Cost	**$348**	**/af**	

With GAP

Supply Source	Amount	Unit Cost		Total Cost
MWD/MWDOC Supplies	2,250 afy	$500	/af	$1,125,000
GAP	1,000 afy	$312	/af	$312,000
Groundwater Pumping (RA, Elec)	6,750 afy	$297	/af	$2,004,750
Total	10,000 afy			$3,441,750
	Melded Unit Cost	**$344**	**/af**	

Difference in Melded Cost	**$4.0**	**/af**	
Percent Difference	**-1.1%**		
Total Water Supply Cost Savings to Producer	**$36,000**	**/year**	

This example illustrates that the cost stay relatively neutral for the Producer. There is a negligible financial incentive for the water supply producer to continue to take GAP supplies.

3.1.2 END USER – RETAILER AGREEMENT

The end user agreement establishes that that recycled water user will be charged a rate of 80 percent (90% in Mesa Consolidated Water District's service area) of their water retailer's potable supply rate.

3.2 OPERATING COST

The operating cost of the GAP has been calculated by examining the actual expenditures over the last few years. Table 3.4 includes a summary based on the last full year of operation (FY 2005-06). The total production out of the plant, deep well water pumped, and IRWD purchases are included in the calculation to determine an overall cost. The deep well water pumped is an extraction of water from the groundwater basin so an assumption was used that the cost of the Replenishment Assessment (RA) should be used on every acre-feet extracted from the basin. The debt costs are not included in the unit cost of the water for comparison purposes. It is addressed in section 3.4 below.

The treatment of the plant includes chemicals, maintenance, repair, and minor equipment. Electricity is divided up amongst onsite, offsite, and deep well pumping components. Labor to support the operations of the GAP is mostly attributed to the Laboratory and Water Production staff.

TABLE 3-4: GAP UNIT COST (FY 2005-06)

	Acre-feet		
Total Production 05-06	7,114		
IRWD Purchases	2,354		
Deep Well	2,055		
GAP Production	2,705		
Current Expenses			
Operation and Maintenance			
Treatment		$	60,000
Chlorination		$	53,600
Pumping/ Distribution Electricity		$	459,776
Treatment Electricity		$	83,561
Deep Well Pumping		$	80,470
Labor		$	271,377
Subtotal		$	1,008,784
Deep Well Replenishment		$	472,673
Irvine Ranch Water District Water Purchases		$	169,298
R&R Contribution		$	200,000
Expenses (Total)		$	1,850,755

Acre-feet		
O&M Component (per acre-foot)	$	260
Water Sales		
OCSD	$	833,340
Fountain Valley	$	352,881
MCWD	$	217,175
Newport Beach	$	82,490
Santa Ana	$	51,430
Local Resources Program (LRP) from Metropolitan Water District	$	514,000
Total Revenue	$	2,051,316
Loss (Profit)	$	(200,561)
Total Debt		
OCWD CIP Debt	$	2,500,000
State Loan Debt	$	500,000
Total	$	3,000,000
Total Debt Payment (per acre-foot)	$	422
Net Cost after Debt Payments	$	2,799,439
Unit Cost (per acre-foot)	$	394

3.3 DEBT COSTS / STATE WATER RESOURCES CONTROL BOARD LOANS

Two SWRCB loans were issued for the construction of the GAP through the Clean Water and Water Reclamation Bond Law of 1988 (Chapter 17, Division 7, Water Code) (see Table 3.4).

The repayment schedules are included in Section 3.3.2. In addition, OCWD has included the remainder of the construction costs into a debt issuance as part of the District's larger Capital Improvement Program debt program. This amount was approximately $42 million. While these debt payments have been restructures as part of the District's overall plan of finance to be paid in future years, the annual cost can be estimated using a 30 year life and an interest rate of 4.5 percent and equates to approximately $2.5 million.

3.3.1 STATE LOAN TERMS

The two state loans have been issued for the treatment plant and the pipeline.

TABLE 3-5: STATE WATER RESOURCES CONTROL BOARD LOANS

LOAN	AMOUNT	INTEREST RATE	CONTRACT DATE	TERM
Phase I	2,000,000	3.3%	1989	14 years
Phase II	4,380,000	2.8%	1997	19 years

The major terms are listed in the table above. The loan agreements also state that the Agency "shall not abandon, substantially discontinue use of, lease, or dispose of the Project or any significant part or portion thereof during the useful life of the Project without prior written approval of the State Board. Such approval may be conditioned as determined to be appropriate by the State Board, including a condition requiring repayment of all or any portion of all remaining loan funds covered by this contract together with accrued interest and any penalty assessments which may be due."

3.3.2 REMAINING STATE LOAN PAYMENT

The remaining state loan payments are included below.

TABLE 3-6: STATE LOAN PAYMENT ALLOCATION – PHASE I

YEAR	PRINCIPAL	INTEREST	REPAYMENT
2006	$206,444	$83,887	$290,331
2007	$212,225	$78,106	$290,331
2008	$218,167	$72,164	$290,331
2009	$224,276	$66,055	$290,331
2010	$230,555	$59,775	$290,331
2011	$237,011	$53,320	$290,331
2012	$243,647	$46,684	$290,331
2013	$250,469	$39,861	$290,331
2014	$257,482	$32,848	$290,331
2015	$264,692	$25,639	$290,331
2016	$272,103	$18,227	$290,331
2017	$279,722	$10,609	$290,331
2018	$99,154	$928	$100,082

TABLE 3-7: STATE LOAN PAYMENT ALLOCATION – PHASE II

YEAR	PRINCIPAL	INTEREST	REPAYMENT
2008	$160,909	$17,022	$177,931
2009	$166,219	$11,712	$177,931
2010	$171,705	$6,226	$177,931
2011	$16,985	$47	$17,032.64

3.4 METROPOLITAN WATER DISTRICT OF SOUTHERN CALIFORNIA SUBSIDY

OCWD receives a subsidy of $250/af on water produced and delivered through the GAP. This subsidy is administered through the Local Resources Program from MWD. Currently a revised LRP subsidy agreement for GAP is being

developed. Based on current and expected demands, GAP would receive $250/af for up to a maximum of 2,800 afy of recycled water delivered to regular customers (excludes OCSD deliveries). The revised agreement would also allow GWR System water to be sent to GAP (whether microfiltration (MF) or reverse osmosis (RO) treated) to supplement GAP to receive the full $250/af subsidy. All IRWD intertie water for GAP would continue to receive the full subsidy. In addition, the $250/af would be fixed (i.e., not sliding scale as is currently required) without annualized capital and operations and maintenance (O&M) cost reconciliations. The term of the agreement expires in the October 2016.

4 ISSUES/CONCERNS

There are various issues which affect the operation and cost of the Green Acres Plant. These include water quality concerns, separate treatment systems, and cost impacts. The issues are summarized below.

4.1 WATER QUALITY

4.1.1 ADVANCED PRIMARY

The OCSD uses advanced primary treatment as a part of their treatment process. This treatment option involves adding anionic polymer to increase the settling in the first treatment stage (primary treatment). Depending on the type of polymer used, potential deleterious impacts on the GAP treatment may be inevitable. While chemical usage coordination takes place with OCSD consistently, a polymer that may help OCSD's treatment may hurt OCWD's GAP operations. Certain polymers prevent the GAP treatment processes from treating the higher turbidity water. Coordinating this use of polymer is a challenge to both OCWD and OCSD operations.

4.1.2 TURBIDITY

Turbidity fluctuations and spikes are common in secondary effluent received from OCSD. The GAP permit does not allow the plant to operate if the influent turbidity exceeds 10 nephelometric turbidity units (NTU). While OCSD makes efforts to control this, it is an inevitable part of operating a large wastewater treatment facility. The filtration process that is used in the GAP treatment is sensitive to varying influent water quality. Filtration rates can sharply decline with these spikes causing serious reductions in water quality and flow in the plant output. This variability of influent turbidity was one of the reasons that microfiltration was chosen as a pretreatment step in the GWR System process as it is able to maintain consistent water quality throughout turbidity spikes.

Turbidity spikes can occur due to various reasons. One example is if the activated sludge process at OCSD enters into a nitrification state and a chlorine residual is difficult to maintain, blowers need to be shut down to kill off the organisms. This would upset not only their plant but the GAP. Turbidities could average over 10.0 NTU causing a plant upset.

4.1.3 SALINITY

Salinity is a concern for some end users of GAP recycled water. The treatment process at OCSD and in the GAP treatment plant does not remove salinity. This is a concern for two golf course users who elect not to use the GAP water during the summer months for watering their fairways and greens as it can result in dying grass. Currently, these two users have access to and have been periodically using potable water which is lower in salt content than the recycled water. There is a potential concern that this could impact other end users and may be a deterrent to future users.

4.2 COORDINATION WITH GWR

GAP and the Groundwater Replenishment System (GWR System) both receive clarified secondary effluent from OCSD. When the GWR System is fully operational, it will take the majority of the OCSD water and treat it for groundwater recharge and injection into the seawater intrusion barrier. A smaller portion will be used to feed the GAP plant. The Water Production group, consisting of operators and maintenance staff, is responsible for the operations of both treatment facilities. With a new treatment plant being commissioned, it is anticipated that the major focus of the staff will be operating the new GWR System efficiently.

While the two treatment plants can be operated by the same staff, they are very different technologies and the filtration system of the GAP requires more labor per acre-foot produced than the microfiltration plant. Microfiltration produces a better water quality to the flocculation/ filtration system of GAP.

4.3 SUPPLEMENTING GAP SUPPLIES WITH DEEP WELL WATER

Because of the issues discussed above, the District needs to supplement the GAP water supply with deep well water to make up for shortages of untreatable high turbidity water from OCSD and to help with controlling salinity. This deep well water is rich in color and low in salinity. It has been mainly used to satisfy flow shortages during water quality problems with OCSD. The deep well water is pumped from four deep wells owned and operated by OCWD. Because OCWD is pumping from its own groundwater basin, there is a reduction in the amount of available groundwater. This impact is also included in the cost of GAP water as the replenishment assessment multiplied by the amount extracted. There has been no indication that pumping from this colored zone has a negative impact on preventing seawater intrusion. While the deep well water is generally not potable, the wells are screened between the color and clear zones potentially drawing from both aquifers. This is a draw on the groundwater basin and is not the optimum supplement for the GAP supplies. Deep well water used in the GAP system is not eligible for the MWD Local Resource Program (LRP) subsidy offered through MWD.

5 ALTERNATIVES

Five alternatives are listed below for consideration. Staff had begun evaluating additional options but was able to reduce the options after input from the Board and Producers. Preliminary cost estimates have been developed to support each of the options and are provided at the end of this section. All alternatives include a base cost of paying off the debt to construct GAP and the associated pipelines. These alternatives are not mutually exclusive and may be combined.

5.1 MAINTAIN CURRENT SYSTEM

This alternative involves operating the plant in the same manner as it is currently. In January 2012, OCWD would stop serving OCSD and would not be required to take water from IRWD. Issues regarding this option have been discussed in Issues chapter.

5.2 ABANDON GAP SYSTEM

This alternative involves decommissioning the entire GAP. The treatment plant, pump station, chlorine contact chamber, reservoir, and pipelines would need to be demolished, sold, or abandoned. This would discontinue delivery of recycled water supplies to over 50 customers.

There are concerns regarding this alternative. While the end-user agreements are expired, there will be a cost to retrofit their connections to the city's potable distribution system. This is estimated at $1,250,000 ($25,000 a connection x 50 connections). OCWD is not responsible for this cost but it would be a cost associated with abandoning the project. There is still a contractual obligation to provide water to OCSD (and receive water from IRWD) until January 2012. If GAP was decommissioned, OCWD would need to explore how to be relieved of these two obligations.

GAP was constructed at an approximate cost of $47 million. Approximately $3.3 million remains in low interest loans from the SWRCB. Based on the agreement, OCWD "shall not abandon, substantially discontinue use of, lease, or dispose of the Project or any significant part or portion thereof during the useful life of the Project without prior written approval of the State Board. Such approval may be conditioned as determined to be appropriate by the State Board, including a condition requiring repayment of all or any portion of all remaining loan funds covered by this contract together with accrued interest and any penalty assessments which may be due." This could be a large one time expenditure on the annual budget if an immediate payment was required.

A cost to demolish the GAP facilities has not been estimated. Some salvage costs may be expected and OCWD could actively market the Santa Ana Reservoir for resale.

Coastal Producers would increase their normal groundwater production by approximately 1,500 afy (assuming a 75% BPP). There would be a reduction of deep well pumping (approximately 2,500) which would benefit the groundwater basin.

With the decommissioning of the GAP, operations staff would then be able to focus their attention on the startup and operation of the GWR System. It would reduce the challenges of staff operating two treatment facilities.

5.3 SELL CAPACITY TO IRWD

IRWD operates a recycled water facility which provides water to GAP during winter months. IRWD, the City of Newport Beach, and OCWD entered into an agreement related to the OCWD use of IRWD reclaimed water in 1996. In order for IRWD to reduce discharges of reclaimed water into the Upper Newport Bay, the agreement requires OCWD to accept between 4.6 and 7.8 mgd of supplies for up to six winter months at a discounted rate of $84/af. A 24-inch intertie connection was constructed following execution of this agreement which allows for the introduction of IRWD reclaimed water into the OCWD GAP distribution system. OCWD shuts down operation of the Green Acres Plant during these months. OCSD is the primary user of GAP supplies in the winter and pays $168/af to OCWD for the supplies. This agreement expires in 2011.

IRWD desires to maintain this relationship with the District whereby they can continue to send excess winter time reclaimed water to the District or OCSD. IRWD may be interested in supplying water to GAP customers (excluding OCSD) throughout the year. IRWD tends to have less salinity in their water due to the source of their wastewater. This could alleviate the concerns of the two golf course users who are currently connected to potable water.

There are various options regarding the involvement of IRWD. If the treatment responsibilities are passed on to IRWD, the LRP subsidy should still be available to either IRWD or OCWD depending on the pricing structure arranged by both agencies. The options include:

1. Let existing IRWD agreement expire in 2012
2. Extend current agreement with IRWD and Newport Beach
3. Contract operation and maintenance or sell entire GAP System to IRWD
4. Contract operation and maintenance or sell Newport Beach branch to IRWD

Option 1: Let Current Arrangement Expire in 2012.

The agreement with IRWD and Newport Beach will expire in 2012. IRWD would continue to provide water to OCWD in the winter months until that time.

Option 2: Extend the Current Agreement with IRWD and Newport Beach

The agreement with IRWD and Newport Beach could be renewed in 2012. IRWD, OCWD and City of Newport Beach may need to renegotiate terms of this agreement.

Option 3: Contract or Sell Operations of GAP System to IRWD

OCWD could hire IRWD to supply, operate and maintain the GAP system. IRWD would not be able to produce enough water to supply the entire GAP system until

2012 when the OCSD is no longer a user. There may be perception and institutional hurdles of IRWD operating in various water jurisdictions.

Alternatively, OCWD could transfer ownership (sell) the GAP system to IRWD who would need to negotiate new agreements with the users and the participating producers. IRWD would own facilities in the Cities of Fountain Valley, Huntington Beach, Santa Ana, Costa Mesa, and Newport Beach. Some water agencies may have concerns about such an arrangement.

This would allow OCWD to discontinue pumping deep well water as well as having coastal cities reduce groundwater pumping by continuing to rely on recycled water. IRWD may need to make improvements to the distribution system in order to satisfy minimum pressure requirements to have IRWD water reach the northwestern area of the GAP service area.

Option 4: Contract or Sell Operations of Newport Beach Branch of GAP System to IRWD

Options for this section of the GAP system are being separately provided because: (1) the Newport Beach golf courses served require a lower salinity water supply which can force the District to pump well water to blend down the overall GAP plants TDS concentration; and (2) there could be fewer institutional issues.

A. OCWD would contract with IRWD to supply, operate and maintain this section of the GAP system for the District.

B. OCWD could transfer ownership (sell) of this portion of the GAP system to IRWD who would need to negotiate new agreements with the users and the City of Newport Beach.

5.4 GWR SYSTEM MF TO PROVIDE RECYCLED WATER

The GWR System treatment plant consists of three major treatment processes; MF, RO and an advanced oxidation process, which consists of ultraviolet (UV) light and hydrogen peroxide. Currently in the GWR System plant, membranes operate in conjunction with advanced oxidation processes to provide treatment of wastewater. MF is a low-pressure membrane process that removes suspended matter from water. MF specifically will be used to separate suspended and colloidal solids including bacteria and protozoa from the OCSD secondary effluent.

MF produces a quality of water very similar to the flocculation/filtration system of GAP. While the two treatment plants can be operated by the same staff, they are based on very different technologies and the filtration system of the GAP requires more labor per acre-foot produced than the MF process.

This alternative would entail the decommissioning of the treatment plant portion of GAP and replacing that treatment step with MF. The GWR System was designed with piping that would accommodate delivering excess MF product to the GAP chlorine contact basin for chlorination disinfection and then delivery (via the GAP pump station) to GAP customers.

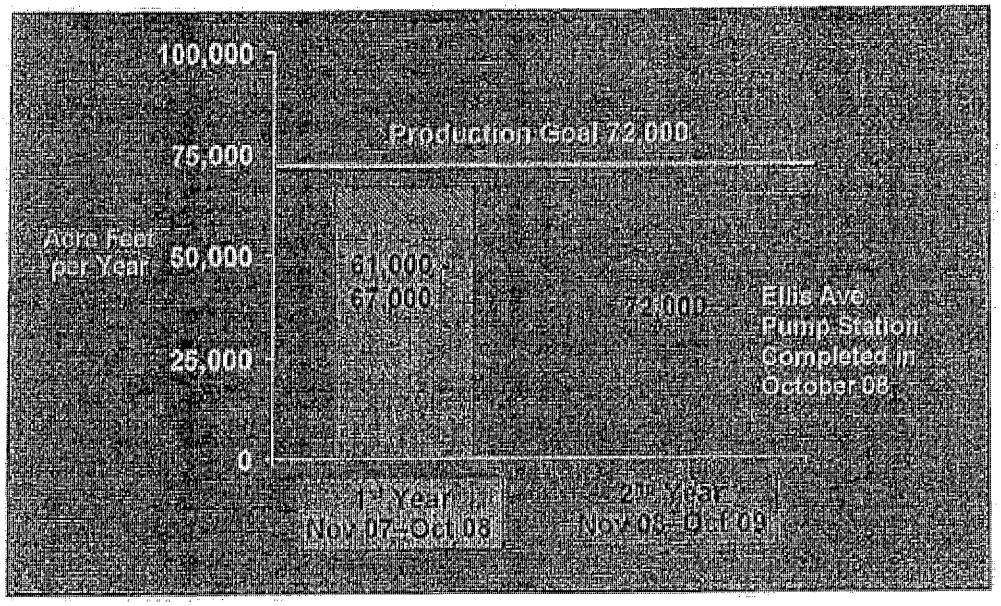
Because the majority of the GAP System (distribution facilities, pumps station, and chlorine contact basin) is being used, it is not expected that the State Board would require an immediate payback on the low interest loans. A portion of the treatment plant would no longer be needed and there could be a cost to convert or demolish it.

The GWR System production amounts (shown in Figure 5.1) for the first year of operation assume that GAP will continue to produce approximately 2,700 afy. Staff believes that with the storage in the GAP System, increased flows can be produced during the day with the excess MF capacity. This process will need to be examined when the operation of the GWR System begins and can be ramped up according to available flows from OCSD. An initial operational approach may entail ramping up MF production while decreasing the GAP treatment output.

This alternative also allows a discontinuation of operating two separate reclamation treatment plants as addressed in the other alternatives. Coastal pumping would be reduced as reliance on deep well water would be removed.

Finally, MWD has approved in concept the idea of MF water being eligible for the full GAP LRP subsidy.

FIGURE 5-1: PRODUCTION OF GWR SYSTEM BASED ON OCSD FLOWS



5.5 DEEP WELL WATER

This alternative involves decommissioning the GAP treatment facility and relying entirely on deep well water for GAP customers. There is a concern that this is not the appropriate water resource message that the District should promote. Using groundwater supplies for irrigation and other non-potable uses is not a

prudent management practice for the groundwater basin when reclaimable water supplies are economically avaiable.

This alternative would continue to impact the basin due to the groundwater pumping. There has been no indication that pumping from this colored zone will have a negative impact on preventing seawater intrusion. While the deep well water is generally not potable, the wells are screened between the color and clear zone potentially drawing up both supplies. This would be a draw on the groundwater basin and may not be the optimum supplement for the GAP system. Currently, four deep wells are used to extract the water from the basin. These may not provide enough production to meet the summer demands.

This deep well water is high in color and low in salinity. Issues of perception may arise from the color and possible staining. Deep well water used in the GAP system is not eligible for the LRP subsidy offered through MWD.

However, some benefits include the discontinuation of operating two separate reclamation treatment plants and a minimal maintenance cost to operate the pumps for the deep well water.

5.6 COST COMPARISON

Table 5.1 presents a cost comparison of the alternatives. The IRWD option(s) are not shown as the costs of that alternative would be based on negotiations with IRWD.

This cost comparison uses actual figures (Alternative 5.1) from the last full year of operation of GAP. This was in 2005-06. This comparison is valid until 2012 when the IRWD/OCSD commitment ends.

The table calculates:

A. Total Expenses of each option. This includes operation and maintenance costs as well as any costs associated with IRWD purchases, deep well pumping, and replacement and refurbishment costs.

B. Unit cost independent of revenues is calculated next.

C. Total revenue from water sales and LRP subsidies.

D. Net unit cost including the capital (or debt) component.

TABLE 5-1: COST COMPARISON OF ALTERNATIVES

	Acre-Feet
Total Production 05-06	**7114**
IRWD Purchases	**2354**
Deep Well	**2055.1**
GAP Production	**2704.9**

	Keep GAP operating in current mode	Abandon GAP program completely	Use MF water to supply GAP customers	Use deep well water to supply GAP customers
	Current	**Option 1**	**Option 2**	**Option 3**
Capital Improvements Required (annualized)		$ 81,314	$ 9,758	
Operation and Maintenance				
Treatment	$ 60,000	$ -	$ 200,000	$ -
Chlorination	$ 53,600	$ -	$ 53,600	$ 53,600
Electricity Offsite	$ 459,776	$ -	$ 459,776	$ 459,776
Treatment Electricity	$ 83,561	$ -	$ 118,037	
Deep Well Pumping	$ 80,470	$ -		$ 105,914
Labor	$ 271,377	$ -	$ 200,000	$ 50,000
Subtotal	**$ 1,008,784**		**$ 1,031,412**	**$ 669,289**
Deep Well Replenishment	$ 472,673	$ -	$ -	$ 1,094,800
Irvine Ranch Water District Water Purchases	$ 169,298	$ -	$ 169,298	$ 169,298
R&R Contribution	$ 200,000	$ -	$ 200,000	$ 25,000
Expenses (Total)	**$ 1,850,755**	**$ (81,314)**	**$ 1,410,468**	**$ 1,958,388**
O&M Component (per acre-foot)	**$ 260**		**$ 200**	**$ 275**

	Keep GAP operating in current mode	Abandon GAP program completely	Use MF water to supply GAP customers	Use deep well water to supply GAP customers
Water Sales				
OCSD	$ 833,340	$ -	$ 833,340	$ 833,340
Fountain Valley	$ 352,881	$ -	$ 352,881	$ 352,881
MCWD	$ 217,175		$ 217,175	$ 217,175
Newport Beach	$ 82,490	$ -	$ 82,490	$ 82,490
Santa Ana	$ 51,430	$ -	$ 51,430	$ 51,430
Local Resources Program (LRP) from Metropolitan Water District	**$ 514,000**	**$ -**	**$ 514,000**	
TOTAL REVENUE	**$ 2,051,316**	**$ -**	**$ 2,051,316**	**$ 1,537,316**
Loss (Profit)	**$ (200,561)**	**$ -**	**$ (640,847)**	**$ 421,072**
Debt				
Debt	$ 2,500,000	$ 2,500,000	$ 2,500,000	$ 2,500,000
State Loans	$ 500,000	$ 500,000	$ 500,000	$ 500,000
Total	**$ 3,000,000**	**$ 3,000,000**	**$ 3,000,000**	**$ 3,000,000**
Debt Payment (per acre-foot)	**$ 422**	**$ 422**	**$ 422**	**$ 422**
Net Cost after Debt Payments	**$ 2,799,439**	**$ 2,918,686**	**$ 2,359,153**	**$ 3,421,072**
Unit Cost (per acre-foot)	**$ 394**	**$ 410**	**$ 332**	**$ 481**

6 RECOMMENDATION

Based on the issues presented, the alternatives available to OCWD and the startup of the GWR System, staff recommends proceeding with Alternative 5.4. This involves using the excess microfiltration capacity to provide water to the GAP system. It is proposed to continue use of the GAP pump station, the chlorine contact chamber and reservoir and distribution system. Based on the cost analysis, this alternative is the least costly for the District and increases operational efficiencies of Water Production staff. The demolition of the treatment portion of the plant is not included. This may not be required as the building houses the effluent pump station which would still need to be operated. Figure 6.1 identifies a timeline of important milestones in the future of GAP.

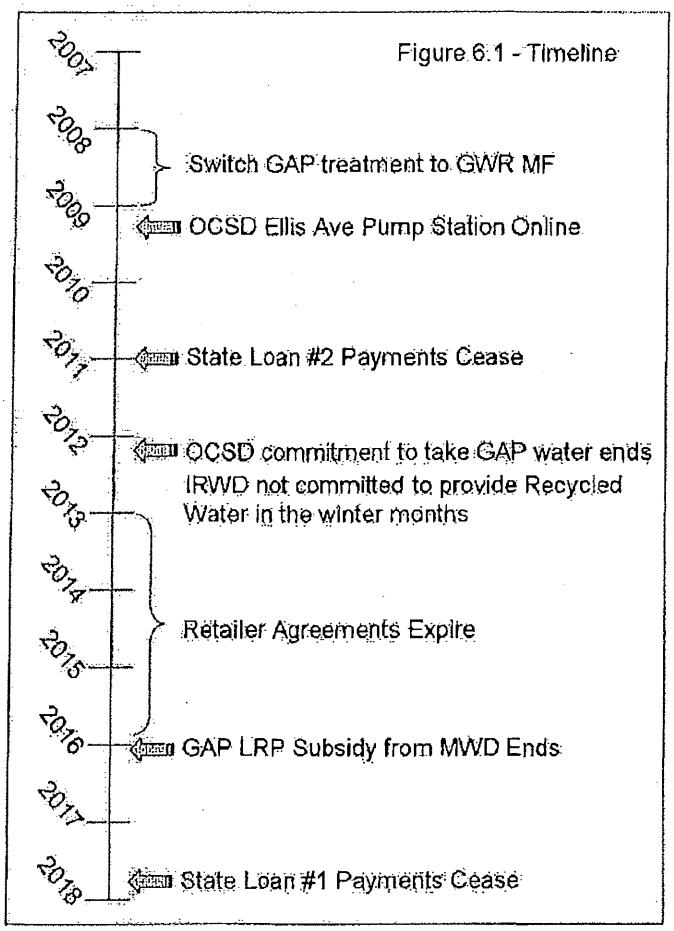


Figure 6.1 - Timeline

This recommended alternative does not preclude OCWD from continuing to discuss options of leasing or selling portions of the GAP capacity to IRWD. A cost basis has been developed that will allow the District to evaluate if it is beneficial to proceed with a sale or lease option with IRWD.

This recommended alternative would entail a staged approach to using MF as the main treatment step. As the GWR System plant starts up and operates in regular mode, water production staff can begin introducing MF water into the GAP system. If at any point, this option requires increased costs (compared to the current operation), the process can be revaluated. This would also be done as water is available from OCSD. The Ellis Avenue Pump Station being constructed by OCSD will provide additional flows to Plant 1 for reclamation. This facility will allow the GWR System to receive increased flows. Until that time, operations staff will take advantage of higher daytime flows to produce both GWR and GAP supplies to meet demands.

This approach will require regulatory approval though the Regional Water Quality Control Board and California Department of Public Health. It is anticipated that this should not be problematic as MF water has been used for GAP previously.

Aside from operational changes, it is recommended that OCWD consider "renegotiating" the retailer agreements with the four retailers. The agreements' initial term is 25 years (which ends as early as 2013 and as late as 2016). If OCWD desires to renegotiate or terminate the agreements, it would have to notify the retailer in writing "at least four years prior to expiration of the initial term" (Section 9.2 in most agreements). Thus, OCWD, if it so choose, should start the "notification/ renegotiation process now. Each agreement is very similar to the others in content, which means they all should be renegotiated at the same time as a group.

Appendix A

EXECUTION VERSION

JOINT EXERCISE OF POWERS AGREEMENT FOR THE DEVELOPMENT, OPERATION AND MAINTENANCE OF THE GROUNDWATER REPLENISHMENT SYSTEM AND THE GREEN ACRES PROJECT

November 12, 2002

(c) Automobile Liability, including non-owned and hired vehicles	$1,000,000 combined single limit per occurrence

Each Party shall name the other Party as an additional named insured on all of the above listed policies (other than Worker's Compensation). Each Party shall furnish certificates of insurance showing coverage to the other Party. Where a Party, by its Board of Directors approval, has elected to partially or fully self-insure any of the above required coverages, it shall provide to the other Party all the relevant written policies and actions to establish said programs.

46. Reclaimed Water Service To The Sanitation District. The Water District may deliver Reclaimed Water to the Sanitation District on the terms and conditions set forth in this Agreement, provided however, that the Water District is not obligated to deliver any specific quantity of Reclaimed Water to the Sanitation District.

46.1 Cost of Reclaimed Water. During the period of July 1, 2001 through June 30, 2002 the Sanitation District has paid to the Water District one hundred and fifty dollars ($150) per acre-foot for Reclaimed Water that the Water District delivers to the Sanitation District. This rate shall be adjusted as of June 30, 2002 and annually thereafter by the lower of (i) the change in the U. S. Consumer Price Index for Los Angeles – Riverside – Orange County for the preceding year or (ii) 2.5%.

46.2 Quality of Reclaimed Water. Subject to Section 54, the Reclaimed Water to be provided to the Sanitation District by the Water District shall meet the Reclaimed Water Standards and shall be reclaimed by tertiary treatment or other effective disinfection treatment that is acceptable to both of the Parties.

46.3 Minimum Delivery of Project Reclaimed Water. Until January 15, 2012, the Water District may deliver, and the Sanitation District shall accept if delivered, Reclaimed Water on a continuous basis of not less than 4.2 mgd average, calculated on a yearly basis. Water District shall deliver Reclaimed Water to the Sanitation District at a pressure of no less than 105 pounds per square inch (105 psi). Sanitation District warrants that flow demand requirements shall be a minimum of 1000 gpm daily average and not exceed an instantaneous combined maximum flow for the Sanitation District's Reclamation Plants 1 and 2 of 3500 gallons per minute (5 mgd). The Water District, with thirty (30) minutes advance notice to the Sanitation District, may suspend deliveries to the Sanitation District if the secondary effluent from the Sanitation District does not meet the requirements for Specification Influent. The Water District may resume deliveries when the secondary effluent meets the requirements for Specification Influent for a period of at least two (2) hours. After January 15, 2012, the minimum average daily requirement shall no longer apply.

46.4 Ownership of Green Acres Project Reclaimed Water Facilities. Sanitation District shall own, operate and maintain at its own expense all wastewater treatment facilities that lie within the boundaries of its two plants, specifically excluding the Water District's pump station at Plant No. 1 and metering facilities at Sanitation District's Plant No. 2. Water District shall own, operate and maintain at its own expense

Appendix B

AGREEMENT

This Agreement is entered into this 17th day of July, 1996, by and between the Orange County Water District (OCWD), the Irvine Ranch Water District (IRWD), and the City of Newport Beach (City).

Recitals:

A. The Parties support projects which beneficially use Reclaimed Water (for purposes of this Agreement, the term "Reclaimed Water" generally means water which fully satisfies Title 22 standards), without adversely impacting the environment and which are cost effective or have positive cost benefit ratios;

B. IRWD is the proponent of the Wetlands Water Supply Project (WWSP) which consists of a two (2) year Demonstration Phase (Demonstration Phase) and a subsequent Permanent Phase (Permanent Phase). The Demonstration Phase and the Permanent Phase each contemplate a winter (October 1 through March 31) discharge of a maximum of five (5) million gallons per day (mgd) of Reclaimed Water into waterfowl ponds (Duck Ponds) for a seven (7) day detention period with subsequent discharge into San Diego Creek and a summertime San Diego Creek "low flow" diversion component;

C. IRWD's implementation of WWSP will achieve the following objectives (collectively referred to as Project Objectives):

1. Provide a source of water to irrigate the Duck Ponds and marsh mitigation areas (MMA's) consistent with the WWSP Environmental Impact Report (EIR) and

IRWD's obligations pursuant to the Grant Deed from The Irvine Company (TIC) to IRWD dated December 28th, 1995.

2. Use Reclaimed Water for beneficial purposes.

3. Reduce the amount of nutrients flowing into Newport Bay during the summer.

4. Modify the amount of contributions to the County Sanitation District of Orange County (CSDOC) to more closely correspond with actual IRWD usage of CSDOC facilities.

5. Provide data relative to water quality and existing flora and fauna in Newport Bay that would be useful to the Santa Ana Regional Water Quality Control Board (SARWQCB) in setting standards pursuant to the Clean Water Act to protect and enhance bay water quality.

D. On July 1, 1996, SARWQCB approved Orders 96-2 (the Permit) and 96-3 which authorized IRWD to implement WWSP subject to certain conditions and restrictions,

E. City has been actively seeking measures which would allow the scientific community to better evaluate the potential impacts of WWSP and alleviate concerns expressed by certain members of the public and the scientific community about possible impacts of WWSP on Newport Bay, without interfering with IRWD's ability to achieve all or substantially all of the Project Objectives;

F. The Parties have identified a series of actions, projects, and permits (Basic Integrated Reuse Project) pursuant to which some of the Reclaimed Water otherwise used in conjunction with WWSP would be transmitted to OCWD for beneficial use or lawful disposal.

G. IRWD and City have identified additional actions or projects which, if implemented, could achieve Project Objectives on an interim basis, and possibly on a permanent basis, with discharge reductions or no discharge of Reclaimed Water into San Diego Creek or Newport Bay

H. The Parties desire to establish the terms and conditions pursuant to which they are willing to implement those components of the Basic Integrated Reuse Project, modify the amount of Reclaimed Water to be discharged pursuant to the Permit, establish the criteria that must be satisfied to preclude discharge of Reclaimed Water pursuant to the Permit for the period from October 1, 1996 to March 31, 1997 and to identify the additional issues that must be resolved to achieve, or possibly exceed, Project Objectives without Reclaimed Water discharges.

1. BASIC INTEGRATED REUSE PROJECT:

The Basic Integrated Reuse Project consists of the components specified in this Section. The Parties shall perform in accordance with their respective obligations provided all conditions precedent have been satisfied.

A. GREEN ACRES PHASE II (GAP II). GAP II is a water pipeline with a nominal capacity of 7.8 mgd to be constructed from the current terminus of OCWD's "Phase I" facility to the point of intersection with the Intertie as determined in the ASL Study and then extended to Newport Beach to serve End-users. OCWD shall pay the entire cost of GAP II. OCWD shall commence the design of GAP II when City has contributed $500,000 toward End-user retrofits which will increase the cost-benefit ratio of GAP II to 1.5 or more, and shall commence construction of GAP II when City has complied with its obligation to obtain End-user Agreements;

B. INTERTIE. The Intertie is a water pipeline with a nominal capacity of 7.8 mgd to be constructed between the Michelson Water Reclamation Plant (MWRP) and GAP II. IRWD shall pay the entire cost of designing and constructing the Intertie. IRWD shall commence the design of the Intertie when City has contributed $500,000 to OCWD for GAP II and shall authorize OCWD to commence construction of the Intertie when City has complied with its obligation to obtain End-user Agreements.

C. OCWD FLOW ACCEPTANCE COMMITMENTS. OCWD shall accept at least 4.6 mgd, and up to 7.8 mgd, of Reclaimed Water from IRWD (the additional 3.2 mgd is sometimes referred to as Excess Flows) during the period from October 1 through March 31. These commitments are subject to the following conditions:

(1) Completion of GAP II and the Intertie;

(2) The execution of a written agreement between CSDOC and OCWD pursuant to which CSDOC commits to accept from OCWD at least 4.2 mgd of Reclaimed

Water during the period from October 1 through March 31 for a period of fifteen (15) years, and to pay OCWD for the Reclaimed Water at a rate per acre foot equal to OCWD's cost to treat secondary water to a tertiary standard;

(3) IRWD's commitment to supply 4.6 mgd of Reclaimed Water on a continuous basis for the fifteen (15) year term of this Agreement;

(4) IRWD's commitment to supply a total of 7.8 mgd of Reclaimed Water (the 4.6 mgd described in 1.C(3) and an additional 3.2 mgd) on a basis to permit peaking by OCWD up to 7.8 mgd for up to fifteen percent (15%) of any twenty-four (24) hour period for the fifteen (15) year term of this Agreement;

(5) IRWD's commitment to sell at least 4.6 mgd of Reclaimed Water for no more than fifty percent (50%) of the price CSDOC pays OCWD for the Reclaimed Water and to receive no consideration for any Reclaimed Water in excess of 4.6 mgd except to the extent that OCWD receives consideration for the sale of some or all of the Excess Flows to any third party and, as appropriate, the framework for determining that consideration;

(6) IRWD's commitment to resolve, in good faith, issues related to water subsidies for Reclaimed Water, and Reclaimed Water transmission rates during peak period of demand; and

D. IRWD's FLOW TRANSMISSION COMMITMENTS. IRWD shall transmit at least 4.6 mgd of Reclaimed Water to OCWD during the period from October 1 through March 31 subject to the following:

(1) Completion of GAP II and the Intertie;

(2) Satisfaction of the conditions precedent to OCWD's Flow Acceptance Commitments;

(3) OCWD's payment for at least 4.6 mgd of Reclaimed Water at a rate not to exceed fifty percent (50%) of the price CSDOC pays OCWD for the Reclaimed Water;

E. CITY COMMITMENTS. City commits to do the following;

(1) Obtain fully executed End-user Agreements with Major Purchasers of Reclaimed Water within the corporate limits of City (Big Canyon Country Club and Newport Beach Country Club are among the End-users considered to be Major Purchasers and agreements with them are essential). City shall use its best efforts to obtain these agreements on or before October 1, 1996. OCWD and City shall amend the Green Acres Agreement to allow for the sale of Reclaimed Water above the current price ceiling.

(2) City shall contribute $500,000 towards End-user retrofits which will increase the cost benefit ratio of GAP II to I.5 or more. IRWD will loan City the $500,000 at a rate of interest equal to 6.4% , with the loan to be repaid over fifteen (I5) years in annual payments beginning twelve (I2) months after the receipt of the loan. The loan proceeds will be available within thirty (30) days after a written request of IRWD submitted by City at any time subsequent to the effective date of this Agreement.

2. CONSTRUCTION OF BASIC INTEGRATED REUSE PROJECT:

A. The Parties agree that OCWD will be designated as the lead agency for the construction of GAP II and the Intertie. The Parties agree to use their best efforts to ensure that GAP II and the Intertie are constructed and installed on or before October 1, 1997. Toward that end, the Parties agree to do the following:

(1) OCWD agrees to phase the construction of GAP II such that the initial portion of the facility to be constructed is the pipeline from the current terminus of Phase I to the point of connection with the Intertie (generally at the intersection of University and Jamboree);

(2) OCWD agrees to consolidate the construction of the Intertie and GAP II under the same contract, with the same construction management;

(3) The Parties agree to use their best efforts to expedite permit issuance, permit review, or plan check, including the assignment of personnel capable and willing to expedite, review or approve necessary plans or permits.

B. City, OCWD, and IRWD each agree to pay up to one third of the cost, not to exceed $30,000 each, of retaining engineering consultant who shall act as a Project Manager to implement and coordinate the timely completion of all components of the Basic Integrated Reuse Project.

3. FLOW CONSIDERATIONS

A. IRWD and OCWD agree to meet and confer to develop mutually acceptable adjustments to the flow commitments specified in this Agreement in the event of any change in winter Reclaimed Water demand, provided, however, IRWD will not initiate discharge of any Reclaimed Water into San Diego Creek as a result of any flow commitment modification implemented pursuant to this subsection.

B. In the event IRWD's ability to deliver 4.6 mgd of Reclaimed Water is interrupted or reduced due to operational conditions or other circumstances, and it is necessary for OCWD to supply Reclaimed Water from another source, IRWD will pay OCWD at one-half the CSDOC rate for the Reclaimed Water supplied by OCWD during such period.

4. WWSP DISCHARGE REDUCTIONS

A. In consideration of City's commitments pursuant to Subsection 4.B (1)-(4) and Section 5, IRWD agrees not to discharge more than 3.2 mgd of Reclaimed Water pursuant to the Permit.

B. In consideration of IRWD's commitment to reduce WWSP discharges, City agrees;

(1) Not to file an appeal of the Permit;

(2) Not to file or support any legal challenge to the Permit or the WWSP EIR;

(3) To request modification of AB 3344 to facilitate implementation of some or all of the provisions of this Agreement.

(4) To support amendment of IRWD's consolidated NPDES permit to authorize use of reclaimed water in the MMA's for irrigation of vegetation in a manner that does not result in any discharge of Reclaimed Water to San Diego Creek.

5. INTERIM WWSP DISCHARGE RESTRICTIONS

IRWD agrees not to discharge Reclaimed Water pursuant to the Permit during the period from October I, I996 through and including March 3I, I997 subject to satisfaction of the following:

A. CSDOC agrees, on or before October 1, I996, to calculate IRWD flows to CSDOC for the purpose of determining Capital Outlay Revolving Fund and Annual Equity Adjustment as if IRWD was exercising the Permit pursuant to provisions of this Agreement (discharging 3.2 mgd of reclaimed water into San Diego Creek);

B. SARWQCB acknowledges that the additional modeling and monitoring as determined pursuant to Subsection C will, if used with the data derived from a simulated two month operation of the WWSP (actual operation except for discharge) satisfy the first year of the Demonstration Phase;

C. City and IRWD shall, on or before September 1, I996 agree on any modifications to the internal monitoring program, the external monitoring program, and the model used to analyze the potential impacts of the discharge necessary or appropriate to

ensure the most accurate scientific evaluation of the Demonstration Phase of WWSP. City and IRWD shall cooperate with SARWQCB staff in evaluating modifications to the monitoring program required by the Permit to ensure scientific accuracy of the Demonstration Phase without increasing the costs of monitoring above those required to evaluate WWSP in accordance with the Permit. City shall fund the initial costs associated with the additional or modified monitoring or modeling up to a maximum of $15,000. IRWD shall fund additional costs in excess of the City's initial contribution up to a maximum of $30,000 ($15,000 from City and $15,000 from IRWD). City and IRWD shall attempt to reach agreement regarding any additional costs in excess of $30,000 .

D. City has obtained fully executed End-user Agreements with the Major Purchasers;

E. In the event the preconditions to "no discharge" (A,B,C and D of this Section) have not been satisfied on or before October 1, 1996, IRWD shall be entitled to discharge up to 3.2 mgd of Reclaimed Water only if it has received all necessary permits, approvals and authorizations, provided, however, IRWD shall cease discharge of Reclaimed Water pursuant to the Permit if all preconditions to "no discharge" have been satisfied on or before December 1, 1996, the cessation of discharges will not prejudice IRWD and the City pays for any costs associated with the cessation of discharges.

F. In the event the preconditions to "no discharge" are fully satisfied on or before October 1, 1996, and subsequent to the simulated operation of WWSP as well as at least two months of the summertime low flow diversion, City and IRWD shall meet and

confer relative to preparation of, and then issue, a joint report on the data received during monitoring and, to the extent that science will permit, any conclusions that can reasonably be drawn from the data. This report, which shall be presented to the Newport Beach City Council, the IRWD Board of Directors and the SARWQCB shall address, at a minimum, the following:

(1) Nutrient and other constituent reductions achieved in the Duck Ponds during the winter and summer;

(2) The extent to which WWSP discharges would impact nutrient and other constituent levels in Newport Bay during the winter and summer;

(3) The extent to which the discharges would function to stimulate or arrest the growth of algae and other plant-life;

(4) The location and extent of salinity dilution as well as the likely impact, if any, on flora and fauna in and around Newport Bay; and

(5) The public health risks, if any, posed by the discharges.

G. In the event there is no discharge of Reclaimed Water pursuant to the Permit during the period from October 1, 1996 through March 31, 1997, then the initial discharge pursuant to the Permit shall commence on October 1, 1997 at the rate of 3.2 mgd subject to further reduction or elimination pursuant to Section 6.

6. LONG TERM "NO DISCHARGE" SCENARIO

A. City and IRWD agree to use their best efforts to reach agreement on ways to fully achieve Project Objectives without the discharge of Reclaimed Water into San Diego Creek or Newport Bay. City and IRWD acknowledge that development of a long term "no-discharge" scenario requires the resolution of the issues identified in this section.

B. OCWD has expressed a willingness to accept 7.8 mgd of Reclaimed Water from IRWD on a continuous basis during the period from October 1 through March 31 if it has the ability to beneficially use, or lawfully dispose of, excess flows. The Parties have been advised that disposal of excess flows directly into the outfall facility maintained by CSDOC is feasible and is estimated to cost approximately $100,000. Accordingly, by January, 1997, there must be an agreement between the City and IRWD regarding the preparation of, and payment for, all necessary environmental documents, the processing and approval of all necessary permits, the design and construction of any physical facility necessary to discharge, and payment of all costs related to the actual discharge or transmission of, that portion of the excess flows that OCWD is unable to beneficially use.

C. To satisfy Project Objectives and its obligations pursuant to the Grant Deed, IRWD must have a reliable source of water to irrigate the Duck Ponds and the MMA's from October 1 through March 31. Possible sources of irrigation water include San Diego Creek and Reclaimed Water which is retreated and distributed to IRWD's customers. Diversion of flows from San Diego Creek during the winter will involve the

construction of an instream facility which may require environmental documentation and mitigation. The cost of construction is uncertain as is the source of funding. IRWD is uncertain about operational feasibility issues, including the cost to retreat Reclaimed Water used to irrigate the Duck Ponds and MMA's. City and IRWD shall discuss, in good faith, the irrigation alternatives, the responsibility for implementing the preferred alternative and the funding of any costs associated with the preferred alternative.

D. WWSP has the potential to significantly reduce nutrients in Newport Bay during the summer. The external monitoring program and the baseline characterization studies will provide the SARWQCB with information helpful to establishment of standards pursuant to the Clean Water Act and other actions which will improve bay water quality. City and IRWD will attempt, in good faith, to reach agreement on continued summertime creek diversions, monitoring, and other activity important to improvement in bay water quality in the event IRWD is not obligated to do so because it is not discharging pursuant to the Permit.

(7) **TERM.**

The term of this Agreement shall expire at the end of the fifteen year period described in Section 1 (C) (2)

Approved as to Form:

By _____
General Counsel

Irvine Ranch Water District

By _____
President, Board of Directors

By _____
Secretary

Approved as to Form:

By _____
General Counsel
Orange County Water District

Orange County Water District

By _____
President, Board of Directors

By _____
General Manager

Approved as to Form:

By _____
City Attorney

City of Newport Beach

By _____
City Manager

F:\cat\bumham\irwdocw2.doc
7/6/96

From: Herndon, Roy
Sent: Monday, December 14, 2009 12:43 PM
To: Kennedy, John; Miller, Craig
Subject: FW: Reclaimed Water
Attachments: Reclaimed Water.doc; GWRS Water Neutral or Not.xls

John and Craig –

It's good to remind the Producers how direct purchase of reclaimed water affects the BPP calculation. Following are my comments:

Regarding the last paragraph, "developing reclaimed supplies" can be taken different ways. Counting reclaimed water as "neutral" for BPP purposes has certainly not impacted OCWD from developing the GWRS. The "neutral" issue does, however, disincentivize producers from taking GWRS water directly, as explained below.

I prepared the attached spreadsheet with 3 scenarios (base case, 2 alternatives) to figure out the impact to a hypothetical participating (GWRS water-purchasing) producer and a hypothetical non-participating producer, both with the same demands. I used a large enough GWRS direct purchase amount (10,000 afy) so that the resulting numbers could be illustrated – otherwise, everything gets lost in the minutiae. **The spreadsheet indicates that the most equitable way of distributing the benefit of GWRS water is to recharge all of it in the basin to maximize the BPP (the base case).**

Alternative 1 (direct GWRS water counted as "neutral") shows how the participating producer is negatively impacted by purchasing more expensive water than under the base case. This assumes GWRS water is priced at least at what it costs to make – which is a lot more than current GW costs. This also shows how non-participating producers are negatively impacted because the BPP is reduced because supplies to the basin are reduced and not completely offset by the reduced "BPP demand" of the participating producer. The lowering of the BPP also negatively affects the participating producer.

Alternative 2 (direct GWRS water counted as "imported") shows how the participating producer is negatively impacted (but to a much lesser extent than Alternative 1), essentially to the same degree as all other producers, because the BPP is lowered for everyone (including the participant) and forces everyone to proportionately buy more imported water to offset the lost supply to the basin. The non-participating producers are impacted more than under Alternative 1, because the BPP is lower in this case. **What is not shown is the potential financial benefit the participating producer would have if the GWRS water was sold <u>below</u> alternative imported water rates. If that happens, then the participating producer could receive a financial windfall.**

This analysis only applies to GWRS water. GAP or Michelson water (which is not able to be recharged to the basin) is a different situation, and I have not analyzed that type of water. Since the base case does not exist for GAP or Michelson water, I suspect the "neutral" Alternative [assuming GAP and Michelson water are priced at what they REALLY cost to produce] will also appear onerous to the participating producers. However, counting GAP or Michelson water as "imported" would likely provide a financial benefit to the participants at the expense of non-participants by impacting the BPP.

I think we need to be careful about opening up the discussion of counting reclaimed water as anything but "neutral," as currently in the OCWD Act. If the current structure disincentivizes producers from buying GWRS water directly or building their own reclaimed water projects, so what? It doesn't stop OCWD from expanding GWRS for the benefit of all.

Roy

From: Everhart, Jill
Sent: Monday, December 14, 2009 8:02 AM
To: A.T. Kilani (KILANI@irwd.com); Alan Bramlett (SB); Amy Rego, MWD; Ann Michel, Serrano; Anthony Manzano (YLWD); Art Valenzuela, Tustin; Barbara - GM's Office @ IRWD; Betsy Eglash (betsy.eglash@surfcity-hb.org); Bob McVicker, MCWD; Brian Jones (BP); Burnett, Alice; Carl Ballard (IRWD); Carolyn for Heiertz, IRWD; Cel Pasillas (GG); Chuck Fowler, BP; Craig Justice (NB); David Eikamp, GSWC; David Entsminger (Garden Grove); David Noyes, Serrano;

Exhibit No. 47
Witness: John Kennedy
Date: 10/12/17
Christianne Lee Fong, CSR 7559

David Schickling, Fullerton; Denise Garcia (MCWD); Deshmukh, Shivaji; Diana for Don Calkins, Anaheim; Diana Leach (GSWC); Dick Wilson, Anaheim; dnguyen@ylwd.com; Don Calkins, Anaheim; Everhart, Jill; Fick, Randy; Fred Adjarian, Tustin; Fred Bockmiller (MCWD); Fuller, Christina; Gary Tegel (gtegel@city.newport-beach.ca.us); George Murdoch, NB; Greg Heiertz, IRWD; Harvey De La Torre (MWDOC); Howard Johnson, HB; James Tsumura (jamest@cityoflapalma.org); Jay Kleinheinz, HB; Jeff Moneda (City of La Palma); Jeff Watson, SB; Jennifer for Joe D. (Orange); Jerry Mendzer, EOCWD; Jerry Vilander (Mesa); Jim Atkinson (MESA); Jim Biery, Buena Park; Joan for Davidson@NB; Joe DeFrancesco, Orange; John DeCriscio, YLWD; John Hills, IRWD; Karl Seckel, MWDOC; Kate Brophy (GSWC); Lyon, Keith; Ken Dills, HB; Ken Vecchiarelli. YLWD; Kennedy, John; Kevin Hunt, MWDOC; Kovacevic, Janice; Lars Oldewage, IRWD; Lee Cory, YLWD; Leslie for Paul Jones @irwd; Lisa Ohlund (lohlund@eocwd.com); Lorrie Lausten; Lyle, Joan; Mark Lewis (FV); Markus, Mike; Mike Green (mike.green@fountainvalley.org); Mike Hoolihan, IRWD; Mike Jouhari, Anaheim; Miller, Craig; Miller, Scott; Nabil Henein, BP; Nabil Saba (SA); Nancy Savedra IRWD GM's Office; Parks, Casey; Patrick Scanlon, GSWC; Paul Cook, IRWD; Paul Jones, GM IRWD; Paul Shoenberger (Mesa); Peggi Oviedo; pmeszaros@mwdoc.com; Raquel Manson (rmanson@ci.garden-grove.ca.us); Ray Burk (SA); Richard Bell, MWDOC; Rick Hurtado, Orange; Rick Shintaku, Anaheim; Rob Hanford (Robert.Hanford@gswater.com); Robert Baehner, Orange; Robert Bermudez, GG; Robert Jordan (GSWC); Scott Moulton, YLWD; Shawn Dewane (MESA); sray@anaheim.net; Stan Kennedy (Mesa); Stan Yarbrough, GSWC; Steve Conklin (YLWD); Steve Garten; Tim DeTurk, Serrano; Toby Moore, GSWC; Umeda, Cheryl; Vi Atiya, Anaheim; Vikki Beatley, Mesa; Vince Mastrosimone (Seal Beach); Warren, Karen; Wil Davee (wdavee@westminster-ca.gov); Zack Barrett (GG)
Cc: DePinto, Gina; Dosier, Bruce; Greene, Kevin; Herndon, Roy; Hutchinson, Adam; Kuperberg, Joel; Sharma, Vishav; Sharp, Gwen; Sovich, Tim; Swanson, Dianne; Tan, Lo; Tate, Alexis; Torres, Eleanor; Wehner, Mike; Woodside, Greg; Yamachika, Nira; Youngblood, David
Subject: Reclaimed Water

Attached is information requested at the December 9th Producers Meeting regarding how taking reclaimed water impacts a Producers' annual BPP calculation.

Jill Everhart for John Kennedy
(714) 378-3301

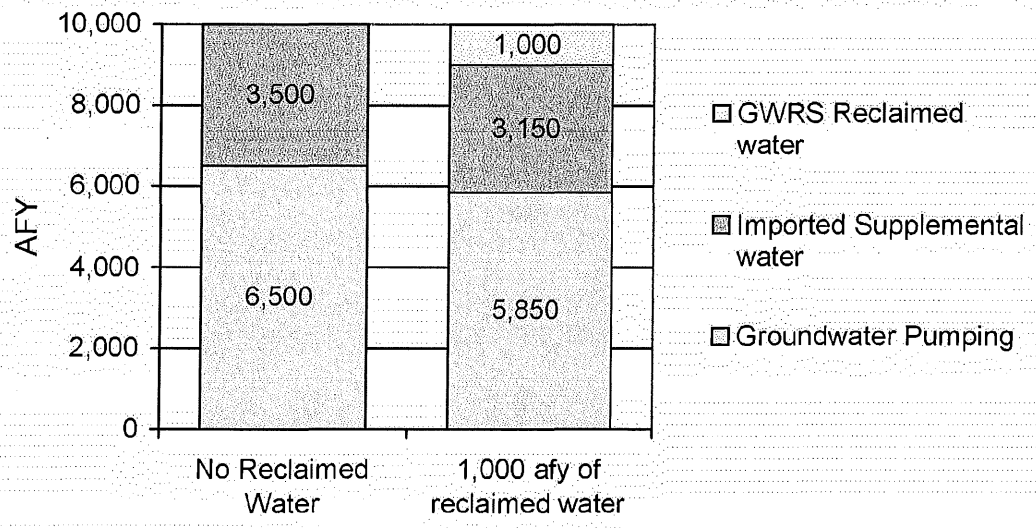
Reclaimed Water Purchase Impact to Annual Producer BPP Calculation

Any GWR System water directly received by the Producers would be considered "neutral" water per the District Act. The water is not considered groundwater or imported supplemental water for purposes of calculating the Producers annual Basin Production Percentage (BPP). The net effect is that the Producer would pump less groundwater (which is much less expensive) when using more expensive GWR System water supplies to meet their water demands.

This policy for reclaimed water was developed when the price of Green Acres Project water was established. The current cost to purchase GAP water is $326/af which is relatively low. However this low price is offset by the fact that taking GAP water also reduces how much low cost groundwater the Producer can receive. This pricing policy also recognizes that GAP customers are along the coast and reducing pumping along the coast is good basin management.

The following figure demonstrates the impacts of using GWR System or reclaimed water (1,000 afy) for a hypothetical producer who has 10,000 afy of total water demands. The figure assumes the BPP is 65 percent. As shown, if no reclaimed water is taken, allowable pumping is 6,500 afy (65% BPP x 10,000 afy of total water demands). However, if 1,000 afy of reclaimed water is used, allowable pumping is 5,850 (10,000 afy -1,000 afy x 75%).

PRODUCER BASIN PUMPING IMPACT OF USING RECLAIMED WATER



It has been argued that this policy can discourage the development of reclaimed water supplies. That it would be better to have new local reclaimed water supplies completely offset the need for more expensive imported water supplies.

From: Kennedy, John
Sent: Friday, May 27, 2016 4:04 PM
To: Green, Cathy
Cc: Markus, Mike
Subject: IRWD Reclaimed Water Issue
Attachments: Historical Documents.pdf

Cathy,
Here are the historical documents Mike mentioned today.

John Kennedy
Executive Director of Engineering and Water Resources
Orange County Water District
18700 Ward Street, Fountain Valley, CA 92708
tel: (714) 378-3304
email: jkennedy@ocwd.com

GWRS

Follow OCWD on Twitter

www.ocwd.com

Exhibit No. 50
Witness: John Kennedy
Date: 10/12/17
Christianne Lee Fong, CSR 7559

Redacted

Redacted

Redacted

Redacted

RESOLUTION NO. 84-7-71

RESOLUTION OF THE BOARD OF DIRECTORS OF
THE ORANGE COUNTY WATER DISTRICT
ESTABLISHING POLICY RE PRICING OF
GREEN ACRES PROJECT PRODUCT WATER

WHEREAS, District staff is in the process of negotiations with prospective customers for product water from the planned Green Acres Project; and

WHEREAS, it is necessary to establish the price at which said water will be sold; and

WHEREAS, this Board has reviewed the Green Acres cost factors with staff;

NOW, THEREFORE, the Board of Directors of the Orange County Water District does hereby resolve that reclaimed water produced from the Green Acres Project shall be sold at a variable price based on the actual O & M cost up to a maximum not to exceed 80 percent of the cost of groundwater, depending upon demand.

(5) Property Acquisition - Santa Ana River Area

Mr. Cline stated that in discussions regarding the continued maintenance of the Orange County groundwater basin, the Committee concurred with the suggestions of Director Clark that staff investigate the feasibility of acquiring approximately 100 acres of land owned by R. J. Noble Co. adjacent to the Santa Ana River trail north of Lincoln Avenue, and of Director Owen that the staff conduct a long-range planning study investigating possibilities for increased percolation capabilities including the use of greenbelts, ponds or other methods. The following action was taken.

MOTION NO. 7542

INSTRUCTING STAFF TO INVESTIGATE METHODS TO
ASSURE CONTINUED OPERATION OF THE GROUNDWATER BASIN

Upon motion by Director Clark, seconded by Director Waite, and carried, staff is hereby instructed to 1) investigate the feasibility of acquisition of land owned by R. J. Noble Co. adjacent to the Santa Ana River trail north of Lincoln Avenue in the City of Orange, and 2) initiate a long-range planning study to explore innovative methods for increased percolation capabilities.

ORANGE COUNTY WATER DISTRICT ACT

EFFECTIVE JANUARY 1, 1990

Section 30. Filing amended statement of water production

Upon good cause shown an amended statement of water production may be filed or a correction of the records may be made at any time prior to the final date for filing the next semi-annual water production statement.

Section 31. Preparation annually of "The Record of Water Production" and "The Record of Replenishment Assessments and Charges"

The district shall maintain records in which shall be noted the annual water production from each water producing facility within the district.

The district shall also maintain records in which shall be entered each district assessment levy and charge, a general description of the property upon which each water producing facility is located and any identifying number or code which may be assigned to such facility.

Section 31.5. Basin equity assessments: Production requirements and limitations: "Supplemental sources": Basin production percentage: Engineering investigation: Hearing on assessments

(a) Basin equity assessments, as well as production requirements and limitations on persons and operators within the district are declared to be in furtherance of district activities in the protection of water supplies for users within the district which are necessary for the public health, welfare and safety of the people of this state. The basin equity assessments, as well as the production requirements and limitations provided for herein, are authorized to be levied upon and applied to all persons and producers within the district for the benefit of all who rely directly or indirectly upon the groundwater supplies of the district.

(b) The basin equity assessments levied pursuant to this act against all persons and operators within the district may be uniform or nonuniform in amount, as determined by the board of directors of the district, in order to effectuate the goals and purposes of the district. The proceeds of the basin equity assessments levied and collected shall be used as provided for herein to equalize the cost of water to all persons and operators within the district, and to acquire water to replenish the groundwater supplies of the district.

(c) As used in this act:

(1) "Supplemental sources" means sources of water outside the watershed of the Santa Ana River, excepting that portion of that watershed on and along Santiago Creek upstream of the downstream toe of the slope of the Villa Park Flood Control Dam, such as, but not limited to, water produced from the Metropolitan Water District of Southern California.

AGENDA ITEM SUBMITTAL

MEETING DATE: February 13, 1991

TO: Water Issues Committee

FROM: William R. Mills Jr.

Budgeted: N/A

Cost Estimate: N/A

General Counsel Approval: Yes

CEQA Compliance: N/A

Staff Contact: N. Richardson

SUBJECT: CHANGE DISTRICT ACT TO INCLUDE RECLAIMED WATER AS A "SUPPLEMENTAL SOURCE"

RECOMMENDED ACTION

To authorize General Manager to seek legislation to modify District Act.

PRIOR RELEVANT BOARD ACTION(S)

None

DISCUSSION/ANALYSIS

Currently, recycled wastewater is utilized in two areas of the District. One area is the use of reclaimed wastewater for injection at the Talbert Barrier. Since this water does not involve production to a user, there is no need for additional wording in the District Act to cover this operation. Irvine Ranch Water District is utilizing recycled wastewater, and the District Act is silent on the category that this water falls under. The District's Green Acres Project is expected to be operational in the Summer of 1991, and additional wastewater will then be utilized by Mesa Consolidated Water District, the City of Fountain Valley and the City of Santa Ana. Clarification needs to be made in the District Act to account for this water.

RUTAN & TUCKER
ATTORNEYS AT LAW
A PARTNERSHIP INCLUDING PROFESSIONAL CORPORATIONS
CENTRAL BANK TOWER, SUITE 1400
611 ANTON BOULEVARD
COSTA MESA, CALIFORNIA 92626
DIRECT ALL MAIL TO P.O. BOX 1950
COSTA MESA, CALIFORNIA 92628-1950
TELEPHONE (714) 641-5100
(213) 625-7500
TELECOPIER (714) 546-9035

February 4, 1991
VIA FAX NO. (714) 963-7472

William R. Mills, Jr.
Orange County Water District
P.O. Box 8300
Fountain Valley, California 92728-8300

Re: Proposed Amendment to OCWD Act Section 31.5 (Supplemental Sources)

Dear Bill:

Per your request, enclosed please find a proposed Amendment to the Section 31.5 of the Orange County Water District Act, revising the definition of "Supplemental Sources" to include reclaimed water in addition to imported water sources. The proposed Amendment is fairly clean, and does not affect the language of any of the other applicable provisions of the Orange County Water District Act.

Should the proposed Amendment be enacted, reclaimed water would be accounted for as a supplemental water sources, thereby increasing the actual amount of groundwater that a producer could pump in accordance with a given basin production percentage. In the event that the proposed Amendment is not enacted, reclaimed water would continue to constitute what is referred to as "water produced by persons and operators from all other sources" as set forth in subdivision (d)(3) of Section 31.5.

RUTAN & TUCKER
ATTORNEYS AT LAW
A PARTNERSHIP INCLUDING PROFESSIONAL CORPORATIONS

I hope this assists you in considering the proposed Amendment to the basin equity assessment provisions of the Orange County Water District Act. As always, should you have any questions regarding this or any other legal matter affecting the District, please do not hesitate to call.

Very truly yours,

RUTAN & TUCKER

Joel D. Kuperberg

Attachments
8/131/006104-0001/188

Section 31.5 of the Orange County Water District Act (Chapter 924 of the Statutes of 1933) is amended to read:

1 (a) Basin equity assessments, as well as production
2 requirements and limitations on persons and operators within the
3 district are declared to be in furtherance of district activities
4 in the protection of water supplies for users within the district
5 which are necessary for the public health, welfare and safety of
6 the people of this state. The basin equity assessments, as well as
7 the production requirements and limitations provided for herein,
8 are authorized to be levied upon and applied to all persons and
9 producers within such district for the benefit of all who rely
10 directly or indirectly upon the groundwater supplies of such
11 district.

12 (b) The basin equity assessments levied pursuant to this act
13 against all persons and operators within the district may be
14 uniform or non-uniform in amount, as determined by the board of
15 directors of the district, in order to effectuate the goals and
16 purposes of the district. The proceeds of the basin equity
17 assessments levied and collected shall be used as provided for
18 herein to equalize the cost of water to all persons and operators
19 within the district, and to acquire water to replenish the
20 groundwater supplies of the district.

21 (c) As used in this act:

22 (1) "Supplemental sources" as used in this act means <u>(1)</u>
23 <u>reclaimed water, and (2)</u> sources of water outside the watershed of
24 the Santa Ana River excepting that portion of that watershed on and

1 along Santiago Creek upstream of the downstream toe of the slope
2 of the Villa Park Flood Control Dam, such as but not limited to
3 water produced from the Metropolitan Water District of Southern
4 California.
5 (2) "Basin production percentage" as used in this act means
6 the ratio that all water to be produced from groundwater supplies
7 within the district bears to all water to be produced by persons
8 and operators within the district from supplemental sources as well
9 as from groundwater within the district during the ensuing water
10 year.
11 (d) Annually the district shall order an investigation and
12 report to be prepared by an engineer or engineers employed by such
13 district. The investigation and report shall set forth the
14 following information, together with such other information as the
15 district may desire, relating to the preceding water year:
16 (1) Amount of water produced by persons and operators from
17 groundwater within district;
18 (2) Amount of water produced by persons and operators from
19 supplemental sources;
20 (3) Amount of water produced by persons and operators from
21 all other sources;
22 (4) Condition of groundwater supplies within District;
23 (5) Information as to the probable availability of water from
24 supplemental sources during the next succeeding fiscal year;
25 (6) The cost of producing water from groundwater within the
26 district, including any replenishment assessment of district;

(7) The cost of water produced within the district from supplemental sources.

(e) On the second Wednesday in February of each year, the engineering investigation and report provided for herein shall be delivered to the general manager. The general manager shall cause to be published, pursuant to Section 6061 of the Government Code, a notice of the receipt of such report and of the public hearing to be held on the date of a meeting of the board of directors in March, in a newspaper of general circulation printed and published within the district, at least 10 days prior to the date at which the public hearing regarding water supplies within the district shall be held. The notice, among other information which the district may provide therein, shall contain an invitation to all persons or operators within the district to call at the offices of said district to examine said engineering investigation and report. There shall be held, by the board of directors on the date of a meeting of the board of directors in March of each year, a public hearing at which time any person or operator within the district or any person interested in the amounts and source from which all persons and operators produce their total supply of water, as well as the estimated difference in the cost of water produced from groundwater within district or supplemental sources, may in person, or by representative, appear and be heard.

(f) On the date of a meeting of the board of directors in April of each year, the board of directors shall hold a public hearing for the purpose of determining the need and desirability

of levying basin equity assessments and the amounts thereof, as well as the need for establishing production requirements and limitations and the extent thereof, as to each person or operator within the district for the ensuing water year. In computing and fixing the amount of any such basin equity assessment for any such person or operator within the district, the board may allow a percent not to exceed 10 percent as shall be determined by the board of directors of the district, for delinquencies. Notice of the proposed hearing shall be published in the district pursuant to Section 6061 of the Government Code at least 10 days prior to the date set for said hearing.

Such notice shall set forth the following:

(1) That a report regarding water supplies within the district has been prepared;

(2) The date, time and place of the proposed hearing;

(3) The board shall consider at said hearing the need and desirability of levying basin equity assessments and the amounts thereof, as well as establishing production requirements and limitations, on persons and operators within the district for the ensuing water year and surcharges in connection therewith;

(4) An invitation to all persons and operators to appear at the public hearing and be heard in regard to any of the foregoing matters.

(g) At the hearing the board shall hear, take, and receive all competent evidence presented and offered in regard to the need for basin equity assessments, production requirements and

limitations in general, and specifically, the extent of such requirements or limitations as to each person or operator within the district, the amount of the basin equity assessment which shall be levied against each person and operator for all purposes other than irrigation at uniform or non-uniform rates and may be levied against each person and operator for irrigation purposes at different uniform or non-uniform rates for the ensuing water year, and the amount of surcharges for production in excess of the basin production limitations. Subsequent to the hearing, the board may, by adopting a resolution which resolution shall require the vote of eight members of the board, find and determine for the ensuing water year as follows:

(1) The estimated total amount of water to be produced by all persons and operators within the district from the groundwater within the district and the estimated amount to be produced by such persons and operators from supplemental sources;

(2) The basin production percentage;

(3) That a basin equity assessment and production requirement and limitation from groundwater within the district are necessary for the protection of the water supply of the district;

(4) The surcharge, in an amount to be determined in the discretion of the board, for production in excess of the production limitations;

(5) The amount of the basin equity assessment to be levied against each person and operator in a dollar amount per acre-foot of water produced from the groundwater supply for all purposes

other than irrigation, which basin equity assessment need not be uniform as to each such person or operator within the district, and that such amount is reasonable;

(6) The amount of the basin equity assessment to be levied against each person and operator in a dollar amount per acre-foot of water produced from the groundwater supply for irrigation purposes, which basin equity assessment need not be uniform as to each such person or operator within the district, and that such amount is reasonable;

(7) Production requirements or limitations and the surcharge for production in excess of the basin production limitations on persons and operators within the district shall be applicable during the ensuing water year. Such requirements and limitations shall be on the amount of groundwater produced by such persons and operators expressed in a percentage of overall water produced or obtained by such persons or operators from groundwater within the district and from supplemental sources;

(8) That during the ensuing water year, upon the district giving published notice thereof, pursuant to Section 6061 of the Government Code in a newspaper of general circulation printed and published within the district at least 10 days prior to such a hearing, a subsequent public hearing may be held to modify the basin production percentage, any basin equity assessment, any production requirement or limitation, or the surcharge for production in excess of the production limitation established by the district. Such modifications, if any, shall be effective on

the date established by the board and the district shall give notice of such modification 10 days prior to the effective date thereof in the manner provided hereafter in subdivision (e).

(h)(1) The board may exclude all persons and operators who produced 25 acre-feet or less of water from groundwater within the district during the ensuing water year from the levy of the basin equity assessment and the production requirements and limitations provided for herein.

(2) The findings and determinations of the board in regard to any of the foregoing shall be final, conclusive and binding upon all persons and parties.

(i) The district shall thereafter, and in any event prior to July 1, in each year, give notice to each person or operator within the district which notice shall state:

(1) The amount of the basin equity assessment levied against such person or operator per acre-foot of water produced for purposes other than irrigation and the amount of the basin equity assessment levied against such person or operator per acre-foot of water produced for irrigation purposes;

(2) The basin production percentage;

(3) The production requirement or limitation upon the person or operator; and

(4) The amount of surcharge imposed for production in excess of the basin production limitations.

The notice provided for herein and the notice of any subsequent modifications may be sent by post card or by other first

1 class mail with postage prepaid by the district.

2 (j)(1) Each person or operator within the district not
3 excluded from the levy of a basin equity assessment and the
4 production requirements and limitations, shall file with the
5 district, on or before the 30th day of September of each year, a
6 basin equity assessment report in the form prescribed by the
7 district setting forth the total amounts of water produced from
8 groundwater within the district and from supplemental sources
9 during the preceding water year by such person or operator. The
10 statement shall be verified by a written declaration under penalty
11 of perjury.

12 (2) If a person or operator has been required by the district
13 to produce or has in fact produced more water from groundwater
14 within the district than the equivalent of the basin production
15 percentage determined by the district, such person or operator
16 shall pay to the district, on or before September 30, an amount
17 determined by the number of acre-feet of water which such person or
18 operator has produced from groundwater within the district in
19 excess of the acre-foot equivalent of the basin production
20 percentage multiplied by the basin equity assessment rate
21 applicable to such person or operator, plus the amount of surcharge
22 due for production in excess of the production limitations.

23 (2) If a the event that a person or operator, pursuant to the
24 requirement of the district, has produced from
25 groundwater within the district less than the equivalent
26 of the basin production percentage, such person or

operator, on or before the 30th day of November, shall be paid by the district from the basin equity assessment fund an amount determined by the number of acre-feet by which the production of such person or operator from groundwater as required by the district is less than the acre-foot equivalent of the basin production percentage multiplied by the basin equity assessment rate applicable to such person or operator, or if the production of such person or operator from groundwater is more than the production required by the district and less than the equivalent of the basin equity production percentage, then such person or operator shall be paid by the district an amount determined by the number of acre-feet by which the actual production of such person or operator from groundwater is less than the acre-foot equivalent of the basin production percentage multiplied by the basin equity assessment applicable to such person or operator.

(g) If any person or operator shall fail to pay, when due, the applicable basin equity assessment or surcharge due for production in excess of the production limitations, the district shall charge interest on the delinquent amount at the rate of 1 percent each month or fraction thereof for which the amount remains delinquent. Should any person or operator within the district fail to file a basin equity assessment report on or before the 30th day of September of any year, the district shall, in addition to charging interest as provided herein, assess a

1 penalty charge against such operator in the amount of 10% of the
2 amount found by said district to be due.
3 The district may, from time to time, require other reports
4 from persons and operators as necessary and desirable in the
5 application of the basin equity assessment procedures provided
6 herein.
7 Upon good cause shown an amendment to any report required
8 under this section may be filed or a correction of any such report
9 may be made within six (6) months after the date such report was
10 filed with the district.

S.B. No. 430—Bergeson.

An act to amend Section 31.5 of the Orange County Water District Act (Chapter 924 of the Statutes of 1933), relating to the Orange County Water District, and declaring the urgency thereof, to take effect immediately.

1991

Feb. 21—Introduced. Read first time. To Com. on RLS. for assignment. To print.
Feb. 22—From print. May be acted upon on or after March 24.
Mar. 7—To Com. on AGR. & WAT. RES.
April 18—Set for hearing April 30.
April 29—From committee with author's amendments. Read second time. Amended. Re-referred to committee.
May 1—From committee: Do pass. To Consent Calendar. (Ayes 8. Noes 0. Page 1027.)
May 2—Read second time. To Consent Calendar.
May 9—Read third time. Urgency clause adopted. Passed. (Ayes 32. Noes 0. Page 1231.) To Assembly.
May 9—In Assembly. Read first time. Held at Desk.
May 13—To Com. on W.P. & W.
June 18—From committee: Do pass. To Consent Calendar.
June 19—Read second time. To Consent Calendar.
June 24—Read third time. Urgency clause adopted. Passed. (Ayes 74. Noes 0. Page 2811.) To Senate.
June 24—In Senate. To enrollment.
June 26—Enrolled. To Governor at 2 p.m.
July 1—Approved by Governor.
July 2—Chaptered by Secretary of State. Chapter 105, Statutes of 1991.

S.B. No. 431—Hart.

An act to add Article 3 (commencing with Section 43250) to Chapter 2 of Part 5 of Division 26 of the Health and Safety Code, and to add Section 6056 to the Revenue and Taxation Code, relating to air pollution.

1991

Feb. 21—Introduced. Read first time. To Com. on RLS. for assignment. To print.
Feb. 22—From print. May be acted upon on or after March 24.
Mar. 7—To Coms. on TRANS. and REV. & TAX.
Mar. 11—Set for hearing April 2.
April 3—From committee: Do pass, but first be re-referred to Com. on REV. & TAX. (Ayes 6. Noes 2. Page 642.) Re-referred to Com. on REV. & TAX.
April 8—Set for hearing April 17.
April 17—Set, first hearing. Hearing canceled at the request of author.
April 18—Set for hearing May 1.
April 24—From committee with author's amendments. Read second time. Amended. Re-referred to committee.
May 1—Set, second hearing. Testimony taken. Further hearing to be set.
Sept. 11—From committee with author's amendments. Read second time. Amended. Re-referred to committee.

1992

Feb. 3—Returned to Secretary of Senate pursuant to Joint Rule 56.

S.B. No. 432—Morgan.

An act to amend Sections 94304, 94305.5, and 94337 of the Education Code relating to private postsecondary education, and declaring the urgency thereof, to take effect immediately.

1991

Feb. 21—Introduced. Read first time. To Com. on RLS. for assignment. To print.
Feb. 22—From print. May be acted upon on or after March 24.
Mar. 7—To Com. on ED.
Mar. 14—Set for hearing April 3.
April 1—From committee with author's amendments. Read second time. Amended. Re-referred to committee.
April 3—From committee: Do pass, but first be re-referred to Com. on APPR. (Ayes 6. Noes 2. Page 635.) Re-referred to Com. on APPR.
April 4—Set for hearing April 15.
April 10—From committee: Be placed on second reading file pursuant Senate Rule 28.8.
April 11—Read second time. To third reading.
April 25—Read third time. Urgency clause adopted. Passed. (Ayes 29. Noes Page 953.) To Assembly.
April 25—In Assembly. Read first time. Held at Desk.
April 29—To Com. on HIGHER ED.
May 20—Hearing postponed by committee.
May 28—From committee with author's amendments. Read second tim Amended. Re-referred to committee.
June 5—From committee: Do pass, but first be re-referred to Com. on W. M. (Ayes 10. Noes 0.) Re-referred to Com. on W. & M.
July 11—From committee with author's amendments. Read second tir Amended. Re-referred to committee.
July 17—From committee: Do pass. To Consent Calendar.
July 18—Read second time. To Consent Calendar. From Consent Calenda third reading. Read third time. Urgency clause adopted. Pass (Ayes 63. Noes 0. Page 3557.) To Senate.
July 18—In Senate. To unfinished business. Unanimous consent granted consider without reference to file. Senate concurs in Assem amendments. (Ayes 37. Noes 0. Page 2511.) To enrollment.
July 22—Enrolled. To Governor at 4 p.m.
Aug. 5—Approved by Governor.
Aug. 5—Chaptered by Secretary of State. Chapter 335, Statutes of 1991

S.B. No. 433—Dills.

An act to amend Section 5400 of the Business and Professions Code, relatin outdoor advertising.

1991

Feb. 21—Introduced. Read first time. To Com. on RLS. for assignment print.
Feb. 22—From print. May be acted upon on or after March 24.
Mar. 7—To Com. on C.O.
April 24—Set for hearing May 7.
May 1—Set, first hearing. Hearing canceled at the request of author.

1992

Feb. 3—Returned to Secretary of Senate pursuant to Joint Rule 56.

In order to eliminate technical problems in a statute vitally important for the protection of California homeowners against earthquake hazards, it is necessary for this bill to take effect immediately.

CHAPTER 105

An act to amend Section 31.5 of the Orange County Water District Act (Chapter 924 of the Statutes of 1933) relating to the Orange County Water District, and declaring the urgency thereof, to take effect immediately.

[Approved by Governor July 1, 1991. Filed with Secretary of State July 2, 1991.]

The people of the State of California do enact as follows:

SECTION 1. Section 31.5 of the Orange County Water District Act (Chapter 924 of the Statutes of 1933) is amended to read:

31.5. (a) Basin equity assessments, as well as production requirements and limitations on persons and operators within the district, are declared to be in furtherance of district activities in the protection of water supplies for users within the district which are necessary for the public health, welfare, and safety of the people of this state. The basin equity assessments, as well as the production requirements and limitations provided for in this act, are authorized to be levied upon, and applied to, all persons and producers within the district for the benefit of all who rely directly or indirectly upon the groundwater supplies of the district.

(b) The basin equity assessments levied pursuant to this act against all persons and operators within the district may be uniform or nonuniform in amount, as determined by the board of directors of the district, in order to effectuate the goals and purposes of the district. The proceeds of the basin equity assessments levied and collected shall be used to equalize the cost of water to all persons and operators within the district and to acquire water to replenish the groundwater supplies of the district.

(c) As used in this act:

(1) "Supplemental sources" means reclaimed water and sources of water outside the watershed of the Santa Ana River, excepting that portion of that watershed on and along Santiago Creek upstream of the downstream toe of the slope of the Villa Park Flood Control Dam, such as, but not limited to, water produced from the Metropolitan Water District of Southern California.

(2) "Basin production percentage" means the ratio that all water to be produced from groundwater supplies within the district bears to all water to be produced by persons and operators within the district from supplemental sources as well as from groundwater

within the district during the ensuing water year.

(d) The district shall annually order an investigation and report to be prepared by an engineer or engineers employed by the district. The investigation and report shall set forth all of the following information, together with such other information as the district may desire, relating to the preceding water year:

(1) Amount of water produced by persons and operators from groundwater within the district.

(2) Amount of water produced by persons and operators from supplemental sources.

(3) Amount of water produced by persons and operators from all other sources.

(4) Condition of groundwater supplies within the district.

(5) Information as to the probable availability of water from supplemental sources during the next succeeding fiscal year.

(6) The cost of producing water from groundwater within the district, including any replenishment assessment of the district.

(7) The cost of water produced within the district from supplemental sources.

(e) (1) On the second Wednesday in February of each year, the engineering investigation and report shall be delivered to the secretary of the district.

(2) The secretary shall publish, pursuant to Section 6061 of the Government Code, a notice of the receipt of the report and of the public hearing to be held on the date of a meeting of the board of directors in March, in a newspaper of general circulation printed and published within the district, at least 10 days prior to the date at which the public hearing regarding water supplies within the district shall be held.

(3) The notice, among other information which the district may provide, shall include an invitation to all persons or operators within the district to call at the offices of the district to examine the engineering investigation and report.

(4) The board of directors shall hold on the date of a meeting of the board in March of each year, a public hearing at which time any person or operator within the district or any person interested in the amounts and source from which all persons and operators produce their total supply of water as well as the estimated difference in the cost of water produced from groundwater within the district or supplemental sources, may in person, or by representative, appear and be heard.

(f) (1) On the date of a meeting of the board of directors in April of each year, the board of directors shall hold a public hearing for the purpose of determining the need and desirability of levying basin equity assessments and the amounts thereof, as well as the need for establishing production requirements and limitations and the extent of those requirements and limitations as to each person or operator within the district for the ensuing water year.

(2) In computing and fixing the amount of any basin equity

assessment for any person or operator within the district, the board may allow a percent not to exceed 10 percent, as shall be determined by the board of directors of the district, for delinquencies.

(3) Notice of the proposed hearing shall be published in the district pursuant to Section 6061 of the Government Code at least 10 days prior to the date set for the hearing.

(4) The notice shall set forth all of the following:

(A) That a report regarding water supplies within the district has been prepared.

(B) The date, time, and place of the proposed hearing.

(C) The board shall consider at the hearing the need and desirability of levying basin equity assessments and the amounts of those assessments, as well as establishing production requirements and limitations, on persons and operators within the district for the ensuing water year and surcharges in connection those requirements and limitations.

(D) An invitation to all persons and operators to appear at the public hearing and be heard in regard to any of the foregoing matters.

(g) (1) At the hearing, the board shall hear, take, and receive all competent evidence presented and offered in regard to the need for basin equity assessments, production requirements and limitations in general, and specifically, the extent of those requirements or limitations as to each person or operator within the district, the amount of the basin equity assessment which shall be levied against each person and operator for all purposes other than irrigation at uniform or nonuniform rates and may be levied against each person and operator for irrigation purposes at uniform or nonuniform rates for the ensuing water year and the amount of surcharges for production in excess of the basin production limitations.

(2) Subsequent to the hearing, the board may, by adopting a resolution upon the vote of eight members of the board, find and determine for the ensuing water year as follows:

(A) The estimated total amount of water to be produced by all persons and operators within the district from the groundwater within the district and the estimated amount to be produced by persons and operators from supplemental sources.

(B) The basin production percentage.

(C) That a basin equity assessment and production requirement and limitation from groundwater within the district are necessary for the protection of the water supply of the district.

(D) The surcharge, in an amount to be determined in the discretion of the board, for production in excess of the production limitations.

(E) The amount of the basin equity assessment to be levied against each person and operator in a dollar amount per acre-foot of water produced from the groundwater supply for all purposes other than irrigation, which need not be uniform as to each person or operator within the district, and that the amount is reasonable.

(F) The amount of the basin equity assessment to be levied against each person and operator in a dollar amount per acre-foot of water produced from the groundwater supply for irrigation purposes, which need not be uniform as to each person or operator within the district, and that the amount is reasonable.

(G) Production requirements or limitations and the surcharge for production in excess of the basin production limitations on persons and operators within the district shall be applicable during the ensuing water year. The requirements and limitations shall be on the amount of groundwater produced by those persons and operators expressed in a percentage of overall water produced or obtained by those persons or operators from groundwater within the district and from supplemental sources.

(H) That during the ensuing water year, upon the district giving published notice pursuant to Section 6061 of the Government Code in a newspaper of general circulation printed and published within the district at least 10 days prior to such a hearing, a subsequent public hearing may be held to modify the basin production percentage, any basin equity assessment, any production requirement or limitation, or the surcharge for production in excess of the production limitation established by the district. The modifications, if any, shall be effective on the date established by the board and the district. The district shall give notice of the modification 10 days prior to the effective date of the modification pursuant to subdivision (e).

(h) (1) The board may exclude all persons and operators who produced 25 acre-feet or less of water from groundwater within the district during the ensuing water year from the levy of the basin equity assessment and the production requirements and limitations.

(2) All findings and determinations made by the board pursuant to this section are final, conclusive, and binding upon all persons and parties.

(i) (1) The district shall thereafter, and in any event prior to July 1 in each year, give notice to each person or operator within the district. The notice shall include all of the following information:

(A) The amount of the basin equity assessment levied against that person or operator per acre-foot of water produced for purposes other than irrigation and the amount of the basin equity assessment levied against that person or operator per acre-foot of water produced for irrigation purposes.

(B) The basin production percentage.

(C) The production requirement or limitation upon the person or operator.

(D) The amount of surcharge imposed for production in excess of the basin production limitations.

(2) The notice required by this subdivision and the notice of any subsequent modifications may be sent by post card or by other first-class mail with postage prepaid by the district.

(j) (1) Each person or operator within the district not excluded

from levy of a basin equity assessment and the production requirements and limitations, shall file with the district, on or before the 30th day of September of each year, a basin equity assessment report in the form prescribed by the district setting forth the total amounts of water produced from groundwater within the district and from supplemental sources during the preceding water year by the person or operator. The statement shall be verified by a written declaration under penalty of perjury.

(2) If the person or operator has been required by the district to produce, or has in fact produced, more water from groundwater within the district than the equivalent of the basin production percentage determined by the district, that person or operator shall pay to the district, on or before September 30, an amount determined by the number of acre-feet of water which the person or operator has produced from groundwater within the district in excess of the acre-foot equivalent of the basin production percentage multiplied by the basin equity assessment rate applicable to that person or operator, plus the amount of surcharge due for production in excess of the production limitations.

(3) If a person or operator, pursuant to the requirement the district, has produced from groundwater within the district less than of the equivalent of the basin production percentage, the person or operator, on or before the 30th day of November, shall be paid by the district from the basin equity assessment fund an amount determined by the number of acre-feet by which the production of the person or operator from groundwater as required by the district is less than the acre-foot equivalent of the basin production percentage multiplied by the basin equity assessment rate applicable to that person or operator, or if the production of the person or operator from groundwater is more than the production required by the district and less than the equivalent of the basin equity production percentage, then the person or operator shall be paid by the district an amount determined by the number of acre-feet by which the actual production of the person or operator from groundwater is less than the acre-foot equivalent of the basin production percentage multiplied by the basin equity assessment applicable to that person or operator.

(k) If any person or operator fails to pay, when due, the applicable basin equity assessment or surcharge due for production in excess of the production limitations, the district shall charge interest on the delinquent amount at the rate of 1 percent each month or fraction thereof for which the amount remains delinquent. Should any person or operator within the district fail to file a basin equity assessment report on or before the 30th day of September of any year, the district shall, in addition to charging interest, assess a penalty charge against that person or operator in the amount of 10 percent of the amount found by the district to be due.

(*l*) (1) The district may, from time to time, require other reports from persons and operators as necessary and desirable in the

application of the basin equity assessment procedures.

(2) Upon good cause shown, an amendment to any report required under this section may be filed or a correction of any report may be made within six months after the date the report was filed with the district.

SEC. 2. This act is an urgency statute necessary for the immediate preservation of the public peace, health, or safety within the meaning of Article IV of the Constitution and shall go into immediate effect. The facts constituting the necessity are:

In order for the Orange County Water District to equalize the cost of water to all persons and operators in the district, thereby protecting the public peace, health, and safety, it is necessary that this act take effect immediately.

CHAPTER 106

An act to amend Section 12921.4 of the Insurance Code, relating to insurance.

[Approved by Governor July 9, 1991. Filed with Secretary of State July 10, 1991.]

The people of the State of California do enact as follows:

SECTION 1. Section 12921.4 of the Insurance Code is amended to read:

12921.4. (a) The commissioner shall, upon receipt of a written complaint with respect to the handling of an insurance claim or other obligation under a policy by an insurer or production agency, or alleged misconduct by an insurer or production agency, notify the complainant of the receipt of the complaint within 10 working days of receipt. Thereafter, the commissioner shall notify the complainant of the final action taken on his or her complaint within 30 days of the final action.

The department shall include, with each notification of final action, or, at a minimum, with a number of randomly selected notifications of final action sufficient to assure the validity of results, a complaint handling evaluation form. This form shall clearly and concisely seek an evaluation of the department's performance in handling the complainant's grievance. The areas of evaluation shall include, but not be limited to: whether the complaint was handled in a fair and reasonable manner, evaluated thoroughly and without bias; the time required for resolution of the complaint; whether the complaint was referred and, if so, whether it was referred within a satisfactory time; whether the staff involved in handling the complaint demonstrated an adequate knowledge of the issues involved in the complaint; whether the complainant was satisfied with the result of the department's intervention; and whether the

DRAFT REPORT ON EXPANSION OF THE GREEN ACRES PROJECT

Revised
November 20, 1992

State Loan for Phase II Expansion

The District received Facilities Plan approval in September 1992 for a $20 million low-interest rate loan from the State Water Resources Control Board (SWRCB) for the Phase II expansion of GAP. The District's loan request was for $38 million, and comprised a project somewhat different than that proposed here. Therefore, the application must be revised. In other times, this would result in a $20 million loan in one year followed by an $18 million loan in the next year. However, the current budget crisis in the State makes it very doubtful that an additional $18 million loan can be made for the project next year. Therefore, the current $20 million loan offer is all that should be expected from the SWRCB for the expansion project.

In addition to certain other conditions for the loan, the State has established a rigorous time schedule. The schedule calls for submittal of final design plans and specifications by July 1993 and completion of construction by October 1995.

Staff of the retailers receiving GAP water have been approached with the new pricing concept and are in agreement that the new pricing schedule, consistent with the Act change, will be cost neutral to them. Additionally, they asked for our assistance in presenting the rationale and associated costs for changing the Green Acres Product Water Pricing to their respective Boards and Councils.

COST ANALYSIS

Revised GAP Pricing

In order to enhance the financial viability, the proposed expansion of the project is accompanied by a proposal to revise the existing sales price for the product water.

The sales price for Green Acres Project water to the local retailers was set many years ago by the Board at not to exceed 80% of the cost of groundwater as defined in the District's Engineer's Report. This included costs for energy, O&M, Replenishment Assessment, and amortized capital (the most recent 92-93 Report estimated the total cost at $185/AF.) The Project is also eligible to receive a subsidy from MWD. Originally, the subsidy was only about $75/AF. Recently, the subsidy was increased to $154/AF. Even with the higher MWD subsidy, revenues from product water sales (approximately $150/AF) fall short of expenses for O&M and amortized capital (about $900/AF).

Recognizing that water recycling was desirable as a way to extend our limited supplies, and that additional reclamation projects and the expansion of the GAP would be unlikely unless reclamation projects could be made more financially feasible, staff proposed that the District Act be modified in order to put recycled water on a par with imported water. For example, in other areas within the MWD service area, where groundwater extractions

are limited by adjudication or where groundwater does not exist, the value of recycled water is equal to the cost of obtaining an alternate water supply, usually water from MWD. The current MWD price for filtered non-interruptible water is $322/AF.

For purposes of computing compliance with the Basin Production Percentage (BPP), the Orange County Water District Act defines three types of water: "Supplemental Sources" (brought in from outside the watershed), Groundwater, and "Other Sources" (such as Santiago Creek water originating above Villa Park Dam). Since reclaimed water was neither supplemental or ground water, it was included under the "Other Sources" category and was not included in the computation of the BPP. The net effect of this was that an acre-foot of recycled water to a water retailer was only equal to the retailer's average water production and acquisition cost. This is illustrated on Figure 2 which shows the value of recycled water to be $168/AF. However, the classification did result in reduced production from the basin and thus helped reduce overdraft on District supplies.

It was concluded that the unrealistically low value for recycled water was attributable to the water definitions for BEA purposes, contained in the Act. Further, it was concluded that a revision of the Act to include recycled water categories in the BEA computation to be considered as supplemental water, would allow recycled water to be priced relative to its value. This is illustrated in Figure 3. Last year a District Act amendment (SB430) placed reclaimed water in the "Supplemental Source" category.

Since reclassification, reclaimed water now has a much higher value to end users. It is proposed that the Green Acres Project water be priced at approximately 85% of the MWD non-interruptible treated rate (e.g., 85% of $322/AF currently). This increase in sales price would not adversely impact the retailer; it will only capture the added value to the producer that resulted from the change in the Act. Figure 4 shows the average cost of water production using the new pricing is $163/AF, even though the retailer pays more for the recycled water as compared to the average cost of $165/AF using the current pricing mechanism, i.e. 80% of groundwater production cost.

The value of reclaimed water to the end-user will vary somewhat as the BPP is raised or lowered and in accordance with the cost of MWD water. To ensure the end-user pays no more for the water than they would have prior to the Act change (in other words, to maintain "cost neutrality") the GAP price would be determined each year as shown in the attached portion of the OCWD/End-User agreement that establishes pricing (Section 2.4), see Figure 5.

The objective of the new pricing mechanism is to price the water to recover the maximum possible rate necessary to offset the O&M and amortized capital costs, while still keeping the retailer's overall system cost at or below what it would have been prior to the Act change.

The accompanying graph Figure 1 entitled "COST ANALYSIS OF FACILITY VS. MWD WATER RATES" compares the cost of water production, on a per unit cost basis, for: (1) the existing Phase I facility which produces, on average, 3,300 acre feet per year, (2) expansion within the initial Phase I area by adding a reservoir and pump station for an average of 6,000 acre feet per year, and (3) maximum expansion (Phase II) to include servicing Huntington Beach and Newport Beach for a total production of 10,000 acre feet per year.

The cost of water produced includes the amortized capital cost, plus O&M, less the MWD subsidy ($154/AF) all computed on a per acre foot basis. Additionally, MWD rates shown are projected at the full requested rate of increase (100% of MWD) and projected at a more conservative 75% of MWD's requested rate of increase (75% of MWD). Although all scenarios show that the project costs are greater than MWD's costs in the early years, the project costs are less than MWD prices, even with the conservative "75% of projected" case, by the year 2000, if the project is expanded. Considering the favorable economic comparison and the added reliability of a wastewater source of supply, it is concluded that the proposed expansion is desirable and beneficial to the district.

FUNDING THE EXPANSION

An analysis was performed for the three project options of:

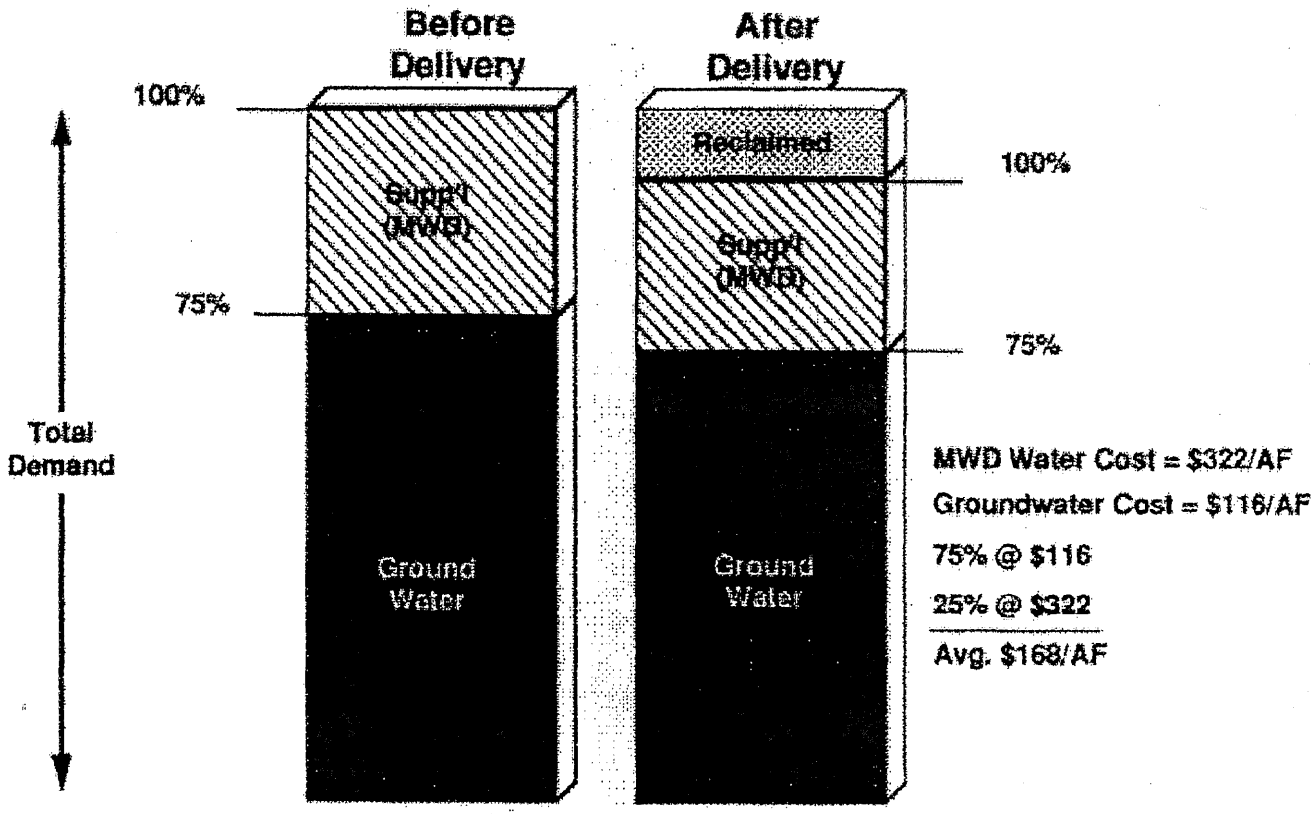
- Do not expand the project. Average annual production of water would be 3,300 acre feet per year.

- Expand the project within the Phase I service area by purchase of the Santa Ana reservoir, and construction of a new reservoir pump station for an additional estimated cost of $5.9 million. Average annual production would increase by 2,700 acre feet per year to a total of 6,000 acre feet per year.

- In addition to the Santa Ana reservoir and pump station, construct all needed facilities to expand service into the Cities of Huntington Beach and Newport Beach for an estimated additional cost of $22.0 million. Average annual production would increase by another 4,000 acre feet per year to a final total of 10,000 acre feet per year.

These alternatives were compared using the District's standard financial model which projects expenditures and revenues out through the year 2000. The impact on District reserves was then used to compare the economic advantage for each alternative. Two additional assumptions were incorporated into the model:

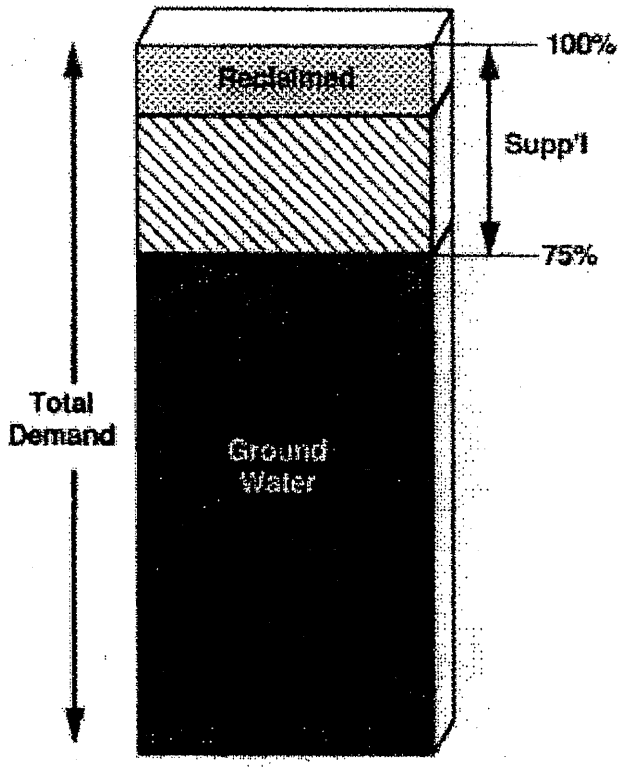
THE VALUE OF RECLAIMED WATER IS EQUAL TO THE COST OF DISPLACED WATER WHEN CLASSIFIED AS "OTHER" WATER OR $168/AF



IMPACTS: Reduces amount of groundwater production.
Sets artificially low value for reclamation water.

FIGURE 3

THE VALUE OF RECLAIMED WATER IS EQUAL TO THE COST OF THE DISPLACED MWD WATER WHEN CLASSIFIED AS "SUPPLEMENTAL" WATER OR $322/AF



Value of Reclaimed Water: $322/AF

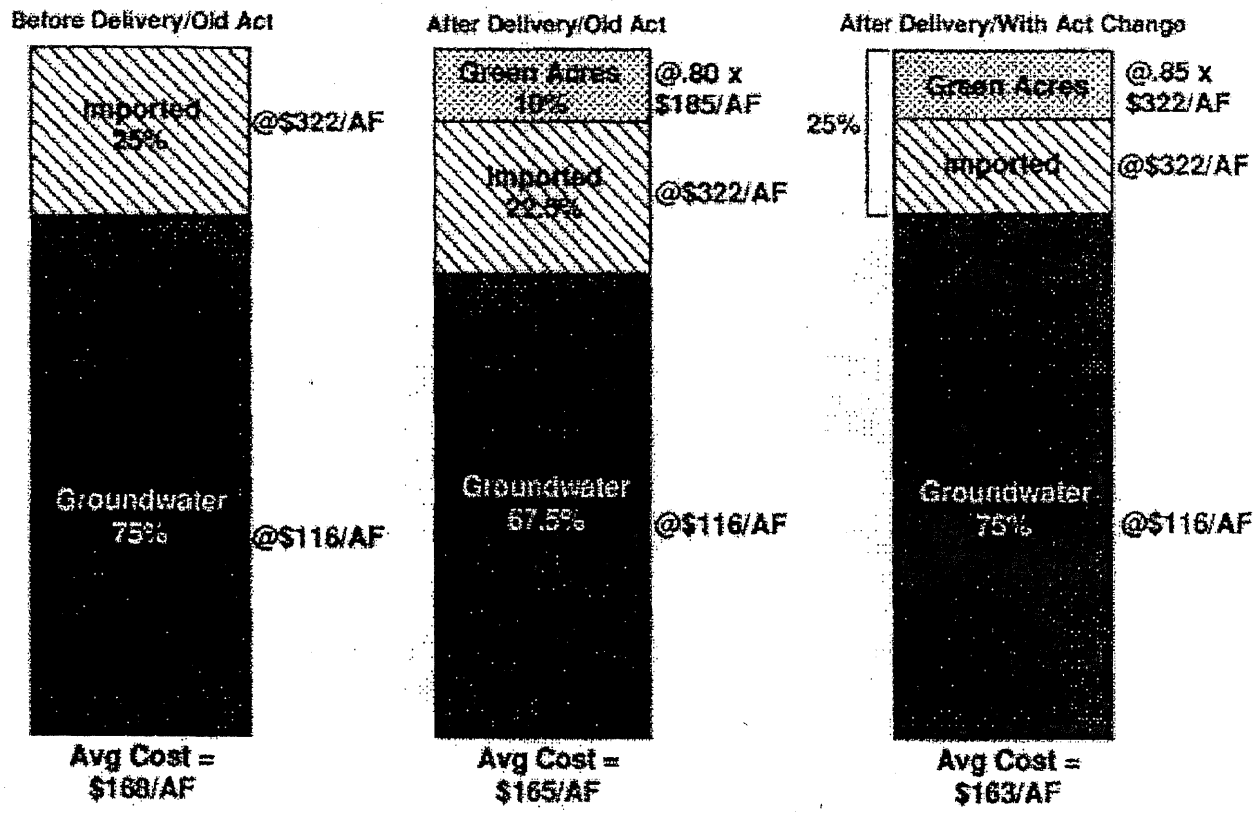
IMPACTS:

Allows same amount of groundwater production

Sets value of reclaimed water at cost of supplemental water

FIGURE 4

RETAILER OVERALL SYSTEM COSTS DO NOT INCREASE BECAUSE OF ACT CHANGE



7

SRC

ORANGE COUNTY WATER DISTRICT

Celebrating our 60th Anniversary

OFFICE OF THE GENERAL MANAGER

January 3, 1994

Mr. Jeff Renna
Water Operations Manager
City of Huntington Beach
P.O. Box 190
Huntington Beach, CA 92648

Green Acres Water Not Counted as "Supplemental Water"

Dear ~~Mr. Renna:~~ Jeff

This letter is intended to serve as a reminder to the Green Acres Project retail agencies that Project water sold within a given service area is not to be counted as "supplemental water" for purposes of determining the annual Basin Equity Assessment (BEA). Section 9.4 of the agreement dated December 18, 1991 between OCWD and your agency reads as follows:

> 9.4 Basin Limitation: OCWD and RETAILER mutually understand and agree that any and all Project Water delivered and sold by OCWD hereunder shall not constitute either "supplemental sources" or "groundwater supplies" for the purpose of the annual establishment of the basin groundwater production requirements and limitations by OCWD pursuant to Section 31.5 of the OCWD Act. Project Water is hereby established as a separate class of water for the purposes of Section 31.5 of the OCWD Act.

Per Section 2.4 of the agreement, the price paid by the retail agencies to OCWD for Project water continues to remain at 80% of the "area groundwater cost." As you are aware, the retailers have indicated a preference for this existing pricing policy over an alternative pricing arrangement that would have allowed Project water to be counted as supplemental water for the BEA.

The District appreciates your agency's continued support and cooperation in making the Green Acres project a success.

If you have any questions concerning this matter, please contact Mr. John Chaufty of my staff at (714) 378-3205.

Very truly yours,

William R. Mills

William R. Mills Jr., P.E.
General Manager

MAILING ADDRESS:
P.O. BOX 8300
FOUNTAIN VALLEY
CA 92728-8300

10500 ELLIS AVENUE
FOUNTAIN VALLEY
CA 92708

TELEPHONE (714) 378-3200
FAX (714) 378-3371

AGENDA ITEM SUBMITTAL

MEETING DATE: February 15, 1995

TO: Board of Directors

FROM: William R. Mills Jr.

Staff Contact: J. Van Haun/M. Leyes

Budgeted: n/a
Program/Line Item No.: n/a
Cost Estimate: n/a

General Counsel Approval: n/a

Engineers/Feasibility Report Approved: n/a

CEQA Compliance: n/a

SUBJECT: PROPOSED AMENDMENTS TO OCWD ACT FOR 1995

SUMMARY

Staff requests authorization to request amendment of the OCWD Act and the Public Contracts Code by the California State Legislature.

RECOMMENDATION

Adopt resolution authorizing District staff to have a bill introduced to make the proposed changes in the OCWD Act and the Public Contracts Code.

DISCUSSION/ANALYSIS

At its January 18, 1995 meeting, the OCWD Board directed staff to submit to the legislature a bill to amend the Public Works Contract Code to eliminate the requirement for performance bonds for contracts not advertised for bid, and to amend the OCWD Act to change the expiration date of directors' terms to conform with the Uniform District Election Law (see Nos. 1 and 4 below).

Staff was also directed to return to OCWD constituent agencies for further discussion of proposed amendments regarding the categorization of supplemental water for the purposes of calculating the basin production percentage, and giving the Board discretion to waive penalties for late submission of production reports and payment of the Replenishment Assessment (see Nos. 2 and 3 below).

Additionally, during a review of new provisions of law for 1995, District General Counsel discovered a drafting error in the Public Contracts Code which incorrectly identifies the Board of Supervisors as the governing body of the District (see No. 5 below).

On February 1 and February 8, 1995, the OCWD Technical Advisory Committee (TAC) and Groundwater Producers also reviewed the proposed amendments and their comments are denoted in bold below.

1) *An amendment to conform the Public Works Contracts Code to present practice of requiring performance bonds only on contracts requiring advertising for bids, and making such bonds optional on other contracts.*
This proposal was accepted in January.

2) *An amendment to give the Board authority to determine classification of waters of impaired quality for purposes of calculating the Basin Equity Assessment (BEA).*
Concern in January regarding this proposal was the issue of providing long-term incentive to hook up to recycled water projects. After further explanation the TAC committee agreed with the merit of this proposal.
♦ RESPONSE: OCWD will seek to delete the inclusion of reclaimed water from the definition of supplemental water, making reclaimed water neutral for the sake of calculating the Basin Production Percentage and subject to classification by individual contracts on a project-by-project basis.

3) *Change RA payments from semi-annually to bi-monthly based on use over the two-month period. Also give Board authority to set late payment penalty and discretion to forgive penalty.*
This proposal generated the most discussion in January and February. Producers seemed most concerned at the loss in interest income they would suffer by paying the RA earlier. Most acknowledged the goal of improving OCWD cash flow and expressed that they could support the change if the Board made an adjustment in the RA to compensate for lost interest earnings. There was also concern regarding allowing the Board discretion to waive penalties and having the same rules apply to all producers regarding late payment penalties.
♦ RESPONSE: OCWD can drop the request for more frequent billings and amend the act to give the Board discretion to waive penalties, including retroactive authority to July 1994.

4) *An amendment to change the expiration date of the terms of office of directors to be consistent with the Uniform District Election Law.*
This is a minor technical amendment accepted in January.

5) ***NEW:** An amendment to the Public Contracts Code to correct an error in an new section relating to emergency contracting procedures (see attached memorandum).*
This was accepted by the Producers without discussion.

Preliminary legislative language for Nos. 1 through 4 was forwarded to Assemblyman Jim Morrissey for submission of to the Office of Legislative Counsel to meet the submission deadline of January 20th. Deadline for introduction of bills is February 24, 1995.

Depending on direction of the Board, amendments may be incorporated into the bill after it is introduced in February. Attached is proposed legislative language.

PRIOR RELEVANT BOARD ACTION(S) - N/A

Section 21045 of the Public Contracts Code is amended to read:

SEC. 21045. Performance bonds

Any Except for contracts let without advertising for bids, any person or persons to whom a contract may be awarded shall enter into a bond, with good and sufficient sureties, to be approved by the board, payable to the district for its use, for at least 25 percent of the amount of the estimated contract price, conditioned for the faithful performance of the contract. The work shall be done under the direction and to the satisfaction of the engineer of the district, and be subject to approval by the board of directors of the district. A bond may also be required for contracts let without advertising for bids at the discretion of the general manager.

Section 31.5 of the Orange County Water District Act is amended to read:

SEC. 31.5. Basin equity assessments; production requirements and limitations

(c) As used in this act:

reclaimed water is not a part of supplemental sources

(1) "Supplemental sources" means ~~reclaimed water and~~ sources of water outside the watershed of the Santa Ana River, excepting that portion of that watershed on and along Santiago Creek upstream of the downstream toe of the slope of the Villa Park Flood Control Dam , such as, but not limited to, water produced from the Metropolitan Water District of Southern California.

(2) "Basin production percentage" means the ratio that all water to be produced from groundwater supplies within the district bears to all water to be produced by persons and operators within the district from supplemental sources as well as from groundwater within the district during the ensuing year.

Section 29 of the Orange County Water District Act is amended to read:

SEC. 29. Filing statement as to water production.

(a) Each operator of a water producing facility within said district, until such time as said water producing facility has been permanently abandoned, shall file with said district, on or before the 31st day of January and on or before the 31st day of July of each year, a statement setting forth the total production in acre-feet of water for the preceding six month period (excluding the month in which the statement is due), a general description or number locating each water producing facility and the method or basis of the computation of such water production. If no water has been produced from said water producing facility during the preceding six months period, said statement shall be filed as provided for herein setting forth that no water has been produced during said period. Said statement shall be verified by a written declaration that it is made under the penalties of perjury. The replenishment assessment and the additional replenishment assessment are payable to said district on or before the last date on which the water production statement shall be filed and are computed by multiplying the production in acre-feet of water as disclosed in the statement, by the replenishment assessment rate and the additional replenishment assessment rate. At such time as any said water producing facility has been permanently abandoned, the operator thereof shall give written notice of such abandonment to said district.

(b) If any operator of a water producing facility shall fail to pay the replenishment assessments when due, the district shall charge interest on the delinquent amount of the replenishment assessments at the rate of 1 percent each month or fraction thereof that the replenishment assessments remain delinquent.

(c) Should any operator of a water producing facility fail to register each water producing facility or fail to file on or before the 31st day of January and 31st day of July of each year the water production statement, said district shall may, in addition to charging interest as provided herein, assess a penalty charge against such operator in an amount to be determined by the board of directors not to exceed of 10 percent of the amount found by said district to be due. This section shall be retroactive to July 1, 1994.

(d) The board of directors may, at the time of fixing the replenishment assessment rate and additional replenishment assessment rate, provide by resolution that the operator of any water producing facilities having a discharge opening not greater than two inches in diameter and which do not provide domestic or irrigation water for an area in excess of one acre may pay a fixed amount as his replenishment assessment an additional replenishment assessment, in lieu of filing a sworn statement as to the production of groundwater.

Section 12 of the Orange County Water District Act is amended to read:

SEC. 12. Directors; time of election; appointment of certain directors; vacancies; bond

(a) An election shall be held on the first Tuesday after the first Monday in November of each even-numbered year, in those divisions of 1 to 7, inclusive, at which directors for the district shall be elected to fill the offices of the directors whose terms of office shall expire at noon on the first last Friday in December ~~that month~~, in accordance with the Uniform District Election Law.

(b) In Division 8, 9, and 10 of the district, the governing body of the city comprising each such division shall appoint the director to represent the division upon the board of directors, to serve a four-year term that expires at the same time as the terms of office of those elected directors whose terms of office expire that year. The terms of office of directors representing Divisions 8, 9 and 10 shall expire at noon on ~~November 29~~ December 6, 1996. A director representing Division 8, 9 or 10 may be removed at any time and without cause by the majority vote of the appointing body.

INTER-OFFICE MEMORANDUM

DATE: February 8, 1995

TO: William R. Mills Jr.

FROM: Mark Leyes

SUBJECT: ERROR IN THE PUBLIC CONTACTS CODE SECTION FOR OCWD

During a review of new provisions of law for 1995, District Counsel Clark Ide discovered a drafting error in legislation that was signed by the Governor and became law on January 1st. This section is regarding emergency contracting procedures in emergency situations. The error was that the law inadvertently identified the Board of Supervisors as the governing body of the Orange County Water District in one section while correctly referring to the "governing body" of the agency in another section.

This ambiguity could probably be resolved by a rational reading of the law, but to clear up the inconsistency as expeditiously as possible, I am trying to arrange to have a correcting amendment to the Public Contracts Code placed in one of the bills introduced in the Special Session regarding the flooding emergency last month. The emergency relief bills introduced in the special session are expedited through the legislative process and become law as soon as the Governor signs the bill. Since most of these bills are already at least through one house, this would be the quickest way to fix the problem.

The Governor has also called a special session to deal with Orange County Bankruptcy issues which could produce a bill or bills which could contain our change. The Special Session will begin on February 17.

If both of the above options fail, we will insert the change into the Assembly Local Government "Omnibus" bill, which is an annual effort to make minor, non-controversial technical changes in state law affecting local government. This bill will be an urgency bill meaning that the law takes effect as soon as the Governor signs the bill. The final option is to amend the bill that Assemblyman Morrissey is carrying.

I will seek Board authorization for this change on February 15 as part of the submittal for the approval of the OCWD Act amendments. I have attached the proposed amendment

cc: Clark Ide; Jim Van Haun

Section 21043 of the Public Contracts Code is amended to read:

SEC. 21043. Performance bonds

(a) Contracts may be let or work undertaken without advertising for bids in an emergency.

(b) In case of an emergency, if notice for bids to let contracts will not be given, the board of ~~supervisors~~ directors shall comply with Chapter 2.5 (commencing with Section 22050).

h:\doc\submits\PCC

CHAPTER 29

(Assembly Bill No. 1140)

An act to amend Sections 21043 and 21045 of the Public Contract Code, and to amend Sections 2.1, 12, 29, and 31.5 of the Orange County Water District Act (Chapter 924 of the Statutes of 1933), relating to water, and declaring the urgency thereof, to take effect immediately.

[Approved by Governor June 28, 1995.]

LEGISLATIVE COUNSEL'S DIGEST

AB 1140, Morrissey. Orange County Water District.

(1) The Orange County Water District Act requires each operator of a water producing facility to file a water production statement each year on or before January 31 for the preceding July to December reporting period and on or before July 31 for the preceding January to June reporting period. The act requires the district, if the operator fails to file the statement, to assess a specified penalty. The act defines the term "supplemental sources" for the purposes of the act to include reclaimed water. The act provides for the election of directors for the district.

This bill would, instead, require each operator to file the water production statement on or before the last day of February and on or before the last day of August of each year for the preceding applicable reporting period. The bill would delete reclaimed water from the definition of "supplemental sources." The bill would conform certain election provisions with the Uniform District Election Law. The bill would make other technical and clarifying changes in the act.

(2) The act requires all groundwater storage by an entity other than the district to be conducted pursuant to a groundwater storage agreement between that entity and the district.

The bill would provide that a groundwater storage agreement may include provisions that provide for the waiver of prescribed assessments on stored water that is extracted pursuant to that agreement.

(3) Existing law requires a person to whom the district awards a contract to enter into a performance bond, as prescribed.

This bill would, instead, require the board to require a performance bond on a contract awarded as a result of advertising for bids, as prescribed, and would authorize the general manager of the district to require a performance bond on a contract awarded without advertising for bids.

(4) This bill would declare that it is to take effect immediately as an urgency statute.

The people of the State of California do enact as follows:

SECTION 1. Section 21043 of the Public Contract Code is amended to read:

§ 21043. (a) Contracts may be let or work undertaken without advertising for bids in an emergency.

(b) In case of an emergency, if notice for bids to let contracts will not be given, the board of *directors* shall comply with Chapter 2.5 (commencing with Section 22050).

Italics indicate changes or additions. * * * indicate omissions.

SEC. 2. Section 21045 of the Public Contract Code is amended to read:

§ 21045. *(a) The district shall require a person to whom the district awards a contract as a result of advertising for bids to enter into a bond, with good and sufficient sureties, to be approved by the board, payable to the district for its use, for at least 25 percent of the amount of the estimated contract price, conditioned for the faithful performance of the contract.*

(b) The general manager of the district may require a person to whom the district awards a contract without advertising for bids to enter into a bond in accordance with subdivision (a).

(c) The work shall be done under the direction and to the satisfaction of the district engineer, and be subject to approval by the board.

SEC. 3. Section 2.1 of the Orange County Water District Act (Chapter 924 of the Statutes of 1933) is amended to read:

Sec. 2.1. (a) All groundwater storage by an entity other than the district shall be conducted pursuant to a groundwater storage agreement between that entity and the district.

(b) Use of the groundwater basin within the district for the purpose of replenishing and managing the groundwater supplies of the district shall have priority over the use of the groundwater basin for storage of water.

(c) The groundwater storage agreement shall be limited to public and private entities distributing water to consumers for domestic, municipal, industrial, and agricultural use within their boundaries, which are located wholly or partially within the district, except that, where the primary benefits accrue to persons or property within the district, the agreement may include other public and private entities, including, but not limited to, the Metropolitan Water District of Southern California and the Department of Water Resources.

(d) The groundwater storage agreement may include provisions that provide for the waiver of replenishment assessments or basin equity assessments, or both, on stored water that is extracted pursuant to the agreement.

(e) In allocating the use of the groundwater basin storage space, the district shall consider and protect the quality of the groundwater and the reasonable water supply needs of the district. The district shall impose such limitations on the quality of the water to be stored as shall be necessary to protect the quality of the groundwater in the district.

(f) The district shall include written findings supporting its conclusions in its record of consideration of a proposed groundwater storage agreement.

SEC. 4. Section 12 of the Orange County Water District Act (Chapter 924 of the Statutes of 1933) is amended to read:

Sec. 12. (a) An election shall be held on the first Tuesday after the first Monday in November of each even-numbered year, in those divisions of 1 to 7, inclusive, at which directors for the district shall be elected to fill the offices of the directors whose terms of office shall expire at noon on the first Friday in December, in accordance with the Uniform District Election Law (Part 4 (commencing with Section 10500) of Division 10 of the Elections Code).

(b) In Divisions 8, 9, and 10 of the district, the governing body of the city comprising each such division shall appoint the director to represent the division upon the board of directors, to serve a four-year term that expires at the same time as the terms of office of those elected directors whose terms of office expire that year. The terms of office of directors representing Divisions 8, 9, and 10 shall expire at noon on December 6, 1996. A director representing Division 8, 9, or 10 may be removed at any time and without cause by the majority vote of the appointing governing body.

(c) Vacancies occurring in any elective office shall be filled pursuant to Section 1780 of the Government Code. If the vacancy is that of an appointed director, the appointing body shall appoint a successor.

(d) Each director shall execute an official bond in an amount fixed by the board of directors that equals or exceeds one thousand dollars ($1,000). The bonds shall be filed with the secretary of the board of directors.

(e) In lieu of requiring each director to execute an official bond pursuant to subdivision (d), the district may provide fidelity insurance through master or blanket bonds, or other insurance approved by the board of directors.

(f) Premiums for bonds required by this act shall constitute a proper charge against the district.

SEC. 5. Section 29 of the Orange County Water District Act (Chapter 924 of the Statutes of 1933) is amended to read:

Sec. 29. (a) (1) Each operator of a water-producing facility within the district, until the facility has been permanently abandoned, shall file with the district, on or before the last day of February and on or before the 31st day of August of each year, a statement setting forth all of the following:

(A) The total production in acre-feet of water for the preceding six month period of January to June, inclusive, or July to December, inclusive, as applicable.

(B) A general description or number locating each water-producing facility.

(C) The method or basis of the computation of water production.

(2) If no water has been produced from the water-producing facility during the reporting period, a statement shall be filed as provided for herein stating that no water has been produced during that period.

(3) A statement shall be verified by a written declaration that it is made under the penalties of perjury.

(4) The replenishment assessment and the additional replenishment assessment are payable to the district on or before the last date on which the water production statements are to be filed and are computed by multiplying the production in acre-feet of water as disclosed in the statement, by the replenishment assessment rate and the additional replenishment assessment rate.

(5) When an operator has permanently abandoned a water-producing facility, the operator shall give written notice of the abandonment to the district.

(b) If any operator of a water-producing facility fails to pay the replenishment assessments when due, the district shall charge interest on the delinquent amount of the replenishment assessments at the rate of 1 percent each month or fraction thereof that the replenishment assessments remain delinquent.

(c) (1) If any operator of a water-producing facility fails to file the water production statement on or before the last day of February or on or before the 31st day of August of each year, for the applicable reporting period, the district shall, in addition to charging interest as provided in this section, assess against the operator a penalty charge, in an amount of 10 percent of the amount due the district.

(2) Paragraph (1), as amended in the first year of the 1995-96 Regular Session of the Legislature, applies to any operator of a water producing facility that fails to file a required water production statement on or after the effective date of those amendments, and to any operator that failed to file a required water production statement on or before July 31, 1994, for the preceding January to June, inclusive.

(d) The board of directors may, at the time of fixing the replenishment assessment rate and additional replenishment assessment rate, provide by resolution that the operator of any water-producing facility with a discharge opening not greater than two inches in diameter and that does not provide domestic or irrigation water for an

area in excess of one acre may pay a fixed amount as the operator's replenishment assessment and additional replenishment assessment, in lieu of filing a sworn statement regarding groundwater production.

SEC. 6. Section 31.5 of the Orange County Water District Act (Chapter 924 of the Statutes of 1933) is amended to read:

Sec. 31.5. (a) Basin equity assessments and production requirements and limitations on persons and operators within the district are declared to be in furtherance of district activities in the protection of water supplies for users within the district which are necessary for the public health, welfare, and safety of the people of this state. The basin equity assessments and the production requirements and limitations provided for in this act may be imposed upon, and applied to, all persons and producers within the district for the benefit of all who rely directly or indirectly upon the groundwater supplies of the district.

(b) The basin equity assessments imposed pursuant to this act against all persons and operators within the district may be uniform or nonuniform in amount, as determined by the board of directors of the district, in order to effectuate the goals and purposes of the district. The proceeds of the basin equity assessments imposed and collected shall be used to equalize the cost of water to all persons and operators within the district and to acquire water to replenish the groundwater supplies of the district.

(c) As used in this act:

(1) "Supplemental sources" means sources of water outside the watershed of the Santa Ana River, excepting that portion of that watershed on and along Santiago Creek upstream of the downstream toe of the slope of the Villa Park Flood Control Dam, such as, but not limited to, water produced from the Metropolitan Water District of Southern California.

(2) "Basin production percentage" means the ratio that all water to be produced from groundwater supplies within the district bears to all water to be produced by persons and operators within the district from supplemental sources and from groundwater within the district during the ensuing water year.

(d) The district shall annually order an engineer employed by the district to prepare an investigation and report. The investigation and report shall set forth all of the following information, together with other information requested by the district, relating to the preceding water year:

(1) Amount of water produced by persons and operators from groundwater within the district.

(2) Amount of water produced by persons and operators from supplemental sources.

(3) Amount of water produced by persons and operators from all other sources.

(4) Condition of groundwater supplies within the district.

(5) Information as to the probable availability of water from supplemental sources during the next succeeding fiscal year.

(6) The cost of producing water from groundwater within the district, including any replenishment assessment of the district.

(7) The cost of water produced within the district from supplemental sources.

(e) (1) On the second Wednesday in February of each year, the engineering investigation and report shall be delivered to the secretary of the district.

(2) The secretary shall publish, pursuant to Section 6061 of the Government Code, a notice of the receipt of the report and of the public hearing to be held on the date of a meeting of the board of directors in March, in a newspaper of general circulation printed and published within the district, at least 10 days prior to the date at which the public hearing regarding water supplies within the district is to be held.

(3) The notice, among any other information that the district may provide, shall include an invitation to all persons or operators within the district to call at the offices of the district to examine the engineering investigation and report.

(4) The board of directors shall hold on the date of a meeting of the board in March of each year, a public hearing at which a person or operator within the district, or any person interested in the amounts and source from which all persons and operators produce their total supply of water, as well as the estimated difference in the cost of water produced from groundwater within the district or supplemental sources, may appear and be heard, in person or by representative.

(f) (1) On the date of a meeting of the board of directors in April of each year, the board of directors shall hold a public hearing to determine the need and desirability of imposing basin equity assessments and the amounts thereof, the need for establishing production requirements and limitations, and the extent of those requirements and limitations as to each person or operator within the district for the ensuing water year.

(2) In computing and fixing the amount of any basin equity assessment for any person or operator within the district, the board may allow a percentage for delinquencies, not to exceed 10 percent, as determined by the board.

(3) Notice of the proposed hearing shall be published in the district pursuant to Section 6061 of the Government Code at least 10 days prior to the date set for the hearing.

(4) The notice shall set forth all of the following:

(A) That a report regarding water supplies within the district has been prepared.

(B) The date, time, and place of the proposed hearing.

(C) A statement that the board will consider at the hearing the need and desirability of imposing basin equity assessments and the amounts of those assessments, as well as establishing production requirements and limitations, on persons and operators within the district for the ensuing water year and surcharges in connection with those requirements and limitations.

(D) An invitation to all persons and operators to appear at the public hearing and be heard in regard to any of the foregoing matters.

(g) (1) At the hearing, the board shall hear, take, and receive all competent evidence presented regarding the need for basin equity assessments, production requirements and limitations in general, and specifically, the extent of those requirements or limitations as to each person or operator within the district, the amount of the basin equity assessment which shall be imposed upon each person and operator for all purposes other than irrigation at uniform or nonuniform rates and may be imposed upon each person and operator for irrigation purposes at uniform or nonuniform rates for the ensuing water year, and the amount of surcharges for production in excess of the basin production limitations.

(2) After the hearing, the board may, by a resolution adopted by a vote of not less than eight members of the board, find and determine for the ensuing water year all of the following:

(A) The estimated total amount of water to be produced by all persons and operators within the district from the groundwater within the district and the estimated amount to be produced by persons and operators from supplemental sources.

(B) The basin production percentage.

(C) That a basin equity assessment and production requirement and limitation from groundwater within the district are necessary for the protection of the water supply of the district.

(D) The surcharge, in an amount to be determined in the discretion of the board, for production in excess of the production limitations.

(E) The amount of the basin equity assessment to be imposed upon each person and operator in a dollar amount per acre-foot of water produced from the groundwater supply for all purposes other than irrigation, which need not be uniform as to each person or operator within the district, and that the amount is reasonable.

(F) The amount of the basin equity assessment to be imposed upon each person and operator in a dollar amount per acre-foot of water produced from the groundwater supply for irrigation purposes, which need not be uniform as to each person or operator within the district, and that the amount is reasonable.

(G) Production requirements or limitations and the surcharge for production in excess of the basin production limitations on persons and operators within the district that will apply during the ensuing water year. The requirements and limitations shall be on the amount of groundwater produced by those persons and operators expressed in a percentage of overall water produced or obtained by those persons or operators from groundwater within the district and from supplemental sources.

(H) That during the ensuing water year, upon the district giving published notice pursuant to Section 6061 of the Government Code in a newspaper of general circulation printed and published within the district at least 10 days prior to such a hearing, a subsequent public hearing may be held to modify the basin production percentage, any basin equity assessment, any production requirement or limitation, or the surcharge for production in excess of the production limitation established by the district. A modification, if any, shall be effective on the date established by the board and the district. The district shall give notice of pursuant to subdivision (e).

(h) (1) The board may exclude all persons and operators who produced 25 acre-feet or less of water from groundwater within the district during the ensuing water year from the imposition of the basin equity assessment and the production requirements and limitations.

(2) All findings and determinations made by the board pursuant to this section are final, conclusive, and binding upon all persons and parties.

(i) (1) The district shall thereafter, and in any event prior to July 1 in each year, give notice to each person or operator within the district. The notice shall include all of the following information:

(A) The amount of the basin equity assessment imposed upon that person or operator per acre-foot of water produced for purposes other than irrigation and the amount of the basin equity assessment imposed upon that person or operator per acre-foot of water produced for irrigation purposes.

(B) The basin production percentage.

(C) The production requirement or limitation upon the person or operator.

(D) The amount of surcharge imposed for production in excess of the basin production limitations.

(2) The notice required by this subdivision and the notice of any subsequent modifications may be sent by postcard or by other first-class mail with postage prepaid by the district.

(j) (1) Each person or operator within the district not excluded from the imposition of a basin equity assessment and the production requirements and limitations, shall file with the district, on or before the 30th day of September of each year, a basin equity assessment report in the form prescribed by the district setting forth the total amounts of water produced from groundwater within the district and from supplemental sources during the preceding water year by the person or operator. The statement shall be verified by a written declaration under penalty of perjury.

(2) If the person or operator has been required by the district to produce, or has in fact produced, more water from groundwater within the district than the equivalent

of the basin production percentage determined by the district, that person or operator shall pay to the district, on or before September 30, an amount determined by the number of acre-feet of water which the person or operator has produced from groundwater within the district in excess of the acre-foot equivalent of the basin production percentage multiplied by the basin equity assessment rate applicable to that person or operator, plus the amount of surcharge due for production in excess of the production limitations.

(3) (A) If a person or operator, pursuant to the requirement of the district, has produced from groundwater within the district less than of the equivalent of the basin production percentage, the district shall pay the person or operator, on or before the 30th day of November, from the basin equity assessment fund, an amount determined by the number of acre-feet by which the production of the person or operator from groundwater as required by the district is less than the acre-foot equivalent of the basin production percentage multiplied by the basin equity assessment rate applicable to that person or operator.

(B) If the production of the person or operator from groundwater is more than the production required by the district and less than the equivalent of the basin equity production percentage, then the district shall pay the person or operator an amount determined by the number of acre-feet by which the actual production of the person or operator from groundwater is less than the acre-foot equivalent of the basin production percentage multiplied by the basin equity assessment applicable to that person or operator.

(k) If any person or operator fails to pay, when due, the applicable basin equity assessment or surcharge due for production in excess of the production limitations, the district shall charge interest on the delinquent amount at the rate of 1 percent each month or fraction thereof for which the amount remains delinquent. Should any person or operator within the district fail to file a basin equity assessment report on or before the 30th day of September of any year, the district shall, in addition to charging interest, assess a penalty charge against that person or operator in the amount of 10 percent of the amount found by the district to be due.

(l)(1) The district may require other reports from persons and operators as necessary and desirable in the application of the basin equity assessment procedures.

(2) Upon good cause shown, an amendment to any report required under this section may be filed, or a correction of any report may be made, within six months after the date the report was filed with the district.

SEC. 7. This act is an urgency statute necessary for the immediate preservation of the public peace, health, or safety within the meaning of Article IV of the Constitution and shall go into immediate effect. The facts constituting the necessity are:

In order to implement, as soon as possible, certain changes affecting the administration of the Orange County Water District , it is necessary for this act to take effect immediately.

EXPLANATORY NOTES ASSEMBLY BILL 1140:

Pub C § 21043. Substituted "directors" for "supervisors".

Pub C § 21045. Substituted the section for the former section which read: "Any person or persons to whom a contract may be awarded shall enter into a bond, with good and sufficient sureties, to be approved by the board, payable to the district for its use, for at least 25 percent of the amount of the estimated contract price, conditioned for the faithful performance of the contract. The work shall be done under the direction and to the satisfaction of the engineer of the district, and be subject to approval by the board of directors of the district."

Historical GAP Pricing/Supplemental Water/Reclaimed Water Classification documents

1. 1982 Rutan and Tucker Letter – Reclaimed water cannot be counted as supplemental water

2. 1984 OCWD Resolution – Set the price of GAP water at maximum of 80% of groundwater cost;

3. 1990 District Act (SB340) - Reclaimed Water is not included in supplemental water definition

4. February 13, 1991 Agenda Item recommending to change the District Act to add reclaimed water to the definition of supplemental water.

5. 1991 District Act change – Reclaimed water added to the definition of supplemental water.

6. November 20, 1992 Draft Report – GAP water should be priced at 85% of MWD rate now that it is considered supplemental water

7. January 3, 2004 letter to HB - Reclaimed Water is not considered supplemental water per contract

8. February 15, 1995 OCWD Agenda Item – Recommended removing reclaimed water from supplemental water definition and to classify it based on a project by project basis via contract

9. 1995 Assemble Bill (AB1140) - Removed reclaimed water from supplemental water definition.

Exhibit No. 51
Witness: John Kennedy
Date: 10/12/17
Christianne Lee Fong, CSR 7559

ANALYSIS OF HYDRAULIC AND FINANCIAL OPERATIONS OF A RECYCLED WATER SYSTEM: A CASE STUDY OF THE ORANGE COUNTY WATER DISTRICT'S GREEN ACRES PROJECT

A THESIS

Presented to the Department of Civil Engineering and

Construction Engineering Management

California State University, Long Beach

In Partial Fulfillment

of the Requirements for the Degree

Master of Science in Civil Engineering

Committee Members:

Antonella Sciortino, Ph.D. (Chair)
John Kennedy, P.E.
Bruce Phillips, P.E.

College Designee:

Antonella Sciortino, Ph.D.

By Benjamin Smith

B.S., 2012, California State University, Long Beach

December 2013

WE, THE UNDERSIGNED MEMBERS OF THE COMMITTEE,

HAVE APPROVED THIS THESIS

ANALYSIS OF HYDRAULIC AND FINANCIAL OPERATIONS OF

A RECYCLED WATER SYSTEM: A CASE STUDY OF THE

ORANGE COUNTY WATER DISTRICT'S

GREEN ACRES PROJECT

By

Benjamin Smith

COMMITTEE MEMBERS

Antonella Sciortino, Ph.D. (Chair) — Civil Engineering and Construction Engineering Management

John Kennedy, P.E. — Orange County Water District

Bruce Phillips, P.E. — Civil Engineering and Construction Engineering Management

ACCEPTED AND APPROVED ON BEHALF OF THE UNIVERSITY

Antonella Sciortino, Ph.D.
Coordinator of Graduate Programs
College of Engineering

California State University, Long Beach
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LIST OF ABBREVIATIONS

AF	Acre Feet
AFY	Acre Feet per Year
ATLL	Aigues Ter Llobregat
BEA	Basin Equity Assessment
BPP	Basin Pumping Percentage
CIP	Capital Improvement Program
CPI	Consumer Price Index
DIP	Ductile Iron Pipe
DSS	Decision Support System
EPA	Environmental Protection Agency
FV	City of Fountain Valley
FY	Fiscal Year
GAP	Green Acres Project
GPM	Gallons Per Minute
EPA	Environmental Protection Agency
GWRS	Groundwater Replenishment System
HPEP	High Pressure Effluent Pump
IEUA	Inland Empire Utilities Agency
IRWD	Irvine Ranch Water District

LPEP	Low Pressure Effluent Pump
LRP	Local Resource Program
MCWD	Mesa Consolidated Water District
MGD	Million Gallons per Day
MWD	Metropolitan Water District
MWDOC	Municipal Water District of Orange County
NB	City of Newport Beach
O&M	Operation and Maintenance
OC	County of Orange
OCSD	Orange County Sanitation District
OCWD	Orange County Water District
psi	Pounds per Square Inch
PVC	Polyvinyl Chloride
R&R	Repair and Rehabilitation
RA	Replenishment Assessment
RWQCB	California Regional Water Quality Control Board, Santa Ana Region
SA	City of Santa Ana
SAR	Santa Ana Reservoir
VFD	Variable Frequency Drive

CHAPTER 1

INTRODUCTION AND THESIS OUTLINE

California Water Supply

Southern California imports roughly 60 percent of its water supply from outside the region. While approximately two-thirds of California's population lives in the southern region of the State, approximately two-thirds of the rainfall occurs in the northern portion. The heavily populated portions of the South are located in arid climates and require vast amounts of water for irrigation, commercial, industrial and residential use. The Central Valley of California is primarily used for agriculture and also requires large amounts of imported water to support the agriculturally based economy. While some local water supplies exist in Central and Southern California, the demands greatly outweigh the local supplies. This water deficit situation has led to arrangements and infrastructure that import water from hundreds of miles away to satisfy demands in these areas. This can be a tenuous arrangement due to the risks of supply interruption associated with transferring water over long distances, judicial court rulings that interrupt and decrease water supply quantities, and negative impacts to the environment and endangered species. Most of the imported water is transported through open concrete canals that are susceptible to earthquake damage. In recent history, judicial courts have limited the amount of water that may be pumped from the Bay Delta in order to protect endangered species. In general, California faces major challenges to provide water in a

sustainable manner to most urban and agricultural areas. The State has set goals to reduce water demands and develop alternatives to importing large amounts of water. The State has recognized the potential for wastewater reuse and estimates that in 2009, only 669,000 AF of wastewater was recycled out of the approximately 5,000,000 AF produced (Newton et al. 2009). There are many more states, nations, and regions around the world that also face water supply problems and shortages.

Recycled Water

In order to help develop solutions to water supply challenges, communities around the world have turned to water reuse (Okun 1997), along with other alternative strategies, to supplement water supplies. One particular method of water reuse is commonly referred to as recycled, or reclaimed, water. Recycled water is typically produced from wastewater collected through sanitary sewer systems. In California, sewage must be treated by primary, secondary, filtration, and a disinfection process before being reused as recycled water. These treatment processes remove contaminants from the wastewater and neutralize harmful biological elements in the water so that it can be safely reused in public places for non-potable uses. Typical uses for recycled water include landscape irrigation, toilet flushing, power generation cooling processes, agricultural irrigation, industrial processes, in-stream replenishment, and groundwater recharge (Kang and Lansey 2011; Okun 1997; Maeda et al. 1996). Recycled water is generally not safe for human consumption so its use needs to be closely monitored. California regulation for recycled water includes requirements for cross connection testing, informational postings at sites using recycled water, and infrastructure that is

easily identifiable as being used for recycled water. Typically pipes and other infrastructure used for recycled water are purple or wrapped in purple tape.

A community using recycled water is benefited in multiple ways. First, the wastewater generated by the community needs to be treated and disposed of. Traditionally, communities in Southern California dispose of the treated wastewater by discharging it into rivers and the Pacific Ocean. When recycled water is put into practice, some of the treated wastewater no longer needs to be discharged into the rivers and ocean. This can be a financial saving for communities and may reduce negative environmental effects of concentrated wastewater disposal into the environment (Cusker 2000; Okun 1997). Secondly, the wastewater stream is converted from a waste into a resource (Kang and Lansey 2011; Okun 1997; Cusker 2000). While the treated wastewater still contains undesirable constituents, it is primarily composed of water and also contains nutrients that can be beneficial to vegetation. By replacing the use of potable water with recycled water, the potable water supply is conserved. Since a "new source" of water becomes available with the implementation of recycled water programs, communities are better able to meet their respective water demands, gain reliability in water supply by diversifying their portfolios, reduce dependence on limited resources, and reduce their impacts to the environment in which they live.

Since recycled water is of a lower quality than potable water, it can produce negative effects. One common complaint of recycled water uses is the high conductivity of the recycled water (Mujeriego et al. 2008). This is primarily caused by the salt content in the water that is introduced by its sewage ancestry. Sensitive landscapes, including some species of grass used in golf courses, can be damaged through application of salts.

Long term application of salty recycled water may lead to increased salt content of soils which can have negative effects on vegetation and other ecology. For this reason, it is important for recycled water producers to monitor the quality of the water they produce and to improve the process and strive to minimize conductivity. Another common complaint associated with recycled water programs is the capital cost (Kang and Lansey 2011; Okun 1997; Maeda et al. 1996; Young and Holliman 1991). Since recycled water systems require a distribution system, treatment plant, water quality monitoring, and special maintenance operations, their financial capital costs can reduce their appeal. Typically recycled water systems are most needed in existing communities that have already been heavily developed. However, building systems within these existing communities is very expensive because other infrastructure is already in place and would need to be replaced after installation of the recycled water system. Rate structures, special financing, grants, and execution of properly designed master plans need to be utilized in order to overcome the financial obstacles (Cusker 2000). Many researchers have recommended constructing recycled water systems in developing communities rather than existing ones in order to reduce the economic impacts (Kang and Lansey 2011; Okun 1997). Some public perception of recycled water is also negative due to the source of the water (Kang and Lansey 2011). Since the recycled water was recently sewage water, some community members are reluctant to its implementation within their communities because it seems unnatural. This is generally overcome through use of public education and outreach programs. Another factor that persuades the public to research and better understand recycled water is the rising cost of potable water. The public becomes more motivated to search out less expensive alternatives, such as

recycled water, when portable water expenses start to impact their commercial and personal finances. Water rights issues can also become a barrier to recycled water systems (Okun 1997). If a regional wastewater treatment plant is used to treat wastewater produced from within the boundaries of multiple jurisdictions, then the wastewater effluent produced can remain under the rights of the respective generators. In most urban areas water supply sources can be highly competitive, legal rights to water have been established, and particular quantities of water from these sources are allotted to each respective party. The same principles and rights apply to wastewater. A jurisdiction owns its collected wastewater supply and if a benefit can be developed from it, that same jurisdiction may not want to freely share the benefit with other neighboring communities. The challenge is encountered when regional wastewater treatment plants, widely used in the United States, are in operation and wish to distribute the recycled water but may not be able to do so throughout the entire wastewater collection boundary, thereby neglecting some of the parties with rights to the water. Another challenge to overcome is the conflict with potable retail water authorities (Cusker 2000). Since end-users of recycled water will be using less potable water, the potable water retailer will see a reduction in demand and revenue. If a regional wastewater agency desires to distribute the recycled water to an area where potable water is being supplied by another agency, the potable water agency will have a reasonable objection and usually an exclusive right to provide all qualities of water to the end-users.

Orange County Water District

Orange County Water District (OCWD) is a special water district located in central and northern Orange County, California. The state legislature formed OCWD in

1933 to protect Orange County's water rights in the Santa Ana River. Since its inception, OCWD has maintained a groundwater basin located beneath its jurisdictional boundaries in northern and central Orange County. The District is well known for its Groundwater Replenishment System (GWRS). The GWRS is a joint project between OCWD and Orange County Sanitation District (OCSD) through which wastewater is purified to near distilled water quality. This water is used for groundwater recharge, a seawater intrusion barrier, and power plant cooling. In combination with GWRS water, imported water, base flow in the Santa Ana River, and winter period storm flows are used to recharge the groundwater aquifers. OCWD maintains two seawater intrusion barriers near the Pacific Ocean coastline, one of them in conjunction with Los Angeles County, in order to protect groundwater supplies from increased salinity caused by pumping of groundwater further inland. The District works closely with the Army Corps of Engineers to store some storm water flows at Prado Dam. The water can then be released after the storm event when OCWD obtains sufficient capacity to capture and recharge the water. Behind Prado Dam, OCWD owns and operates wetlands to help improve the water quality of Santa Ana River flows. One of the projects OCWD has developed to help reduce demands on the groundwater basin and mitigate for seawater intrusion is a recycled water treatment and distribution system called the Green Acres Project (GAP). The recycled water program has separate treatment and distribution from the GWRS project, but is supplied from the same OCSD wastewater treatment plant. The recycled water system serves five coastal cities with non-potable water for irrigation, industrial processes, toilet flushing, and cooling applications. (OCWD Finance Department 2012)

Objective of the Present Study

This study will present a detailed case study of the recycled water system built within existing communities in northern Orange County, California. The GAP system was constructed and is operated by the OCWD. Study of this particular system has been chosen because it was constructed within existing communities and has overcome many barriers common to recycled water projects. Even though it has overcome these barriers, the GAP's worth and profitability have been called into question. Published studies of recycled water systems constructed within existing communities are lacking, in particular studies relating to the financial costs and benefits of these types of systems. In order to better understand the complex operational and financial issues of recycled water systems, the GAP has been chosen for a case study.

A conceptual hydraulic model of the GAP distribution system was developed and run using the EPANET software (Water Supply and Water Resources Division et al. 2008) in order to better understand the hydraulic operations of the system. The hydraulic model was also used to simulate and analyze proposed modifications to the distribution system such as breaking loops, expected changes in demand, and using lengths of the pipeline for other distribution projects. Financial modeling was developed using spreadsheets in order to better understand the recent history, current, and potential future cost and revenue of the system. The financial perspective of OCWD, water retailers, and end-users of the recycled water were developed independently in order to better understand the effects of potential changes to each respective party. These financial models were used to analyze proposed alternatives to the master plan of the GAP system, including maintaining the current operations, changing the treatment technology,

modifying the system as simulated in the hydraulic model, abandoning the system, and modifying the OCWD Act to reclassify recycled water as a supplemental source of water. Additionally, other local agencies utilizing recycled water programs were contacted and briefly interviewed in regards to the success and challenges of their respective programs. A summary of recommendations for future studies, operational efficiencies, and financial changes has been presented.

Thesis Overview

Chapter 2 of this thesis reviews a brief history of water reuse, studies and findings about recycled water systems and dual plumbing, models used to simulate water distribution and treatment systems, and positive and negative aspects of recycled water programs. Chapter 3 presents a background of the GAP including information about the water supplies available in Orange County, a brief history of the GAP system, existing agreements between agencies, overview of financial components, and system performance requirements. Chapter 4 details the development of the hydraulic model selection, EPANET model, data collection, calibration and analysis. Chapter 5 presents the hydraulic model scenarios, their respective modeling, and results associated with each alternative. Chapter 6 contains a summary of recent financial history, data collection, assumptions, retailer financial views of the GAP system, and end-user views. Chapter 7 presents the various financial scenarios modeled and their results. Chapter 8 summarizes the comments and information gathered from other local agencies operating recycled water systems. Finally, Chapter 9 discusses the conclusions and recommendations for the GAP along with concepts that can be applied towards other communities interested in developing recycled water projects within existing communities.

CHAPTER 2

LITERATURE REVIEW

An Abbreviated History of Recycled Water

Recycled water is a relative newcomer to the world of water resource management. While uses of low quality water for non-potable applications can be traced all the way back to Caesar Augustus in the year 10 AD, recycled water creation and application began in the middle of the nineteenth century. Caesar Augustus used a dual water supply system consisting of the seventh aqueduct of Rome for delivery of poor quality water for use in entertainment, landscape, and garden irrigation in order to avoid drawing on higher quality water sources delivered through other aqueducts (Okun 1997). Before recycled water was considered as a potential water source, urban communities faced serious public health issues resulting from little to no wastewater management. During the mid-nineteenth century household wastes started to be carried away from urban areas through use of sewerage systems and water closets. In London, the pollution of the Thames River during this time period resulted in public health epidemics because water supplies were drawn from the river where sewerage was also discharged. Sir Edwin Chadwick directed "the rain to the river and the sewage to the soil" which resulted in the construction of an interceptor to divert sewage away from the river. In addition to the separation of wastewater from water supplies, advances in water filtration and disinfection helped deter the large outbreaks of waterborne illnesses (Okun 1997).

The use of recycled water requires the implementation of dual water distribution systems so that both potable and non-potable demands can be satisfied. Okun (1997) has outlined some of the significant recycled water history in the United States. The first dual distribution system in the United States was located in Arizona near the Grand Canyon. During the 1920s the community in this area was growing considerably but water supply sources were very scarce. The community found value in the wastewater to be too high to just dispose of it. In 1926, wastewater began to be treated and reused for toilet flushing and landscape irrigation. Later uses have included vehicle washing and cooling water. Power plants in the United States began using recycled water for cooling and cleaning processes in 1942. Colorado Springs, Colorado, developed a large scale treatment plant for the purpose of selling recycled water in 1960. A third of the city's effluent was treated to the tertiary level for the purpose of irrigation at colleges, golf courses, cemeteries, and other large urban end-users water demands. The recycled water was sold for two-thirds of the potable water rate and became highly desirable. Initially, recycled water in the United States was offered to end-users at extremely low costs because wastewater treatment plants needed outlets to discharge their effluents. Over time, as recycled water quality has improved and high quality potable water sources have become scarcer, the price for recycled water has risen to be slightly lower than potable rates. In addition to the lower cost for the recycled water, end-users are also motivated to implement its use for increased reliability of supply and sustainable development practices.

The basis for most recycled water statutes and regulation in the United States comes from California and began in 1968 (Okun 1997). These rules have come to be

referred to as "Title 22" or the "Purple Pipe Book" (California Department of Public Health 2011). The Californian regulations found successful application with little incident, which resulted in its use in other States (Okun 1997). California has continued to update and add to the statues and regulations with the latest updates in 2011 and 2009, respectively (California Department of Public Health 2011, 2009). Of particular interest to the water communities of California are the regulations for direct and indirect potable reuse. Projects around the state, such as GWRS, strive to promote the more direct use of recycled water to supplement potable water supplies. Public concern remains high in regards to reused wastewater and the implementation of statues and regulations helps to build public trust and increase understanding.

Recycled water use has developed worldwide. Yi et al. (2011) present a brief summary of recycled water use in China. China began irrigating farmland with untreated wastewater during the 1940s. The wastewater was free to the end-user and contained an abundance of nutrients for the crops. The widespread practice of dumping untreated sewage directly on agricultural lands resulted in a lack of wastewater collection infrastructure across the country. Okun (1997) has pointed out that irrigation of crops with untreated wastewater leads to high rates of waterborne disease. As late as 1997 these disease rates remained high in parts of Asia, Africa, and Latin America primarily because untreated irrigation water is drawn directly from sources that contain wastewater discharges (Okun 1997). The salt content of soil and groundwater near the farms has also increased (Yi et al. 2011). The history of China's recycled water can be divided it into three periods: first, emerging from 1940 to 1985; second, demonstration from 1985 to 2000; and third, developing taking place since 2000 (Yi et al. 2011). In 1985 the

government of China began to promote recycled water research projects, however the projects commonly had funding issues and lacked public acceptance of their findings. Due to these challenges only short term studies have been completed leaving the long term effects of recycled water not understood. There has not been a comprehensive set of regulations developed in China, while a uniformly applied set of regulations will help promote use of recycled water and improve public perception (Yi et al. 2011). Communities living within the areas subject to the wetter climates of China are not concerned with developing recycled water programs, while the communities located in more arid areas seek its implementation actively. Although the arid communities are seeking recycled water implementations, the systems have been constructed as an afterthought to original development of the communities, which trend Yi et al. (2011) suggest should be reversed. The City of Beijing has vastly improved its recycled water programs primarily due to local government leadership, water resource management strategies, and international attention drawn by the Olympics. However, the city needs to improve its construction synchronization, operations, and recycled water pricing structure. Increased recycled water use in China can help to resolve water supply shortages due to limited supplies, pollution, and over exertion of sources (Yi et al. 2011).

Maeda et al. (1996) point out that Tokyo started to use recycled water as early as 1951. The early application of recycled water was used for paper manufacturing. The paper factory was motivated to use recycled water because the water quality in the nearby river was extremely poor and the groundwater basin had been vastly overdrawn. After the first paper factory successfully used the recycled water, the treatment plant began using sand filtration on its secondary effluent and delivering the recycled water to dozens

of other paper mills in the surrounding area. Since that time other common uses for recycled water in Tokyo have included washing trains, stream restoration, and toilet flushing. According to Maeda et al. (1996) there are 938 wastewater treatment plants in all of Japan and only 91 of them provide recycled water. While the national government provides subsidies for recycled water treatment and distribution capital costs, the country lacks a standard for effluent water quality. Tokyo is a highly developed urban area with many high rise buildings. The community was successful in constructing treatment plants in the basements of some buildings. In 1994, nineteen high rise buildings were plumbed with non-potable water for toilet flushing from a central treatment plant. The plant treats secondary wastewater effluent with sand filters and disinfection. The distribution system is only 1.8 miles long and connects to a storage tank on the roof of each high rise. The recycled water rate structure has been created to cover capital and operational costs while charging end-users less than 80 percent of the potable water rate. This particular project operated in a financial deficit during the first five years of service, however returned a surplus for the following five years and is now being expanded. The implementation of a treatment plant within an existing structure and a small distribution system serving a large number of end-users have helped the project to be financially effective.

Irvine Ranch Water District (IRWD) was also successful in serving high rise buildings with recycled water. IRWD is located in central Orange County, California. Young and Holliman (1991) provided an account of IRWD's exploration into new markets for recycled water beginning in 1976. The district was already operating a recycled water system that served irrigation uses for landscaping and agriculture before

exploring expanding uses to toilet flushing, residential developments, and on-site systems. IRWD found it economically viable to provide recycled water for toilet flushing and priming drain traps in high rise buildings of six stories or more. Since the distribution system was designed for irrigation end-users, the addition of a large point load to the system caused by a high rise building created multiple obstacles to overcome. Since the high rise buildings being studied are primarily used for commercial purposes, the use of recycled water in the toilets would reduce the demand for potable water within the buildings by 80 percent. Recycled water connections to residential developments were successful because home owner associations have responsibility for the majority of landscaping. The connections were only made in locations that were adjacent to existing recycled water pipelines in order to minimize capital expenses. New residential developments were dual plumbed with potable water piping and recycled water piping for non-potable uses. The developments consisted of large lots and were assumed to be maintained by professional landscape companies who would be familiar with the use of recycled water.

A typical modern recycled water system in the United States was developed in the San Jose, California area. As described by Cusker (2000) the system was constructed within existing communities and primarily serves irrigation and industrial end-users. While the primary motivations for the system were to comply with judicial orders, the system fulfilled other goals such as reduction of wastewater impact on the environment, creating a useful purpose for wastewater discharge, and diversifying the region's water supplies. The system is named the "South Bay Water Recycling Program" and began operations in 1996. As of 2000 the system delivered 21 million gallons per day (MGD)

to over 200 end-users through sixty miles of pipeline. The project is an excellent example of interagency coordination because working agreements and relationships were developed between multiple cities, wastewater authorities, and water retail agencies. The system is expected to match costs with revenues in the future, but as of 2000 was operating at a financial loss. Financial losses are typical of many recycled water programs in the United States. In contrast to the Tokyo example where recycled water is being provided to high rise buildings with many end-users located within a small area, communities in the United States are typically not constructed as densely and end-users are located further away from each other and from the treatment plant. Since the distribution systems have to be inherently larger to reach all of the end-users, the capital costs for recycled water projects in the United States tend to be high. The high capital costs in turn make the economic return of the systems questionable. If the costs of the program cannot be completely covered, then communities need to examine the non-monetary benefits of such systems, such as the diversification of water supply, the reduced impact of wastewater discharges to the environment, the conservation of high quality water sources that can be reserved for exclusively potable applications, the increased water supply reliability, and perhaps in the future direct potable reuse.

In February of 2010, California finished its publication of a document outlining the need for water conservation and strategies to implement the conservation: "20x2020 Water Conservation Plan." The primary goal of the multi-agency collaboration is to reduce water demands by 20 percent by the year 2020. "...With a burgeoning population and the movement of that population to drier climates, our overall demand for water has exceeded our reliable developed supply. Without additional action, demand will continue

to exceed supply … Our need to pursue conservation and eliminate unnecessary uses of water is more important than ever to ensure the future health of our state" (California Department of Water Resources et al. 2010, iii). Of the nine primary recommendations provided in the document, increased use of recycled water is a central component. As populations continue to concentrate in urban communities throughout the world, and particularly in the United States, the scarcity of water supplies has come to the center stage of the public's attention. The use of recycled water to help fulfill the thirsty needs of communities has steadily increased and will continue to increase and be implemented worldwide.

Recycled Water Case Studies

Recycled water systems have been implemented throughout the world in order to minimize wastewater discharges and supplement water supplies. In the following, two such systems located within California are presented since they have features closely related to the GAP. The third case study presented is about a system under construction in Barcelona, Spain that utilized in part the lessons learned by the OCWD. The motivations for each project are diverse but all have found a common solution to their respective issues through development of recycled water treatment and distribution systems.

Irvine Ranch Water District

As partially discussed above, the IRWD published a paper in 1991 outlining the three new areas it had been expanding recycled water use into. Young and Holliman (1991) describe the new areas as toilet flushing in commercial buildings, large scale conversions of residential developments, and privately owned and operated on-site

residential recycled water systems. The development of recycled water into these new areas required innovative marketing, quantifying water use and savings, studying the economic viability of conversions, and changes to the California Department of Health Services regulations.

A study was completed in 1987 resulting in the conclusion that expanding recycled water use into high rise buildings was only viable if the building was at least six stories tall. The recycled water in these buildings would be used for toilet flushing and priming floor drain traps. As mentioned earlier, these high rise service connections place a large point load on the distribution system. IRWD levied a surcharge to help mitigate the stresses on the distribution system and expects the potable water use to decrease by 80 percent. The application of recycled water to the buildings required the use of dual plumbing systems. It was discovered that the high rises contained a central utility core with the plumbing and bathrooms centrally located on each floor. The risers for recycled and potable water were placed on separate sides of the core in order to reduce the risk of cross connections. For a typical commercial high rise it was found that the costs for dual plumbing increased the total plumbing costs by 8.94 percent. The recycled water replaced 78.5 percent of domestic water at the site under investigation. Since the cost of recycled water amounts to about 90 percent of the cost of potable supplies, the economics were determined to be favorable to the recycled water end-user. The Health Department was particularly concerned about the exposure of children to recycled water since they would not understand the warning information and location of recycled water. Since the high rises were primarily commercial offices, the population was made up of only adults. It was determined that signs and advisory information would be adequate enough to

protect the adults from using the recycled water improperly. All of the recycled water piping was labeled as such and tactile marking tape was used to help identify it. Health departments first required that different pipe materials be used for potable and non-potable plumbing. Typically PVC pipe is used for recycled water applications, however it was found that PVC did not perform well enough hydraulically. Working with county and state officials, IRWD was able to use copper piping for both types of water through the application of heavy labeling and purple tape on the recycled lines. All of the valves were sealed with IRWD seals after start-up to protect against cross-connections. Most of the occupants of the high rises are leasing from a common owner. Usually this owner maintained a professional maintenance company for building repairs and modifications which will limit the personnel working on the system and potentially making incorrect connections. The public acceptance and misconceptions about recycled water were also a concern. IRWD focused on education of maintenance personnel and management teams, posting signs, distributing printed materials, and giving presentations to building occupants.

Young and Holliman (1991) explain how the conversions of residential areas to recycled water occurred. As pipes were replaced and with new construction, recycled water pipelines were extended as a measure to reduce capital expenses. IRWD receives financial subsidies from the Metropolitan Water District (MWD) for replacing potable uses with recycled water which has helped to financially justify the program. The residential developments chosen for this program were located adjacent to existing mains so that large diameter pipeline expansion was not necessary. The areas were also located near the recycled water treatment plant to ensure that adequate pressure in the supply

system was maintained. The respective homeowners' associations knew the financial benefits of using recycled water over potable water for irrigation and were self-motivated to convert. However, the payback period based only upon the savings in water rate was too long. The conversion of three neighborhoods replaced an estimated 438 acre feet (AF) per year of potable supply with recycled water for an estimated capital cost of $1,178,900. IRWD provided no-interest financing to the associations for conversion costs and was able to apply the subsidy directly to their rates thereby invalidating the payback concerns. Since these conversions were located in home owner associations that performed landscape maintenance for all of the properties, it was relatively easy to educate the maintenance personnel. Cross connection concerns were resolved through education and extensive use of signs and labels.

Prior to this IRWD project use of recycled water for individual residences had not been allowed by governing bodies (Young and Holliman 1991). Within a new development of 88 properties ranging from 2 to 5 acres, two golf courses, and common areas, the individual use of recycled water was sought after in addition to use on the common areas and golf courses. Since the development was completely new the costs for dual plumbing and distribution were greatly reduced. Each residential lot had at least 10,000 square feet of landscaped area that would most likely be maintained by professionals. Since the development is new, IRWD would need to provide a new source of potable water. Through the implementation of recycled water in the development it is estimated that the residence would save up to $400 per acre foot. Proposed methods to limit cross connections include use of copper for all potable pipes and PVC for recycled water pipes, backflow prevention devices, use of separate pipes on residential property

through the same standards required in the public right of way, not allow conventional connections to the recycled water supply (such as hose bibs), and annual inspections. A substantial public education campaign will need to be initiated and maintained to address concerns of the public in regards to the use of recycled water.

The successful integration of high rise buildings and irrigation of residential common areas into the IRWD's recycled water program can serve as guidance for the GAP. There are some high rise buildings located within the GAP service area that could possibly be retrofitted with recycled water systems. Irrigation areas located near to the current recycled water mains of the GAP system can also be converted to the non-potable supply. One of the obstacles to the implantation of these practices is that OCWD is not the retail water agency within its service area, unlike the IRWD. The extra costs associated with inspection and connection issues would need to be borne by the retail agencies and would result in complicated financial agreements with OCWD. While some financial details are presented by Young and Holliman (1991) they do not provide enough information about the pay back periods and long term success of the conversions. The IRWD attitude of expanding recycled water use in an urban and developing area can be applied to the GAP system as well to encourage more recycled water use.

South Bay Water Recycling Program

Cusker (2000) describes a new recycled water system that was constructed in the South San Francisco Bay Area of California during the 1990s. The project is named the South Bay Water Recycling Program and the City of San Jose has played a major role in its implementation. The primary purpose of the project was to construct an urban water recycling system to mitigate the wastewater discharges into a marsh. The discharges

were causing negative effects on the ecology and animals of the marsh. This system partially represents a change in public policy to include concerns about the environment. It is also a great example of inter-agency coordination. The treatment plant is located in the Santa Clara Valley Water District and uses advanced wastewater treatment processes to produce 167 MGD of near distilled quality water. The wastewater is generated from 1.3 million people in addition to commercial and industrial wastewater generators. The business community had been thriving in the recent decade as the area known as Silicon Valley was created. This high tech sector produced considerable wastewater flows due to the industrial processes of making advanced technological components. The South Bay water body receives wastewater discharges from 40 treatment plants. The impact of the wastewater discharge is minimized in these deep water areas; however the San Jose-Santa Clara Water Pollution Control Plant discharges its effluent to a marsh that drains to the South Bay. The high quality of effluent water is decreasing the natural salinity of the marsh and impacting the natural habitat. Development in the South Bay area has destroyed many marsh areas which in turn has endangered some rare plant and animal habitats. Due to the limited habitats for these animals and the degradation of the marshes, agencies with jurisdictional authority imposed a 120 MGD discharge cap on the treatment plant in 1989. A drought in 1991 helped to motivate the region to develop an alternative water source. As a result of the regulation and economical pressure, the implementation of the recycled water project was fast tracked.

The construction of the project began in 1996 and as of 2000 was delivering 21 MGD to over 200 end-users through sixty miles of pipeline. Two pump stations and a reservoir have been constructed as part of the distribution system. The advanced

treatment process was designed to surpass water quality standards and improve public perception. The distribution facilities were built to blend in with the neighborhood surroundings. Additional chlorination was required at the treatment plant and required additional capital investment. Simultaneous construction work was achieved through implementation of twelve separate design and construction contracts. Potential end-users for a recycled water system were selected based upon water demand, proximity to the proposed pipeline alignments, and ease of connection to the distribution mains. The original design of the distribution system was a "hub and spoke" approach, meaning that the closest customers would be hooked up first with end-users located further away while waiting for more capital investment. Two independent analysis of the design approach influenced the decision to change the design to "trunk," or "backbone," which means that the largest customers would be hooked up first regardless of location and that smaller end-users would fill in later. The marketing for the recycled water project focused on the reduced price of recycled water and increased reliability of supply. The agencies governing the recycled water program helped end-users with design, construction, and permitting while providing subsidies and grants in order to speed up the process. 70 percent of the recycled water produced is distributed to San Jose and 30 percent is distributed to Santa Clara and Milpitas. Operation and maintenance (O&M) of the distribution system is delegated to the retail water agency with piping running within their jurisdiction. The water retailers were concerned about losing revenue due to the lower cost of recycled water so retailer-wholesaler agreements were created. Public outreach and education were critical to the success of the project. As of 2000, phase two of the project was being developed which would expand the distribution system and

create more end-user connections. Phase two of the project will also include a conservation focus in addition to expansion of the recycled water system.

The project was funded by $95 million in debt service through state loans and a $141 capital investment. Since the primary need for the system was to dispose of wastewater, sewer rates were increased in order to help offset the capital costs. In the short term, the program is expected to generate enough revenue to cover operational and maintenance costs only. Long term estimates that take into account the rising costs of drinking water are optimistic that both operational and capital debt service will be covered, with a potential return on investment. City rebates have been granted to residents and business who install low flush toilets. Three separate rates were established for irrigation, industrial processes, and agricultural irrigation. The landscape irrigation rate was reduced 25 percent from the potable rate. Up to a 92 percent reduction was given to industrial and agricultural customers because of the higher costs associated for use by these end-users.

The South Bay Water Recycling Program is a great example of agency coordination, investment into natural resources, long term planning, and sustainability. Cusker (2000) describes a successful project to modify wastewater discharges and construct new recycled water facilities in an existing urban area. The study however does not discuss in detail the amount of the debt service that has not been covered by revenue and even suggests that current revenues may not sufficiently cover operational expenses. There are speculations that the GAP also does not generate sufficient revenue to cover operational and capital expenses. The San Jose project has been successful; however its implementation was motivated by the requirements of multiple state and federal agencies

which were threatening penalties if the wastewater discharges were not reduced. While the GAP also reduces wastewater effluent discharges to the environment, there are no major objectionable impacts. Additionally, the more recently constructed GWRS by OCWD also reduces wastewater discharges and has sufficient capacity to treat additional flows. The retailer-wholesaler agreements generated in the San Jose project are similar to those implemented by the GAP organization. In Chapter 8 of this study, the rates of the San Jose project are compared with those of the GAP.

El Prat de Llobregat, Barcelona, Spain

Mujeriego et al. (2008) presented a summary of the recycling water efforts undertaken by the Catalan Water Agency. Aigues Ter Llobregat (ATLL) is a water wholesaler of the Catalan Water Agency. ATLL provides the water supply to the Barcelona Metropolitan Area by drawing from the Llobregat River, the Ter River, and groundwater aquifers. The metropolitan area is densely populated and it is a central industrial hub of the Catalan service area. Limited water quantities within the rivers and groundwater overdraft have prompted ATLL to search out alternative sources of water. The Llobregat River has multiple water agencies drawing from its supply, existing water rights upstream of the plants, and the local governing agency has required a designated minimum flow past the water treatment plants. In combination with the irregular rain patterns within the rivers catchment area and supply demands, the remaining water is regularly less than sufficient to fill reservoirs beyond 50 percent of capacity. Due to the consistent and large amount of groundwater aquifer overdraft, seawater intrusion into the aquifers has been advancing rapidly. The water reclamation plant of El Prat de Llobregat

seeks to implement better water resources management for all parties affected by the surface and groundwater flow restrictions.

The treatment plants effluent water is used for in stream water flow substitution, wetlands, irrigation, and a seawater intrusion barrier. The plant produces three qualities of water effluents, in stream and wetland flows, irrigation supply, and water to inject along the coastline as a seawater intrusion barrier. As of 2008, Spain had no regulations established for recycling water, but the Catalan Water Agency has adopted quality goals from the Californian Title 22 regulation, the United States Environmental Protection Agency (EPA), and the World Health Organization. The treatment plant uses treatment processes of coagulation, flocculation, settling, filtration through screens, and ultra violet light disinfection. There is public concern about irrigating agriculture with the recycled water due to the high conductivity of the water. A separate treatment plant process is being constructed in order to reduce the conductivity through electro dialysis. A pumping and distribution network was built to deliver recycled water to end-users. Some of the users require addition of oxygen before the recycled water is discharged to the distribution system. The seawater intrusion barrier concept and design was based primarily on the experience from the OCWD's GWRS project along with other projects located within Spain. As described in Chapter 1, the GWRS treats wastewater effluent to near distilled water quality and uses the product water for groundwater recharge and to supply a seawater intrusion barrier. The barrier injects the high quality water into the groundwater aquifers created a high pressure zone that has the effect of repealing the intrusion of seawater towards groundwater extraction wells. Both the OCWD and ATLL treatment plants utilize micro screen filtration, reverse osmosis, and ultra violet light

treatment processes. The El Prat plant also uses ultra-filtration as an intermediate treatment process between micro filtration and reverse osmosis. El Prat must also blend the product water with other supplies before injecting it into the barrier. The OCWD model also used blended water initially in order to meet regulatory requirements and gain public support. The advanced treatment process is also in place to gain public support and is not necessarily required for the treatment process from a water quality standpoint.

Mujeriego et al. (2008) performed a brief economic analysis of the capital and operational costs associated with the treatment plant and distribution system. They concluded that the costs of this particular project are similar to other projects in Spain, that the seasonal operation of the treatment plant negatively affects the unit cost of product water, the electro dialysis treatment process raises the costs by a factor of three, and that the reverse osmosis treatment process raises the costs by a factor of ten. Two operational recommendations are provided. First, to operate the treatment plant continuously year round, and secondly, to implement source control measures within the wastewater collection system. The new water generated from the treatment plant replaces demand of higher quality water sources thereby allowing additional storage of water within the reservoirs and creating a more reliable supply for agricultural end-users. The agricultural users were under water restrictions during previous times of drought. The new water supply source has also allowed more flexibility in the region's water resource management. At the time the article was published, the Spanish government had regulations pending. Conductivity has remained a reason to resist the implementation for the agricultural end-users even with the promised benefits of increased water supply reliability.

Mujeriego et al. (2008) present a well formed argument pointing out the need for more water supply sources in Barcelona and how the new water recycling treatment plant may help to meet the supply needs. The plant was in construction at the time the article was written so production and cost estimates were provided but actual figures were not yet available. Mujeriego et al. (2008) assumed that the public and agricultural users would accept the recycled water and that the water would meet all future regulatory requirements that were being developed by the government. While part of the El Prat project that generates recycled water was based upon OCWD's GWRS project, the OCWD uses an entirely separate treatment process to provide its recycled water.

Simulation Modeling

There have been many attempts made to accurately model the hydraulics of distribution systems, treatment plant processes, and financial conditions of water distribution systems. Various software has been developed and improved on in order to determine the hydraulics of complex distribution systems and attempt to determine methods of increasing efficient operations of the systems. Four studies are listed below as examples of modeling and optimizing treatment and distribution systems.

An Integrated Simulation Model for Treatment and Distribution

Joksimovic et al. (2006) integrated simulation models to perform simulation of both treatment plant processes and distribution systems. Existing models that optimize treatment plants typically do so without examining the most cost influential component, the distribution system, while the existing distribution models tend to over simplify the treatment alternatives. In order to determine the best combination of treatment processes, a decision support system (DSS) was developed. The number of water treatment

processes has been steadily growing in recent years and has created challenges for determining the suitable treatment trains for each particular application. Development of new projects is typically a three stage process: first, the determination of appropriate alternatives, second, the construction and operation of a pilot plant, and third, the selection of a particular method for detailed design. This study focused on the first stage and further divides it into the selection of unit process for water treatment, synthesis of combining treatment processes into trains, evaluation and screening of each respective train, and finally the selection of an optimal train for the pilot plant. A key component for most water treatment and distribution models is financial cost; however the authors suggest that other criteria should be considered as well. Distribution models usually perform comparisons that are dependent on the same alignment of pipelines with variances of different pipe sizes. However, reservoir operation and size are also important in distribution system modeling. The new DSS model developed by Joksimovic et al. (2006) is made to include multiple treatment facilities and is not limited to one central plant, contain an open modeling environment that allows the user to edit the model's knowledge base. The DSS provides solutions for complete treatment trains based upon the given water quality, and includes modeling of the distribution system. The distribution modeling allows users to control the system layout, pumping operations, storage of reservoirs, and compiles the least cost options for preliminary sizing that meets operational needs.

The proposed DSS used a Visual Basic graphical interface, created a knowledge base of treatment processes and distribution system components with efficiencies and costs, and utilizes computational modules to analyze the treatment plant and distribution

system. The knowledge base contains water quality requirements, design and costing for each unit process, common and suggested treatment trains based upon influent water quality, general rules for combining various processes together into one train, and design costs for the respective distribution system components. End-users of the distribution system can be classified into eight groups: residential, urban, restricted irrigation, impoundments, industrial, surface, bathing, and unrestricted irrigation. The treatment unit processes are classified into four groups: primary, secondary, tertiary, and disinfection. The following information is retained for each individual unit process: allowable influent quality, process efficiencies, land and labor requirements, sludge and concentration production, capital and operational cost estimates, and preference score based upon qualitative evaluation criteria. The software WTRNet is used to help the user generate treatment trains using either the "Expert" approach or the "Step Wise" approach (Joksimovic et al. 2006). The "Expert" approach treatment trains are suggested as starting points for the user based upon the knowledge base developed through compilation of known treatment plant trains used throughout the world. The "Step Wise" approach allows the user to set the effluent water quality required and add in unit processes to obtain the quality level required by the rules governing each process. The modeling of the distribution system takes into account the respective cost for pipes, pumping, storage facilities, land use, and types of reservoirs used. The computational evaluation of the treatment performance is based upon quantitative, qualitative technical, and qualitative environmental criteria. The computational evaluation of the distribution system is based upon least-cost sizing for a designated layout. Joksimovic et al. (2006) state that their DSS model provides a combined simulation model framework for

analyzing decentralized treatment while allowing user flexibility, providing guidance, and incorporating optimization for pipe sizing.

The ability to conceptually plan and evaluate different treatment processes in various arrangements is very useful and the tool developed by Joksimovic et al. (2006) helps to achieve that purpose. The distribution system evaluation provided by this DSS does not seem as complete as other modeling software and is limited in application. The distribution modeling is not applicable to looped distribution systems, but rather only to branched systems. This is a particular weakness because most water distribution systems are looped in order to eliminate common pressure problems. Before applying this model, the user should familiarize themselves with the knowledge base especially in regards to the water quality parameters to ensure that it is accurate to the particular part of the world the proposed treatment will be located. The model does not seem to truly integrate the treatment process with the distribution system, which is the main purpose of the new model. The two evaluations are distinctly separate and the distribution evaluation does not appear to build upon existing models. Since OCWD is open to considering alternative treatment technologies and applications, this model may provide great insight and a feasibility analysis of the particular water quality parameters for the GAP.

Infoworks WS versus EPANET

Results from modeling water distribution networks with Infoworks WS software were compared to results provided by EPANET software by Vuta and Piraianu (2008) EPANET is widely used modeling software developed by the United States EPA. This software uses pipes, nodes, pumps, valves, and tanks to model pressure, flow, storage, and water quality within water distribution systems. EPANET can be run both for

extended period simulations and steady state. It uses continuity and head loss relationships to compute the respective heads and pressures within the system. The software can track water quality criteria which are typically applied towards disinfection residuals. Infoworks WS suite can model supply and distribution systems, urban drainage systems, and wastewater management. It can perform demand analysis, automated fire flow, and critical link analysis. Infoworks WS has developed its own calculation engine independent of EPANET through which it can model real world conditions more accurately (Vuta and Piraianu 2008). The Hanoi water system was modeled using both software systems. This network is relatively flat in elevation, contains thirty two nodes, thirty four pipes, three loops, and is fed by gravity from a fixed head reservoir. Vuta and Piraianu (2008) conclude that a good correlation exists between the flow rates, pressures, and chlorine residual of the actual distribution system with those found by both the software programs.

According to the authors, Infoworks WS is a superior modeling software over EPANET, but the results presented demonstrate that the two software are essentially equivalent. Of particular interest are the results from each software program and their accuracy in comparison with the measured field conditions.

Dual Water Distribution Network Design Comparisons

Kang and Lansey (2011) used computer modeling to compare dual distribution systems with a single distribution system. A dual system is typical of a water supplier that provides both recycled water and potable water. The dual system is required to keep the water qualities separate. Kang and Lansey (2011) caution that this modeling is suitable for planning purposes but not for design. Not only does the model analyze the

economic costs of the systems, but it also considers some of the environmental costs in the form of greenhouse gas emissions, and reliability through pressure and minimum velocities. This three prong approach has been labeled a "triple-bottom-line" analysis because of the three distinct criteria. In order to compare the dual versus single distribution systems four scenarios were analyzed. The first scenario plainly consists of modeling the single potable distribution system. The second scenario is of a dual distribution system where irrigation uses are supplied by the recycled water. The third scenario is also a dual distribution system with the recycled water supplying both irrigation and toilet flushing. The fourth, and final, scenario supplies irrigation, toilets, and fire flows with recycled water and all other uses with potable water. The three mixed objectives were measured using a mixed integer optimization problem. This method solves the modeling using a multi-objective genetic algorithm linked with EPANET. The four scenarios were applied to a simple hypothetical network and a real world midsized water distribution system. The real world distribution system consisted of 117 nodes, 150 pipes, thirty five square files, an elevation change of up to 150 feet, and a peaking factor of 1.75 over the base demand.

Kang and Lansey (2011) state that communities should strive to obtain a sustainable water supply, especially under the current climate changes and urban population growth. A new water resource, the wastewater effluent, can be used for toilets, landscaping, and firefighting and does not pose water right issues. Dual systems used for potable and non-potable supply delivery have mostly been used to supply large irrigation and residential uses. The increased use of recycled systems has been impeded due to financial costs and social perception issues. By considering more than the

financial costs of dual systems, communities can realize some of the other paybacks that come through recycled water. In the model analysis financial cost is measured by the capital expenses to construct the systems and operational expenses for both the distribution network and the pump stations. Equations were developed for pipe construction, pipe repair, pump construction, and pump operation costs. The greenhouse gas costs were measured from the amount typically produced during pipe manufacturing and pump operation. Reliability was quantified by the number of pipe breaks which represents the number of system interruptions. The interruptions could be local, affecting only a few end-users, or global, affecting the entire system.

For the hypothetical modeling scenarios, Kang and Lansey (2011) concluded that dual distribution systems are more reliable, cost 27 to 31 percent more capital, and produced 3.6 to 5.6 percent more greenhouse gas. The dual systems were more reliable because there were less service interruptions given that the potable distribution system can substitute for the recycled water when an irruption occurs. Since smaller pipes are required for the dual systems, as a result of some demand being split into two separate pipes, the pipes would fail more frequently. The greater the elevation change within the distribution systems, the larger the pumps needs to be. Similarly, the larger the service area of the distribution the larger the pumps and pipe sizes need to be. The study found that the larger the service area the less favorable the economics of the dual system become. In general the single potable distribution system was less expensive, produced a comparable amount of greenhouse gas, and was a slightly less reliable. The greater amount of demand placed on the non-potable system resulted in the most favorable economics for dual systems. The conclusions drawn from modeling of the real world

distribution system resulted in the single system being 23 to 36 percent less capital cost, produced greenhouse gas 11 to 23 percent less, and reliability 6 to 26 percent less. In the dual systems, a better water quality existed due to the smaller pipe sizing causing higher velocities. The requirement to provide fire flows had a large impact on the system variables.

Kang and Lansey (2011) pointed out that the smaller the distribution area of the system the more favorable the economics become. This observation coincides with Maeda et al.'s (2006) finding that the small area systems in Tokyo were able to return a profit after only five years. The GAP is fairly large and may be experiencing financial challenges due to its large size. Kang and Lansey (2011) also suggest that dual systems should be constructed as part of new developments, a point that was also made by Okun (1997). The approach proposed in this work is insightful because it emphasized some of the possible benefits of having recycled water systems that are not solely based upon financial payoffs. Other benefits of recycled water use that are not included in the work are the differences in water and recycled water treatment costs as well as the values of supplementing limited water supplies and finding suitable outlets for wastewater discharges. One aspect of the modeling presented was unrealistic because it assumed that the recycled water system would serve individual households, which is not very common due to the large capital costs relative to the small volume of recycled water used. Another downfall of the modeling is that the software assumed that each pipe link could be isolated, which is not realistic. In a real world system there may be hundreds of feet between isolation values.

Optimal Pump Operation

Al-Ani (2012) presented his findings regarding optimizing pump startups in water distribution systems. Optimal pumping schedules allow for energy savings and more efficient operation of water distribution systems. The proposed analysis technique included the use of a multi-agent particle swarm optimization to determine the most cost effective solutions for pumping schedule and operation for multiple pumps and multiple pump stations within a single distribution system. This criterion is very useful because it is typical of real world distribution systems. The optimization of the pumping is based upon two criteria: first, to minimize the energy costs for pumping and second, to minimize the number of pump starts. Essentially the approach sought to reduce the amount of time the pumps are running while also reducing the amount of times a pump needed to start from a stopped condition because this causes extra wear and electrical usage. The constraints within the modeling included pressure and tank levels. The optimization used the EPANET software to find the most economical solution. Al-Ani (2012) considers this work to be unique because it links an optimization model with a network simulator. The system that was chosen to be modeled is located in Saskatoon, Canada. The system supplies water to farmers, villages, residential, and large industrial users in a rural area near the City of Saskatoon. The infrastructure of the distribution systems consists of arterial pipes, junctions, valves, reservoirs, tanks, lift stations, hydrants, meters, service connections, and backflow preventers. One of the pump stations has two pumps that operate in parallel with an emergency pump held in reserve. The distribution system was built in EPANET and simulation results were verified with measured data and found to be accurate. The optimization algorithm is based on the

natural behavior of a flock of birds in search of food. Individual birds learn and leaders influence the entire group. In the optimization model when a potential solution is found all of the resources are focused on to that area for exact computation. One risk of optimizing the system is that it will be less prepared for unusual events, such as a pipe failure. The energy cost was minimized by maximizing usage of storage volumes in the system's tanks and reservoirs. The number of pump starts was used to simulate the maintenance costs. The effective operation of real world water distribution systems requires more than financial manipulations, therefore additional trade-offs need to occur between multiple objectives. The results produced from the optimization algorithm were simulated in EPANET in order to ensure that the system constraints were met. The analysis of this particular system in Canada resulted in a weekly operational cost savings of 3.4 to 13.7 percent.

The proposed approach allows for solutions to more complex water distribution systems that contain many pumps and tanks; however the application presented in this study is based on a rural system that has been skeletonized. To gain more validity, the approach should be applied to more systems including more complex distribution systems. Al-Ani (2012) used EPANET to accurately model an existing water distribution system and run simulated changes with pump controls. The accuracy of the results produced by EPANET makes this software feasible for use on the GAP.

Advantages and Disadvantages

There are many facts, opinions, and arguments both in favor of and against the use of recycled water. These varying conditions make it difficult for communities to decide whether to construct new or continue operating existing recycled water systems.

In particular, communities that have already been developed and seek to add in recycled water systems face increased capital expenses that may have payoff periods decades away, if at all. This section discusses some of the common consensus about recycled water, proposes some ways to resolve these concerns, and presents some common advantages related to the development of recycled water programs.

The expansion and widespread adoption of recycled water systems has been impeded due to cost and social perception issues (Kang and Lansey 2011). When analyzing recycled water systems based solely upon finances, they often seem undesirable. Cusker (2000) found that in the short term the South Bay Recycling Program's revenue may cover only operational expenses and not debt service created by capital expenses. In regards to social perception, some members of the public are not comfortable with the concept of bringing water back to their house that was sent away through a toilet flush (Kang and Lansey 2011; Mujeriego et al. 2008). Another reasonable objection to recycled water use is related to the quality of the water itself. Okun (1997) noted that parts of Asia, Africa, and Latin America currently have problems with agricultural crops irrigated with contaminated reused water. Another water quality issue encountered in the case studies performed by Mujeriego et al. (2008) and Yi et al. (2011) was the conductivity or salt content of the recycled water. In China salt levels have risen in farmland soil and groundwater due to the use of recycled water (Yi et al. 2011). Mujeriego et al. (2008) stated that agricultural land users are unwilling to use the recycled water in fear of increased salt content ruining their farmlands. Modeling by Kang and Lansey (2011) showed that master planning a development with dual distribution systems results in smaller pipe sizes that are prone to more frequent failure

than larger sizes. Along the same lines, the authors found that a single potable distribution system was less expensive, but produced similar greenhouse gas emissions and fell behind in reliability when compared with dual distribution systems. They also suggest that the larger the service area of a dual distribution system the less favorable the finances for a dual system become. Conversely, Maeda et al. (1996) found that small distribution systems serving high rise buildings were able to return a profit within six years. It follows that maximizing the density of recycled water use within the distribution area may be a critical component to a recycled water system's success. Okun (1997) cited problems with open storage leading to algae blooms and groundwater storage issues caused by previously unidentified geological conditions within a recycled water project in St. Petersburg, Florida. Yi et al. (2011) and Young and Holliman (1991) report concerns with cross connections between recycled and potable water distribution systems. These cross connections can occur during construction if contractors and inspectors are not paying close attention to the work and also during maintenance and improvement operations. The worst case risk associated with cross connections is that recycled water may be used for potable applications such as drinking water and bathing.

Kang and Lansey (2011) suggest that an economic analysis is a more appropriate approach than a strictly financial one since it will take into account other costs and benefits that may not be easily quantifiable into monetary instruments. The recycled water project analyzed by Maeda et al. (1996) in Tokyo was able to return a profit after five years of operation. Cusker (2000) projects that the long term revenues of the South Bay Project may provide a return on investment, based primarily on the continued trend of rising costs for potable water supplies. The concern of public perception associated

with wastewater recycling can be addressed through public education about recycled water and also about the limited and precious high quality water supplies are often dwindling (Young and Holliman 1991). Water quality issues, including salt content and biology, can be resolved through proper treatment processes accompanied by disinfection. Modern treatment technologies can remove large amounts of salt and easily provide disinfection during distribution (Mujeriego et al. 2008; Okun 1997; Cusker 2000). It should be noted that it is typically more expensive to remove salt from water (Mujeriego et al. 2008). As Maeda et al. (1996) point out, there have been times that recycled water quality may be higher than that of surface water supplies. Young and Holliman (1991) report that the IRWD was able to overcome cross connection concerns through implementation of extensive warnings, infrastructure identification, construction inspection and annual inspection activities.

Development of recycled water systems can help communities obtain more sustainable water supplies under conditions of climate change and urban population growth (Kang and Lansey 2011). Furthermore recycled water provides increased flexibility in water resource management (Mujeriego et al. 2008). Recycled water can be crucial during periods of drought and can help reduce wastewater discharge to environmentally sensitive areas (Cusker 2000). Additional flexibility can result from dual distribution systems by saving high quality potable water for necessary uses (Okun 1997). According to the author, only about one third of water use in urban areas needs to be potable quality and that it is generally less expensive to reuse wastewater than to treat and dispose of it. Some of the potential uses for recycled water include toilet flushing, landscape irrigation, and firefighting (Kang and Lansey 2011). Okun (1997) adds that

recycled water may reduce the need for fertilizer due to the nutrient rich quality and be also be used for air conditioning, car washing, laundries, biocide, construction, dust control, fountains, augmentation of dry streambeds and wetlands, industrial processes, and power plant cooling. McGrew and Tobon (2012) have described a recycled water project specifically designed and constructed for use in a power plant cooling process as yet another use. This project reduced demands on groundwater extraction from aquifers and reduced injection of wastewater into the same aquifers. Mujeriego et al. (2008) reinforce the point that replacing potable water supply needs with recycled wastewater can increase storage of potable supplies and reduce seawater intrusion into groundwater aquifers. They also list the use of recycled water in Spain and California to form seawater intrusion barriers. Another advantage found in both Kang and Lansey's (2011) modeling and Okun's (1997) observations suggest that there would be improved water quality within the distribution system due to smaller pipe sizes resulting in higher velocities of water moving through the system. Additionally, the findings of Kang and Lansey (2011) and Mujeriego et al. (2008) indicate that use of both recycled water and potable water distribution systems increases reliability of supply in terms of interruptible service during droughts and the number of pipeline breaks.

CHAPTER 3

GREEN ACRES PROJECT BACKGROUND

The GAP has been delivering recycled water to end-users for more than twenty years. Due to the organization of water retail agencies, wastewater collection and treatment agencies, and OCWD the history of the GAP is characterized by many agreements, rate structures, construction phases, maintenance issues, performance requirements, and complex financial situations. This chapter provides a background on the GAP program that will help to justify the operational and financial analysis performed within this study.

A Chronological History

The current extent of the GAP was constructed in two phases and was preceded by multiple studies and board actions. Most of the GAP's history has been summarized by the "Green Acres Project--Future Direction" report published in 2007. OCWD conducted a feasibility study of recycled water use within the City of Fountain Valley in 1975. The State of California legislature amended the water code in 1977 to prohibit the use of potable water when recycled water is available. While conservation of water has been emphasized in the State's constitution since 1928, the 1977 mandate was the first to require the use of recycled water supplies (Atwater et al. 1998). OCWD developed a facilities plan in 1978 that projected a total cost of $26 million to deliver 12,000 acre feet per year (AFY). The plan called for a grant to pay 87.5 percent of the project's capital

costs. In March of 1979 the OCWD board adopted the Environmental Impact Report for the GAP. During the same year it was discovered that the anticipated grant funds would no longer be available for recycled water projects. In 1981, a pre-design feasibility study was completed and a phased project was outlined. The first phase would cost $6 million and produce 2,700 AFY, while the ultimate project would only produce a total of 5,300 AFY. The study also suggested combining some treatment processes with those existing in OCWD's Water Factor 21 treatment plant. This plant was used to treat wastewater for the purpose of injection into the seawater intrusion barrier. In 1984, OCWD performed a preliminary design which again described a phased approach with initial production of 8,400 AFY that could be expanded up to 16,800 AFY. Finally in 1986 the final design of the treatment plant, distribution pipelines, and end-user connections and location was completed. The cost estimate performed in 1987 predicted a construction cost that ranged between $16.3 to 17.9 million with the lower cost alternatives sharing treatment process with Water Factory 21. Construction for the treatment plant began in 1988 with demolition of existing structures on the OCWD Fountain Valley property. During this year OCWD staff revised the plans and specifications to separate the recycled water treatment plant from the Water Factory 21, to close loops in the distribution system, and to add additional end-users. In 1989 the distribution system was modified to allow for the next phase of the construction into the City of Newport Beach and Huntington Beach. During that year the construction contract was awarded to construct the treatment plant, a two million gallon reservoir, and effluent pump station. In 1990 the construction contract for Reach 1 of the distribution system was awarded. This reach would primarily serve the City of Fountain Valley. Contracts to build Reaches 2 and 3 which would serve the

Cities of Santa Ana and Costa Mesa, respectively, were awarded in 1991. 1991 was a landmark year for the GAP because the first recycled water delivery was made to Mile Square Park in the City of Fountain Valley. The same year, the OCWD Board changed the District Act to define recycled water as a supplemental source, which made its value comparable to imported water costs. Since this change in definition made GAP water more valuable, OCWD wanted to increase the sales rate of water from GAP to the retail water agencies. In 1992, the subsidy from the MWD was increased and OCWD applied for a low interest loan from the state in order to finance the second phase of the distribution system construction. In this year OCWD plumbed recycled water to the toilets in its administration building, being the first single story building to do so. As of 1993, twelve end-users had been connected to the system and annual demand amounted to 2,700 AF. The OCWD Board reversed its decision to classify recycled water as supplemental water in 1994 thereby classifying it as neutral and greatly reducing its value. The decision was reversed because the increase rate for sales of GAP to retail agencies proved unsuccessful due to institutional barriers. In 1995, OCWD purchased a second reservoir from the City of Sana Ana for $5 million. The reservoir and associated pump station helped to balance pressure spikes within the distribution system. In 1999, the second phase of the GAP was completed and delivery of recycled water in to the City of Newport Beach began. Since 1999, there has been no expansion of the distribution system. While some end-users have been added to the existing mainline loops, the push for recycled water end-users has declined within the service area.

A new project at OCWD, the GWRS, began producing water in 2008. The GWRS, just like the GAP, receives its water supply from the OCSD's plant number one

located adjacent to the OCWD facilities in Fountain Valley, California. While the GAP treats water to tertiary water quality standards, the GWRS produces water to near distilled water quality. The GWRS replaced the Water Factory 21 and supplies water for the seawater intrusion barrier along with groundwater recharge in spreading basins located within the City of Anaheim. Some end-user connections have been established from the GWRS pipeline that travels from the treatment plant in Fountain Valley up the Santa Ana River to the City of Anaheim. GWRS end-users are charged the cost of water produced from that treatment plant. The existence of two distinct treatment plants and limited wastewater supply from OCSD plant number one has created a competition for the water. The GWRS plant is capable of treating all of the wastewater available from plant number one, which means that water used to supply the GAP's recycled water system is essentially diverted away from GWRS.

Agreements

The OCWD has entered into agreements related to the GAP with retail water agencies, the OCSD, the IRWD, the MWD, and State Revolving Fund Loans. While these agreements are all designed to have mutual benefits among the parties involved, their requirements are complicated and become even more complex when considered together. In order to fully understand the alternatives presented in this study, a brief description of each agreement is provided in the following sections.

Retailer Agreements

The OCWD does not sell the recycled water it produces directly to end-users, but instead sells it to local water retailers, which are referred to as Retailers. From 1988 to 1991, OCWD entered in agreements with five separate Retailers: the Mesa Water

District (formally Mesa Consolidated Water District), the City of Santa Ana, the City of Fountain Valley, the City of Newport Beach, and the City of Huntington Beach. All of the agreements are very similar and generally require the same distribution performance, water quality, and sales rates.

Each agreement has an initial term of twenty five years with automatic renewals every five years for a maximum of twenty five additional years. If either party wishes to terminate, they must provide four years notice before the next renewal date. Table 1 depicts the current termination and respective notification dates required for each Retailer agreement. The agreements state that the use of recycled water is mutually beneficial in particular to fulfill water resource conservation as outlined in Sections 13550 and 13551 of the California Water Code. According to the agreements, OCWD owns the treatment plant and distribution system and the Retailer's responsibilities begin at the end-user meter location. Each respective Retailer is to perform maintenance and repairs on the distribution system located within their jurisdictional area and are credited for the associated costs through accounting balance sheets.

TABLE 1. Critical Dates for Retailer Agreement Terms

Retailer	Initial Agreement Date	Initial Termination Date	First Possible Termination Date	Last Date for Termination Notification
Mesa Water	03/16/1988	03/16/2013	03/16/2018	03/16/2014
Santa Ana	09/21/1988	09/21/2013	09/21/2018	09/21/2014
Fountain Valley	12/20/1989	12/20/2014	12/20/2019	12/20/2015
Newport Beach	01/16/1991	01/16/2016	01/16/2021	01/16/2017
Huntington Beach	12/18/1991	12/18/2016	12/18/2021	12/18/2017

The OCWD sells the recycled water to the Retailer at the end-user meter location and the Retailer sells it to the end-user at the same location. Through these definitions, the Retailers are not financially responsible for the O&M of the treatment plant or distribution system. The rate at which the Retailer purchases recycled water from OCWD is 80 percent of the Area Groundwater Cost. This cost is determined annually, published in the OCWD Engineer's Report, and represents the costs of using a production well to extract groundwater. The Retailer can sell to the end-user at a rate not to exceed 80 percent of the potable water rate, except for the Mesa Water District which does not currently have a maximum end-user rate defined by the OCWD agreement. The difference in purchase and sales rates for the Retailers produces revenue, however it is partially offset by loss of revenue to not selling as much potable water, accounting costs, and end-user annual testing expenses. An analysis of the recent financial history associated with these rates is presented in Chapter 6. Distribution performance requirements and water quality criteria outlined in the agreements are presented later in this chapter.

The agreement with the City of Fountain Valley differs from the others because some end-users replaced their groundwater pumping with recycled water, in opposition to the vast majority replacing their potable water use with recycled water. These unique users are only allowed to pump up to 20 percent of their demand from groundwater and replace the remaining demand with recycled water purchased from the City of Fountain Valley. As a result of this arrangement, the end-users pay a higher rate for recycled water than other recycled end-users within the Retailer's boundaries.

Currently the City of Huntington Beach does not purchase any recycled water from OCWD even though the agreement was created and some pipelines were constructed. The pipelines located within the City are isolated from the rest of the recycled water distribution system by multiple miles. The lines were constructed in anticipation of delivering recycled water to end-users, however it was determined that the project was not feasible due to the availability of alternative water sources. The City leased the pipelines in 2006 with the intent to connect them to a groundwater pumping well that was producing water tainted in color due to local geologic conditions. Since the water produced was tainted it was not fit for delivery to customers without treatment, so the City wanted to use the well to supply irrigation water. As of the date of this report, the pipeline has not been used for that purpose, but rather as a domestic water distribution pipeline. OCWD paid for the construction of the main line pipeline and developers covered some of the dual plumbing required for lateral and service connections. The larger proposed users in Huntington Beach were golf courses and parks. These end-users have found alternative sources for irrigation water other than GAP water and domestic supplies. The lease of these pipelines to Huntington Beach is inexpensive, however the City provided a connection to a blending water supply that was needed for development and operation of the GWRS project. The lease term is twenty years which places the termination date at October 2, 2026. There are clauses that allow early termination of the lease for both the City and OCWD.

The agreements also define the expected demands for each Retailer within their respective Exhibit "B" sections. There is some language within the agreements that allows for termination of the agreement if the Retailers are unable to enter into

agreements as outlined in the exhibit. A comparison between recent demand for each retailer and the projected demand listed in the exhibits can be found in Table 2, in Appendix C.

End-User Agreements

The end-user agreements are managed and entered into by the Retailers and the customers. While OCWD does impose some requirements contained in the permit, they are not a party of the end-user agreement other than acknowledging their execution. The end-user agreements establish a maximum flow each user can take and pressure requirements for service. All of the end-user agreements have expired, however the Retailers and end-users operate as if they were still binding. The agreements also establish the sales rate for purchase of recycled water from the Retailer to be 80 percent of the potable rate, except for Mesa Water end-users which were charged 90 percent and may see an increase in the future. New end-users recently added to the distribution system have not executed an agreement. Since the current investment philosophy of the GAP is to place all connection expenses on the new end-user, OCWD does not require end-users to establish a capital expense recuperation term. The end-users may find it beneficial to execute an agreement to establish flow and pressure requirements as well as guarantee the sales rate.

Orange County Sanitation District

The GAP related agreements with the OCSD regulate the supply of wastewater influent to the GAP treatment plant and the effluent recycled water service back to OCSD. The two agencies have enjoyed a long history of cooperative operation and collaboration, developing innovative solutions to water and wastewater predicaments.

Beginning in 1975, OCSD began providing secondary wastewater to OCWD. Originally the secondary water was treated further by Water Factory 21 and used in the seawater intrusion barrier, followed by use in the GAP. Beginning in 2008, all of the remaining secondary effluent available is used for the GWRS. Representatives from the two agencies participate in monthly planning, operation, and coordination meetings.

In November of 2002, the two agencies executed the "Joint Exercise of Powers Agreement for the Development, O&M of the Groundwater Replenishment System and the Green Acres Project" agreement. In regards to the GAP, this agreement specifies that OCWD must provide 4.2 MGD to OCSD to be used in their wastewater treatment processes. In practice, OCSD has received approximately 5,000 AFY (approximately 4.46 MGD) of GAP water from OCWD. Given that the total production of the GAP is typically around 7,000 AFY, this indicates that OCSD's use of GAP water has a major impact on the program. The recycled water is not provided for free to OCSD, but its sales rate is highly discounted relative to the Retailer rate. For example in the fiscal year (FY) of 2010-2011 (July through June), the OCSD rate was $177.52 per AF while the general Retailer rate was $329.60 per AF. The OCSD discounted rate is adjusted annually according to changes in the Consumer Price Index (CPI). While this may seem unjust at first glance it is important to note that the secondary wastewater provided to OCWD for use in the seawater intrusion barrier, GAP distribution system, and GWRS project is provided free of sales cost to OCWD. The arrangement is mutually beneficial to both agencies because the OCSD is able to reduce discharge expenses including permitting, infrastructure, and pumping while OCWD is able to provide new water supply sources to the region without purchasing influent water. GAP water is sold to

OCSD at a rate lower than the cost of producing the recycled water. This financial arrangement has had a downward effect on the overall financial outlook of the GAP.

The OCSD has a project to be completed in 2013 to reduce their demand for GAP water. The project will construct a closed loop cooling system to replace a single pass system. This means that the water required to provide the same amount of cooling is greatly reduced because the same water can be used multiple times. This will not eliminate the demand for recycled water from OCSD but it is predicted to reduce the demand to one MGD (1,120 AFY) or less. This indicates that additional recycled water supplies will become available for distribution and/or the secondary influent wastewater can be diverted into the GWRS project. If the freed up recycled water supply were sold through the GAP project, the financial outlook would improve because a larger volume of water would be sold at a rate higher than is required to produce the flows. If the freed up supply were used in the GWRS project, the variable costs associated with producing GAP water would be reduced which may also result in an improved financial outlook. The agencies had this change in demand in mind when the existing agreement was amended in May of 2010. The new amendment provides for a flow of 1 MGD to be provided to OCSD free of charge and a discounted rate to be charged for flows above that quantity.

Irvine Ranch Water District

Among its many operations, IRWD collects and treats sewage flows. In 1996, OCWD entered into a 15 year agreement with IRWD and the City of Newport Beach to allow IRWD to discharge treated wastewater flows into the GAP distribution system. The agreement has allowed IRWD to release peak flows encountered during winter months into the GAP system instead of paying to send them to OCSD or releasing them

directly into the environment. The second construction phase of GAP included an intertie pipeline to connect the GAP system being constructed in the City of Newport Beach to the recycled water distribution system of IRWD. This agreement established a rate of purchase by OCWD from IRWD of 50 percent of the sales rate from OCWD to OCSD. For example, in FY 2010-11 the rate for OCSD was $177.52 per AF so OCWD would pay IRWD $88.76 per AF. This is a savings for OCWD because the cost of purchasing the water is much less than the cost of producing the water at the GAP treatment plant. While this is most certainly less than the treatment costs for IRWD, it represented a savings for them due to the large financial charges associated with sending wastewater to the OCSD or the effects, both environmental and financial, associated with discharging directly to the environment. The water was generally purchased from November to March each year and allowed a shutdown of the GAP treatment plant. The shutdown provided a reliable occasion for maintenance and repair operations of the treatment plant.

A new agreement was entered into by OCWD and IRWD, among other parties, for the intertie supply flows in early 2012. As part of this agreement the intertie pipeline connection came into IRWD ownership, OCWD was to construct a connection between the GAP distribution system and GWRS inflow to allow for excess IRWD discharge flows to enter the GWRS plant through the GAP system instead of conveying it through OCSD, and IRWD's supply to the GAP system would be provided free of cost to OCWD. This new agreement has only been in effect for one season, so long term trends have not been established, however the quantity of water supplied to GAP from IRWD was approximately half of the amount that was provided the previous year. Staff from IRWD has confirmed that the lower quantity of GAP water provided was due to lack of

rainfall and not to the implementation of alternative discharge sources. It is probably IRWD's intention to keep the GAP connection in reserve for use during excessive peak flows but generally find alternative discharge sources for its recycled water supplies. During the winter rainy months, IRWD experiences a dramatic decrease in recycled water demand within its own independent recycled water distribution system. The decrease in demand results in the need for storage or alternative discharge of recycled water since it is produced based on wastewater flows. The free supply of GAP recycled water from IRWD greatly favors a positive financial outlook; however its longevity questionable.

Metropolitan Water District's Local Resources Program

The MWD of Southern California is the agency in charge of importing water to satisfy the demands of the majority of urban Southern California communities. There are twenty-six member agencies of MWD which can purchase imported water directly. One of these agencies is the Municipal Water District of Orange County (MWDOC). OCWD is a member of agency of MWDOC and must purchase imported water supplies through them. The water imported by MWD travels through the California State Water Project (from the Sacramento Delta area) and through the Colorado River Aqueduct (from the Colorado River along the eastern border of the State). Due to the large demands placed on the imported water sources and the limited supply and conveyance quantities, MWD has developed programs to help reduce demands on imported water supplies. One of these programs is the Local Resources Program (LRP). The LRP provides an operating subsidy for local water supply alternatives that are developed to replace an existing demand or prevent a new demand for imported water.

OCWD has been receiving LRP subsidy payments for GAP deliveries since its first recycled water delivery in 1991. The payment formula was simplified in 2008 to be $250 per AF up to a maximum of 2,800 AFY. This means that recycled water delivered through the GAP generates revenue from both sales to the Retailers and from the LRP subsidy. The deliveries to OCSD are not eligible for the subsidy because the demand for imported water from MWD is not replaced or prevented. The recycled water provided through the GAP by IRWD is eligible for the subsidy and OCWD collects the payment. When OCWD uses groundwater sources to blend with GAP treatment plant effluent, to control water quality parameters, the groundwater quantity is not eligible for subsidy. The $250 per AF subsidy will terminate on October 31, 2016. The effects of the subsidy termination are outlined in Chapter 6. A clause in the agreement states that OCWD shall make its best efforts to operate the GAP to a maximum yield during the term of the agreement, which may have an effect on any efforts to reduce or terminate GAP recycled water deliveries.

State Water Loans

In order to help finance the capital expenses associated with the GAP treatment and distribution facilities, two loans were initiated through the State Water Resources Control Board. These loans are low interest and provide favorable financing for water improvement projects throughout the State of California. The first loan was contracted in 1989 for $2 million at an interest rate of 3.3 percent. The annual repayment amount was $177,932 and the loan was completely repaid in 2010. The second loan was issued for phase two construction of the GAP distribution system into the City of Newport Beach for $4.38 million at an interest rate of 2.8 percent. The annual repayment amount for this

loan is $290,331 and is due to be completely repaid in 2016. The effect of these loans on the financial outlook of the GAP system is examined in Chapter 6. Regardless of the future decisions on the operation of the GAP, the remaining balance of the outstanding loan must be repaid in full. If operation of the GAP was terminated or the facilities leased, the agreement states that the remaining loan balance would need to be repaid immediately with a possible penalty. The remaining capital expenses of approximately forty two million dollars for the GAP construction were covered through OCWD's Capital Improvement Program (CIP). As discussed in Chapter 6, it is estimated that the Capital debt is roughly equivalent to $2.5 million per year with a lifetime of thirty years ending 2021.

California Regional Water Quality Control Board Permit

The California Water Code outlines the procedure for regulation of recycled water use and in the case of the GAP assigns the regulating agency as the Santa Ana Region of the California Regional Water Quality Control Board (RWQCB or Board). In essence this gave the authority to regulate the use, monitoring, treatment, disinfection, water quality, inspection, reporting, and other standards associated with recycled water to the RWQCB. A permit has been issued form the Board to OCWD for operation and distribution of GAP facilities. The Board is primarily concerned with the public health risks associated with recycled water use that include direct contact with the water at irrigation sites, cross connections, and water quality of the receiving waters. The permit places requirements that OCWD must enforce on end-users, which is placed into effect through the Retailers. OCWD ensures compliance with these requirements through annual inspections of each end-user site performed by OCWD personnel. The latest

version of the permit was issued in 2002. As stated within the permit, GAP effluent qualifies as Disinfected Tertiary Recycled Water as defined in the California Water Recycling Criteria, Section 60301.230.

Treatment and Distribution

The GAP treatment plant began producing recycled water in 1991. Its facilities include a treatment plant, two reservoirs, distribution system, and two pump stations. All of these components must work together to provide the necessary performance requirements outlined within the permits and agreements discussed previously.

Treatment Plant

The treatment plant is located in Fountain Valley at the same site as the main administration building of OCWD. The OCSD secondary treated influent water is mixed with coagulant in two rapid mixers before entering a flocculation mixer. Typically alum is used to coagulate the phosphorus and suspended solids in the water but specialized polymers are also available. The flocculation process utilizes thirty two paddles in each of two cells. The water is then passed through four dual media filtration beds and discharged into a chlorine contact basin referred to as the "Clear Well." The dual media used in the GAP plant is made of anthracite, twenty-four inches deep, and sand, twelve inches deep. The media is usually loaded with 3 to 5 gallons per minute (GPM) per square foot. Filter run time ranges from ten to forty-eight hours before backwash occurs. The backwash process uses air scour and a flow of fifteen GPM per square foot. The filtration treatment can treat 7.5 MGD average and 9.5 MGD peak. The chlorine contact chamber can treat 12.67 MGD and is located within the 1.35 million gallon Clear Well. Groundwater pumped from the OCWD's Deep Well system can be added to the flows

entering the Clear Well. The deep wells pull groundwater tainted in color from a deep aquifer and are used to improve effluent water quality parameters when necessary. There are also two ways for water treated through the GWRS plant to enter the Clear Well: microfiltration effluent and ultra violet light effluent. These sources can also be used to improve water quality, but are not typically relied upon because of the greater treatment costs associated with the more advanced and energy intensive treatment technologies.

Fountain Valley Pump Station

From the Clear Well water is pumped into the distribution system through a 10,500 GPM capacity pump station. The pump station consists of four pumps split into two operating conditions. The first operation condition is used to initially fill the distribution system with water and during startup from zero pressure. There is one pump used for this condition and it is referred to as the Low Pressure Effluent Pump (LPEP). Of more interest, because they are used almost all of the time, are the High Pressure Effluent Pumps (HPEP). All three HPEP pumps are identical and are able to operate in parallel to generate supplemental flows. One HPEP pump is constantly running at all times with the others used to increase flowrate when necessary. In practice the only time all three pumps would operate is when there is a major break in the distribution system pipeline. All of the control logic has a delay of three minutes, meaning that a change in operation is not executed until the event warranting change has occurred for three minutes. This delay reduces the occurrence of pump cycling, multiple pump starts within a short amount of time, due to system pressure fluctuations. All of the performance parameters of this pump station are intended to ensure a pressure of 125 pounds per square inch (psi) leaving the pump station into the distribution system.

Santa Ana Reservoir and Pump Station

Another reservoir and pump station exists within the GAP distribution system and is referred to as the Santa Ana Reservoir (SAR). As the name implies these facilities are located within the City of Santa Ana. The reservoir was purchased from the City of Santa Ana in 1995 for the purpose of maintaining operational performance requirements such as distribution system pressure. The reservoir has a capacity of six million gallons and the pump station can provide up to 7,000 GPM flow into the distribution system. The reservoir filling and pumping are controlled by water storage levels within the Clear Well back in Fountain Valley. There are two identical pumps at the SAR site that also operate in a lead-lag configuration. If the water elevation within the Clear Well drops below nine feet then the lead pump starts up and if the elevation drops below seven feet then the lag pump joins in. The lag pump shuts off when the Clear Well level is greater than ten feet and the lead shuts down when the level is greater than twelve feet. The reservoir drains when the pumps are running and does not permit any filling. In order for the reservoir to fill, the Clear Well level must be above 12.2 feet. The maximum height of the SAR is nineteen feet. In general the reservoir fills during the early afternoon and drains during the night and early morning, in accordance with the peak demands placed on the recycled water distribution system.

Distribution System

There are currently approximately thirty-seven miles of recycled water distribution pipeline owned and maintained by OCWD. The distribution system layout is depicted in Figure 1. The pipeline sizes range from forty-two inches to two inches and the materials primarily include cement mortar lined and coated steel pipe with sections of

polyvinyl chloride (PVC) pipe. The pipelines deliver water to one hundred meters located within the cities of Fountain Valley, Huntington Beach, Santa Ana, Costa Mesa, and Newport Beach. Over the last five FYs the GAP system has delivered an average of 7,400 AFY of recycled water; 2,900 AFY delivered to end-users other than OCSD. The distribution primarily serves landscape irrigation end-users including parks, schools, golf courses, roadway medians, and cemeteries. Other users on the distribution system take recycled water for toilet flushing, commercial processes, and cooling systems.

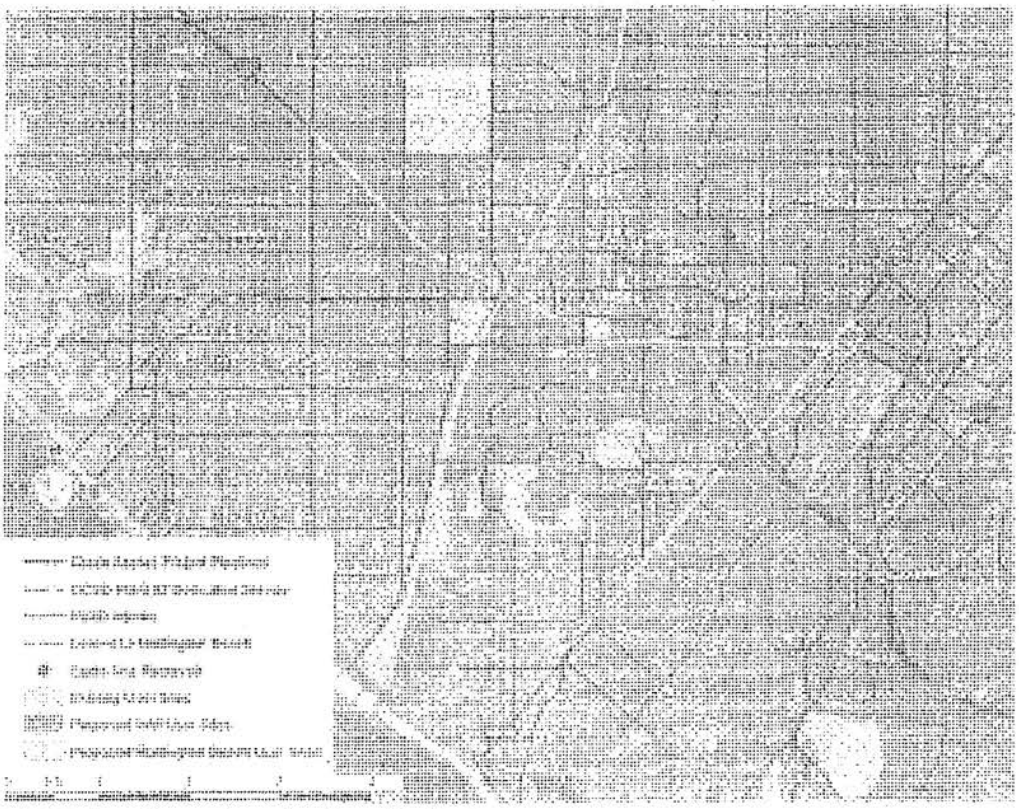


FIGURE 1. Green Acres Project distribution system.

As shown in Figure 1, OCWD owns pipelines within the City of Huntington Beach that are currently under lease to the City. These pipelines were constructed with the intention of connecting to the active distribution system and serving recycled water end-users within the City. As described in the agreement section of this study, the pipelines are leased to the City of Huntington Beach and are used for distribution of domestic water supplies. If these pipelines were to be used in the future for recycled water delivery from GAP, approximately an additional three miles of pipeline would need to be constructed. Another hindrance is that the large water users in Huntington Beach proposed to be supplied with GAP water already have secured alternative water sources to domestic supply. During FY 2011-12, 39 percent of end-user demand for GAP water was for irrigation use and 61 percent for industrial use, including OCSD as industrial use. With the proposed reduction in OCSD demand the percentages should shift to 72 percent irrigation and 28 percent industrial.

Performance Requirements

The Retailer agreements require a pressure of 60 psi or more to be delivered to end-user meters between the hours of 8 PM and 6 AM, and 20 psi or more to be delivered between 6 AM and 8 PM. These pressure requirements and time periods are uniform among all of the Retailer agreements. As indicated by the time frames the primary demand on the system is predicated to be between 8 PM and 6 AM since irrigation is typically performed during times when the sun is not shining in an effort to conserve water amounts and transpiration effects. The OCSD agreement guarantees a delivery pressure of 105 psi or greater. Among fifteen required water quality parameters typical GAP deliveries are to have total dissolved solids between 950 and 1,050 milligrams per

liter and hardness between 300 and 350 milligrams per liter. As cited in the RWQCB permit, the concentrations in the FY 1999 to 2001 were 438 to 1,130 milligrams per liter for total dissolved solids and 158 to 263 milligrams per liter for total hardness. The permit also notes that water quality within the aquifers below the recycled water application zones has not been affected by the use of GAP recycled water.

Some performance problems have been encountered within the City of Newport Beach. The City is serviced through the southeast branch of the distribution system has users located approximately seventy-five feet higher in elevation from the treatment plant and pump stations. Pressure problems tend to affect branching distribution systems, which is why looping pipeline alignments are typical in urban water distribution. The effect of the distribution branch serving the City in combination with the large change in elevation and travel distance from the pump stations have resulted in pressure and flow issues in the City. Since the distribution system is highest in elevation within the City, whenever there is a pressure drop due to pump failure or dramatic change in system demand the pressure can drop dramatically. The resulting pressure surges and air entrainment within the distribution system have resulted in pipeline failures and delivery interruptions. The City has invested in booster pump stations in order to meet the performance requirements of its end-users.

Issues and Benefits

As described in Chapter 2, there are common problems and benefits to all recycled water systems; however the GAP has some unique ones as well. Issues of concern for the GAP system include influent water quality, effluent turbidity and salinity, deep well groundwater augmentation, limited quantities of influent, and financial costs.

Noteworthy benefits of the GAP system include reduction of coastal pumping, a drought-proof water supply, and promotion of water conservation.

Issues of Concern

The influent water to the GAP treatment plant is provided from secondary treated effluent from OCSD. OCSD employs multiple treatment technologies to treat the wastewater flows it receives. The use of advanced primary treatment involves adding anionic polymer to increase settling effects. The use of this polymer may have deleterious impacts on the GAP treatment efficiency. Additionally, the turbidity fluctuations of influent water to both OCSD and OCWD can cause problems. The RWQCB permit limits the amount of turbidity that can enter the GAP treatment plant and at times the effluent from OCSD is high due to OCSD influent conditions. Even when acceptable turbidly limits are reached at the mouth of the GAP treatment plant, the effluent may exceed turbidity limits and require blending with higher quality water sources. Also reported by Mujeriego et al. (2008) in Spain, some end-users of GAP are cautious about the recycled water's salinity. In OCWD's case the two end-users that are most concerned about salinity are golf courses that refuse to water their sensitive grass species during the summer months with recycled water without periodically "rinsing" them with potable water supplies. When the GAP effluent flows need to be blended with higher quality sources, there are additional costs encountered. Primarily deep well groundwater is used for this blending. This water is used because it is tainted in color and therefore not tolerable for potable uses. The supplement of groundwater into the system is counterproductive because one of the GAP's purposes is to reduce coastal groundwater pumping. When supplemental streams are taken from the GWRS treatment

plant then much greater treatment costs are associated with the GAP flows due to capital investment and energy intensive technologies. Improvements in effluent water quality and coordination efforts by staff from OCSD and OCWD have resulted in more efficiency and a better water quality from the GAP system in recent years, including a reduction on the dependence of deep well groundwater supplement. It is known at OCWD that the GAP system has never produced a return on investment when capital expenses are considered. The worth of the GAP program is in question because the GWRS project produces recycled water at a much higher quality and volume. Additional conflict arises when the influent flows are considered because the GWRS has the capacity to accept the GAP influent flows. OCWD operations staff also has to maintain and operate two distinct treatment plants with very different treatment technologies. This can increase labor costs and divert attention from improving efficiencies into just operating both systems simultaneously.

Noteworthy Benefits

Since the GAP provides recycled water to coastal cities in Northern Orange County, the cities are meeting part of their water supply demands through an alternative source. Without GAP water, the cities would completely rely upon groundwater pumping and imported water. Along the coast there is a problem with seawater intrusion into the groundwater aquifer. The intrusion is caused by cities and water agencies pumping large amounts of groundwater causing groundwater to flow inland from the ocean. This is a danger to the entire groundwater basin because the high salinity content of ocean water can spoil the fresh water stored beneath the ground. The alternative of importing water through MWD or MWDOC is very expensive and has become less

reliable in recent years. Judicial court actions to protect the environment have limited the amount of water that can be imported and supplies have dwindled due to drought conditions. A similar condition is being experienced with Orange County local flows in the Santa Ana River; which have dropped due to drought, economic recession, and upstream water efficiency. The provision of recycled water to these coastal cities has an effect of decreasing the amount of groundwater they need to pump, thereby reducing the tendency of seawater to intrude into the groundwater basin. Since GAP water is produced from wastewater it is considered a drought proof supply. The water is not reliant on imported or groundwater supplies therefore it is a new source of water that is not dependent upon weather conditions.

As previously discussed, California has established goals to reduce the amount of water it demands. One of the ways that has been suggested by the State to reduce these demands is to implement more recycled water programs. Recycled water is considered a new water source and reduces demands for high quality potable water resources. While the consideration of new recycled water systems are primarily questioned based upon large capital expenses, the GAP system is already in place. Since the capital investment has already been made, and will be paid for regardless of the system's operation, then the "sunken" capital costs can be ignored during financial analysis. Essentially, if the GAP system can generate enough revenue to sufficiently cover operational, maintenance, and repair expenses, then the system can be viewed as financially neutral. Since OCWD is a public agency, it is not interested in providing programs that produce profit, but rather ones that are of the most benefit to retail water agencies and end-users.

CHAPTER 4

MODEL SELECTION AND DEVELOPMENT

EPANET

In order to accurately explore the various operational and financial scenarios involved with this study, it is necessary to develop a hydraulic model of the GAP distribution system. OCWD has developed at least one hydraulic model of the system in the past; however the model is no longer operational and is outdated. There are many software programs in the marketplace today that can model complex hydraulic distribution systems. The following three software programs were considered for this study: WaterGEMS, H2OMAP Water, and EPANET. WaterGEMS has been developed by Bentley and can be integrated into ArcGIS and AutoCAD for ease of use. H2OMAP is a product of Innovyze and can also be used in connection with ArcGIS. EPANET has been developed by the United States EPA uniquely for water distribution system modeling.

Ultimately, EPANET was the software selected to perform the hydraulic modeling in this study. The alternative software programs need to be purchased before modeling can be performed while EPANET is free for all users. As confirmed by Vuta and Piraianu (2008), Kang and Lansey (2011), and Al-Ani (2012) use of EPANET software is widespread both within the United States and internationally. There have been many studies performed through implementation of EPANET models and the

results from the software are acceptable and accurate. The software has been developed by the EPA which is a trusted source. Also, since the use of EPANET is so widespread, there have been many conversion tools developed to transfer the data between formats accepted into other software applications. This means that a model developed with EPANET can usually be converted to the format of another software program with little effort. All of these positive aspects associated with EPANET led to the decision to use this software for the hydraulic modeling of the GAP.

The computational power of EPANET lends itself to accurate modeling and analysis of water distribution systems. The software was developed in order to help public agencies better understand the complex hydraulic and water quality scenarios encountered in today's distribution systems. EPANET can perform a steady state analysis as well as an extended period simulation. Pipe networks in EPANET include the following components: pipes, nodes, pumps, valves, and storage tanks. During a simulation EPANET will track the flow in each pipe, the pressure at each node, the height of water in each tank, and the chemical concentration of water in the system. For this study the water quality aspect of the program was neglected, however future GAP studies may warrant tracking of disinfection chemical properties. The program can be used for many applications that include varying pumping and storage operations, fire flow analysis, targeted improvement of hydraulic efficiency, operator training, and system planning.

Data Collection

Before performing any modeling of current operation or proposed alternative scenarios, a conceptual model of the distribution system has to be created. Typically

hydraulic models of distribution systems depict the system as "skeletonized," meaning the piping is simplified by removing minor laterals and combining demand locations. With the foresight that this model may be converted to another software program in the future and in order to achieve the most accurate results, this study did not skeletonize the system. This required substantial time and research in order to accurately simulate all of the necessary system components. The valves within the system were not added to the model; however the pumps, tanks, pipes, laterals, and service connections to each meter were included. The GAP distribution system consists of various pipe materials which were assigned proper friction coefficients, however pipeline age was ignored. Once the physical aspects of the model were correctly described in the input, the demand and treatment patterns needed to be determined.

AutoCAD for Horizontal Alignment

The first step to create the model was to secure copies of the record drawings for the distribution system. These drawings were only available in Adobe PDF format and therefore needed to be digitized in a way that EPANET can utilize the pipeline alignments. The horizontal alignments were drawn using Autodesk's AutoCAD software in combination with ESRI's ArcMap software. The centerline of each pipe segment was drawn in AutoCAD based upon the bearing and length stated within the OCWD record drawings, then imported into ArcMap with an aerial image background. Both software programs had to be used simultaneously because it was not possible to check the accuracy of the AutoCAD line work without placing the lines on top of an aerial map view in ArcMap. Some of the bearings were found to be recorded incorrectly and were adjusted according to the valves and known alignments through relative distances

measure in the aerial view. Many of the record drawings were created in the early 1990s and drawn by hand, which introduced some error into the calculations. Also, since the distribution system covers large distances, small rounding errors or line work mistakes can be compounded into large errors. The AutoCAD line work was meticulously checked for accuracy due to the nature of EPANET requiring pipe segments to meet at exactly the same node and a node to be located at every pipe junction.

ArcMap for Attributes

Once the horizontal alignments were fully completed in AutoCAD, a conversion to ArcMap was performed. ArcMap contains a tool to perform the conversion from an AutoCAD .dxf file to a .shp, or shape, file. A shape file can contain both spatial data and attributes about each of its features. For example one shape file can contain information about where a pipe is located, what it is made of, who constructed it, when it was installed, length, diameter, and more all within one file. For the GAP distribution system, ArcMap was used to add attributes information about the diameter and material of each pipeline segment. This information was also extracted from the OCWD record drawings. The Hazen-Williams friction coefficients for each pipe material were added to the attributes at this time. An average value for each material was selected for the friction coefficients which are summaries in Table 3. It was discovered during this phase of the model development that there were active service connections that were not shown on the record drawings. A copy of the route that the OCWD meter reader takes monthly to read each end-user's meter was obtained from OCWD's accounting department in order to locate the missing meter locations. Since the record drawings for each connection were not provided, this study assumed that the service connections were two inch copper pipes.

The assumed size and material for the service connections without record drawings were selected because detail specifications in the original record drawings required such for small service connections.

TABLE 3. Hazen-Williams Friction Coefficients

Pipe Material	Coefficient
PVC	150
Cement Lined	120
Copper	135
DIP	140
Steel	100

Source: Houghtalen et al. (2009). "Fundamentals of Hydraulic Engineering Systems".

Conversion to EPANET

Once every pipe segment was assigned the information about its respective diameter and material, a conversion tool was used to put the data into a format acceptable for the EPANET software. The tool used for this process is called "shp2epa.exe" and was downloaded free of charge from www.zonuma.com. As the name implies, the tool converts from shape file format to EPANET's format of .inp file. The .inp file format can easily be edited using a text editor or spreadsheet application. After the conversion was completed, a trial run was attempted. It was soon discovered that multiple problems existed with the model data. The length of each pipe segment was correct if the segment was straight. If the segment contained a bend or curvature then the conversion tool provided a length from the start node to the end node directly which neglected the true length of the segment traced along its alignment. This issue was resolved by updating the lengths in the .inp network data file using those contained in the shape file. Another

problem with the conversion tool is that a node was created at each end of each pipe segment. This means that two adjacent pipe segments terminated at two different nodes at exactly the same location. EPANET could not model the system because the pipe segments were not connected. The duplicate nodes were removed and the pipe segments connected together. The EPANET software was difficult to work with in regards to editing the existing system and exporting simulated model data as compared to alternative software programs. Since the shape file to network file conversion tool could not include elevation information, the elevation of each node had to be entered after conversion. OCWD maintains files in its ArcMap database that estimate the elevation of points within the jurisdictional boundaries of the District. The nodes of the EPANET network were exported from the .inp file and imported to ArcMap in order to use a tool to assign an elevation to each node. The elevation data was then transferred back to the .inp file using Microsoft Excel.

Flow Data

The GAP distribution system has very limited real time data collection. The treatment plant is connected to operational software and real time data is collected and stored. The flows and pressure within the distribution system, however, are not actively monitored and all of the end-user meters have to be read by a person. For this reason, the meters are read once per month by the OCWD accounting department. The most recent peak season for the GAP system with data available starts in the summer of 2012. The hydraulic modeling of the distribution system is based upon average conditions during this peak season which was taken to be from May 1, 2012 to August 31, 2012. The average reading for each meter over the four month period was determined. A sum of all

the averages was compiled and used to determine the percentage of flow each end-user demanded during the average peak month. The two end-user meters for OCSD were removed from these calculations because their demand pattern is not typical of the other end-users. The majority of end-users use recycled water for irrigation, but OCSD uses the water for power plant cooling and treatment plant processes. OCSD demands a relatively constant amount of water throughout the day, while the other end-users tend to irrigate during the late night and early morning hours. The flows exiting the GAP treatment plant and entering into the Clear Well reservoir were obtained from OCWD operations staff. Since a computer logs this information, an average hourly rate was obtained for each hour during the four month period. The same approach for data collection was used for the backwash flows, effluent flows into the distribution system, reservoir water levels of the Clear Well, SAR, and pumping operations of the pumps located at the SAR. Table 4, in Appendix A, contains the raw data collected from the treatment plant operational software. The determination of flow patterns and hourly demand at each end-user meter are discussed in the following section. Pump characteristic curves were obtained from OCWD operations staff for three different pump models used in the system. Copies of the pump curves can be found in Figures 2, 3, and 4 of Appendix A.

Conceptual Model Development

Once sufficient data had been collected, it was analyzed to determine demand and treatment patterns to input into the EPANET model. Due to lack of information from the distribution system, some assumptions had to be made in order to perform the hydraulic modeling. The pattern development process centered on the most accurate information available: the flows into and out of the clear well reservoir. The GAP treatment plant

discharges to the Clear Well along with any supplemental water sources, such as deep well or flows from the GWRS plant. The filter backwash flows are drawn from the Clear Well. The majority of water leaves the Clear Well into the distribution system through the HPEP pumps. The same approach was used with all of the hourly average flow rates collected. The flows were organized in Excel spreadsheets according to their chronological occurrence. An average flow was determined for each day and each hour. For example, the treatment plant effluent was determined for Sunday from 1 AM to 2 PM, 2 PM to 3 PM, etc. and average for every Sunday within the four month period. These averages were placed together into a table summarizing the weekly patterns experienced over the four month period. The tables developed for this analysis are presented in Appendix A as follows: Table 5 for treatment plant effluent with Figures 5 and 6, Table 6 for the backwash flowrate with Figure 7, Table 7 for Clear Well level with Figure 8, Table 8 for SAR level with Figure 9, and Table 9 for total distribution system pumping with Figures 10 and 11. General observations can be made when looking at the figures. The peak demands times on the distribution system are generally from 21:00 (9 PM) to 03:00 (3 AM) and from 06:00 (6 AM) to 10:00 (10 AM). These times for peak demand are expected because the primary end-users with fluctuating demand are irrigating landscape which is typically done in the late evening or early morning. In general the treatment plant produces the most effluent on Mondays because the influent flows and recycled water demands are generally lower during the weekend. The Monday ramp up brings the reservoirs back up to the necessary operational levels to support the weekday demands. It can also be observed that demand is generally lower on Saturdays and Sundays, which also coincides with irrigation patterns. End-users deter irrigation on

the weekend because people are more likely to be enjoying parks and golf courses during those days so the area is maintained slightly drier than normal. The SAR level slightly lags that of the Clear Well, which is explained by the controls for the SAR being based upon the levels of the Clear Well.

Demand patterns were developed for the treatment plant flows, backwash flows, the OCSD flows, and the end-user meter demands. Generally, patterns are developed by multiplying a base value by a peaking coefficient. From the data shown in the previous figures and tables, the lowest average point was assigned a pattern coefficient of one. All of the remaining hours were assigned a coefficient based upon their ratio with the lowest point. Although not yet discussed, this method was applied to the meter pattern as well as the treatment and backwash patterns. The daily flowrate for both of the OCSD meters are shown in Table 10 and Table 11, in Appendix A. The OCSD flow pattern was assumed to be flat, meaning that the demand from OCSD remains constant throughout the day. The daily flow for the OCSD meters was averaged over the twenty-four period and subtracted from the total flow each hour before determining the pattern for the other end-user meter flows. As an example of the resulting peaking factor pattern, Figure 12 depicts the demand coefficients used for the end-user meters. Figure 13, in Appendix A, depicts the factors as a trend line. Table 12 and Table 13 were derived to determine the end-user demand patterns and can be found in Appendix A.

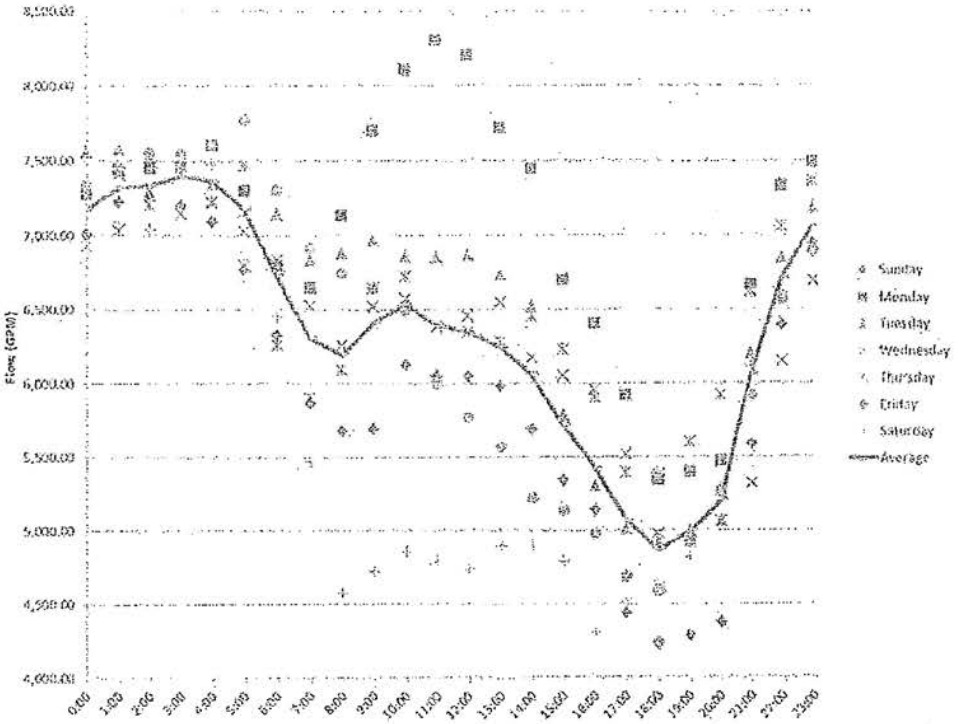


FIGURE 5. Average hourly treatment plant flow rates.

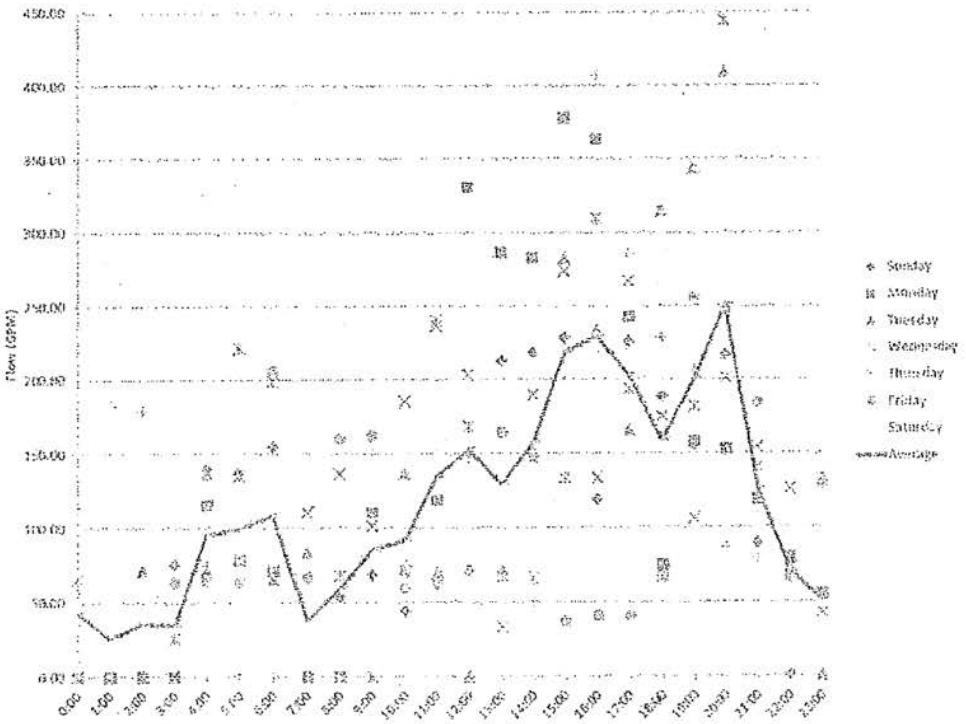


FIGURE 7. Average hourly backwash flow rates.

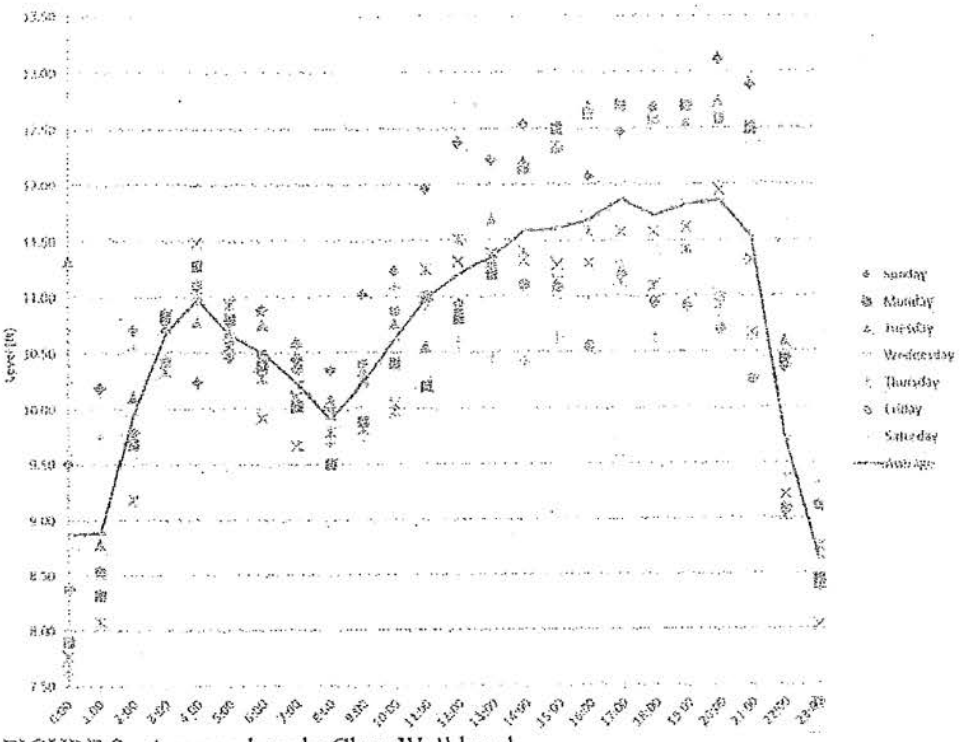


FIGURE 8. Average hourly Clear Well level.

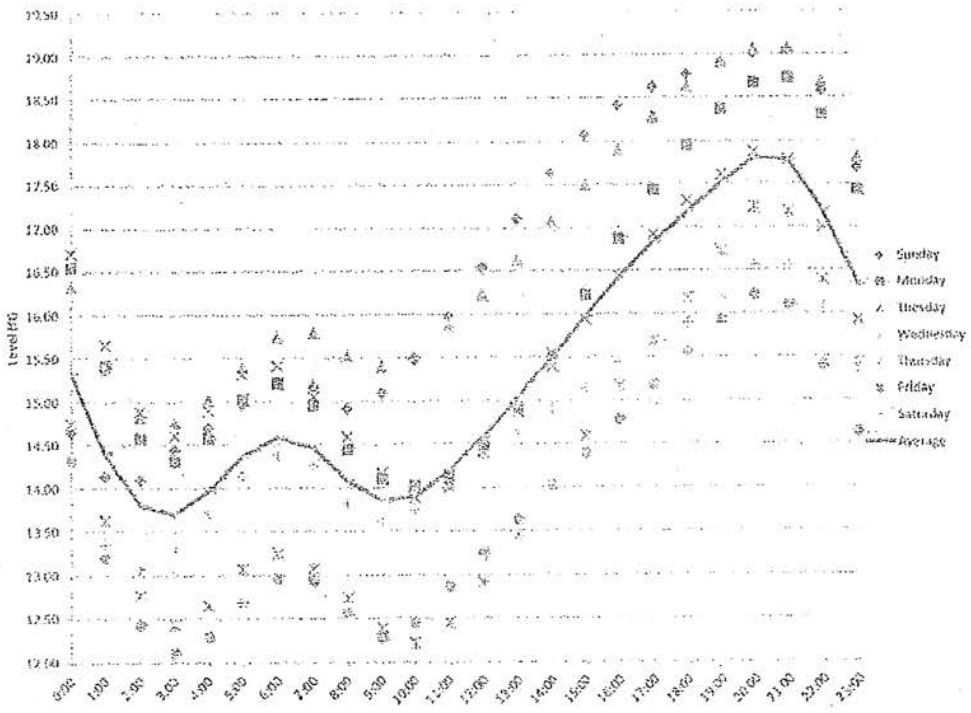


FIGURE 9. Average hourly Santa Ana Reservoir level.

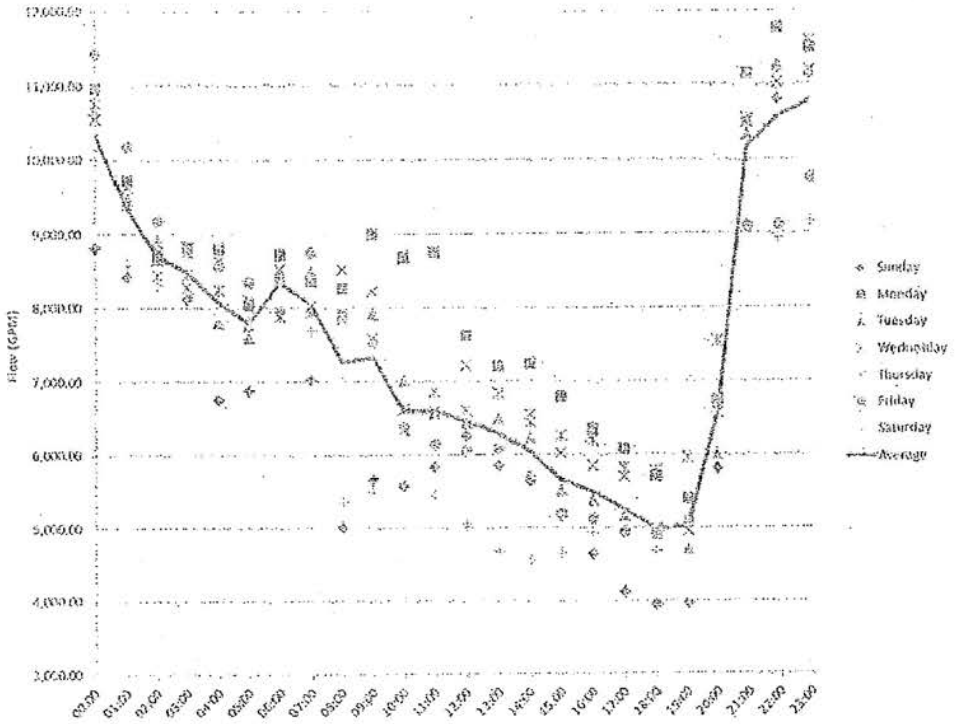


FIGURE 10. Average hourly total pumping flow rates.

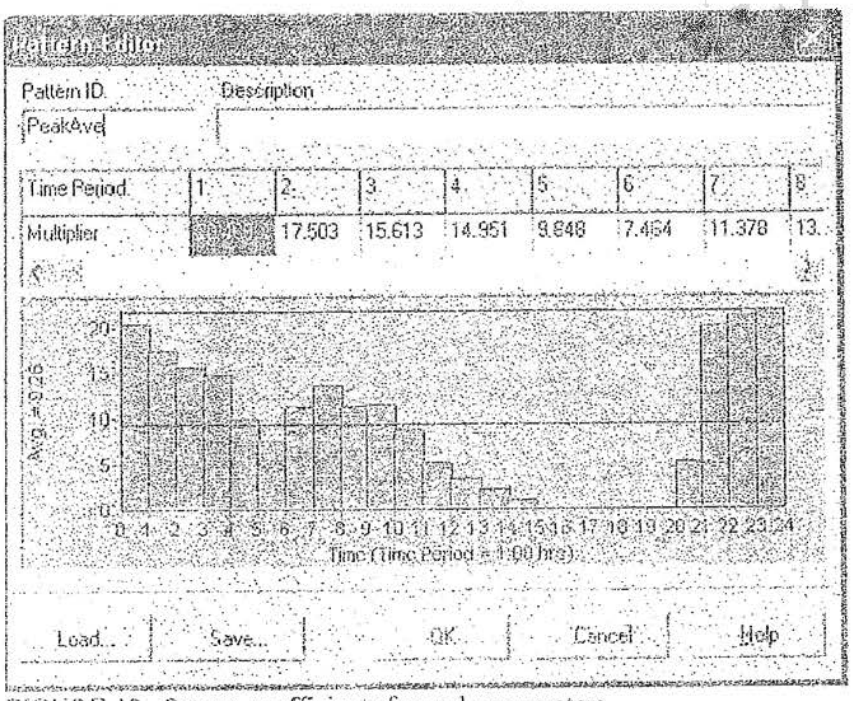


FIGURE 12. Pattern coefficients for end-user meters.

The control logic governing operation of the pump stations and the SAR filling had to be programmed into EPANET. This was accomplished through implementation of rule-based controls. The rule-based controls are used when multiple conditions and/or multiple actions are required at the same time. The rules to govern the pumps response to pressure readings and flow into the distribution system from the treatment plant were much more difficult to control accurately than the reservoir filling controls. These pumps are primarily controlled by variable frequency drive (VFD), which means that their pump speed is changed depending upon multiple considerations. A series of statements was required in order to walk the pump speeds up and down as various conditions are met and actions required. A list of rules programmed into EPANET can be found in Table 14, in Appendix A. The first HPEP pump is referred to as the LEAD. This pump can operate at various speeds as directed by its VFD. Another HPEP pump operates as in the first lag position, LAG1, and is manipulated with a separate VFD. LAG1 will commence pumping when the speed of the LEAD reaches 90 percent of maximum. The two pumps will then operate at the same speed until the speed drops below 80 percent at which time LAG1 will shut down. The third pump is essentially a redundant pump held in reserve for maintenance operations and emergencies. The third pump is referred to as LAG2 and would commence pumping if the speeds of the two running pumps reach 98 percent. LAG2 does not operate on a VFD, therefore it is either off or on at 100 percent speed. A feature of EPANET that is desirable in this control programming is a delay feature. In the real world controls of the pumps and valves there is a three minute delay before an action is taken. This means that a condition must be met for a continuous three minute period before the action is executed. This feature prevents oscillations in system

pressures and flows from cycling the pumps. Cycling the pumps means that the pumps are turned on and off multiple times in a short amount of time. Since EPANET does not have the delay feature, some cycling of the pumps occurs in the models and creates sharp pikes in the predictions of hydraulic behavior. In addition to the controls for the pump behavior, the pump curve information had to be entered into the software. This was accomplished by plotting the curves flow rate versus head for each of the three distinct pump models.

The final parameter to define in the EPANET model simulation is the time step. The time step controls how often calculations are performed, how often the modeling results are reported, and are important for model stability and accuracy. The time step can be thought of as a resolution in resultant data and analysis, meaning that more steps equals more results and smoother curves. For this study a data time step of one hour was implemented with reporting and calculation time steeps lowered to one minute for more accuracy. The simulations were run on the extended time period of 24 or 48 hours. In order to do this, the weekly average conditions shown in the previous figures were averaged into a single 24 hour period and repeated for the second 24 hour time period. Future studies may wish to extend the simulation period to a full week since daily variations in demand, reservoir water level, treatment plant influent and effluent are easily observed.

Since historical pressure and flow readings are not available for the distribution system, the accuracy of the model had to be based upon alternative criteria. The criterion selected was behavior of the reservoir levels. From the figures shown previously, it can be seen when the reservoir levels are increasing and decreasing and by what amount.

This information was compared to the results of the EPANET hydraulic model and used to judge its accuracy. After the actual information, collected from OCWD Operations staff, was input into the EPANET model and the pump controls implemented, the model required some calibration. The first calibration was performed to correct model's finding that the total 24 hour system demand was greater than the system production. In reality, the GAP system produces what is demanded and does not run on a deficit. In order to resolve this, the treatment plant output was uniformly increased by approximately 0.5 percent in order to produce the same amount of water that the end-users demand. The data input into the EPANET model likely contains rounding errors as well as possible errors from meter readings in the treatment plant. The second calibration was a shift in the storage curve. The EPANET model showed storage occurring slightly early when compared with the actual field measurements. In order to correct this, the peaking factors for the treatment plant effluent were adjusted to match the actual operational pattern more closely. Figure 14 shows a comparison between the actual reservoir water levels and those determined from the EPANET model after calibration. The figure clearly demonstrates that the model has produced the same water level trend, but the values may be slightly off. The actual water levels shown in the figure appear in a stair-step pattern because the values were provided hourly, while the EPANET model levels were determined every minute. For the purposes of this study, the EPANET model is sufficiently accurate to predict the effects caused by changes in the distribution system operations. It should be noted that the EPANET modeling encountered oscillating pressures and pump controls when the conditions for filling the SAR were meet. This is not experienced in the real life system because it has a delay feature built into the control

logic. In the real GAP system, when conditions are satisfied to justify a preprogrammed action the conditions must remain true for a period of three minutes. This prevents oscillations of pumps and valve controls. The hydraulic modeling of EPANET does not have a delay feature; therefore the oscillation is seen in some of the model output, particularly pressure fluctuations and even negative pressures. These conditions were ignored for the purposes of this study with the understanding that if the EPANET software had a delay feature then the oscillations would not occur.

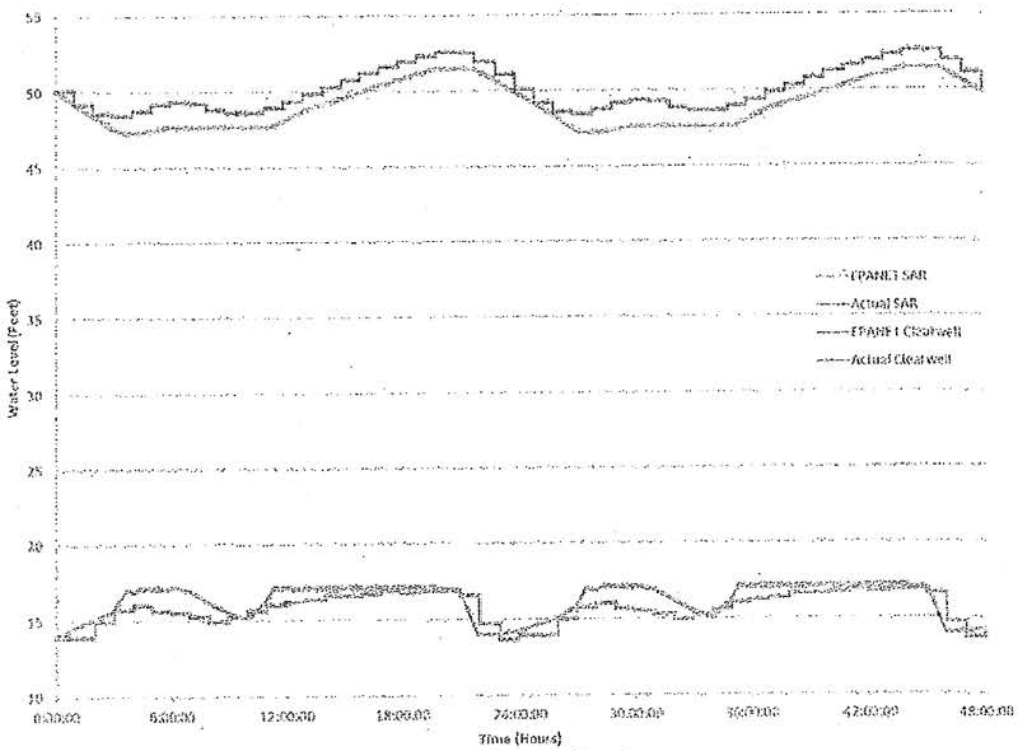


FIGURE 14. EPANET model versus actual water levels.

CHAPTER 5

MODEL ALTERNATIVES AND RESULTS

Proposed Scenarios

A total of five scenarios were modeled hydraulically with EPANET: first, the current operating condition; second, the predicted future operation and demand changes; third, a modification to the distribution system near the intersection of Edinger Avenue and the Santa Ana River; fourth, a modification to the distribution system near the intersection of Adams Avenue and the Santa Ana River; and fifth, a hypothetical scenario of large demand changes that would cause the cost versus revenue finances to breakeven. Figure 15 depicts the location of where the modifications to the system described in Scenarios 3 and 4 are implemented and provides more detail of the current GAP distribution system in service.

Current Operation

The Current Operating Condition scenario is used as a base to build the remaining scenarios upon. It is necessary to use this scenario as a base to adequately and accurately simulate the known operation conditions of the distribution system. This scenario aims at matching the pump flows and reservoir elevation levels found in the real distribution system to those in the EPANET model. This scenario's characteristics and calibration were discussed in the previous chapter during the data collection and model development phases. As expected and shown in the results comparison of Scenario 1, the model

indicates that terminal branches of the distribution system that do not have active end-users located at the end of the line have low to no flow, which can be indicative of a water quality problem due to the dissipation of the chlorine disinfection residual.

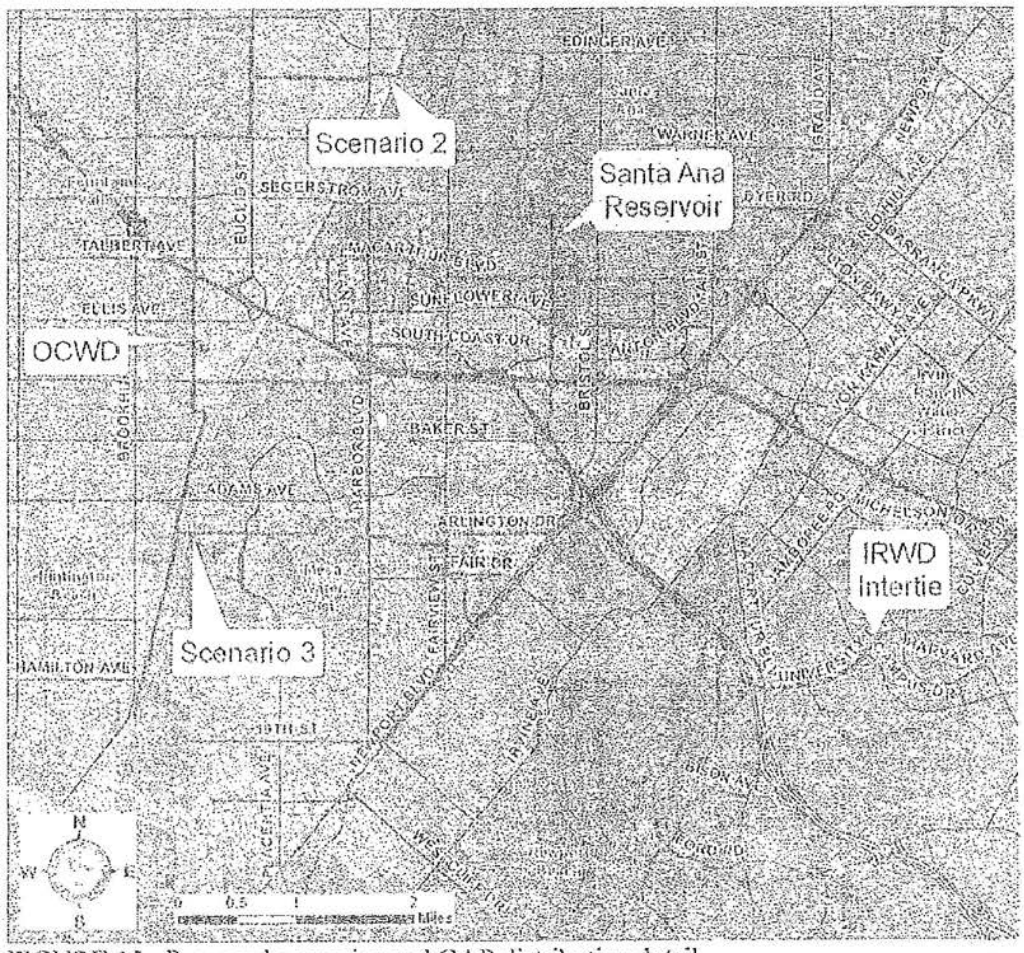


FIGURE 15. Proposed scenarios and GAP distribution detail.

Scenario 1: Future Demands

The Future Demands scenario corresponds to the financial alternative "Scenario A: Continue Current Practices." The purpose of modeling this set of parameters is to see

what effect continuing current operation of the GAP distribution system with expected demand changes and without distribution system modification has on hydraulic performance criteria. A historical trend of GAP demand for the last five FYs indicates a variable annual change in demand; however the overall trend is essentially flat, suggesting that the longer-term demands will remain constant. This is consistent with the recent management of the GAP system being to not add significant new demand from new end-users and to not remove the demands produced by existing end-users. The main difference between this scenario and the current operations base scenario is that the predicted drop in demand by OCSD will be taken into account in this scenario. As previously described, the OCSD project to use closed loop cooling will dramatically decrease their demand for GAP water supplies. Since OCSD currently demands 60 to 70 percent of GAP effluent, the reduction in demand is highly significant. Since the project will be completed this year and actual changes in the demand are not known it has been estimated that the demand will drop from approximately 5,000 AFY to 1,120 AFY. This lower value was chosen because this is the amount of water that OCSD can receive free of charge according to the 2012 agreement. The two meter locations that deliver GAP water to OCSD are located adjacent to the GAP treatment plant at OCSD Plant 1 and approximately 3.5 miles south of the GAP treatment plant at OCSD Plant 2. As calculated on Table 15, in Appendix A, the demands for the two OCSD meters were reduced to meet the expected demand quantity while maintaining the same proportion of demand that has historically existed between the two. The GAP treatment plant production and backwash flows were also reduced to simulate the decreased demand and therefore decrease in supply needed. This reduction was applied globally, meaning an

equal volume was subtracted from each of the hours run in the model. It is predicted that the reduction of demand for the meter adjacent to the treatment plant will have little to no effect on the general hydraulics of the distribution system because it is located so close to the distribution source point. The change to the demand of the meter located more than three miles south of the source point will probably have significant impact to the flow patterns and pressures experienced within the southern loop of the distribution system. This scenario is also used as a base for the remaining scenarios because the reduction in OCSD demand is inevitable and, although limited information was available, predicted based upon the most accurate approximation of future demand patterns within the distribution network.

In order to analyze the results of the change in future conditions from the current operations, multiple parameters were compared between the scenarios. The first comparison was made by looking at the pressure changes on an hourly interval at each of the model junctions. In order to summarize the data, the percent difference was determined for each junction at each hour mark and an average was taken. The average percent difference values are presented in Figure 16. The computed values can be found in Table 16, in Appendix A. The absolute value of the percent difference ranges from nearly zero to 18 percent. In general, during low demand periods, the percent difference is low and during high end-user demand periods, the percent difference is high. This means that the distribution system will see pressure differences that range from zero to 18 percent in the future when compared with the past FY, 2011-12. The EPANET model does not predict any pressure problems that indicate danger for the piping, such as negative pressures. The pressure oscillations due to the controls filling the SAR that

were discussed in the previous chapter were observed in the results. These oscillating values were removed from the data set in order to obtain a more realistic output.

The next parameter used to compare the current demand scenario with the future demand scenario was a time series pressure measurement at three particular junctions. The three junctions are located at the Fountain Valley pump station discharge into the distribution system (J444), the tee leading to the SAR and from the Santa Ana pump station (J80), and the end of the distribution system branch in Newport Beach (J222). The pump station junctions are of interest because the source of pressure is immediately upstream of the junctions and therefore the junctions may experience pressure variability if a problem exists. The end of the branch in Newport Beach was selected because this is the most difficult location for the GAP distribution system to supply due to its distance from the pump stations, high elevation, and large end-user demand. In Table 17, in Appendix A, the pressures of each junction were compared at each minute of simulation over a 24 hour period with removal of large pressure fluctuations caused by control oscillations. The average percent difference over the entire time period was determined for each junction. The Fountain Valley pump station experienced an average percent difference of -3.1 percent, the SAR junction an average of -3.1 percent, and the end of branch an average of -4.5 percent. The pressure trends closely resemble that of the entire system average represented in Figure 16. The reduction in pressure at the pump station junctions presents some advantages and disadvantages. The lower pressure indicates that pumping energy costs may be reduced, but also indicates a pressure reduction throughout the entire distribution system which may become a problem for end-user connections. The lower pressure at the end of the Newport Beach branch is a concern because this area

already experiences failures to comply with pressure requirements. The EPANET model shows that the reduction in demand by OCSD will reduce pressures throughout the distribution system.

The final parameters analyzed for comparison are the reservoir water levels. Again the water level was compared for every minute of a 24 hour simulation resulting in an average percent difference for the Clear Well of 0.3 percent and 0.1 percent for the SAR. This result indicates that the change in OCSD demand will not have significant impact on the storage levels in the reservoirs, if the assumptions made are correct. As previously described, the assumptions included an equal reduction of the OCSD demand over each hour along with equal reductions per time period of treatment plant output and backwash demands. The results and calculations for the pressure and reservoir water level comparisons can be found in Table 17, in Appendix A.

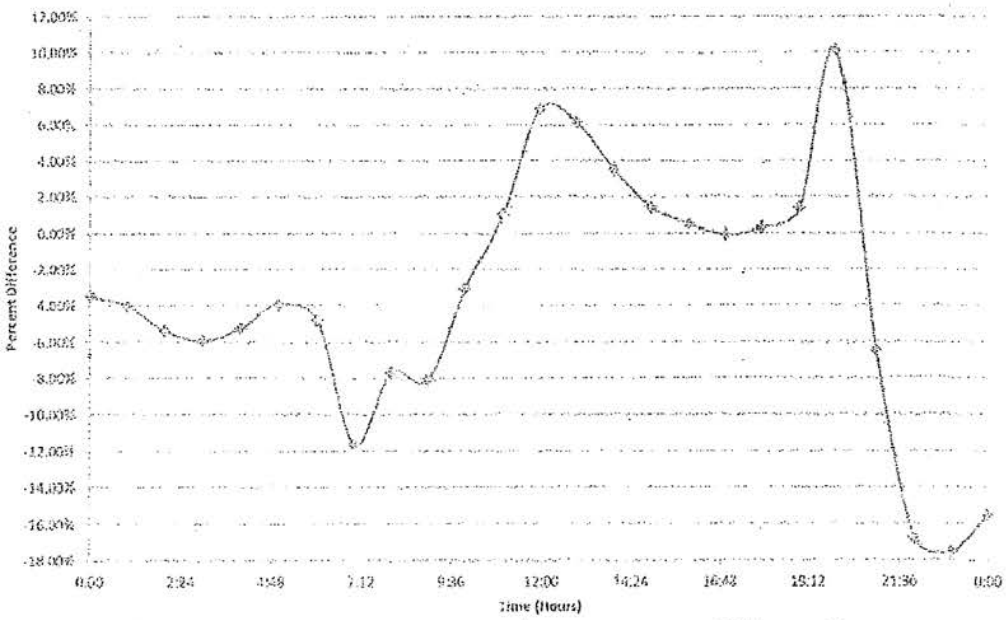


FIGURE 16. Scenario 1: Average pressure change as percent difference between current and future demand scenarios

Scenario 2: Edinger Avenue and Santa Ana River

Building upon Scenario 1, this scenario models a proposed severing of a portion of the northern loop of the GAP distribution system. The change is of interest to OCWD because the GWRS pipeline feeding water to the Anaheim area recharge basins is also located here. Figure 17 shows a map of the area and pipeline proximities. The GAP pipeline crosses beneath the Santa Ana River just south of Edinger Avenue. The GWRS pipeline is located on the west side of the Santa Ana River and OCWD is proposing projects to deliver GWRS water to injection wells located on the east side of the river. This indicates that another pipeline to convey the GWRS water would still need to be constructed, however the cost savings associated with not crossing the river would reduce the design and construction costs for such a project. In order to save expenses associated with crossing the river with another pipeline, it has been proposed to cap the GAP pipelines on either side of the crossing and use the isolated portion for a GWRS connection. These proposed pipeline modifications are shown in Figure 17. Since there are service connections to Centennial Park located directly on the east side of the river, the GAP pipeline would need to remain intact at those locations. The concept of a closed loop distribution system greatly resolves pressure problems associated with branching distribution systems. The loops allow water flow and pressure to travel from both directions as demands change and the pressure can equalize more readily throughout the system. Another advantage to distribution loops is water quality improvement because the water is always moving through the pipeline instead of becoming stagnant in a branch's dead-end and the water quality potentially deteriorating. One of the reasons that

pressure problems have been encountered in Newport Beach is that the distribution system there is located on a branch instead of a loop.

During the modeling periods of minimal irrigation demand, the only demand comes from OCSD. Since the OCSD connections are located near the Fountain Valley pump station and three miles south, the northern portion of the distribution system experienced little to no flow during the low demand periods. Under Scenario 1, the northern loop would experience some low flow during the period; however during Scenario 2, since the northern loop has been severed there was no flow in the northern distribution loop. This can pose a water quality problem because the water within the northern third of the distribution system would be stagnant and may experience a diminishment of disinfection residual. The water level in the SAR was analyzed for any potential differences between Scenario 1 and 2. This reservoir is located just north of the southern loop and would be considered part of the northern loop. The water level experienced no notable difference over a 24 hour period. Therefore the break in the northern loop of the distribution system would not affect the reservoir water levels. Similar to the analysis of Scenario 1, the percent differences of pressure for the entire distribution system were reported and compared in Table 18, in Appendix A, and are shown in Figure 18. As previously described, the pressure and velocity spikes caused by oscillations in control parameters have been removed from the analyzed data set. The average of the entire system shows negligible differences in pressure.

In order to understand the changes associated with the break in distribution loop a more detailed analysis was performed for junctions near the new end branches along with existing end branches near Mile Square Park, OCSD Plant 2, and Newport Beach. The

junction at the end of the branch leading to OCSD Plant 2 experienced no detectable changes in pressure over a 24 hour simulation. The end of the Newport Beach branch experienced an average percent difference of pressure of 0.1 percent, which can be considered negligible. The Mile Square Park end branches are fed by the northern distribution loop which has been severed for this Scenario. The two branches experienced approximately an average of 0.5 percent difference, also negligible. The two newly created end branch junctions were expected to experience low pressures due to the break in the distribution loop. On the contrary, the two junctions experienced an average of 0.6 percent difference of pressure. The modeling results indicate that severing the distribution loop would have little effect on pressures within the distribution system. Table 19, in Appendix A, shows the calculations and results for these pressure comparisons.

The final set of parameters analyzed in this study was the velocities in the entire distribution system and for individual pipe sections of interest. Figure 19 summarizes the average percent difference of velocity between Scenario 1 and 2, while Table 20 in Appendix A, shows the calculations and data. It can be seen from the figure that the velocities have changed dramatically during the early morning time frame. Overall the velocity percent difference ranges from 0.3 to 57.4 percent over a 24 hour simulation. This indicates that the water within the distribution system must travel faster in order to reach the demand locations. Since the pipe sizes are kept constant within the distribution system, by the continuity principle, this means that an increasing flowrate is occurring through the system.

To obtain a clearer picture of the effects of the loop break, velocities of the pipe sections located on either side of the break were analyzed in Table 21, in Appendix A. The Centennial Park side of the break, or east side, the pipeline experienced an average percent difference of -81.5 percent over the 24 hour simulation. This indicates that the flowrate through the piping is greatly reduced. This may lead to water quality issues due to the age of the water within that part of the distribution system. Likewise, on the west side of the break the pipeline experienced an average percent difference of -97.1 percent. The same potential water quality issues as the east side may exist here. Refer to Figure 17 for a graphical representation of these locations. The last four pipeline locations examined for velocity changes are on either side of the tee intersections coming out of the pump station and reservoir locations. Since both source of water are located within the northern loop the flow water from them is expected to be changed dramatically with the break in the northern loop. Starting with the Fountain Valley pump station the pipe section heading north from the connection tee experienced an average of 2.9 percent difference in velocity over the 24 hour simulation period. This indicates that under Scenario 1, the portion of the distribution system north of the Fountain Valley pump station and west of the Santa Ana River received flows from the west side of the river. The pipeline portion south of the connection tee experienced an average of -16.4 percent difference in velocity over the simulation time. From the SAR pump station tee heading north the pipeline section experienced an average of -66.7 percent difference in velocity. This means that under Scenario 1, the northern demands between the reservoir and the Fountain Valley pump station were receiving more flows from the reservoir direction than under Scenario 2. South of the reservoir connection tee the pipeline section

experienced an average of -33.9 percent difference in velocity. The resultant velocities and flow rates are not alarming because they are below values that are typically harmful.

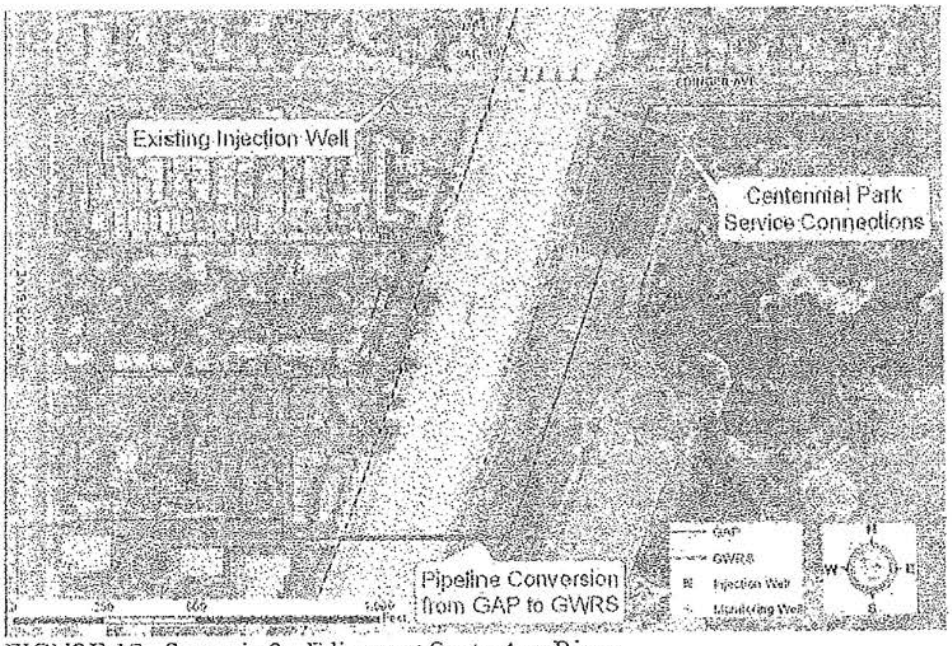


FIGURE 17. Scenario 2: Edinger at Santa Ana River.

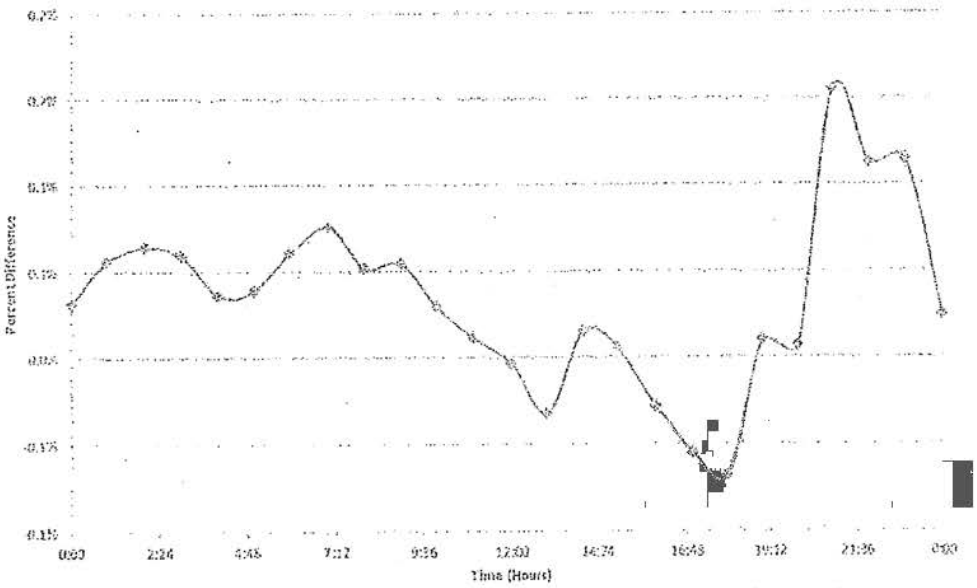


FIGURE 18. Scenario 2: Average pressure change as percent difference between Scenario 1 and Scenario 2.

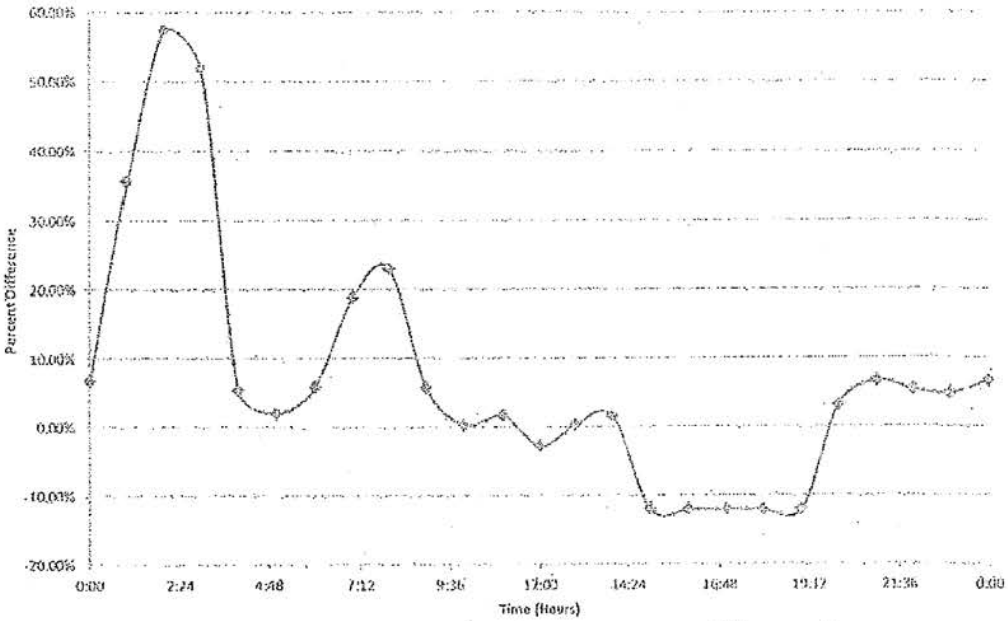


FIGURE 19. Scenario 2: Average velocity change as percent difference between Scenario 1 and Scenario 2.

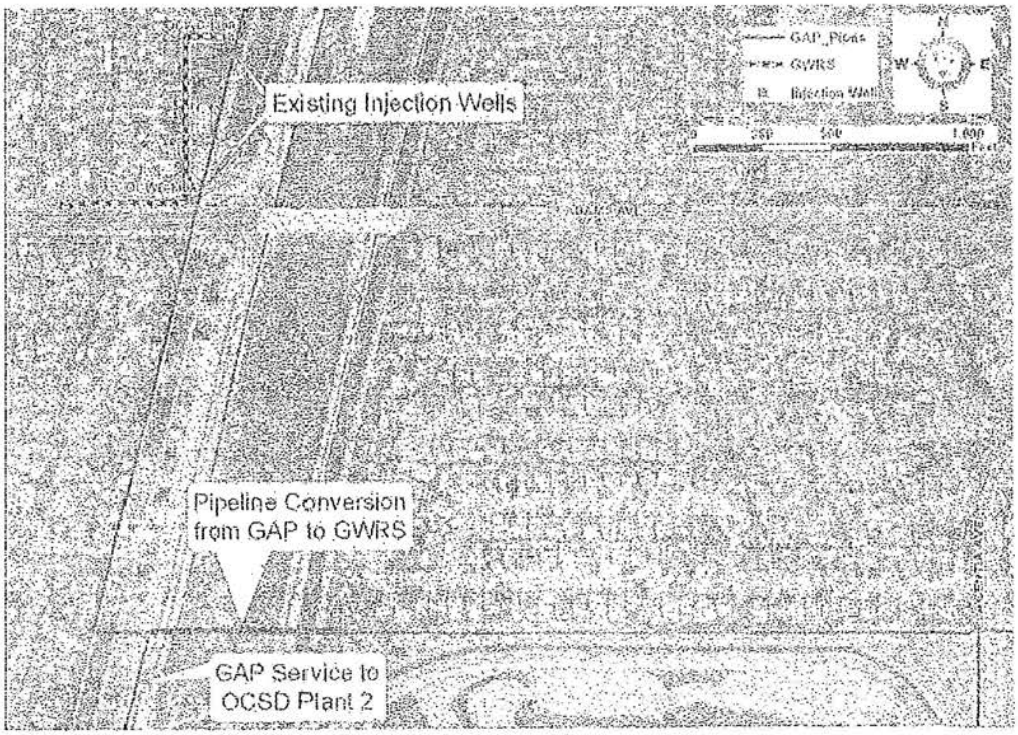


FIGURE 20. Scenario 3: Adams at Santa Ana River.

Scenario 3: Adams Avenue and Santa Ana River

The third scenario is similar in concept to the second, in that it involves the breaking of a distribution system loop for the purpose of transporting GWRS water across the Santa Ana River. OCWD's interest in this scenario again stems from the large capital costs, environmental concerns, and property rights associated with placing a pipeline beneath the river or across the top of it. The crossing is located south of Adams Avenue between the cities of Huntington Beach and Costa Mesa through the Santa Ana River. As shown in Figure 20, an extension of the GWRS pipeline would be required to convey water across Adams Avenue and southward to the location of the GAP crossing of the Santa Ana River. This section of the GWRS piping is referred to as the Southeast Barrier. This portion of GWRS water distribution is part of the seawater intrusion barrier. The purpose of crossing the river here with GWRS water would be to place new injection wells on the east side of the river in order to help deter seawater intrusion from continuing to enter the Costa Mesa area. To implement this scenario, the southern GAP distribution loop would need to be broken at a location close to the dedicated service connection of OCSD plant 2. This may present pressure problems for the OCSD service because the pressure advantages associated with the loop may be lost. In accordance with the OCSD agreement, the GAP connection is required to provide a 105 psi pressure to OCSD. The pressure problems may also be experienced by other end-users located on the east side of the river.

Since the break of the northern loop presented in Scenario 2 had no effect on the water level within the SAR, it is assumed that this break would also have no effect. Three junctions were selected for particular pressure analysis in addition to the general

analysis of the entire system: the service connection to OCSD Plant 2 (J264), the end of the Newport Beach branch (J222), and a large demand end-user connection on the east side of the break location for Costa Mesa Country Club (J151). As shown in Figure 21, the average percent difference of pressure for the entire distribution system between Scenarios 1 and 3 ranges from 0.01 to 3.12 percent. This range is larger than under Scenario 2, primarily because the largest end-user demand is located off of the southern distribution loop. The entire scenario runtime suggests that a pressure drop will occur except during times of very low demand during which pressures will remain relatively the same. The average pressure drop of the entire system does not seem to pose any operational or performance issues. The calculations for the entire system's pressure difference can be found in Table 22, in Appendix A.

The 24 hour analysis and comparison of the OCSD Plant 2 service connection predicts an average of 0.1 percent difference in pressure. This indicates that the change in the southern distribution loop will have little effect on the pressure delivered to the connection. The pressure did not drop below the 105 psi specified by the agreement. The end of the Newport Beach branch experienced an average of -2.1 percent difference in pressure. While this change in pressure may not be significant in quantity, it may drop the provided pressure below the contractually agreed upon 60 psi during peak demand periods. The pressure provided to the Costa Mesa Country Club on the east side of the distribution loop break experienced an average of -1.6 percent difference in pressure. This drop does not indicate any problems and would probably be negligible. Table 23, in Appendix A, summarizes the individual node pressure calculations.

In addition to the overall velocity changes, the pipeline velocities near the pump stations and on either side of the loop disruption were selected for more detailed analysis. The average velocity percent differences presented in Figure 22, and in Table 24 and 25, in Appendix A. It can be seen that a significant change in velocity occurs the over the entire period. Since large amounts of service territory can only be supplied through branching systems, the velocities required to move the flows during peak demand periods increases greatly. The two end-users placing demand during the low demand period are located near the Fountain Valley pump station and therefore the flows travel through fewer pipes to arrive and decrease the average velocity. On the west side of the break that serves OCSD plant 2, the pipeline experienced an average of -51.3 percent difference in velocity. On the east side of the break, the pipeline experienced an average of -93.9 percent difference in velocity. These large drops in velocity are expected and indicate that only the demands within that branch are supplied by flows, instead of flows passing by the demand connections. From the Fountain Valley pump station the distribution system piping experienced an average of 24.1 percent difference to the north and -15.5 percent difference to the south. The increased velocities to the north may be a result of the southern loop requiring more supply from the central connection therefore the north needs to be fed primarily from the north. From the SAR, the pipeline experienced an average of -38.9 percent difference on the north and -34.5 percent difference on the south. These drops in velocity from the reservoir probably result from the entire OCSD demand for both plants coming primarily out of the Fountain Valley pump station and Clear Well. The increased velocities are well below the level that would cause concern for pipeline integrity.

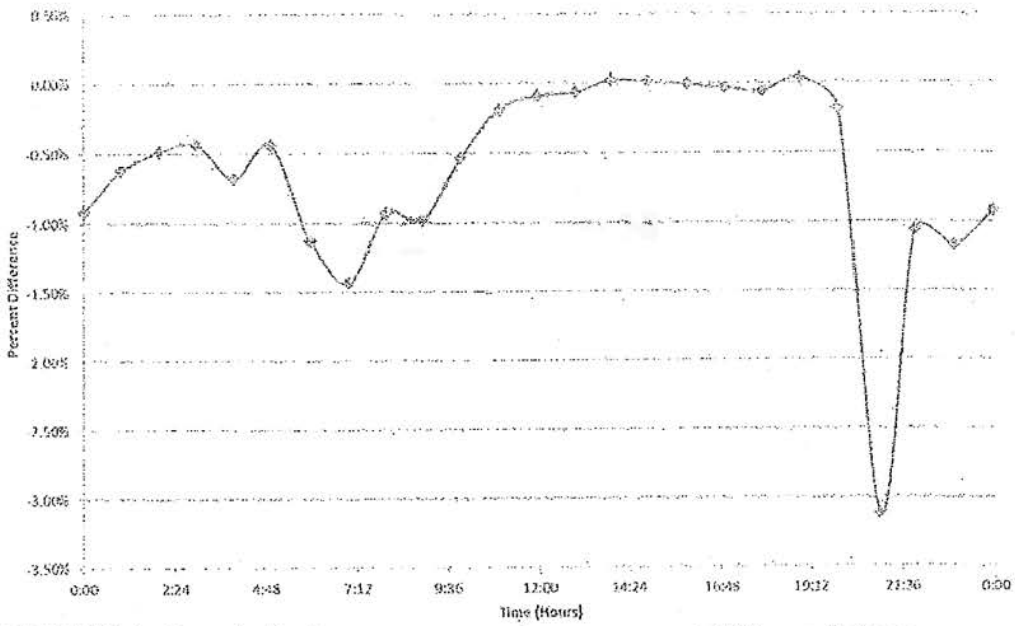


FIGURE 21. Scenario 3: Average pressure change as percent difference between Scenario 1 and Scenario 3.

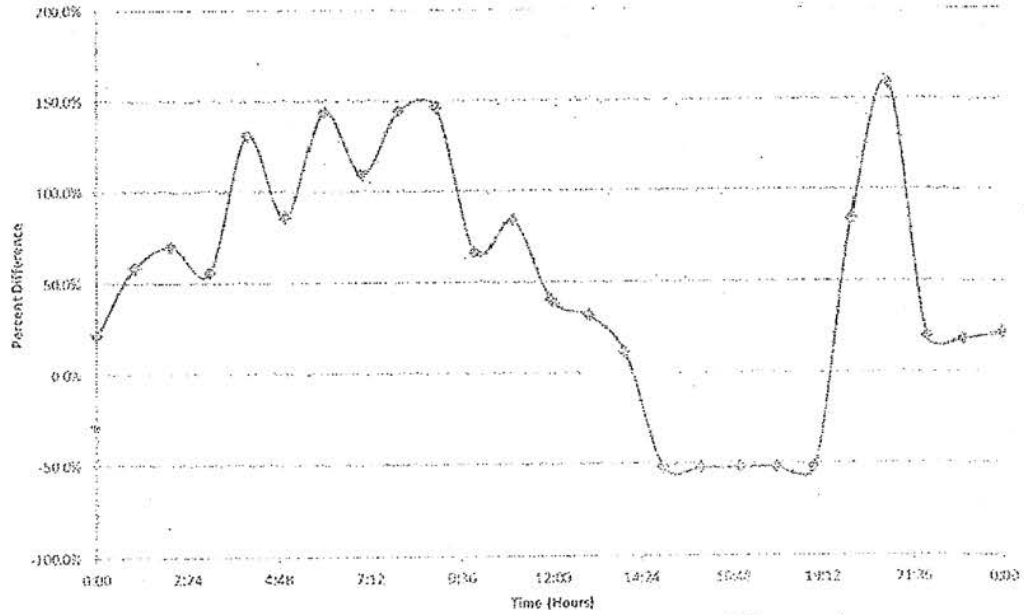


FIGURE 22. Scenario 3: Average velocity change as percent difference between Scenario 1 and Scenario 3.

Scenario 4: Breakeven Demands

The final hydraulic modeling scenario presented in this study is intended to show the effects of continuing the use of the current distribution system alignment with additional demands from end-users. This scenario is associated with Financial Scenario B. The existing end-user demands were scaled up to a point such that the financial model in Scenario B would breakeven. The breakeven point is achieved when the revenue of GAP water sales is equal to the cost to produce the water from the GAP treatment plant. It is important to note that under the O&M viewpoint the system is already profitable, so this analysis includes the sunken capital expenses. Scenario 4 is built upon Scenario 1 and a separate breakeven analysis for FY 2011-12 performed in Table 26, in Appendix A. The percent increase used to scale the demands up to the breakeven point was 147 percent. Increased demands cause a breakeven point to occur because the water is sold for more than the cost invested to create it. The demand was increased from 3,975 AFY to 9,809 AFY. This scenario assumes that the GAP treatment plant can provide all of the new demand volume and that IRWD supplied the same amount as recorded for the FY. It is assumed that the existing pumps can supply the necessary flows, but this assumption may not be probable during peak demands due to excessive flow rates. Another assumption is that the unit cost of new water production is equal to that of the existing production for the same FY. In reality, new demand would not likely come from existing end-users but rather from additional end-users added to the current list. Since the exact location of these new end-users in relation to the distribution system piping is unknown, the existing locations were used. OCWD has identified potential new end-user sites through the service area and would seek users at locations adjacent to existing piping in

order to minimize capital conversion and connection expenses. New end-user connections would likely require financial assistance to end-users in the form of low or no interest financing and/or subsidy in order to draw out the costs of conversion. The support of Retailers for new connections would also be critical to the implementation of this scenario since the Retailers would need to perform inspection, maintenance, and accounting activities.

The first parameter analyzed for this scenario is the average pressure of the entire distribution system. Figure 23 depicts the average percent difference over a 24 hour simulation period; data are shown in Table 27, in Appendix A. The initial low values indicate a poor model calibration to the hypothetical situation. The controls, pump settings, and reservoir water levels were set up for the typical operation of the GAP system and required an initial adjustment period for the higher treatment plant output and end-user demand. Once the system stabilized, the pressure percent difference was generally within a positive or negative 10 percent difference. This is a significant change during certain periods because the pressure may drop below acceptable performance requirements. The second parameter analyzed is the average velocity of the entire system. Figure 24 and Table 28, in Appendix A, show the resulting velocity percent difference between Scenarios 1 and 4. It is important to note that Figure 24 has a logarithmic scale on the percent difference axis. This was necessary because of the very large range of percent difference values. Under Scenario 1 the velocities are very low while under Scenario 4 they are very high and even dangerous at times. Pipeline integrity is definitely at risk under the demands of this scenario. Over the majority of the 24 hour period the velocity is observed to double. This is obviously due to the 147 percent

increase in demand flow. The low demand period experienced little percent difference because minimal flows were traveling throughout the distribution network. Rom these results it was concluded that Scenario 4 is unrealistic because the treated effluent volume and rate is not available, the addition of such a large amount of end-user demand is unrealistic, there are potential pressure problems, and the resulting excessive velocities would damage pipeline materials.

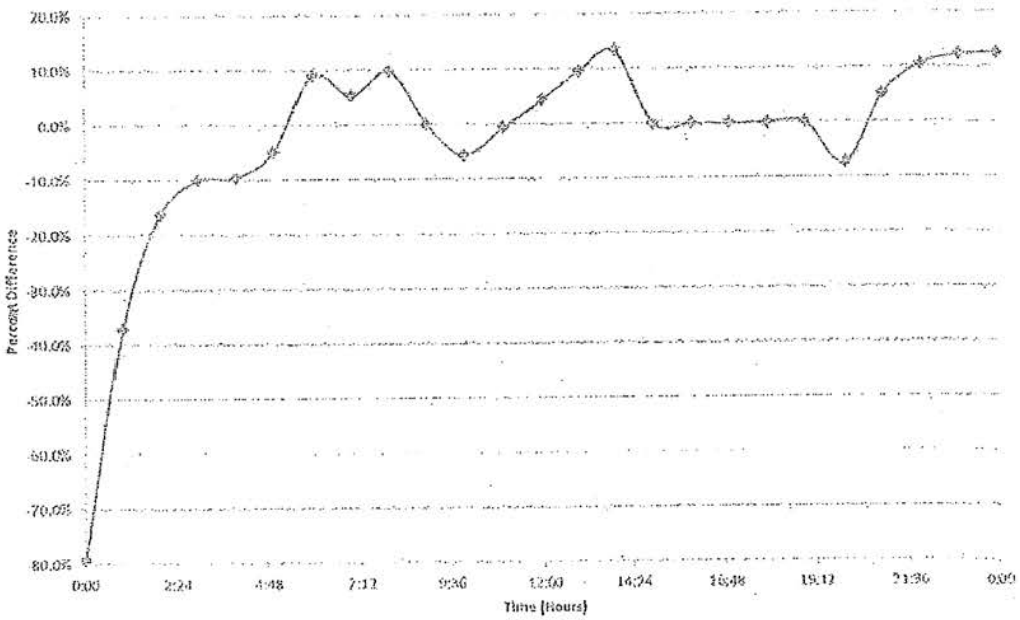


FIGURE 23. Scenario 4: Average pressure change as percent difference between Scenario 1 and Scenario 4.

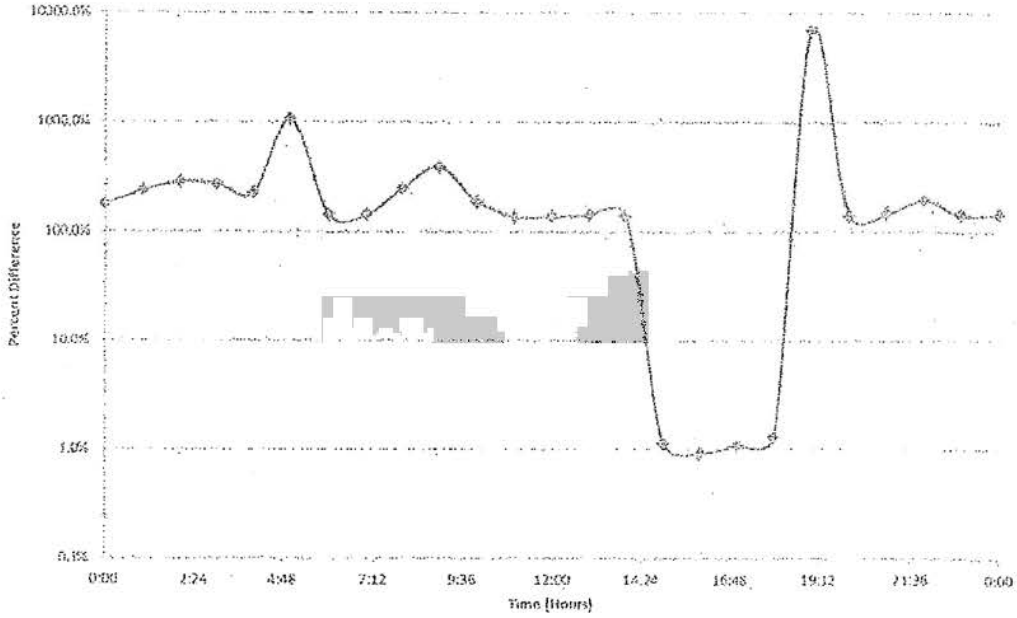


FIGURE 24. Scenario 4: Average velocity change as percent difference between Scenario 1 and Scenario 4. Note the logarithmic vertical scale.

CHAPTER 6

FINANCIAL HISTORY AND PERSPECTIVES

Project Financing

The GAP's capital investment was generally financed through two types of financial instruments: State Revolving Fund loans and OCWD's CIP. The total capital investment for construction of the GAP treatment plant and both phases of the distribution system was approximately $48.38 million spent between the years of 1989 and 1998. $6.38 million was financed through the loans while $42 million was debt issued as part of OCWD's CIP.

The loans were issued by the State Water Resources Control Board. The board specifically funds water projects with low interest loans. The loan issued for phase one of the GAP constructions was issued in 1989 with a twenty-one year term. The amount of the loan was $2 million and was issued with an interest rate of 3.3 percent. OCWD repaid the loan with annual installments of $177,931 until 2010, when the debt was satisfied. The second loan issued in 1997 for phase two of the GAP construction has a term of 19 years. The annual installment of $290,331 is paid by OCWD until 2016, when the loan will be paid in full. As explained in previous sections, the balance of this loan would need to be repaid regardless of the alternative selected for future implementation of the GAP system.

The majority of the project's financing came from CIP expenditures. The entire CIP debt pool for OCWD has been refinanced and restructured multiple times in order to minimize interest expenses, among other reasons. For this reason it is very difficult to trace how much GAP capital investment remains in the CIP debt pool and when it may be repaid in full. As estimated in the 2007 OCWD report, and confirmed with current OCWD staff, an estimation of annual payments to the GAP CIP debt has been created. The assumptions for this $42 million debt are a thirty year life with interest rate of 4.5 percent. Using these principal, life, and interest values results in an annual repayment amount of approximately $2.5 million. A conservative estimate for repayment of the CIP debt would assume the repayment began in 1991, the year that the system went into operation. This means that the total GAP CIP debt should be repaid by the year 2021. Similar to the loans, this debt must be repaid regardless of the alternative selected for the future of the GAP system.

As previously mentioned, the inclusion of capital debt payments is debatable in this financial analysis. While a broad perspective on the GAP finances would include all of the costs associated with the program, a more practical approach would be to consider that capital expenses need to be repaid regardless of any modifications or decisions. For this reason, the financial analysis from OCWD's perspective presented in this chapter looks at the situation both ways. The analysis where the capital cost is neglected is often referred to as O&M, or without capital, while the analysis that includes the capital is referred to as sunk, or with capital.

Current Pricing Structure

The rate that OCWD charges Retailers for GAP water is adjusted annually. The formulas used to calculate the rates are primarily based upon the Replenishment Assessment (RA) set by the OCWD Board each April. According to the OCWD website, the RA is a fee to pump groundwater that is collected by OCWD and finances the replenishment of the groundwater basin and projects for water recycling and water quality improvements. In combination with the RA, values for purchasing pumping energy to extract groundwater, well capital cost, and well O&M costs are used to come up with the Area Groundwater Cost. The general rate that OCWD charges Retailers is defined as 80 percent of the Area Groundwater Cost. For example, for the FY of 2013-14 the Area Groundwater Cost and resulting GAP rate are shown in Table 29. The Area Groundwater Cost is presented each year in the OCWD publication: "Engineer's Report on the Groundwater Conditions, Water Supply and Basin Utilization in the Orange County Water District." This rate is applicable to the City of Newport Beach, the City of Santa Ana, the Mesa Water District, the City of Huntington Beach, and portions of the City of Fountain Valley.

TABLE 29. Area Groundwater Cost and GAP Rate

Component	FY 2013-14
Energy	$ 58.00
RA	$276.00
Capital	$ 58.00
O&M	$ 60.00
Total	$452.00
GAP Rate	$361.60

Source: Orange County Water District (2013). "2011-2012 Engineer's Report on the Groundwater Conditions, Water Supply and Basin Utilization in the Orange County Water District"

The OCSD receives a discounted rate for GAP water purchases. The current agreement between OCSD and OCWD allows for delivery of one MGD free to OCSD. The rate for FY 2013-14 for water taken above the one MGD quantity is $187.45 per AF. This amount is adjusted annually according to the CPI up to a maximum of 2.5 percent per year. The previous year's rate was increased by the measure of CPI inflation for the past year.

There are two more unique rates and they are both applied to end-users within the City of Fountain Valley. The first rate applies to Mile Square Park and other County of Orange connections. It is computed by dividing the City's potable rate in half and subtracting a credit. Since the City's potable rate is well over twice the GAP rate, the end-user has to pay more than other GAP users. The credit applied towards the rate is subtracted from the 50 percent potable rate in order create an allowance for overhead expenditures. The credit was $10 when the agreement with the City of Fountain Valley was first executed in 1989. Every year since, the $10 amount has been adjusted according to the CPI measurement and was $18.14 for the FY 2012-13. This credit is applied per AF resulting in the GAP rate of $530.67 per AF for the 2013-14 FY. The second unique rate in the City of Fountain Valley is for the Mile Square Park Golf Courses. This rate is unique because the end-users' demand for recycled water replaces a demand directly for groundwater. The end-users were pumping their own groundwater independently of the City when the GAP system came online. The GAP water replaces their groundwater pumping as opposed to other end-user demands previously being for the City's potable water supply. This rate requires the introduction of more concepts, the Basin Equity Assessment (BEA), and the Basin Production Percentage (BPP). According

to the OCWD website, the BEA is the additional fee charged by OCWD on water pumped that exceeds the BPP. The BPP is the percentage of an OCWD member agency's total potable water demand that can be produced from the groundwater basin without subjecting that member agency to the BEA. The formula to compute this unique GAP rate is the RA, plus 35 percent of the BEA, plus energy required to pump groundwater, minus the same credit discussed above. For the 2013-14 FY this rate is equal to $495.89 per AF. These unique rates play a significant role in the analysis of GAP finances because in FY 2011-12 they applied to approximately 12 percent of the demand on the system, or 31 percent if OCSD demand is ignored.

OCWD Perspective

There are at least three different parties who will look at the GAP's finances differently: OCWD, Retailers, and end-users. The remainder of this chapter addresses the three different perspectives and explores their respective financial motivations.

In order to grasp the OCWD's perspective more clearly, a financial history of the past six FYs was compiled and used to project estimates for the next ten FYs. The primary finances directly affecting the OCWD's view of the GAP include: treatment plant expenses, distribution system pumping and repair, water quality testing and monitoring, the value of influent water, capital debt repayment, revenue from sales, and the MWD subsidy. In order to obtain as much accuracy as possible, the actual historical financial figures used in this study were gathered from the accounting department of OCWD instead of from the annual budget books. Future expenses were adjusted for projected volume of production and according to historical percent increase trends. The adjustment of future expenditures by amount of production assumes that all of the costs

for each category are variable and not fixed. This may introduce an error in the estimates because some of the annual expenses are fixed and would not change according to how much water is produced.

Treatment Plant Chemical Expenses

The first treatment plant expense considered in this study was chemical expenditures. There are two chemicals regularly used for the treatment of GAP recycled water: alum and chlorine. Alum is used to coagulate and flocculate suspended solids in the wastewater so that they can be more efficiently filtered out. The chlorine is used to disinfect the recycled water and provide a residual disinfection within the distribution system. Table 30 shows the historical costs for chemicals used in the GAP treatment plant. A significant downward trend in chemical expenses has occurred over the last five FYs. This can primarily be attributed to improved water quality received from OCSD as they have increased efficacy of treatment processes. OCWD has also been able to reduce chemical costs through increase efficiency of treatment processes and reliance on supplemental sources to improve effluent quality. The current FY's chemical expense has not been estimated because the value can change dramatically according to season and influent water quality. In order to maintain this study as conservative as possible, a 3 percent increase to chemical expenses was assumed for future FYs. This is conservative because every one of the last four FYs has seen a significant decrease in chemical expenses.

Electrical Expenses

Electrical expenses have been separated into two categories according to location. On-site electrical expenses consist of power used in the treatment plant and the Fountain

Valley pump station. Off-site electrical expenses consist of deep well pumping power and power consumed at the SAR and pump station. The historical expenses for electrical expenses are summarized in Table 31 and 32. The same criteria applied to the chemical expenses have been used for the electrical history in regards to the current and future FYs. It is noticeable that there were significant decreases in electrical costs for FYs 2008-09 through 2010-11. This gives the impression that electricity prices were dropping or that electrical usage dramatically decreased. OCWD staff has suggested that the electrical expenditure decreases were due to power companies giving rebates for overcharging customers in previous years and that the actual costs to provide power have steadily increased. An estimate provided by OCWD staff of Southern California Edison's power rates show that costs have steadily increased 3 percent over the past six years. Future projections of power costs assumed an annual increase of 3 percent and were adjusted for projected GAP water production. It is noteworthy that OCWD negotiates power supply contracts with power companies for its on-site electrical demand but not for off-site GAP demands.

Labor Expenses

There are three departments at OCWD that have regular tasks associated with the GAP. The Operations Department performs maintenance, inspection, repairs, and active operation of the treatment plant and distribution systems. The Laboratory Department performs water quality tests and sample collection at the various stages of the treatment processes. The Engineering Department develops large repair projects, coordination of utility conflicts, and management of construction activities associated with the GAP system. Some OCWD staff time is spent on GAP in the Accounting Department, but the

expense is negligible because the staff would still be necessary whether GAP existed or not. Table 33 shows the historical expenses for GAP labor of the three departments. A significant decrease in labor cost occurred in FY 2008-09 due to the GWRS coming online and a restructuring of staff time and operational personnel. The trend since that year shows an increase of 10 to 20 percent per year of labor expenditures. This is partially due to the increased need for repair of the aging system and the general increase in labor cost. Estimated 2012-13 FY expenditure was extrapolated and suggests a decrease in necessary budget. For future projects, an increase of 3 percent per year was used regardless of quantity of water produced. The personnel will have to maintain the same size distribution system and perform the same number of water quality tests regardless of the production amount.

Other Expenditures

Associated with O&M of the GAP are expenses for equipment, material, and testing supplies among other categories. All of these remaining expenses have been combined together into a single group. Typical expenses included in the group include media replacement for the treatment plant filtration system, miscellaneous materials for pipeline repair, and chemicals and equipment required for laboratory testing of the water quality. Table 34 shows the actual expenses in this grouped category for the previous five FYs. The expenses depict an oscillating pattern moving from year to year. Looking at the five year average however shows an average 2.4 percent annual increase. For the purposes of this study the increase was assumed to be 3 percent for future FYs in order to account for increased costs for materials and inflation. The expenditures for this category were not adjusted for quantity of water produced because the number of tests required

TABLE 30. Actual O&M Chemical History

Fiscal Year	Expense	Percent Increase
2012-13*	-	-
2011-12	$ 5,343.65	-8.69%
2010-11	$ 5,852.29	-56.30%
2009-10	$ 13,391.55	-49.86%
2008-09	$ 26,708.05	-76.10%
2007-08	$ 111,727.20	
Average	$ 32,604.55	-47.74%

*Current FY amounts were not estimated because of seasonal variation.

TABLE 31. Actual On-Site Electrical History

Fiscal Year	Expense	Percent Increase
2012-13*	-	-
2011-12	$ 316,889.66	1.43%
2010-11	$ 312,431.18	0.21%
2009-10	$ 311,786.11	-24.21%
2008-09	$ 411,373.53	-22.65%
2007-08	$ 531,833.38	
Average	$ 376,862.78	-11.31%

*Current FY amounts were not estimated because of seasonal variation.

TABLE 32. Actual Off-Site Electrical History

Fiscal Year	Expense	Percent Increase
2012-13*	-	-
2011-12	$ 135,113.11	33.06%
2010-11	$ 101,540.27	-35.61%
2009-10	$ 157,701.76	-34.26%
2008-09	$ 239,870.59	-3.80%
2007-08	$ 249,346.20	
Average	$ 176,714.39	-10.15%

*Current FY amounts were not estimated because of seasonal variation.

TABLE 33. Actual Labor History

Fiscal Year	Expense	Percent Increase
2012-13	$ 535,667.00	-9.01%
2011-12	$ 588,711.00	16.31%
2010-11	$ 506,151.00	10.99%
2009-10	$ 456,030.00	19.87%
2008-09	$ 380,435.00	-50.24%
2007-08	$ 764,546.00	
Average	$ 538,590.00	-2.42%

TABLE 34. Actual Other Expenditures History

Fiscal Year	Expense	Percent Increase
2012-13*	-	-
2011-12	$93,111.77	-11.50%
2010-11	$105,207.09	29.55%
2009-10	$81,208.78	-10.25%
2008-09	$90,478.63	1.67%
2007-08	$88,989.80	
Average	$91,799.21	2.37%

*Current FY amounts were not estimated because of seasonal variation.

TABLE 35. Actual Replenishment Assessment and Deep Well History

Fiscal Year	RA	Percent Increase	Deep Well Value	Percent Increase
2012-13*	$266.00	4.72%	-	-
2011-12	$254.00	2.01%	$85,189.06	62.94%
2010-11	$249.00	0.00%	$52,282.53	-82.71%
2009-10	$249.00	0.00%	$302,437.89	-14.55%
2008-09	$249.00	5.06%	$353,948.52	-33.01%
2007-08	$237.00		$528,377.28	
Average	$254.29	2.36%	$264,447.06	-16.83%

*Current FY amounts were not estimated because of seasonal variation.

TABLE 36. Repair and Rehabilitation History

Fiscal Year	Expense	
2013-14	$499,500.00	
2012-13	$375,000.00	
2011-12	$60,500.00	
2010-11	-	
2009-10	-	
2008-09	$648,266.00	
2007-08	-	
Average	$226,180.86	Assume $250,000 for future with 1% increase

TABLE 37. Actual JRWD Quantity and Purchase History

Fiscal Year	Expense	Percent Increase	Quantity (AF)	Percent Increase
2012-13	$0.00	-	917.64	-49.76%
2011-12	$96,899.34	-35.75%	1,826.57	-13.23%
2010-11	$150,814.78	0.39%	2,105.18	22.06%
2009-10	$150,227.47	0.02%	1,724.77	1.89%
2008-09	$150,192.32	27.67%	1,692.83	24.54%
2007-08	$117,640.49		1,359.22	
Average	$133,154.88	-1.92%	1,604.37	-2.90%

will remain constant regardless of the amount of water produced and it is assumed that the same number of small repairs will be required. With less production of effluent, and therefore less influent required, the changing of media in the filters will decrease in occurrence, however that has been ignored.

Deep Well Groundwater Value

In order to meet the effluent water quality parameters required by the RWQCB, filtered GAP water occasionally has to be blended with higher quality waters. The blending of the higher quality water with the effluent from the GAP treatment plant dilutes the measured water quality parameters therefore bringing them below the established performance requirements. When higher quality water is required, it is typically groundwater pumped from OCWD's deep well system. This system pumps water tainted in color from high depths within the aquifer below Fountain Valley. Since the water is extracted from a deep part of the aquifer, there is no noticeable increase to seawater intrusion. The water is tainted in color due to ancient geological characteristics of the material the water is located within. Occasionally water is drawn from the GWRS treatment process to supplement the GAP supplies for water quality improvement. Water can be drawn after microfiltration treatment and after advanced oxidation. Since this water is treated with a more expensive treatment process and the production of the GWRS plant is constantly being maximized, the use of this water for the GAP system is very rare. For purposes of this study, all water used to supplement the GAP supplies for water quality purposes is considered to be deep well groundwater. Since OCWD manages the groundwater of the region, it is not charged for use of deep well groundwater in the GAP system. However, the water is still valuable and any other

agency removing it from the aquifer would be charged a fee. For this study, the groundwater has been assessed a value based upon the RA. Since the expenses for groundwater production are included in the off-site electrical and other expenditures budgets the only remaining cost is the value of the water itself. The quantity of water extracted with the deep well system is multiplied by the RA for that FY in order to place an accurate value on the supply. Table 35 depicts the past five FY values for the RA and the respective value of deep well water used in the GAP system. As shown the RA has consistently risen over the past six FYs but the deep well water value has dramatically decreased. This large decrease in deep well value is because less and less deep well water has been required due primarily to improvements in influent water quality and GAP treatment plant efficiency improvement. OCWD Operations staff has predicted a continued decrease in deep well water use as chemical treatment and disinfection treatment changes are currently being explored. With this prediction in mind, this study has assumed no deep well water will be required in the future. A cautionary note in regards to deep well water use is related to the competition for influent water from OCSD to both GAP and GWRS. Since GAP water volume can be provided from two separate sources, OCSD and groundwater, an increase in deep well water use may occur if OCSD influent is directed away from the GAP plant and into the GWRS treatment plant. While this may accomplish the goals of the GWRS plant, it will cause the expenditures in the GAP plant to increase. OCWD is consistently faced with the decision of which treatment plant should have priority in regards to the OCSD flows.

Repair and Rehabilitation

As with any distribution system and treatment plant, repairs and rehabilitation project have been required for the GAP. Some of the more expensive projects have included additions of cathodic protection to distribution system pipelines, repair of infrastructure damaged by vehicular traffic, and general maintenance and inspection. Table 36 shows the last six FYs of expenditures for repair and rehabilitation (R&R). These amounts have been adjusted from what is listed in budget books because some projects have been reported for multiple years of the budget books. With this in mind, it is highly probable that the estimated expenditures for FYs 2012-13 and 2013-14 are over estimated. This assumption ensures a conservative analysis in this study. As the GAP system ages, more and more investment into the R&R funds will be required by OCWD. This fact is comfortably assumed to be accounted for by rounding up the average annual investment into the repair projects, the over estimation of current and future projects, and the increase of expenditures by 1 percent each projected FY.

IRWD Water Purchase and Quantity

As mentioned previously, water supplied by IRWD to the GAP distribution system was purchased prior to 2012. While the water currently supplied by IRWD is free of charge to OCWD, it played a significant role in previous FYs. The rate of charge was based upon the rate charged to OCSD for GAP waters and changed each FY according the CPI. Table 37 shows the amount of expenditure to purchase IRWD GAP water and the quantity of water provided from FYs 2007-08 through 2012-13. Since the new agreement with IRWD allows the use of their water free of charge, it has not been considered an expenditure for future analysis in this study. It has always been financially

beneficial for OCWD to take IRWD supplies because the expense was less than the revenue generated. As explained earlier, it is financially beneficial for IRWD because they would have to pay large amounts to OCSD to discharge the water if they could not discharge it through the GAP intertie connection. IRWD staff has confirmed that the relatively low amount of water supplied to the GAP system in FY 2012-13 was due to the dry winter season and should not be assumed as a new normal. IRWD supplies GAP water during the rainy season because recycled water use within its jurisdiction drops since it primarily consists of irrigation end-users. Since the rainfall during this FY was relatively low, the correlation can be made to the amount of GAP water supplied. Given that the IRWD supply can be volatile and there is no guarantee of supply through the OCWD-IRWD agreement, it has been neglected in the modeling of future GAP finances. This is a very conservative assumption because historical amounts of IRWD supply average greater than 1,600 AFY which is a substantial portion of the water supplied by the GAP, becoming an even greater portion when the OCSD drop in demand is taken into account.

Finance Costs

The GAP was financed through low interest loans and the OCWD CIP. The CIP costs are difficult to estimate and reasonable assumptions have been made in order to perform this analysis. Estimating the CIP investment to be approximately $42 million and paid off in thirty years at 4.5 percent interest, the annual repayment is $2.5 million per year until the year 2021. This is a fixed amount assigned to the previous FYs as well as the future projections. The two low interest loans have different maturity dates and payment amounts. The first loan was paid off by FY 2010-11 and required an annual

payment of $177,932. The second loan requires an annual payment of $290,331 and will be paid off by FY 2016-17. Using this annual payment for the next four years, there is a balance of approximately $1.16 million remaining on the loan. The inclusion in this study of the expenses for finance of the GAP system is debatable. Since these amounts must be repaid regardless of any decision made about system abandonment, changes in distribution system configuration, or changes in treatment technology, their inclusion has little relevance. In economics these are considered "sunk" costs because they are present no matter the future decisions. For purposes of this study, the financial situation of the GAP system is presented with and without consideration of sunk costs.

MWD Local Resources Program

There are two sources of revenue for the GAP: the Local Resources Program subsidy, and payments collected from Retailers. As discussed in Chapter 3, the Local Resources Program is administered by the MWD and has the purpose of encouraging the development of new local water resources that reduce demands for imported water supplies. The recycled water produced by the GAP is eligible for this subsidy until October of 2016. The formula for the subsidy has been modified since payments first started in 1991, and is currently set at $250 per AF up to 2,800 AFY. Table 38 shows the past five FYs of MWD LRP subsidy collected by OCWD for the GAP project. The GWRS project also collects this subsidy, but is not considered part of this study. Groundwater supplied by the deep well system into GAP is not eligible for the subsidy. Also water supplied to OCSD is ineligible for the subsidy because it does not reduce demand for imported supplies. The projection of subsidy amount in future years is based upon all of the GAP system demand being produced by the GAP plant without any deep

well groundwater. This means that the full subsidy amount is assumed to be collected through FY 2015-16. The water supplied by IRWD is eligible for the subsidy and IRWD has released a claim to the subsidy so that OCWD can collect it.

Revenue from Retailers

The second source of revenue is sales to Retailers. Some of the GAP Retailers have differing rates. These rates are adjusted every FY according to the Area Groundwater Cost, inflation, and/or the Retailer's potable water rate. In general most Retailers pay OCWD the same rate with except of the City of Fountain Valley and OCSD. A history of the general GAP Retailer rate is shown in Table 39. The most significant factor in the rate computation formula is the RA. The revenue generated by each Retailer for FY 2007-08, the first year analyzed, is presented in Table 40. The usage for the various rates in the City of Fountain Valley has been placed on separate lines as well as the unique rate for OCSD. There are two total revenue amounts shown. The first total is based upon that FY's rates and the summation of usage according to the meter readings. The second total is what the OCWD accounting department actually collected.

OCWD Financial Past

Table 41 to 45, in Appendix B, depict the GAP financial situation from FY 2007-08 through 2011-12. The history stops at FY 2011-12 because at the time of this study the complete set of values required for the current FY were not available. The tables are split into three sections: revenue, supplies, and expenses. The revenue section, located on the left side, shows the actual rates and summation of meter readings for each Retailer. As described for Table 40, there are two total revenues stated for the sales of GAP water to Retailers. The accounting total was used for the remaining computation. The MWD

LRP revenue amount is also shown on the left side beneath the Retailer sales section. Total revenue is presented for each FY and immediately beneath it is divided by the number of AF of recycled water produced specifically by OCWD. The resulting number provides a unit revenue for each AF of GAP recycled water produced by OCWD. The center section of the tables contains totals for GAP water supply sources. There are three sources listed: GAP Plant, Deep Wells, and IRWD. The GAP plant total is the amount of recycled water produced through the GAP treatment plant in Fountain Valley. The Deep Wells amount is the total groundwater produced for use within the GAP system. The IRWD row depicts the amount of water supplied by IRWD that FY for the GAP distribution system. On the right side is a summary of the GAP expenses for each respective FY. As previously described the expenses include chemicals, electricity labor, testing, equipment, deep well groundwater value, R&R projects, and IRWD purchases water. Below this list of expenses is a total cost subject to OCWD for that particular FY to produce the recycled water. This total is divided by the total amount of recycled water sold as measured by the summation of Retailer meters. This provides a critical value for the purposes of this study: the unit cost of GAP water per AF sold. The next row of calculation is the Unit Profit/Loss for GAP water. The cost per AF sold is subtracted from the revenue per AF produced in order to come up with the unit profit/loss. This number indicates whether or not the GAP system is profitable from the O&M perspective of OCWD. The final calculation performed for each FY is located on the right side of the table towards the bottom. This calculation takes into account the sunken capital and loan expenses associated with the construction of the GAP system. The total costs calculated previously are added to the CIP debt payment and low interest loan payments in order to

establish a total cost including sunken expenses. This value is divided by the amount of recycled water sold as measured by summation of Retailer meters to provide the cost per AF sold. In the same way as the previous Unit Profit/Loss calculation, this amount is subtracted from the revenue per AF produced by OCWD. The assumptions for each FY are also listed within the table. Figure 25 is a chart depicting the results of the historical financial analysis for the GAP system. The lower line on the chart shows the unit loss associated with the sunken cost evaluation and the upper line is for O&M analysis. It is easily seen that the GAP has operated profitably in the last five FYs when only considering O&M costs, but at a loss when sunken costs are accounted for.

Unique Agreement with OCSD

The agreement that OCWD has with OCSD in regards to the GAP recycled water delivery is highly unique and may not be suitable for comparison to other recycled water projects. The agreement essentially provides OCSD with recycled water at a rate that is lower than the cost to treat the recycled water. In practice this means that the remaining Retailers of GAP water, or all of the groundwater producers in the form of a higher RA, are subsidizing the OCSD use. Generally this arrangement is acceptable to the Retailers because they are also subject to charges from OCSD for wastewater disposal and would therefore be paying for the water either way. The influent water for the GAP treatment plant and the GWRS plant are provided freely from OCSD, a savings that is also passed onto the Retailers through lower rates to purchase recycled water. Given the unique aspects associated with the OCSD recycled water deliveries, the past and future financial analysis of the GAP system have been performed with and without the OCSD demand. This makes a significant change to the finances of the system because OCSD demand

TABLE 38. MWD Local Resources Program Subsidy History

Fiscal Year	Quantity (AF)	Revenue	Percent Increase
2011-12	2,670.30	$667,575.00	22.96%
2010-11	2,171.60	$542,900.00	-11.77%
2009-10	2,461.20	$615,300.00	26.59%
2008-09	1,944.30	$486,075.00	-63.35%
2007-08	*	$1,326,158.70	
Average	2,910.41	$727,601.74	-6.39%

*Change in subsidy formula and lack of data

TABLE 39. General GAP Retailer Rate History

Fiscal Year	$ / AF	Percent Increase
2013-14	361.60	2.03%
2012-13	354.40	5.48%
2011-12	336.00	1.94%
2010-11	329.60	0.98%
2009-10	326.40	-4.00%
2008-09	340.00	2.91%
2007-08	330.40	
Average	339.77	1.56%

TABLE 40. Fiscal Year 2007-08 GAP Sales Revenue

Retailer	Demand (AF)	Rate ($/AF)	Total
OCSD	5,297.52	173.10	$ 917,011.31
Fountain Valley	344.13	330.40	$ 113,700.55
Mile Square Park	475.64	403.62	$ 191,976.00
Mile Square Golf	632.49	337.48	$ 213,454.10
Orange County	0.00	330.40	$ -
OCWD	6.79	330.40	$ 2,243.42
Mesa Water	1,154.31	330.40	$ 381,384.02
Santa Ana	157.50	330.40	$ 52,038.00
Newport Beach	264.45	330.40	$ 87,374.28
Total by Meter	8,332.83		$ 1,959,181.68
Accounting Total			$ 1,919,841.31

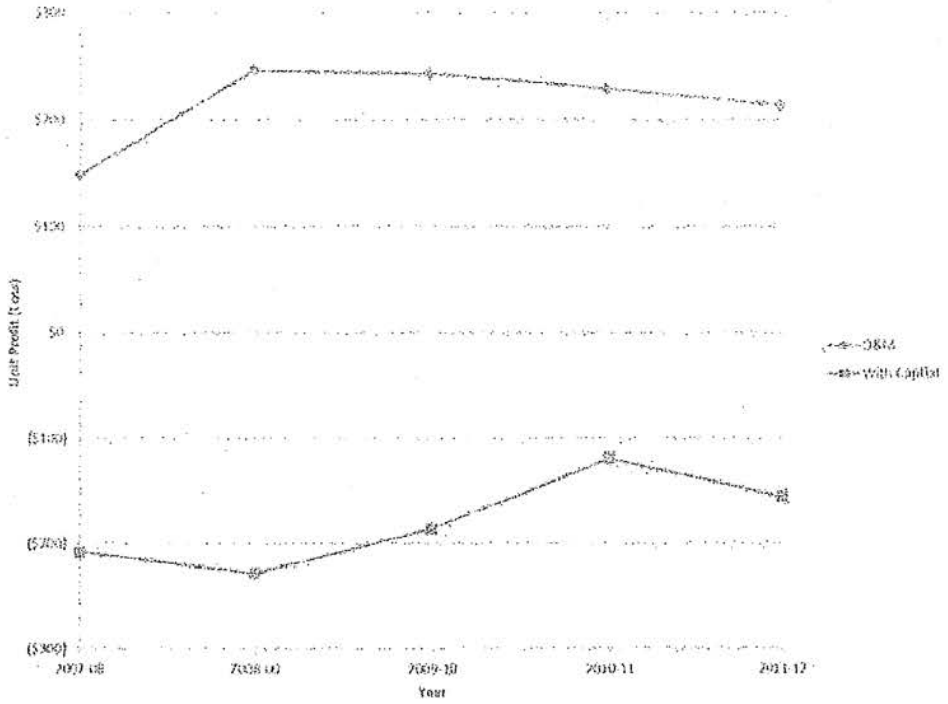


FIGURE 25. Summary of recent GAP financial history.

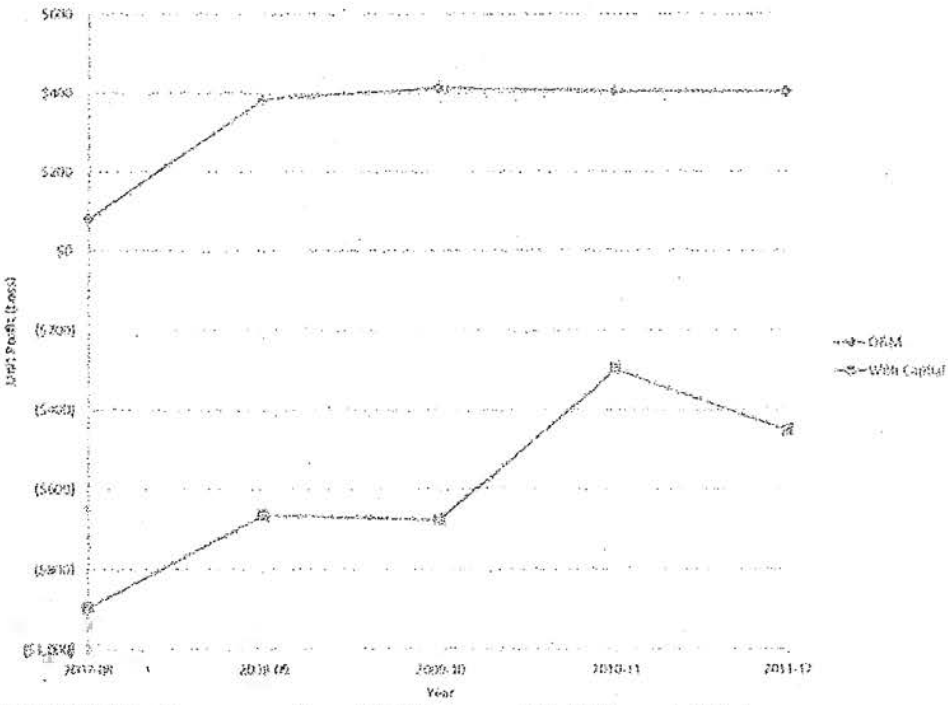


FIGURE 26. Summary of non-OCSD demand GAP financial history.

accounts for over half of the recycled water produced. Since the actual figures used in this study are based upon the real life situation of the GAP, the estimates used for the scenario without OCSD demand may be overstated. It is also notable that different decisions in regards to service, distribution system, and treatment plant size would have been made if OCSD demands were not part of the GAP system. Table 46 to 50, in Appendix B, show the results values used to estimate the financial situation. The tables are organized in the same fashion as the analysis with OCSD demand. Figure 26 depicts the historical unit profit/loss of the GAP system according to the estimated Non-OCSD demand scenario. The O&M unit profit has remained however when accounting for the sunken costs, the unit loss is dramatically increased. This is understandable because the same large distribution system and treatment plant are being used to hypothetically produce a much smaller volume of recycled water. The capital expenses are constant, but the revenue from sales has been significantly decreased.

Retailer Perspective

The Retailer perspective of the GAP can also be complicated like the OCWD perspective; however this study is primarily concerned with the OCWD perspective and therefore simplifies the Retailer point of view. Without the GAP recycled water program each Retailer would need to supply all of its respective water demands with potable supplies. The Retailers can only use a designated percentage, the BPP set annually by OCWD, without incurring the BEA of groundwater to meet its supply needs. The remaining portion of demand must be met by the purchase of more expensive imported water supplies from MWD or MWDOC. The current definition of GAP water is "neutral" meaning that its use is not recognized which effectively reduces the total

amount of water demanded within a Retail agency. The alternative would be to classify the recycled water as "supplemental" meaning that it could be directly substituted for imported water supplies. This distinction is discussed in further detail in Scenario D of Chapter 7's financial alternatives. A simplified historical cost-benefit has been performed for each of the five active Retailers along with a projection of the current and next FYs. The analysis has taken into account the Retailer's respective potable retail sales rate, the GAP water purchase rate, groundwater costs, and imported water costs. The historical potable retail sales rate has been collected from each Retailer and the historical water demands have been obtained from MWDOC. In this analysis it is assumed that each Retailer will maximize the amount of groundwater used in order to minimize the costs to its customers. The GAP water purchase rate is established annually by OCWD and based upon groundwater pumping and RA costs. The imported water cate was obtained from OCWD Local Resources staff. All of the retailers except the City of Santa Ana purchase their imported supplies from MWDOC at a slightly higher rate than MWD. The City of Santa Ana is a member agency of MWD and therefore purchases imported water at a slightly discounted rate compared to the other Retailers. In the analysis, the groundwater costs are estimated only to include the RA and electricity components. The capital and operational expenses have been removed because it is assumed that the Retailers will still have the same number of groundwater production wells in service regardless of the amount of GAP water used. This is a reasonable assumption because the amount of GAP water that is part of the Retailers' portfolios is small and capacity probably exists for the groundwater wells to make up for GAP supplies. The analysis compares the Retailers view of cost and revenue for two

scenarios: with GAP water and without GAP water. Although the Retailers purchase water at a rate that is much less than the rate at which they sell it to the end-users they are also losing revenue due to the sales rate of GAP water being 10 to 20 percent lower than the potable rate. The variables that play the most significant role in this analysis are the BPP and the potable water rate, which determines the GAP retail water rate. Looking at the results of the historical analysis, the two variables work together or against each another to provide an overall benefit or cost for each Retailer's use of GAP recycled water. It is important to note that the cost-benefit is very small in comparison to the entire water budgets for the Retailers and it usually plays less than a 2 percent role. Some of the benefits for Retailers to use GAP water are very difficult to quantify into monetary terms because they have reliability and conservation components. By relying more on GAP water supplies and less on extraction of groundwater and imported supplies, Retailers are widening their water resource portfolios thereby increasing reliability. As previously discussed, water retailers have been charged with the task of reducing water demands by 20 percent by the year 2020. The state has listed recycled water use as a suggested way to meet this demand reduction. Without developing other local water reuse or reduction of use programs, the Retailers have limited options to conserve water other than rationing its use. In Appendix **F** the data used, historical, and projected cost-benefit analysis are shown in Table 51 through 58 for the City of Newport Beach; Table 59 through 66 for the City of Santa Ana; Table 67 through 74 for Mesa Water District; and Table 75 through 82 for the City of Fountain Valley. Figures 27 and 28 respectively show the net benefit of GAP usage and percent of water budget trend lines for the City of Newport Beach. Figures 29 through 34, in Appendix F, show the net benefit and

percentage for the remaining Retailers. All of the Retailers except Mesa Water District consistently show a loss of revenue significantly greater than the reduction in cost. Since the Retailers sell the recycled water at a lower rate than potable, they are losing revenue gains. The simplified analysis does not take into account any savings associated with maintenance, treatment, or capital expenses which may push the trend closer towards breaking even. Generally speaking the trends seem to be steady and the average is not significantly decreasing or increasing in value. This indicates that the Retailers take a small loss in revenue each year in order to provide recycled water. If the GAP system were to meet more water demands for the Retailers and the rate charged for recycled water were to increase, then the use of GAP recycled water may become a revenue benefit to the Retailers. Without performing more historical analysis it is assumed that use of GAP recycled water has probably reduced potential water sales revenues since its inception. The net benefit calculated for Mesa Water District is interesting because it has uniquely remained positive for last five years calculated. Figure 31 shows a summary of the data. The declining demand for water within the Retailer's service boundaries along with the increased prices for all water sources and customer purchases have led the use of GAP recycled water to be positive. The trend is rapidly approaching zero, meaning the breakeven point, and would probably cross back into the negative region if the projection were continued. The current and future projections assume the same total water demand in the Retailer agency and the same amount of GAP water taken as the most recent available data. However, it is more probable that the total water demand will increase, but it is difficult to estimate by how much. While the demands for each type of water were kept constant the new rates for both GAP and potable water were used in the

projections. In order to keep the analysis conservative, the total demand was assumed to remain constant for two more years. It is also notable that total water demands decreased for all the Retailers from FY 2007-08 through 2010-11, while increasing during 2011-12.

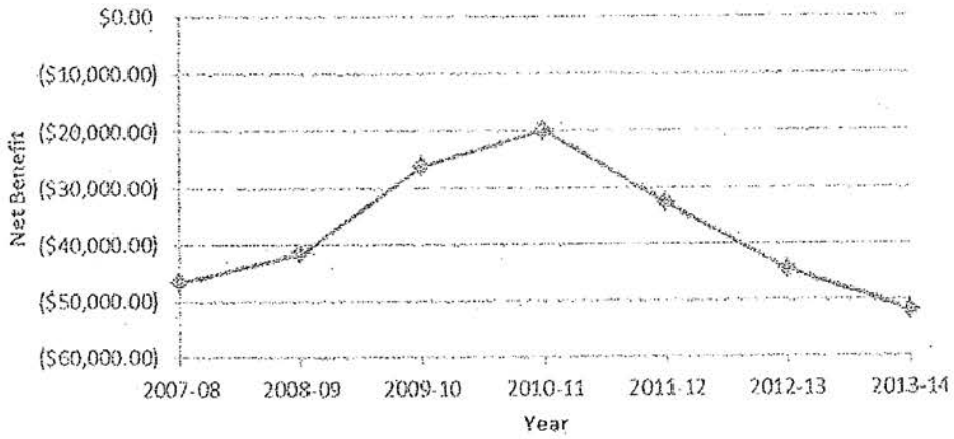


FIGURE 27. Net revenue benefit of GAP to Newport Beach.

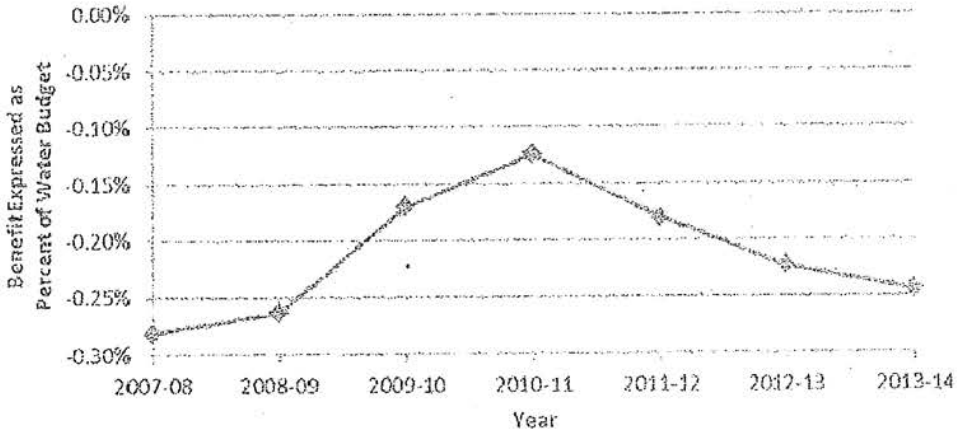


FIGURE 28. Net revenue benefit as percent of water budget to Newport Beach.

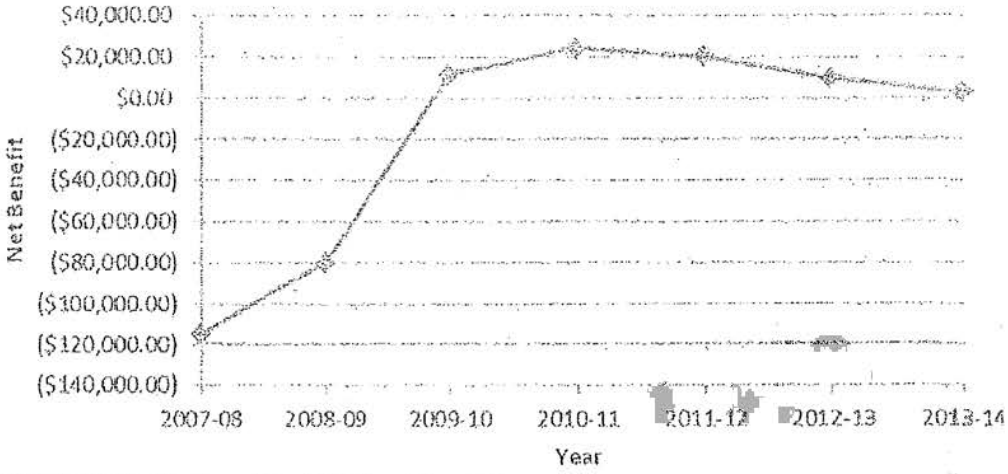


FIGURE 31. Net benefit of GAP to Mesa Water.

Retailer Comments

Representatives from each of the active GAP Retail agencies were contacted and asked to answer a questionnaire to further clarify the Retailer perspective. Individual responses to the questions are in Appendix D. The same list of questions was asked of each Retail agency and included questions regarding potable water costs, policies requiring the use of recycled water within its jurisdictional boundary, if the Retailer had been able to recuperate all of its financial investments into the GAP program, what extra responsibilities does the Retailer have to perform because of the use of recycled water, what are some ways the Retailer has found financial success and reasons for expansion of the recycled water program (if any), would stopping operation of the GAP system be a detriment or beneficial to the Retailer, and any other comments about the GAP system. Informal responses to the questions were encouraged in order to speed the response time and encourage true viewpoints of the program.

The information received from the potable rate question was used in the analysis discussed in the previous section. Most of the Retailers do not have specific policies requiring the use of recycled water other than the California State water code dictating that recycled water is to be used whenever it is available. The City of Santa Ana has established municipal code to require the use of recycled water. In practice, new GAP end-users are usually added upon request of developers and for City irrigation. This suggests there may be an opportunity to promote new end-user connections along the existing alignments of GAP distribution pipelines. Most of the Retailers have not made significant capital investments into the GAP system and therefore have not had a need to recuperate expenditures. The City of Newport Beach has invested in two separate pump stations in an attempt to resolve pressure concerns for golf courses end-users. The City has also invested in some of the recycled water conversion expenses at one of the golf courses. Another City investment has been made into landscape irrigation within residential neighborhoods. A rough estimate from City staff indicates that Newport Beach may not recover capital investment costs until the conclusion of another five to seven years. All of the Retailers expressed similar extra maintenance activities associated with recycled water usage. Each Retailer has dedicated staff to perform cross connection testing and end-user adherence to rules and regulations. Annual inspections have to be performed in conjunction with the County of Orange's Department of Health. Accounting and meter reading labor costs are also an extra expense. The City of Newport Beach has staff to operate the pump stations and GAP distribution system monitoring components. When asked this question about extra maintenance and expenses associated with GAP, the City of Fountain Valley pointed out an operational

cost savings. There are large golf courses and parks within the City of Fountain Valley that previous to the GAP system drew upon the City's potable supply during the nighttime. The City found it a burdensome challenge to supply potable water to customers during the day and irrigation water at night. The potable system was designed to replenish its reservoirs during the nighttime in order to save on electrical costs associated with pumping and because demands are typically lower during that period. However with the large irrigation users active at night, the City struggles to refill its reservoirs and found that it had to operate pumps during the daytime as well as night which resulted in a significant cost for energy consumption. The City also pointed out that it does not have to treat the GAP recycled water or the equivalent amount of potable water and therefore finds a savings in treatment expenses. These benefits are probably realized in each of the Retail agencies. Given that there has not been very many development projects located along the GAP distribution system alignment, the Retailers have not found very much success in adding new end-users. When new developments have been made along the alignment, new GAP connections are encouraged. Mesa Water staff has suggested that public perception and education may be a barrier to further implementation of recycled water. Santa Ana staff points out that large irrigation end-users realize a great benefit for the lower cost water and industrial companies that can find applicable uses of recycled water in their manufacturing processes also appreciate the savings. The question of OCWD stopping GAP service being detrimental or beneficial to the Retailer has spurred two opposing responses. Typically the operational and maintenance staffs of the Retail agencies view the GAP system as an extra burden and cost. The water resource managers of the Retailers see the extra burden and also

benefits of the recycled water service. Retailers suggested that the GAP system is one of the only ways they have to reduce demand on water supplies as directed by the Governor in the 20 by 2020 report. While conflicting arguments exist, the general consensus is that stopping GAP service, from the Retailer perspective, would be detrimental. The Retailers list conversion and cross connection issues among the probable expense to convert existing recycled water service to potable. While labor, pumping, and other maintenance expenses may be saved by stopping GAP service, the Retailers have come to depend upon the recycled water for conservation, portfolio diversity, and reduction of imported water costs. Fountain Valley staff has pointed out that the recycled water system and connection already exist and that conversion and potable supply costs could be expensive for Retailers and end-users. When asked about other comments regarding the GAP system, representatives brought up various points. Newport Beach staff pointed out the performance failures of the GAP distribution, primarily pressure, and cross connection issues that nullified existing capital investments. High salinity of the GAP recycled water remains a concern for some end-users within the City. Santa Ana staff has stated that they like the GAP program and would like to see it expand to serve more end-users within the City. OCWD and Mesa Water have recently amended their agreement to remove the maximum end-user sales rate for recycled water. This change may have caused a potential large irrigation school end-user to abandon their plans to convert from potable to recycled water supplies.

End-User Perspective

The end-user perspective is the most easily understood and straight forward perspective of the three presented here. There are two groups of GAP end-users:

existing and proposed. The existing end-users are already connected to the GAP distribution system and are currently receiving delivery of recycled water. These users have already invested into their conversions from potable use or installation of plumbing required for recycled water application. The capital investment having already been made by these users, the costs can be considered sunk. Given that the costs are sunk, the users have still made investment decisions based upon long term savings from not taking potable water at a higher sales rate. Most of the current end-users of GAP water are saving 20 percent on their water purchase costs, with the exception of Mesa Water end-users receiving a 10 percent discount and Mile Square golf and park irrigation with more complicated savings. It is clear that existing end-users on the GAP system would prefer to continue their discounted water supplies if for no other reason than financial savings.

Proposed GAP end-users face the challenge of overcoming capital investment costs. It has been the recent practice of OCWD to charge the new end-user the complete connection cost for construction and design. This presents a difficult situation for potential medium and small volume users of recycled water. The payback period for recycled water capital investment may be a formidable obstacle to conversion. There are not many potential large recycled water users remaining along the existing GAP distribution system alignment. Incentives and subsidies would probably appeal to potential end-users to make the conversion. The current approach of Retailer and OCWD staff to new connections may also be a hindrance. The attitude is generally indifferent and not encouraging to new end-user connections.

CHAPTER 7

FINANCIAL ALTERNATIVES AND RESULTS

Proposed Scenarios

Five separate financial alternative scenarios have been modeled in order to understand operations of GAP and to explore potential future activities. Scenario A: Continue Current Practices projects the financial situation of the GAP for the next ten FYs by continuing current costs and operational methods. Scenario B: Breakeven Demands or Rates models the financial costs and revenues of the GAP system to break even by increasing demands or by increasing the sales rate charged to Retailers. Scenario C: Microfiltration Treatment takes a look at a treatment plant process change from the existing filtration method to the microfiltration process that is already part of the GWRS plant. Scenario D: Change the OCWD Act looks at the effects of re-classifying GAP water to be "supplemental" instead of "neutral." The last financial alternative studied is Scenario E: Abandon GAP, which summarizes the impacts to end-users, Retailers, OCWD, and agreements currently in place if the entire project were to be abandoned. The purpose of modeling these scenarios and examining their feasibility is to provide OCWD recommendations and concerns regarding potential decisions that may be executed in the future.

Scenario A: Continue Current Practices

The tables created for the financial modeling of Scenario A for the future of the GAP are very similar to those used previously to analyze the past financial situation. At the time this study was performed, the complete set of data was not available for FY 2012-13, so that was the first year projected. The projections continue on a FY basis until 2022-23. This range of projected years accounts for the major financial changes expected in the next decade of GAP system operation. The assumptions for each year are stated on the respective table, but the majority of them are also discussed here. For all of the future projections it was assumed that OCSD would only demand their free allotment of GAP water. This assumption has turned out to be inaccurate for FY 2012-13 because the demand did not drop as expected. It is anticipated that the construction of the OCSD multi-pass cooling system will be completed during the summer of 2013 and GAP demand will be reduced once the project come online. It was also assumed for all years that IRWD would not supply any water into the GAP system. This is a very conservative approach to the analysis because IRWD has provided more than 900 AF annually to the system over the past six years, averaging about 1,600 AF. This assumption was made because IRWD is not committed to supply any water to the system. The analysis represents a worst case scenario as it assumes that IRWD will develop alternate ways to dispose of their excess recycled water supplies during rainy periods. Another assumption made for all years is that deep well groundwater would not be needed to meet water quality performance requirements. This reduction in groundwater need is expected due to proposed changes in treatment, disinfection, and the past trend showing a reduction in need. The current FY's use of deep well groundwater shows that this assumption may

not be accurate. The sales rate to Retailers was already established for the FY 2012-13 and 2013-14 analyses, but was estimated for the remaining years. The rate projections are based upon three separate components: the RA, projected energy costs, and projected well capital and O&M costs. The RA is assumed to increase 4 percent per year, energy 3 percent per year, and well expenses 4 percent per year. After weighing the components, the Retail sales rate is projected to increase 3.88 percent annually. The rate is primarily based upon the RA, so it is highly sensitive to this particular rate that is set annually by the OCWD Board of Directors. The remaining rates are functions of the CPI and the potable water rate in the City of Fountain Valley. The CPI was assumed to be 1.5 percent based upon what was measured between FY 2011-12 and 2012-13. The potable rate was assumed to increase 2.1 percent annually based upon the previous six year average increase. The demand for GAP water was assumed constant for all future years. This assumption is consistent with the quantities demanded over the past five years. It is probable that as potable water rates increase the demand for cheaper GAP recycled water will increase, however that was not accounted for in this study. Since the entire production of GAP recycled water is assumed to come from the GAP treatment plant the entire supply is eligible for the MWD subsidy. The subsidy has a maximum reimbursement volume of 2,800 AFY which is assumed for all future years. As described in the previous chapter, the chemical and electrical costs are adjusted by a combination of two methods. The first is to increase the rates 3 percent per year due to inflationary costs for energy and materials. The second is to adjust for the amount of GAP water produced. Since a large amount of demand has been removed for OCSD, the amount of GAP water produced is greatly reduced. In order to approximate the chemical and electrical costs, a

unit cost was determined for FY 2012-13 and used for the next year after adjusting for inflationary costs. This process was repeated for each following year. The off-site electrical cost would be lower if deep well water would not need to be pumped, however this effect was ignored because the off-site electrical costs are primarily associated with pumping within the distribution system. The amount of GAP water produced by the treatment plant was assumed to be 0.4 percent greater than the amount actually demanded by end-users. This is in an effort to continue the current accounting phenomenon of production exceeding demand. The effect is probably caused by losses in the distribution system, inaccurate meter readings, and maintenance and repair activities. The labor and other expense categories are assumed to increase 3 percent per year. These figures are not adjusted for production because the amount of testing and distribution system maintenance should remain the same regardless of quantity produced. The increase is due to the typical increased costs of labor, material, and inflation. The CIP debt is kept constant until its thirty year maturity before FY 2021-22. The state loan payments are similarly kept constant until their repayment before FY 2016-17.

Table 83 through 93, in Appendix B, show the respective calculations for each FY projected. Figure 35 shows the past and projected O&M unit cost and sunken unit cost, similar to previous figures. There is a significant drop for FY 2012-13, which is due to the assumptions that IRWD will not supply any free water. As discussed previously, this is not probable but would be a worst case perspective. The next drop shown in FY 2016-17 represents the occurrence of two events. The first is the termination of the MWD subsidy, a large loss in revenue, and the second is the loan payments cease due to complete repayment. The net impact of the two effects is a drop even though the loan

payoff has an upward effect. If IRWD supply is assumed, the O&M projection remains well above the breakeven point of $0.00 per AF. The final drastic change in the chart occurs in FY 2021-22 when the sunk cost trend line joins the O&M cost line. This is due to the approximation for capital debt being annualized over thirty years and reaching its conclusion.

As discussed in the previous chapter, a hypothetical situation excluding all past and future OCSD demands has been created and is shown in Figure 36. Table 94 through 104 for this analysis are reported in Appendix B. The chart and tables removing OCSD demands were created to help make a better comparison to other agencies' recycled water systems, but the results may be questionable. The capital investment becomes more expensive per unit of water produced because there is a lower amount of water delivered within the same large distribution system and now oversized treatment plant. The profit per unit of water considering only O&M costs is increased because GAP water is no longer being sold at a discounted rate, or freely provided, to OCSD. In combination with the previous figure a conclusion can be drawn that smaller distribution systems with concentrated demand areas can lead to better recycled water financial situations.

Figure 37 adds two lines to what is shown in Figure 35 in order to show what a continuation of IRWD's average GAP input supply would predict. While the IRWD supply is not guaranteed, it is probable. After discussion with IRWD staff it was confirmed that IRWD does not currently have plans to reduce GAP supply discharges. The primary factor that can reduce IRWD input into the GAP system would be lack of rainfall. The five year average IRWD input was used to generate the predictions shown in the figure. It is noticeable that the financial outlook is greatly improved with the

addition of "free" IRWD water. The large separation of O&M lines in FY 2012-13 is due to the decrease of OCSD demand therefore the proportion of free IRWD water become larger and increases the unit profit. Under this scenario of average IRWD supply, the O&M costs never drop to the breakeven point and once the sunken capital line joins in FY 2021-22, further investments into expanding the system or subsidizing new users may be feasible, or some recovery of the past sunken capital costs can be obtained. While the exact financial figures of each year may be disputable, the trend is reliable. Continuing the current operation of GAP system operation will provide a financial surplus when only considering O&M costs until FY 2016-17 at which point it may begin to breakeven or operate at a slight loss. When taking into account the sunken capital investments the GAP is operating in a deficit until FY 2021-22 when the investments are completely repaid.

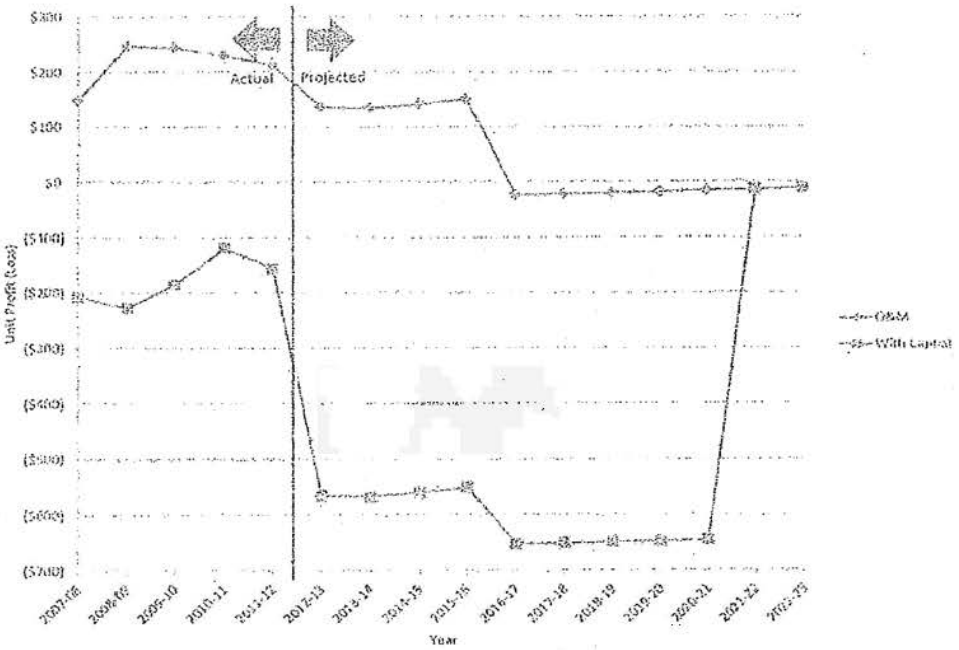


FIGURE 35 - Projection of current GAP operating conditions.

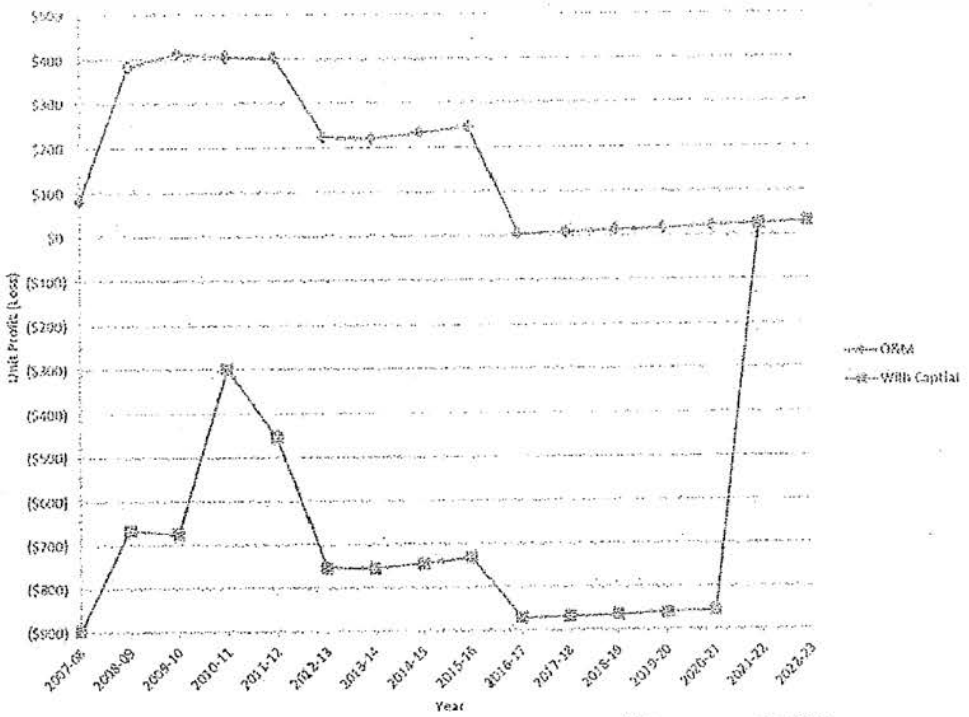


FIGURE 36. Projection of current GAP operating conditions, non-OCSD.

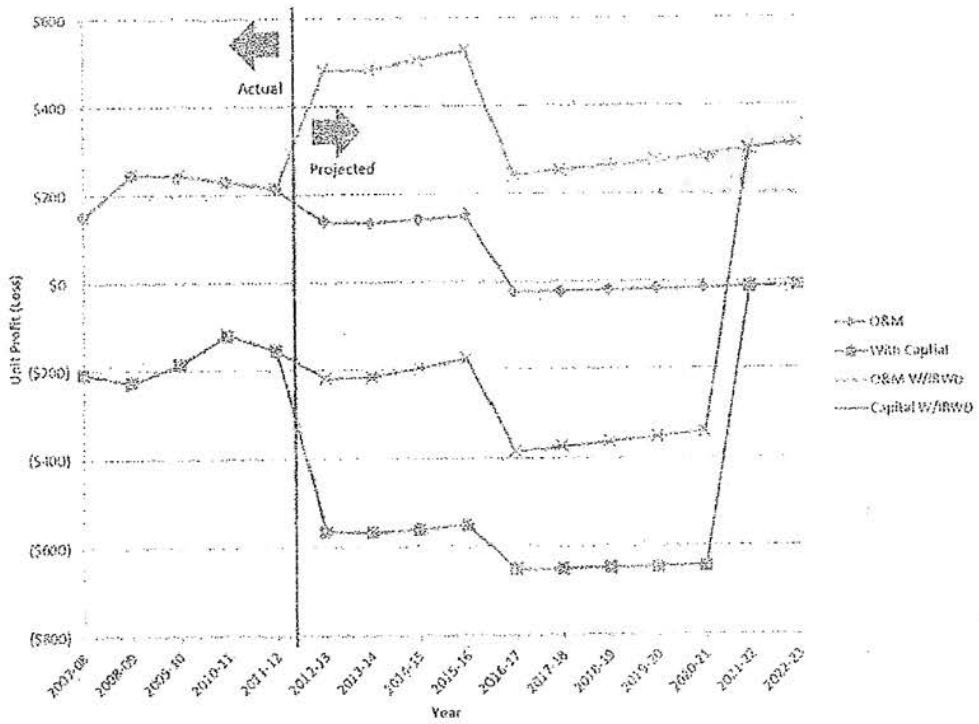


FIGURE 37. Projection of current GAP operating conditions, average IRWD.

Scenario B: Breakeven Demands or Rates

The second financial alternative scenario examined in this study seeks to adjust either the rate charged to Retailers for GAP water or the quantity of GAP water demanded in order to reach an annual breakeven equilibrium between expenses and revenues. In order to change the GAP sales rate the agreements with each of the Retailers would have to be negotiated again. Assuming that the Retailers would oppose such an increase in sales rate, the renegotiation may need to occur at a time that the agreements can be terminated as discussed in Chapter 3 with agreement dates presented in Table 1. For the purpose of this study it was assumed that the rates could be freely negotiated at any time and that the rate structure would be simplified to two separate rates: OCSD and all others. The simplified rates would remove special rates that exist for end-users located in Mile Square Park within the City of Fountain Valley. The second approach to balance the expenses with the revenues was performed by adding additional demand to the GAP system. In practice, this would require new end-user connections to the existing system without any additional capital or O&M costs for OCWD. Since this approach requires the GAP treatment plant to produce, pump, and disinfect a larger quantity of water the associated costs were adjusted according to the unit cost of production established in Scenario A: Continue Current Practices. Although the IRWD supply is not guaranteed as influent into the GAP system, a third analysis was performed holding the rate and demand constant but adding in the no-cost IRWD supply in order to break even the costs and revenues.

The three analyses were performed for two separate FYs: 2013-14 and 2016-17. The first FY, 2013-14, was chosen because it is the first fully predicted year based upon

all of the assumptions listed previously. The first observation made about this particular year is that when only the operational and maintenance costs are considered, the GAP is profitable. Since there is a profit there are no calculations to perform in order to balance the costs and revenues. When considering the addition of sunken costs, there exists a significant difference between revenues and costs. The calculations and respective values for the three analysis of FY 2013-14 are presented in Table 105 through 107, in Appendix B. The rate required to breakeven all costs, including sunken, with revenues for FY 2013-14 would be $1,202 per AF sold. This new rate would be an increase of 232 percent and would exceed the City of Fountain Valley and City of Santa Ana potable rates. This result is unacceptable because charging this much for water would cause all end-users within these cities to be motivated for conversion back to the higher quality and cheaper potable water supply. When looking at only increasing demand to cause a breakeven for all costs, including sunken, a new demand of 8,292 AF would be required annually. This would be an increase of 209 percent, effectively tripling the current projection of GAP demand for the FY. This quantity exceeds the normal operating limits of the GAP treatment plant. Again, the result of this analysis is unacceptable because it exceeds the constraints of the treatment plant and the new amount of demand is probably unrealistic for end-users located along the current distribution system alignment. The last analysis for FY 2013-14 is for IRWD supply and shows that in order to breakeven for all costs, IRWD would need to supply 2,098 AFY. This would account for approximately 53 percent of the GAP production. This result is much more reasonable than the previous two because within the past six years, IRWD has exceeded this quantity once. While

more reasonable, the amount of IRWD supply cannot be expected to reach the six year peak every year, especially considering the option IRWD has to not provide any water.

The second FY examined, 2016-17, was selected because two major events will have occurred in the year prior: loss of MWD subsidy and complete payoff of state loans. Without considering any increase in rates, demand, or IRWD supply there exists a loss for both the O&M and sunken capital viewpoints. Table 108 through 110, in Appendix B, present the results for this analysis. When considering only a change in rate in order to breakeven the O&M costs the rate would need to be $504 per AF. This rate would be an increase of 18 percent to the projected rate for that year. This rate will still be well below 50 percent of the potable water rate within each of the active Retailers. The rate change required when considering the additional sunken costs would be $1,383 per AF. This would be an increase of 224 percent and would probably exceed the potable water rate within the City of Fountain Valley. The rate change for the O&M viewpoint is reasonable and would still represent a significant savings for water users over potable supplies. The rate change required when considering all costs is probably not reasonable due to the loss of significant financial motivation for recycled water usage. When changing the quantity of GAP water demanded for the O&M viewpoint, an increase of 285 AF would be required to breakeven. This is a 7 percent increase in demand and could be met by one large end-user, such as a school, park, or golf course. When considering all of the costs, an increase of 7,869 AF is required. This is a 198 percent increase, again tripling the amount of the predicted demand. While this amount is less than the previous FY studied, it is not reasonable for the same reasons. When only considering IRWD supply for the O&M viewpoint, a supply of 209 AF would be

required for breakeven. This would represent a 5 percent of total supply condition, and is well above the amount of water provided in each of the past six FYs. When considering all of the costs, IRWD would need to supply 2,534 AF of water to breakeven. This would represent 64 percent of the total GAP production. The amount of water provided for the O&M viewpoint is very reasonable and expected. The sunken cost amount of water required for breakeven is unreasonable because it exceeds the amount of water provided in any of the past six years.

Scenario C: Microfiltration Treatment

The third financial scenario analyzed in this study exclusively regards a treatment plant change. All other variables and predictions have been held constant with the historical and continued current conditions as presented in Scenario A. The existing GAP treatment plant consists of flocculation, coagulation, and media filtration. The proposed treatment change would eliminate the need for these three processes by supplying GAP water through the microfiltration process currently in use in the GWRS treatment plant. A pipeline connection between the microfiltration process and the disinfection Clear Well already exists, so very little capital investment would be required for the treatment change. The elimination of the GAP treatment plant would help to reduce operational challenges because staff would only have to operate one treatment plant instead of two. The microfiltration process produces effluent that is similar in water quality to the existing GAP treatment plant processes, except it produces better values for some critical constituents. The existing Fountain Valley pump station would remain in use to provide pressure and flow to the GAP distribution system. The costs associated with demolishing and/or conversion of the existing GAP treatment plant is not addressed in this analysis. It

is expected that all of the GAP demand could be produced through the microfiltration process at the appropriate water quality levels, which would eliminate the need for deep well groundwater supplementation. The change in treatment technology would need to be discussed with the MWD in order to ensure continued eligibility for subsidy. Additionally, the change would need to be discussed with the RWQCB to ensure the recycled water permit remains valid. A central component to the viability of this scenario is the volumetric capacity of the microfiltration treatment process. In order to supply effluent water to the GAP system in addition to the GWRS plant, there needs to exist sufficient inflow from OCSD for both. Another capacity consideration would be for the microfiltration membranes to effectively treat a larger volume of water, approximately a 7 to 8 MGD increase. As discussed earlier, there is currently a competition for the limited supply of flow from OCSD which would continue under this scenario and probably become more intense without the extra volume of deep well groundwater begin added.

In order to determine the financial attractiveness of this scenario, estimates were created for the unit cost of each type of treatment based upon past expenditures. FY 2010-11 was selected for comparison between the two treatment alternatives. The estimates were created by examining accounting records and operations reports from OCWD. The OCWD Operations staff reviewed the financial values and agreed with their accuracy. Table 111 summarizes the treatment expenses associated with the existing GAP treatment process. The first row of the table shows the acre foot production of recycled water through the treatment plant. This is the amount of water produced by the media filtration, deep well groundwater supplementation, and any supplementation from

the GWRS treatment plant combined. The IRWD supply has been removed because it did not cost OCWD anything to produce it. The two chemicals used in the treatment plant are Alum for coagulation and Chlorine for disinfection. The Chlorination costs were excluded because they will be incurred whether the treatment technologies remain the same or change to microfiltration. In practice the microfiltration process may demand less chlorination because it produces a higher water quality. There are two on-site electrical demands for the treatment plant: influent pumping and plant processes. This number had to be partially extracted from a larger value because the treatment plant processes' electrical usage is lumped together with the Fountain Valley distribution pumping usage. OCWD Operations staff has determined that 90 percent of the combined electrical usage is for the distribution pumping; therefore only 10 percent was used to estimate the usage for the treatment plant. The deep well groundwater pumping occurs off-site but is metered directly. In order to determine the labor and benefits component of the expense, all of the OCWD staff time charged to the GAP activity code was obtained. From this value, the time for distribution maintenance staff was subtracted. This means that OCWD staff time in the lab and engineering departments was left in the value. This was intentionally done because it is also included in the microfiltration labor and benefits estimation. The "All Else" category accounts for materials, media replacement, equipment, and treatment plant repairs. The Utiliquest expenses were subtracted because marking of the distribution system pipeline alignments for construction projects is not part of the treatment expense. Also the fuel charges were removed from the category because they are not directly associated with the treatment expenses. As noted in the

table the unit cost for production of suitable recycled water effluent from the existing treatment process is $149 per AF.

The second half of this scenario's analysis was for microfiltration expenses. These values are summarized in Table 112. Expenses associated with the initial influent screening are also included because this would be part of the alternative treatment. There are more categories shown within this part of the expense analysis because more accounting controls have been instituted within the newer GWRS treatment plant processes. The microfiltration process does not use Alum, but does use sodium hypochlorite to reduce algae growth within the treatment cells as well as a proprietary cleaning chemical. The microfiltration process demands more labor than the existing GAP treatment plant because the microfiltration components have to be cleaned and replaced more frequently. One advantage of the microfiltration process over the existing treatment plant is that if there is a problem with some of the micro-filters, the remainder can still be used while the repair is made. If a problem occurs in the existing treatment plant, the entire plant needs to be shutdown in order to make the repair ceasing all production. The unit cost per acre foot of water produced through the microfiltration process is $71. This indicates that converting from the existing treatment technologies to the microfiltration process will be a large financial savings to OCWD operations as well as a simplification for the treatment plant operators and maintenance staff.

TABLE 111. GAP Treatment Expenses and Unit Cost Fiscal Year 2010-11

Category	Existing GAP Expenses
AF of Water Produced	4,398
Chemicals: Alum	$5,852
On-Site Elec. (Influent Pump & Plant)	$50,805
Off-Site Elec. (Deep Well)	$34,516
Labor & Benefits	$489,592
All Else (Except Utiliquest & Fuel)	$73,341
Total	$654,106
Unit Cost	$149

TABLE 112. Screening/Microfiltration Expenses and Unit Cost Fiscal Year 2010-11

Category	Screening & Microfiltration
AF of Water Produced	83,310
Labor	$2,553,000
Electrical Power Treatment	$1,864,609
Electrical Power Shops/Lab/Facilities	$74,503
Chemicals	$1,052,737
Maintenance Processes & Facilities	$177,242
Laboratory Testing	$152,216
Tools and Safety	$3,120
Material Electrical & Maintenance	$7,500
Outside Services	$3,000
Process Optimization & Consulting	$37,332
Total	$5,925,259
Unit Cost	$71

Scenario D: Change the OCWD Act

The final financial scenario analyzed in this study is the re-classification of GAP recycled water from "neutral" water to "supplemental." As noted in the chronological history of the GAP, this change has occurred in the past. Near the initial startup of GAP supply services, the OCWD Board defined the recycled water as supplemental thereby increasing the value of the water substantially. The Retailer agreements, that define the sales rate of GAP water, were not renegotiated due to institutional barriers. This resulted

in a significant water purchase savings to the Retailer agencies while OCWD did not obtain any of the financial benefits. Three years later the water reclassified to be neutral again. In order to better understand how the financial worth of recycled water changes, the Mesa Water District budget, estimated in Chapter 6, for FY 2013-14 has been presented in three ways: no GAP recycled water supply, classification of GAP water as neutral, and classification as supplemental. The three comparisons are presented in Table 113. It has been predicted in Chapter 6 that Mesa Water District will require 18,800 AF of water for FY 2013-14. The BPP is set at 70 percent for this year. Under the "no GAP water" column of the table, the entire water supply must be provided through imported water or groundwater supplies. Since a maximum of 70 percent of supply can be provided by the lower cost groundwater it is assumed that 13,160 AF of groundwater would be purchased. The remaining 5,640 AF would be provided through more expensive imported supplies. The "Neutral" column of the table represents the current classification of GAP water. Assuming 842 AF of GAP water is provided, the remaining water demand is 17,958 AF. Of this amount, only 70 percent of demand can be provided by groundwater resulting in 12,571 AF. The remaining 5,387 AF is provided by imported water. It can be observed that use of GAP recycled water under the current classification of "neutral" decreases the need for both groundwater and imported water supplies. The final column depicts what would occur if GAP water were classified as "supplemental." In short, the amount of imported water is reduced by the amount of GAP water used, while the groundwater used is maximized to 70 percent of total water demand.

TABLE 113. Supplemental vs. Neutral GAP Classification: Mesa Water FY 2013-14

	No GAP	Neutral	Supplemental
BPP	70%	70%	70%
Total Water Demand	18,800	18,800	18,800
GAP	0	842	842
Net Water Demand	18,800	17,958	17,958
Imported	5,640	5,387	4,798
Groundwater	13,160	12,571	13,160

Retailers would prefer the "supplemental" water classification of GAP recycled water because they would purchase lower cost groundwater instead of more expensive imported supplies. There are other water agencies within OCWD's jurisdictional boundary that also favor the "supplemental" classification due to the financial benefits it would create for recycled water projects in their respective areas; including the City of Buena Park, IRWD, and the City of Anaheim. The current classification actually creates a disincentive for recycled water projects to be developed. A change in classification would also increase the value of GWRS water for reuse in addition to groundwater recharge. The change in classification to "supplemental" water would make the value of recycled water near that of imported water supplies and create large water purchase savings for Retailers. As shown in Table 114, in Appendix F, this hypothetical situation for Mesa Water District's FY 2013-14 would amount to about $330,000 in annual savings. In order for OCWD to benefit from the increased worth, the Retailer agreements would have to be amended to charge Retailers a higher rate for purchase of GAP water. Table 115 is a modification of Table 114 by doubling the GAP sales rate to the Retailer. This criterion would provide Mesa Water District with a savings of about $25,000 annually while doubling revenues for OCWD. This increase in GAP Retailer rate can be

applied without raising end-user recycled water rates. The change in classification can generate more revenue for OCWD GAP sales while saving the Retailer agencies water purchase costs without raising end-user rates. This change in recycled water worth would greatly motivate the Retailers to add more end-users to the GAP system until they could replace all of their imported water demands with recycled water. Once that point is reached it would work against the Retailer financial situation to continue adding recycled water use, unless the agencies was also seeing an increase to total water demands.

Since more groundwater could be pumped through the change in classification the BPP would need to be reduced. A more detailed study of the situation should be performed if the OCWD Board is interested in the change, however OCWD staff roughly estimates a drop of 2 percent in BPP would be required. This decrease in allowable groundwater supplies would probably not be welcomed by the OCWD member agencies who are not participating in recycled water projects. The change would also increase coastal groundwater pumping which would probably increase seawater intrusion problems. The competition for the flows coming from OCSD could become more intense if demands for GAP and/or GWRS water were to increase. The greater financial incentive for development of recycled water projects may result in reduced wastewater flows to OCSD due to their diversion into new recycled water programs. This is a concern for OCWD because flow reductions to OCSD would result in flow reductions to both the GAP and GWRS, thereby increasing the level of competition for the flows.

Scenario E: Abandon Green Acres Project

One method of reducing the costs associated with the GAP would be to discontinue its operation. In theory, the execution of this scenario would immediately

stop the production and distribution of GAP recycled water and the existing distribution system would be abandoned. If this option were pursued, OCWD would probably lease and/or sell the existing infrastructure to other agencies. However in practice, the abandonment of the system cannot be made immediately. The complexity of several agreements with various termination dates and criteria would require a multi-year progression of shutdown which would probably cause the financial situation to deteriorate until the final abandonment could take place. Since the Retailers have indicated that abandonment of the GAP system would be detrimental and the Retailers are also currently producing revenue from recycled water sales, it is assumed that they would not mutually agree to terminate the GAP service agreements. As shown in Table 1, the various dates available for termination of the agreements do not coincide. If OCWD were to decide during the summer of 2013 to abandon the GAP system, the Retailer agreements would need to be honored until January 2021. It is assumed that the City of Huntington Beach's agreement can be mutually terminated since the City is not currently involved with the GAP. With each Retailer's agreement terminating at different times, the GAP system would provide progressively less and less recycled water while still having many of the same fixed costs, thereby having a substantial negative impact on the financial situation. Figure 38 shows the change in unit profit/loss of the abandonment scenario compared with that of Scenario A. The total loss from OCWD's perspective would be about $700,000, assuming that the GAP system was to break even under the O&M viewpoint perpetually after FY 2016-17 and that IRWD would not supply any water. The pertinent calculation can be found in Table 116, in Appendix B. The final FY predicted, 2021-22, shows an abandonment sunken cost because the only

end-user for that year is OCSD and they receive the water free of cost. That final year the GAP system would be producing OCSD's demand without collecting any revenue. The jump from FY 2020-21 is due to the complete repayment of CIP investment. The sunken cost perspective is not analyzed for total OCWD loss because the same amount of sunken debt exists under both viewpoints, therefore the total loss would be the same as the O&M viewpoint. Table 117 through 121, in Appendix B, show the analysis with decreasing production rates. Since each of the Retailer agreements has a termination date that falls during the FY, the demand was adjusted proportionately to the part of the year covered by the agreement. This may not be accurate because GAP usage can vary by season; however the trend and reasonable estimates can still be derived from the analysis. The OCSD agreement for GAP recycled water has been executed in conjunction with the GWRS agreement, and does not currently reflect a termination date. This agreement would have to be amended in order for GAP supply to legally cease. The IRWD agreement allows for the agency to discharge water into the GAP system through its term which concludes on January 15, 2027. Therefore this agreement would have to be renegotiated or OCWD would have to receive the discharged flows in some alternative manner. One option would be to divert the flows into the GWRS system, assuming capacity exists and agreed upon infrastructure was constructed. The state loans may require an immediate payment in the event that a decision was made to abandon the GAP system.

From the historical information and projections made during the Retailer perspective analysis in Chapter 6, an estimated loss of revenue can be calculated. Table 122 shows the historical and predicted data, five year annual average, and total annual

loss of revenue to all Retailers. It is estimated that a cumulative annual loss to Retailers of about $144,000 would be avoided by abandonment of the GAP. There will be a financial loss to the OCSD because they will need to find an alternative source for recycled water or develop infrastructure to distribute their own internal supply. The largest financial impact would be felt by the end-users within the OCWD jurisdiction. As

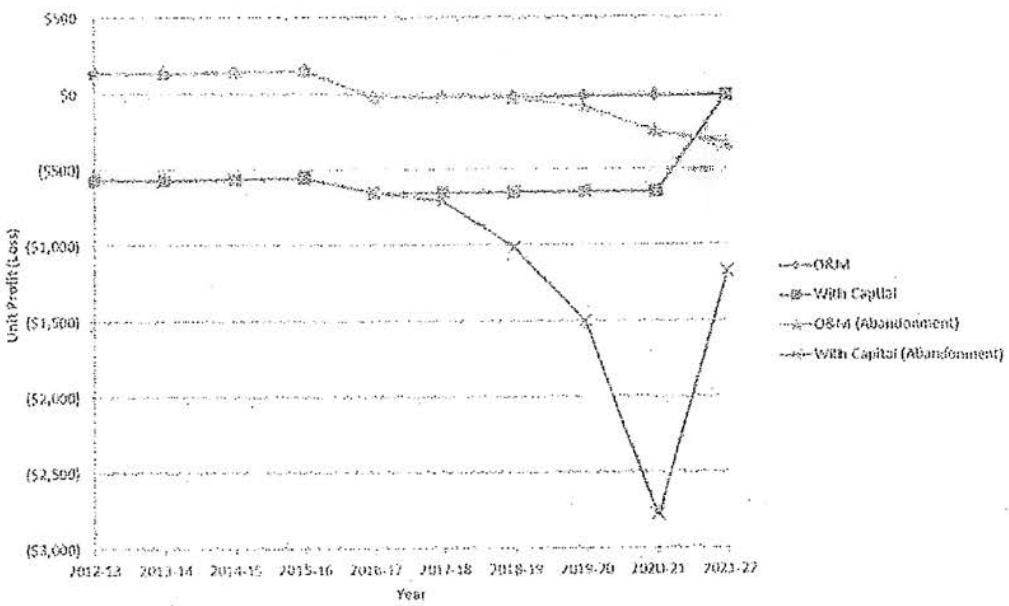


FIGURE 38. GAP abandonment versus continued current operation.

TABLE 122. Retailer Annual Loss in Revenue Due to Use of GAP

Agency	Annual Revenue/Savings					Annual Average
	2009-10	2010-11	2011-12	2012-13	2013-14	
Fountain Valley	$(29,795)	$(106,691)	$(114,884)	$(120,140)	$(123,149)	$(98,932)
Mesa Water	$11,428	$24,412	$20,193	$9,726	$2,485	$13,649
Santa Ana	$(17,505)	$(17,979)	$(25,884)	$(27,481)	$(28,005)	$(23,371)
Newport Beach	$(26,236)	$(19,842)	$(32,819)	$(44,474)	$(51,764)	$(35,027)
					Total:	$(143,681)

TABLE 123. End-User Annual Savings Lost to Abandonment of GAP

End-User Group	2009-10 GAP	2009-10 Potable	2009-10 Savings	2010-11 GAP	2010-11 Potable	2010-11 Savings
Fountain Valley	$541,626	$1,010,251	$468,625	$538,626	$1,271,982	$733,356
Mesa Water	$300,334	$1,042,186	$741,852	$265,855	$948,724	$682,869
Santa Ana	$52,097	$185,856	$133,760	$67,673	$239,083	$171,409
Newport Beach	$140,953	$402,555	$261,602	$118,679	$365,453	$246,774
	Total:		$1,605,839	Total:		$1,834,408

End-User Group	2011-12 GAP	2011-12 Potable	2011-12 Savings	2012-13 GAP	2012-13 Potable	2012-13 Savings
Fountain Valley	$572,859	$1,378,344	$805,484	$591,899	$1,406,822	$814,923
Mesa Water	$282,907	$1,045,363	$762,456	$298,399	$1,100,382	$801,983
Santa Ana	$95,633	$338,120	$242,487	$100,870	$338,120	$237,250
Newport Beach	$141,486	$475,992	$334,506	$149,234	$521,848	$372,615
	Total:		$2,144,933	Total:		$2,226,770

End-User Group	2013-14 GAP	2013-14 Potable	2013-14 Savings	
Fountain Valley	$604,735	$1,406,819	$802,085	5 Year Annual Average
Mesa Water	$304,462	$1,155,401	$850,939	$2,020,372
Santa Ana	$102,919	$338,120	$235,201	
Newport Beach	$152,265	$553,948	$401,682	
	Total:		$2,289,907	

shown in Table 123, the five year average annual cumulative increase in water expenditures by end-users, excluding OCSD, to purchase potable water instead of GAP recycled water is more than $2 million. This study does not analyze the additional costs associated with infrastructure required to switch user connections from recycled water to

potable supplies. These additional costs would have to be borne by the Retailers and end-users.

The non-monetary benefits of recycled water use in northern Orange County would also be lost. One lost benefit would be the decrease in coastal pumping. If GAP were abandoned, the Retailers would need to supply an additional 2,900 AF. The seven year average BPP is 68 percent which means that an additional 1,972 AF of water would be pumped from the groundwater aquifer along the coast line. This would most likely exacerbate seawater intrusion problems. These figures assume that OCSD would not demand water from a Retail water agency, but would instead replace their GAP demand internally. The second benefit lost to the abandonment of the GAP system would be loss of water conservation. Retailers are constantly looking for ways to conserve water resources and would loss the advantage that recycled water provides them in achieving their conservation goals. Third, the region's water portfolio would be concentrated into groundwater and imported water supplies. The reliability and other water resource management advantages of having a third source of water supply would be lost to the abandonment. One possible advantage of abandoning the GAP system would be that competition for flows from OCSD would be eliminated and more flows could be provided to GWRS. This may increase the GWRS treatment plant production resulting in more groundwater recharge along the Santa Ana River through mid-basin injection projects and at the Anaheim spreading grounds.

CHAPTER 8

OTHER RECYCLED WATER PROGRAMS

Communication Methods

In order to better understand the GAP, information about the recycled water projects administered through other public agencies was sought for comparison. In order to receive the information in a timely manner, informal communication methods were used. The responses received from staff at the other agencies can be found in Appendix E. The responses were received either via email correspondence or over the phone and notes were taken. While the information collected is from staff at the respective agency, it may not accurately reflect the official opinion of the agency. The informal approach to collection of response allowed the process to be significantly shortened. All of the agencies were asked the same list of questions about the source of recycled water, how the recycled water is sold and at what rate, if any subsidies are received, portion of potable water supplied by groundwater, types of end-user recycled water categories, annual production quantity of recycled water, unique challenges to implementation and expansion of recycled water projects, recovery of capital expenses through sales of recycled water, and any additional comments. A summary of rate comparison is presented in Table 124. It is important to recognize that the water availability, political situation, and motivations for each respective agency are different and carry a variable influence upon the respective recycled water programs.

TABLE 124. Other Recycled Water Agency Rate Comparison with GAP

	Lowest 2013-14 Rate ($/AF)	Percent Difference with GAP
GAP	$361.60	-
West Basin	$888.00	145.58%
Long Beach	$531.47	46.98%
IEUA	$215.00	-40.54%
IRWD	$483.52	33.72%
South Bay	$932.00	157.74%

West Basin Municipal Water District

The West Basin Municipal Water District is located in western, central, and southern Los Angeles County. The agency is a member of MWD and also draws water from an adjudicated groundwater basin. The source of West Basin's recycled water is the secondary effluent from the City of Los Angeles' Hyperion treatment plant. West basin purchases this secondary effluent for $7.50 per AF. The sale of recycled water produced by West Basin can be complicated because there are seven different rates associated with various water retail agencies and water quality levels. West Basin does not sell directly to the end-user, but rather to a retail water agency. There is an exception to this arrangement in that West Basin does sell directly to some oil refineries. The lowest rate for sale of recycled water for the 2013-14 FY is $888 per AF. West Basin also provides potable water to the retailers for $1,106 per AF. The recycled rate is therefore about 20 percent below the potable rate. A MWD LRP subsidy is received by West Basin in the amount of $250 per AF. Other funding for West Basin operations is provided through stand-by charges, property taxes, sales rates, and fixed payments from oil refineries. The recycled water program is not typically viewed or analyzed financially separate from the other water production and sales operations of West Basin. Some of the initial capital

investment was provided through Army Corps of Engineers grants. The amount of groundwater used for potable supplies is 20 to 25 percent due to the adjudicated groundwater basin. The West Basin recycled water program satisfies about 30,000 AF of demand annually with roughly a third going to irrigation, sea water intrusion barrier, and oil refineries respectively. The system consists of about 120 miles of pipeline and the demand is expected to increase to 40,000 AFY in the next FY with a current end goal of 50,000 AFY. The cities within the jurisdictional area do not have specific policies requiring use of recycled water other than the state water code. West Basin helps end-users with connection fees, low interest loans, and special financing options to help offset conversion capital expenses. Challenges unique to West Basin are that five different recycled water qualities are produced and delivered to various end-users and retail agencies, there are five separate types of treatment plant, marketing of the system has lacked, there may be overlaps in costs due to complexity of the system and lack of operational measurements, the influent from the Hyperion treatment plan can vary, and the backwash and solids handling from the recycled water treatment plants are treated on-site. It is estimated that the capital and operational costs associated with supply to the oil refineries are not being sufficiently recovered because of the outdated agreements that favor the end-user. The irrigation supply costs are currently recovering investment expenses. West Basin has found success in expanding the recycled water program because the ratepayers favor the lower cost water as opposed to the alternative of expensive imported supplies.

The GAP also receives secondary effluent from a sewage treatment plant, but does not pay for it like West Basin. Also similar to West Basin, the GAP system sells

effluent to water retailers and not directly to end-users with the exception of OCSD. Excluding the OCSD agreement, the lowest rate for GAP water is $361.60 per AF. This means that if only comparison is made by the lowest recycled water rate charged, West Basin is charging at least 146 percent more per unit of water than OCWD. While GAP Retailers sell the water to end-users at 20 percent below the potable rate, except Mesa Water District that sells for 10 percent less, OCWD sells the water to the Retailers at a much lower rate. West Basin takes on all maintenance, like OCWD, and their agreements do not pass any revenue onto the retailers, unlike OCWD. OCWD also receives the same MWD subsidy while collecting revenues from water sales and a small amount of property tax. While OCWD does not supply potable water, it does set the percentage of demand that can be pumped from groundwater supplies, typically around 68 percent. West Basin produces about four times as much recycled water as OCWD and distributes it through a pipeline system about three times longer. Unlike West Basin, OCWD does not currently subsidize or provide financing for new end-user connections. OCWD also has a large end-user, approximately 60 percent, that purchases recycled water at a rate lower than the cost to produce, which is similar to West Basin's oil refinery arrangements.

City of Long Beach

The City of Long Beach Water Department supplies potable and recycled water to end-users. The City is located just northwest of OCWD's jurisdictional boundary. The recycled water provided by Long Beach is supplied by the Sanitation Districts of Los Angeles County's Long Beach Water Reclamation Plant. This arrangement separates treatment plant and distribution system facilities' ownership. The arrangements also

allows for water to be further treated in the Leo J. Vander Lans Advanced Water Treatment Facility which provides water for the Alamitos Seawater Intrusion Barrier. The Alamitos Barrier is operated as a joint effort between OCWD and Los Angeles County to prevent seawater from intruding into both Orange and Los Angeles Counties. The sales rate of recycled water to end-users is separated into three categories: "Peaking," "Non-Peaking," and "Interruptible." The "Non-Peaking" and "Interruptible" rates are the lowest and are set at $1.22 per 100 cubic feet plus daily service fee, or $531.47 per AF. The "Peaking" rate is for end-users that demand water during the night, the "Non-Peaking" is for end-users that also take water during the day and are typically industrial, and the "Interruptible" rate allows for a one week interruption in supply. The potable rate for irrigation and industrial users is about $1,062 per AF. This means that recycled water is sold at a 50 percent discount to the end-users. Long Beach has obtained funding from the United States Bureau of Reclamation but does not receive the MWD subsidy. The City was an early adopter of recycled water and therefore implemented its use before the MWD subsidy was created. As a result, the subsidy only applies to new quantities of imported demand replaced with recycled water and the City is not able to meet the minimum annual quantities. The City has adjudicated groundwater rights to supply about 50 percent of their potable demands, or 33,000 AF annually. The end-users of Long Beach's recycled water are 20 percent industrial, 30 percent seawater barrier, and 50 percent irrigation. The City operates about 62 miles of pipeline to distribute the recycled water and total annual demands are roughly 6,000 AF. The City does not have a policy requiring recycled water use other than the state water code and only has one dual plumbed building. The City's system was constructed in the 1970s with the primary

objective of replacing oil extraction replenishment water from potable to recycled supplies. Today this use accounts for about 17 percent of the recycled water produced. The City does not perform accounting in a way to separate recycled water from potable because they are considered the same water supply portfolio. For this reason it is not possible to determine if capital costs have been recovered exclusively by recycled water revenue. New recycled water projects are analyzed based upon how much imported water supplies they will replace minus the loss of revenue caused by selling recycled water at a rate lower than potable. The City has not expanded the system very much within the past 10 years because the large end-users have already been added to the system and other large users would require more distribution piping investment.

The GAP differs from the City of Long Beach situation in that the City does not own and operate the treatment plant, the City is a retail water agency and therefore the City views recycled water supplies differently than the wholesaler type role that OCWD plays. The City sells recycled water for at least 47 percent more than OCWD and has defined varying rates based upon time of demand. OCWD does not have a distinction of timeframe for demands. The lowest recycled water rate provides a 50 percent discount from the potable rate, while the highest provides a 30 percent discount. As mentioned previously GAP end-users currently receive a 10 to 20 percent discount, but OCWD sells at a discount exceeding 69 percent when compared to potable rates. Large grant funds were not secured for the GAP capital investment like they were for the City; therefore the City does not carry the same burden of capital repayment. As mentioned in Chapter 3, other than OCSD demand, the GAP primarily supplies recycled water for irrigation users, which is similar to the Long Beach situation. The City distributes slightly less recycled

water each year than OCWD; however they do so through a system that is about a third larger. Since the City has obtained capital funding from outside sources, it is not burdened with the task of long term debt repayment, therefore it can afford to distribute less water over greater distances than OCWD can. The Long Beach distribution system has not seen very much expansion in the past 10 years which is also the case for the GAP.

Inland Empire Utilities Agency

The Inland Empire Utilities Agency (IEUA) is located northeast of OCWD's jurisdictional boundary in San Bernardino County. The agency provides wastewater service and imported water deliveries to eight other agencies. The wastewater service provided by IEUA is the source of recycled water within its distribution system. The treatment process is traditional and meets Title 22 requirements. IEUA sells recycled water in two categories: direct sale and recharge sale. The lowest rate is that of direct sale and is currently set at $215 per AF, increasing to $290 per AF in the FY of 2014-15. Similar to OCWD, IEUA sells recycled water to retailer agencies who in turn sell it to end-users. The retail rate for potable and recycled water purchases by end-users is different within each retail agency. Since data is lacking, each IEUA member agency is assumed to take the same amount of water and for simplicity it assumed that all water use is through the lowest cost tier. These assumptions are not accurate, but will provide a broad picture of the situation. Of the five retail agency rates provided, the average end-user rate for purchase of recycled water is $580.22 per AF, indicating a markup of $365.22 per AF, or 70 percent, by the retail agency. On average the recycled water is sold at 21 percent discount from potable water. IEUA receives a subsidy for recycled water produced from MWD's LRP in the amount of $154 per AF up to 13,500 AFY.

Within IEUA's boundaries, about 61 percent of potable supplies come from groundwater and 23 percent from imported supplies. The percentage of application use for recycled water in FY 2011-12 was as follows: 64 percent agriculture and irrigation, 7 percent industrial, and 29 percent groundwater recharge. IEUA distributes the approximate annual recycled water quantity of about 31,000 AF through roughly 70 miles of pipeline. The cities and retail water agencies within IEUA's boundaries have adopted recycled water use ordinances. IEUA has found challenges in the capital expenses associated with conversions costs and long payback periods. The agency has not been able to recover all of its recycled water capital expenses. The slow amount of recycled water expansion that IEUA has been able to encourage came as a result of water conservation efforts and grant or favorable loan programs.

The GAP is administered through the local retail water agencies in a way similar to IEUA. Since IEUA is a wastewater agency, it has motivations to find financially favorable discharge methods for the effluent, while OCWD's motivations lay within reductions of groundwater demand. IEUA sells its recycled water to retail agencies at a rate about 41 percent lower than OCWD, passing more of the potential revenue gains onto the retailer. It appears that the rapid increase in recycled water rates by IEUA may shift some revenue back from the retailers. The average markup from recycled water purchase to sales rate by the GAP Retailers is 156 percent, about double that of the IEUA retailers. The IEUA end-user recycled water over potable water discount of 21 percent is very similar to the GAP discount of 10 to 20 percent. The IEUA subsidy from MWD is less per AF than that of GAP, but is eligible for much larger quantity. The end-user application of recycled water to recharge the groundwater aquifer is not defined as such

at OCWD. While OCWD does recharge groundwater with highly purified recycled water through the GWRS program, it does not use the GAP water for such purposes. Similarly with IEUA, the GAP program has not seen very much expansion after the initial large water users were added during the project's early stages.

Irvine Ranch Water District

IRWD is located partially within OCWD's boundaries and adjacently on the east. As previously described, IRWD maintains a recycled water system with the primary objective of discharging treated wastewater flows. A unique relationship exists between IRWD and OCWD in relation to the GAP system. During the winter months when IRWD encounters an excess of recycled water supplies, IRWD has the option to discharge some recycled water flows into the GAP system while OCWD stops operation of the GAP treatment plant. IRWD encounters this excess supply during the rainy season because end-users within its area do not demand as much irrigation water but the wastewater flow remains constant. IRWD operates two recycled water treatment plants: the Michelson Water Recycling Plant and the Los Alisos Water Recycling Plant. The Michelson plant produces about 18 to 19 MGD of recycled water while the Los Alisos produces about 4.5 MGD. The treatment process is traditional with primary, secondary, and filtration treatment with chlorination disinfection. IRWD has instituted a complex tiered water rate structure for both potable and non-potable deliveries. For purposes of comparison, the base rates are considered here. Recycled water is sold directly to the end-user from IRWD for $483.52 per AF which is a 13 percent discount from the IRWD potable rate. Other rates exist for different service areas or end-user application, but these numbers reflect the majority of service. The majority of end-user recycled water

use is for irrigation or landscaping and agriculture, although applications also include industrial, cooling, and dual plumbed buildings. IRWD distributes about 22,000 AFY through at least 473 miles of pipeline. Expansions have been found financially viable in new residential developments because the majority of capital costs are placed upon the developer instead of the water agency. Since IRWD is the only water retailer and wastewater purveyor in its service area it has the unique opportunity to master plan all of the distribution and facilities while placing some expenses upon developing parties. Some unique challenges to IRWD's recycled water program include the effect of rainfall on demand, management of the many recycled water storage reservoir levels and long term supply outlook, and dealing with the Division of Safety of Dams for the reservoir dams.

The amount of recycled water produced by IRWD is about three times as much as by GAP and it is distributed through pipelines about 13 times longer. IRWD has been able to justify such a large distribution system because it reduces wastewater effluent costs and developers have borne some expenses. The GAP system was planned to serve residential end-users at point, similar to IRWD. After the capital investment was made to serve some residential end-users, cross connection issues led to a prohibitive problem ceasing the service. In order to continue the residential service more capital investment would be required in order to prevent future cross connections. Large residential lots are also not as abundant in the GAP service area as they are in the IRWD recycled water service area. IRWD recycled water is sold for 34 percent more than GAP water, however that is to the end-user so there is no middle agency producing revenue. The financial benefits of treating wastewater and distributing it as recycled water are not realized by

OCWD like they are to IRWD. Since OCWD and OCSD are separate agencies, the financial benefit of wastewater discharge is lost. While rainfall will also reduce end-user recycled water demand in the GAP service area, it does not play as significant a role as in IRWD's area. The GAP does not encounter reservoir or long term storage issues like IRWD because its supply is produced almost daily. This is primarily a result of the lower quantity of demand and also the alternative wastewater discharge in the GWRS system.

South Bay Water Recycling Program

The South Bay Water Recycling Program is located in the southern Bay Area of California. The program is primarily administered through the City of San Jose. The recycled water program was developed in response to judicial and regulatory pressure to reduce wastewater discharges into environmentally sensitive habitat. The treatment plant utilizes traditional processes for primary, secondary, and secondary filtration and disinfection. As described in Chapter 2, the recycled water is delivered to end-users through four separate retail water agencies: City of Milpitas, City of San Jose, City of Santa Clara, and the San Jose Water Company. The average end-user rate for recycled water purchase is $932 per AF, which is a discount of 41 percent from potable supplies. South Bay has received grant funding from the United States Bureau of Reclamation and the American Recovery and Reinvestment Act. Approximately two-thirds of the end-user application is for irrigation and one-third for industrial. The program distributed about 12,275 AF in 2012 through roughly 140 miles of pipeline. According to the email correspondence with the agency it is unlikely that South Bay has been able to recover the capital investment made into the recycled water program. The program has found success because it is a locally available and sustainable resource.

A key difference between the Green Aces Project and the South Bay Program is the geographic location. The water industry and portfolio specifics are different between the two regions along with the motivations for development. However, both system were constructed within existing urban communities, distribute recycled water through retail water agencies, and the end-user combinations are very similar. The potable and recycled water rates are much higher in the South Bay area than the GAP. Recycled water is sold 158 percent more in the South Bay program than GAP. South Bay distributes about twice as much recycled water as GAP through a system that is about 4 times longer. The program is relatively young when compared to the other recycled water systems in this study and therefore does not have a complete financial analysis available. Regardless of whether the recycled water system is sustaining itself financially, it is fulfilling the regional need of reducing wastewater effluent discharge into the sensitive environmental habitats of the South Bay. The alternative of large fines, bad publicity, and judicial intervention are not a tolerable solution, therefore the South Bay program can be considered a success regardless of its financial situation.

CHAPTER 9

CONCLUSION AND RECOMMENDATION

Conclusions

The hydraulic and financial modeling of the GAP system have led to many conclusions that be used to make future decisions. The EPANET hydraulic model was used to simulate proposed changes to the distribution system piping, changes in demand quantities, and provided insights into the various changes. The first scenario modeled predicted the hydraulic effects of the expected future demands on the GAP system. The primary change being that of the large OCSD end-user demand dramatically decreasing. The model showed lower pressures were experienced throughout the system as a result of the drop in overall system demand. The modeling did not indicate that pressures would drop dramatically, but this drop may result in service connection problems in Newport Beach. Since Newport Beach end-users are located at a relatively high elevation, end of distribution branch, and consist of some large irrigation demands there already exists occasional pressure problems with the system. Any drops in the pressure would most likely exacerbate the existing problems. The second scenario that was modeled built upon the expected lower demand of the future and severed one of the distribution system loops. The break would be intentional so that a section of pipeline could be used for an alternative project. The modeling of this scenario resulted in stagnant flows in what was the northern distribution loop. During low demand periods the end-users are taking flow

to the south therefore the water in the pipeline to the north cannot move to help support the flows. This may pose a water quality problem due to a reduction in disinfection residual experienced as the recycled water ages. The loop break showed little effect on pressures within the system and no effect on the water levels in the storage reservoirs. The velocities within the system changed dramatically, but were still well below speed of concern for pipeline integrity. The third scenario was similar to the second in that it modeled a break in a distribution system loop. This break also took place intentionally to support an alternative project, but is located in the southern loop of the system. The results are very similar to that of the second scenario except stagnant flows were not as abundant. The southern loop also feeds the Newport Beach branch which experienced a drop in pressure that may be of concern. During peak demand periods the pressure at the end of the Newport branch dropped slightly below 60 psi, which is the minimum pressure stated in the service agreement. The final hydraulic scenario modeled was a large increase in end-user demands that would generate enough sales revenue to balance all of the projects expenses, including sunken capital costs. The scenario proved unreasonable for multiple reasons and should not be attempted without dramatic changes to the system's infrastructure. The large amount of extra demand required to balance the finances would more than double the existing demand without increasing the distribution area. This is not probable because the majority of potential large demand end-users located along the existing pipeline alignments are already taking recycled water. The larger demand required would also stress the existing treatment plant and would require more influent flows. The larger amount of flow moving through the same sized distribution system created pressure drop concerns and dangerous pipeline velocities.

The financial analysis of the existing operation, future operation, and potential changes to the system provided valuable insights. It was generally found that the GAP has operated in a state of profit when only considering operational and maintenance costs. Capital finance expenses remain that would need to be repaid regardless of the GAP system's operation. When the sunken capital costs are considered, the GAP has clearly operated at a financial loss. The future of the GAP system is filled with various decisions and competitions for limited resources. From the OCWD point of view the GAP competes with the GWRS for secondary treated wastewater flows from OCSD and treats water to lower water quality standards. From the Retailer and end-user perspectives, the recycled water provided by GAP is a way to conserve precious high-quality water sources, reduce demands for imported water, and diversify water portfolios. Analysis was performed for multiple scenarios including continuing current operation, uses sales rates or increased demand to recover annual capital financing expenses, changing the treatment plant technology from media filtration to microfiltration, abandoning the system, and modifying the definition of recycled water contained in the OCWD Act. The continuation of current operations would generally result in a breakeven cost benefit from the OCWD perspective of O&M starting in the FY of 2016-17. The analysis took into account changes in OCSD demand, historical trends for expenses and rate increases, debt repayment, repair budgets, and subsidy expiration. When the free supplies from IRWD into the GAP distribution system are considered as part of the continued operation, the program remains fairly profitable, unless sunken capital costs are considered in which case the system maintains an annual loss. It was determined that increases in end-user demand can balance the sunken financial costs, but are highly unlikely to be achieved.

Increases to the sales rate of GAP water would more easily balance the financial situation but would require re-negotiable of complicated agreements with four separate retail water agencies. The change in treatment plant technology from media to microfiltration resulted in a favorable cost savings. The capital expenses for the technologies were ignored because they already exist as part of the existing GAP treatment plant and the existing GWRS treatment processes. There remains a question of available influent to the treatment plants to supply both program goals. The GWRS microfiltration process is currently being expanded and would probably result in excess capacity, in the short-term, that can be applied towards GAP flows. Abandonment of the GAP would cause a chain reaction among many agencies. The first would be to OCWD in the form of lost sales revenues while the production winds down. The process of abandonment would take several years because of the various agreement terms with Retailers. During that time OCWD would still need to operate the treatment plant, distribution facilities, and staff while generating a smaller amount of revenue. It is estimated that OCWD would lose about $700,000 over a 5 year period, excluding IRWD flows. Combining the four GAP water Retailers, a savings of approximately $144,000 per year can be realized because higher priced potable water would be sold to meet the current recycled water demands. The largest financial impact to abandonment of the GAP system would be to the end-users. It is estimated that the entire end-user pool would experience an annual loss of over $2,000,000 due to the higher price of potable water replacement supply. The change of recycled water definition in the OCWD Act was adopted in the past but was reversed shortly thereafter. The reclassification of recycled water as "supplemental" instead of "neutral" would essentially make its financial value equivalent to imported water because

it could replace imported supplies at a ratio of 1 to 1. Under the current "neutral" definition, GAP water reduces the total water demand of each Retailer thereby reducing the amount of groundwater and imported water needed. The "supplemental" would allow Retailers to pump more low cost groundwater and purchase less of the expensive imported water. As an example, it was determined that Mesa Water District could experience an annual water purchase savings of $330,000.

Many other information was observed during the course of this hydraulic and financial study. Interviews with representatives from the Retail water agencies reveal a general consensus that abandoning the GAP system would be detrimental. Even with the increased maintenance, accounting, and inspections costs associated with a recycled water program, the Retailers realize the importance of the water portfolio diversity and that recycled water is one of the only ways they have to conserve potable water. This study primarily ignores flows from IRWD into the GAP because they are not guaranteed. After discussion with IRWD staff it is highly unlikely that IRWD would cease GAP flows because it is cheaper for the agency to discharge treated wastewater effluent to the GAP than to pay OCSD to take it. The primary factor that affects how much GAP water is provided by IRWD is rainfall. When it rains more, then IRWD provides more GAP water. The MWD subsidy will end the same FY that the capital finances are repaid, 2016-17. It has been found that the planned end-user demand for the GAP service area is substantially greater than that of the recent demand. The literature review suggests that smaller distribution systems with concentrated demands tend to perform better financially. Since the GAP does not produce enough revenue to cover both operational and capital expense, the capital expense must be subsidized by other revenues collected

by OCWD. This indicates that the entire OCWD service area has been subsidizing the GAP. This is not necessarily a negative situation though because the GAP reduces coastal groundwater pumping thereby reducing seawater intrusion problems and preserving the high quality of groundwater available to the entire area. The GAP sales rate is based heavily on the RA levied by OCWD for groundwater extraction. This rate is set annually and determined on the basis of groundwater replenishment costs. Since the rate is not set based on factors associated with the GAP, it is likely to increase, and therefore increase GAP sales rates, due to increased production goals of OCWD.

The GAP was constructed within an existing urban environment and has managed to operate profitably when only considering O&M. However, like many other recycled water systems, the GAP has not produced revenues to support all of the project's costs. The lack of promised and new end-user demands, operational efficacy studies, and competing projects have helped to cause the GAP to remain in a state of overall financial loss. OCWD is recognized worldwide for its implementation of the GWRS wastewater treatment and potable reuse programs. The majority of OCWD staff attention has been focused upon these projects, thereby leaving the public generally unaware of the GAP system and resulting in some misconceptions about its operation and finances. Due to the limited flows from OCSD, OCWD staff must make policy decisions regarding the priority of flows for either the GAP treatment plant or the GWRS plant.

Recommendation

Several recommendations have been developed based upon the findings of this study. The hydraulic modeling suggests that OCWD may use the pipeline near Edinger Avenue for an alternative project with the understanding that water quality and pressure

problems may result. It is therefore recommended that OCWD not break the northern distribution loop due to predicted issues that will persist in long term financial investments. The breaking of the southern distribution loop is also not recommended due to the exacerbating of pressure issues elsewhere in the system. OCWD may desire to perform a re-negotiation of the Retailer agreements in order to secure more revenue, but long term financial estimations reveal that breakeven conditions will result without changes in the agreements. A re-negotiation is not necessary if the sunken capital expenses are ignored and no other changes occur. However, it is recommended that OCWD reclassify recycled water as supplemental and perform re-negotiations in order to secure more revenue based upon the higher financial worth of the water. Retailers should be motivated to renegotiate if the change in definition depends upon the new agreements. In the remaining years of the MWD subsidy, OCWD should utilize the extra revenues to encourage new end-user connections. It is also recommended that OCWD should strive to add more end-user demand along the existing distribution system alignment. While breakeven demands are unrealistic, increased demand quantities will improve the overall financial outlook of the system. The treatment plant technology should be changed to microfiltration because it will allow for a significant cost savings to OCWD, will produce a higher quality effluent, and therefore will reduce the need for deep well groundwater pumping. It is recommended that OCWD not abandon the GAP because it operates at an operational financial gain, reduces coastal groundwater pumping, is of benefit to the Retailers, reduces dependence on imported water supplies, and the capital expenses must be repaid either way. The distribution system regularly maintains pressures exceeding 120 psi and is located within many heavily traveled streets. Given the high pressures,

high level of hazard associated with pipeline breaks in these areas, lack of data for troubleshooting and system optimization, and lack of OCWD personnel qualified for immediate street repairs it is recommended that OCWD install real-time pressure monitoring within the system. There exists a potential for pump energy and startup efficiency savings that can be determined through further study. There may also be room for optimization of reservoir storage elevations and treatment plant flows. It is therefore recommended that further study of the GAP system be performed in order to determine potential operational savings. OCWD should also strive to educate the public and potential new end-users about the multiplicity of benefits associated with the GAP.

B. Equal access to groundwater basin

Director Quist reported the Committee's concerns regarding the potential effects of the well drilling ordinance adopted by the City of Fountain Valley, not only on the City of Newport Beach's pending construction of a well field in Fountain Valley but on the overall management of the Orange County groundwater basin. Mr. Quist noted that the Committee had recommended a joint meeting between the OCWD Board and the Fountain Valley City Council. He suggested that it might be better advisable that the District staff first discuss the issue with City staff at the conclusion of the present aquifer pump tests, with a subsequent meeting of a small committee of the OCWD Board and a delegation from the City Council. The Board concurred and the following action was taken.

MOTION NO. 95-200
SCHEDULING MEETINGS WITH CITY OF FOUNTAIN VALLEY
RE NEWPORT BEACH WELL FIELD

Upon motion by Director Quist, seconded by Director Anthony and carried, OCWD staff is requested to meet with City of Fountain Valley staff at the conclusion of the aquifer pump test presently being performed on two City of Fountain Valley wells, to discuss issues regarding the City of Newport Beach's planned well field in Fountain Valley; further, it is agreed that a meeting shall subsequently be scheduled between an Ad Hoc committee of the OCWD Board and a delegation of the Fountain Valley City Council.

President Barr appointed Directors Anthony, Bannister, Owen and Quist to the Ad Hoc Committee for matters concerning the Newport Beach Well Field in Fountain Valley.

C. OCWD-sponsored program to credit groundwater producing agencies for quantifiable water conservation programs

General Manager Mills reported that the Groundwater Producers have requested the development of a program that would make it cost effective for them to encourage the installment of water conservation devices within their areas. He explained that while conservation reduces the amount of imported water required to be purchased by OCWD, it reduces the water sales revenue to the Groundwater Producers, who also have to bear a portion of the cost of the conservation devices.

Mr. Van Haun utilized overheads to demonstrate that the recommended program would be revenue-neutral to the District and at the same time provide assistance to the Producers to offset their costs of implementation of conservation programs. In response to the Director's inquiry regarding similar assistance that might be forthcoming from the County Sanitation Districts of Orange County, Mr. Ed Alario, Assistant General Manager of Water Services for the City of Anaheim, reported that an assistance program has previously been considered but not approved by the CSDOC Board of Directors.

MOTION NO. 95-201
AUTHORIZING IMPLEMENTATION OF PROGRAM TO CREDIT GROUNDWATER PRODUCING AGENCIES FOR QUANTIFIABLE WATER CONSERVATION PROGRAMS

Upon motion by Director Anthony, seconded by Director Quist and carried, with Directors Fonley and Owen abstaining from voting, it is hereby agreed to implement a program, effective September 20, 1995, that will credit groundwater producing agencies for quantifiable water conservation programs by adding the amount of water conserved to the amount of supplemental water used for the purpose of computing the Basin Equity Assessment.

D. Seismic risk and emergency preparedness assessment

General Manager Mills reviewed the recommendation for issuance of a Request for Proposals for a consultant to conduct a detailed analysis of District facilities that were categorized as "very high," "high," or "moderate" risk by the recently completed seismic risk appraisal of District facilities. Director Bannister noted that one of the primary focuses of the study would be to evaluate the District's facilities in terms of their operational uses in order to prioritize retrofitting and thereby enable the District to continue critical operations during crises.

MOTION NO. 95-202
AUTHORIZING ISSUANCE OF REQUEST FOR PROPOSALS FOR SEISMIC ANALYSIS OF DISTRICT FACILITIES

Upon motion by Director Bannister, seconded by Director Quist and carried, a Request for Proposals is authorized to be issued for a consultant to conduct a detailed seismic analysis of District facilities.

GENERAL MANAGER'S REPORT

General Manager Mills reported on the following matters:

1. Northern California tour of State Water Project facilities October 27-28;
2. Association of Ground Water Agencies (AGWA) Meeting September 19;
3. Approval of Los Angeles Department of Water and Power East Valley Groundwater Reclamation Project;
4. Safe Drinking Water Act reauthorization status and proposals re funding of arsenic research; and
5. Report of activities of General Manager and Group Managers for August 1995

Backup materials for Committee items are available in the Committee packet.
Materials distributed at Committee meetings are attached hereto

Water Issues Committee meeting held November 14, 2007

WORKSHOP - BASIN PRODUCTION PERCENTAGE METHODOLGY

Recommendation:

Adopt and implement Option 4 which uses probability analysis to assist in setting the annual Basin Production Percentage beginning in FY 2008-09

Staff Note:
The Committee provided comments for staff to consider regarding how the BPP option (Option 4) using probability analysis could be modified. Staff is in the process of reviewing these comments and will report to the Board.

WITNESS Markus
EXHIBIT 27
DATE 10-11-17 RPTR NH
eLitigation Services Inc.

AGENDA ITEM SUBMITTAL

Meeting Date: November 14, 2007

To: Water Issues Committee/
Board of Directors

From: Mike Markus

Staff Contact: C. Miller / J. Kennedy

Budgeted: N/A
Budgeted Amount: N/A
Cost Estimate: N/A
Funding Source: N/A

Program/Line Item No. N/A
General Counsel Approval: N/A
Engineers/Feasibility Report Approved: N/A
CEQA Compliance: N/A

Subject: WORKSHOP - BASIN PRODUCTION PERCENTAGE METHODOLGY

SUMMARY

The District is evaluating alternative methods to determine the annual basin production percentage (BPP). Monthly meetings have been held with the Committee and Groundwater Producers to discuss this issue. Staff will present a recommended BPP option for Committee consideration.

RECOMMENDATION

Agendize for December 5 Board meeting: Adopt and implement Option 4 which uses probability analysis to assist in setting the annual Basin Production Percentage beginning in FY 2008-09.

BACKGROUND/ANALYSIS

Six BPP setting options have been reviewed with the Committee and the Groundwater Producers over the past four months. The options are provided in the following table and described further in the attached presentation material.

Option #	Description
1	Establish the annual BPP based upon the groundwater basin's accumulated overdraft
2	Establish the annual BPP based upon water level measurements in key groundwater wells
3	Modify the current BPP setting formula by establishing a planned basin refill amount and including an estimate for the current year's hydrology
4	Use probability analysis to estimate captured Santa Ana River storm flows and natural incidental recharge in predicting the end of fiscal year accumulated

	overdraft and the following year BPP
5	Current methodology
6	Establish a base BPP and then attempt to keep future BPP changes to within plus or minus 5% of the base.

The primary and secondary goals in setting the annual BPP are provided below:

- Primary
  - Protect the basin
  - Provide sustainable annual pumping
  - Drought protection
  - Maximize the value of the basin's storage capacity

- Secondary
  - Minimize the service area's water supply cost
  - Maintain Board discretion
  - Provide smooth predictable BPP changes
  - Avoid locking into a BPP for long terms
  - Attempt to establish the BPP by January/February for the upcoming fiscal year
  - Document performance in MWD replenishment program

Option 4 Details

The six BPP setting options listed in the table have been reviewed over the past four months. Three meetings have occurred with the Water Issues Committee, four meetings have been held with the Groundwater Producers. Option 4 appears to be the best option that most responds to Directors' comments and criticisms of the current BPP setting option. A general consensus was reached with the Groundwater Producers for this option. The BPP equation would be as follows:

$$\frac{\text{SAR Storm Flows using Probability} + \text{Natural Incidental Recharge using Probability} + \text{SAR Base Flows (5-yr Avg)} + \text{Expected GWR System Supplies} + \text{Other expected supplies such as Alamitos Barrier and Arlington Desalter} + \text{Expected MWD Replenishment Water} - \text{Expected WQ pumping above BPP} - \text{Planned Basin Refill (from table)}}{\text{Total Water Demands (5-yr Avg)} - \text{Expected Reclaimed \& Local Supplies}} = \text{BPP}$$

Option 4 slightly modifies the existing formula and uses rainfall probability to estimate recharge into the groundwater basin and future overdraft conditions. Additionally the formula would account for the current year's hydrologic conditions in setting the upcoming year's BPP. Under this option the District would become increasing conservative in setting the annual BPP as the accumulated overdraft grows and approaches the bottom of the basin operating range.

The following table plays an important role with the option. It establishes the level of probability to use in the formula based upon the groundwater basin's accumulated overdraft. As the accumulated overdraft increases, a higher level of certainty or probability is used in the BPP calculation to ensure that the basin recharge estimates are attained or exceeded.

The probability percentages are based on over 100 years of rainfall data and represent the probability that the upcoming year will not be drier than the indicated rainfall amount. For example if the accumulated overdraft was 500,000 af, then a 90% rainfall probability would be used to conservatively estimate that the upcoming year's rainfall will only be 9 inches even though there is a 90% chance that it will be greater. With this methodology, there is a 90% likelihood that the upcoming year's basin refill amount will exceed expectations.

Additionally, the table establishes an amount or a range for the planned basin refill water (reduction to the basin's accumulated overdraft) that should be used in the formula based upon the basin's accumulated overdraft. The range is based upon provisions in the District Act which call for refilling the groundwater basin in not less than 10 years and not greater than 20 years. For example; if the accumulated overdraft is 400,000 acre-feet, refilling the basin over a 20-year period would yield a value of 20,000 acre-feet per year while refilling the basin over a 10-year period yields a value of 40,000 acre-feet per year. The Board would decide on the actual value to use in the BPP formula annually within the ranges shown.

Accumulated Overdraft, Basin Refill, Probability Factor & Rainfall Amount

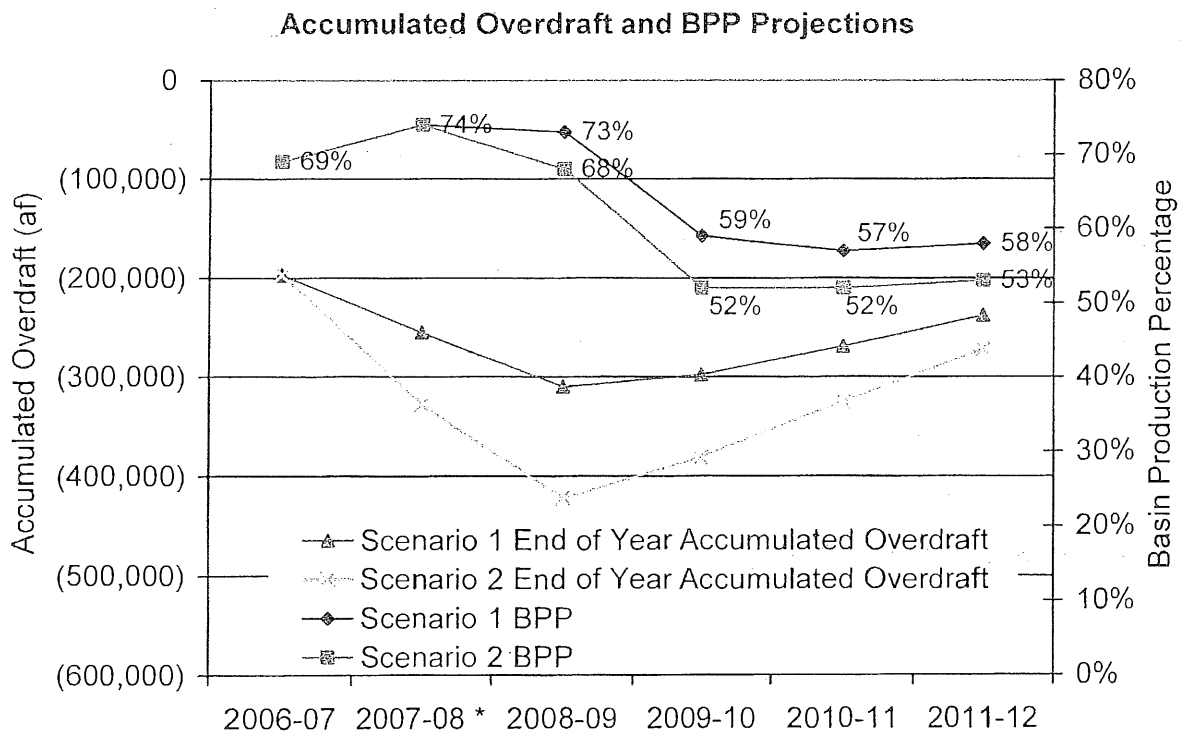
Accumulated Overdraft (af)	Planned Basin Refill Amount (af)	San Bernardino Rainfall Projection (inches)	Probability Factor
0	-20,000	27	10%
100,000	0	15	50%
200,000	10,000 to 20,000	14	60%
300,000	15,000 to 30,000	13	70%
400,000	20,000 to 40,000	11	80%
500,000	25,000 to 50,000	9	90%

Projections

Additional details on how the BPP would be annually calculated under option 4 are provided as Attachment A. The following figure provides estimates of how this option would set the BPP and the resulting accumulated overdraft for the next four years for two scenarios. Scenario 1 uses average hydrology. Scenario 2 assumes relatively dry years in 2007-08 and 2008-09 and then average hydrology thereafter. Both scenarios assume no MWD replenishment water is available for purchase and recharge. However 65,000 acre-feet is included in the BPP formula for FY08-09. This is why the basin's accumulated overdraft increases in FY08-09 and the projected BPP declines significantly beginning in FY09-10 (the 65,000 acre-feet amount is removed from the formula). This assumption needs to be discussed with the Board prior to the establishment of the FY08-09 BPP.

MWD Replenishment Water

As shown in the future projections a key element of any BPP setting formula is the value used for MWD replenishment water. The District has historically purchased approximately 65,000 acre-feet annually and used this amount in the FY2007-08 BPP formula even though we knew it was unlikely that any of this water would actually be available for purchase and recharge into the basin. Thus the groundwater basin's accumulated overdraft will increase this year unless we experience a very wet winter. The amount of MWD replenishment water that should be used in the FY08-09 BPP formula will be discussed with the Board this winter. This is an important issue with many implications. MWD generally expects the District to include replenishment water in the BPP formula for two years after they have discontinued delivering these supplies. Staff will agendize the subject for discussion at the December Water Issues Committee meeting.



Note: For FY07-08 the base BPP was established at 74% as shown on this chart. The BPP was subsequently raised to 82% under the MWD Supplemental (Super In-lieu) program requirements.

Attachment A
Option 4 Basin Production Percentage (BPP) Methodology

Overview

Option 4 is referred to as the Probability Method because it incorporates rainfall probabilities (based on over 100 years of rainfall data) for predicting both the remainder of the current year's hydrology as well as the upcoming year's hydrology for calculating the upcoming year's BPP.

Option 4 incorporates the level of accumulated overdraft in the basin into the BPP formula and allows for increasing conservatism in the choice of assumptions used as the level of accumulated overdraft increases. For example, during low-basin conditions (e.g., 500,000 af of accumulated overdraft), Option 4 would assume a dry upcoming year such that there is a 90% probability of having a year wetter than assumed (90% rainfall exceed probability). For the San Bernardino area (where Santa Ana River storm flows originate), the 90% rainfall exceed probability is 9 inches of annual rainfall. Therefore, assuming only 9 inches of rainfall for the upcoming year's BPP calculation would ensure with 90% likelihood that it would actually be wetter, more water would be recharged into the basin, and the accumulated overdraft would be further reduced.

When the basin is near full, Option 4 would use a suggested rainfall exceed probability of only 10%, which means that there is only a 10% chance of having an upcoming year that is wetter than assumed, or conversely, a 90% chance that the upcoming year will be drier. For the San Bernardino rainfall station, the 10% rainfall exceed probability is 27 inches of rainfall. Therefore, assuming 27 inches of rainfall for the upcoming year's BPP calculation would ensure with 90% likelihood that it would actually be *drier*, less water would be recharged into the basin, and the accumulated overdraft would be *increased* so as to prevent overfilling the basin and losing water to the ocean.

When the basin is within the optimal range of 100,000 to 150,000 af of accumulated overdraft, Option 4 would use a suggested rainfall exceed probability of 50%, which means there would be an equal chance (50/50) of having either a wetter or drier year than assumed. In this case, the 50% rainfall exceed probability is very similar to assuming average hydrology for the upcoming year, as is currently done with the existing BPP method (Option 5).

Lastly, Option 4 provides a guideline for the upcoming year's recommended amount of basin refill, dependent of the level of accumulated overdraft. For each increasing level of accumulated overdraft, an increasing amount of basin refill is suggested, ranging from approximately 5 to 10% of the accumulated overdraft. For example, at an accumulated overdraft level of 400,000 af, the suggested amount of basin refill or overdraft reduction for the upcoming year would range from 20,000 to 40,000 af. Therefore, at this assumed basin refill rate, it would take approximately 10 to 20 years to completely fill the basin and eliminate the overdraft. For future BPP forecasting purposes, the midpoint of this range will normally

be chosen. However, as with the current BPP method, the OCWD Board still has the discretion of choosing a different basin refill amount based on various external factors.

BPP Formula

The BPP Formula used for Option 4 contains the same terms as the existing Option 5 because the formula is derived from a water budget in which inflow to the basin (recharge) minus outflow from the basin (pumping) equals the change in storage. The BPP formula is shown below.

$$\frac{\text{Water Recharged} + \text{MWD Replenish.} - \text{Basin Refill} - \text{WQ Pumping Above BPP}}{\text{Total Water Demand} - \text{Reclaimed \& Local Supplies}} = \text{BPP}$$

The "Water Recharged" term in the BPP formula above is comprised of the individual components listed below, each with their own respective prediction method for the upcoming water year under Option 4.

- Santa Ana River (SAR) storm flow: use rainfall probabilities
- Incidental recharge: use rainfall probabilities
- SAR base flow: use 5-year running average
- GWR System recharge: use budgeted amount
- Barriers, Arlington, and purchases from WMWD, SBVMWD: use budgeted amount

The major difference between Option 4 and the existing Option 5 is that Option 4 uses rainfall probabilities to predict the SAR storm flows and incidental recharge rather than just assuming average hydrology for the coming year. As was discussed previously, this allows for increasingly conservative hydrology assumptions (drier predictions) with increasing levels of accumulated overdraft.

The other components of the BPP formula along with their respective Option 4 estimation methods are listed below:

- MWD Replenishment: use budgeted amount
- Water Quality Pumping Above the BPP: use budgeted amount
- Total Water Demand: use 5-yr running average
- Reclaimed & Local Supplies: use budgeted amount
- Basin Refill: vary depending on the level of accumulated overdraft in the basin

As was previously discussed, Option 4 includes a suggested guideline of basin refill amounts at various levels of accumulated overdraft. When the accumulated overdraft is below the optimal target of 100,000 af, the refill amount equates to approximately 5 to 10% of the accumulated overdraft, so as to remain consistent with the general policy of attempting to

eliminate the accumulated overdraft in the basin over approximately 10 to 20 years. When the accumulated overdraft is above the optimal target (basin nearly full), the suggested refill amount is a negative number to drain the basin (increase the overdraft) back down towards the optimal overdraft target of 100,000 af within a couple years. When already at or very close to the optimal overdraft target of 100,000 af, the suggested basin refill amount is zero.

BPP Option 4 Methodology

The Option 4 methodology is broken into two main categories: the current water year (Jul-Jun) and the upcoming water year. For the current water year, the goal is to estimate the year ending (June 30) accumulated overdraft. Then, this accumulated overdraft estimate is used in the upcoming year to determine the appropriate rainfall probability and basin refill amount for calculating the upcoming water year's BPP.

The BPP is typically first calculated in January. Therefore, actual rainfall for the first half of the current water year is known (Jul-Dec), and therefore storm flow recharged over those past 6 months can be calculated from the monthly "put and take" data. However, rainfall for the second half of the current water year (Jan-Jun) is still unknown in January and therefore the rainfall exceed probabilities described earlier are used to predict the remaining 6 months of rainfall, from which corresponding amounts of storm flow recharged and incidental recharge can be predicted based on their respective empirical correlations with rainfall.

The BPP calculation can be refined in early April just prior to Board adoption of the BPP for the upcoming year. The same approach would then be used as was done in January, except that known rainfall and actual put and take data would be used through March, representing the majority of the current water year, thus improving the June 30 year-ending accumulated overdraft prediction which would lead to a more-refined BPP for the upcoming year.

IN WITNESS WHEREOF, the Parties hereto have executed this Agreement the day and year first set forth hereinabove.

SAN DIEGO GAS & ELECTRIC COMPANY

By: _____

Its: Chris Faretta, Land Services Manager

Approved as to Form:

By: _____

George H. Kaelin, III, Attorney, San Diego Gas & Electric Company

VISTA IRRIGATION DISTRICT

By: _____

Mary Miller, President

By: _____

Eldon Boone, General Manager

Approved as to Form

By: _____

Joel Kuperberg, General Counsel, Vista Irrigation District

Adopted at Board of Directors meeting held 12/5/07

32. WORKSHOP – Basin Production Percentage

Assistant General Manager Craig Miller recalled that six options for setting the annual Basin Production Percentage (BPP) have been considered by the Board and the Groundwater Producers over the past four months. As a result of these meetings, he reported that a consensus has been reached that Option 4 would best suit the District's needs. Mr. Miller explained Option 4 in detail, noting that it uses a probability analysis that incorporates rainfall probabilities and the accumulated overdraft level to assist in setting the annual BPP. After discussion, the Board took the following action.

MOTION NO. 07-170
ADOPTING PROBABILITY ANALYSIS FORMULA TO ASSIST IN SETTING THE ANNUAL BPP

Upon motion by Director Yoh, seconded by Director Pickler, and carried by roll call vote [10-0], the following probability analysis formula is hereby adopted to assist in setting the annual Basin Production Percentage beginning in fiscal year 2008-09:

$$\frac{\text{Water Recharged} + \text{MWD Replenish.} - \text{Basin Refill} - \text{WQ Pumping Above BPP}}{\text{Total Water Demand} - \text{Reclaimed \& Local Supplies}} = \text{BPP}$$

Roll Call Vote [10-0]:
Ayes: Alvarez, Anthony, Bannister, Barr, Bilodeau, Debay, Nelson, Pickler, Sheldon, Yoh