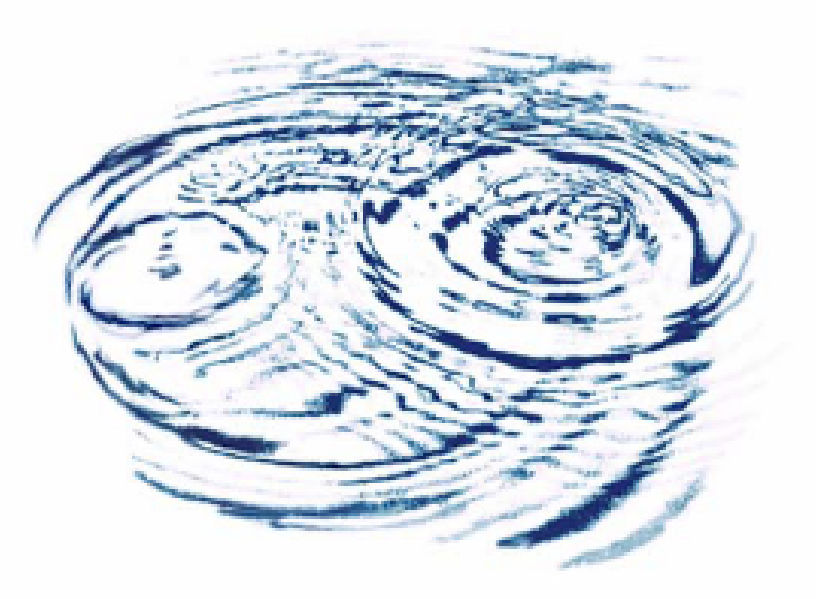
FOOTHILL MUNICIPAL WATER DISTRICT

WATER RESOURCES PLAN
ALTERNATE SUPPLY BRIEFING PAPER
DRAFT

OCTOBER 2008



Stetson Engineers Inc.

861 Village Oaks Drive, Covina, California 91724
Phone: (626) 967-6202, Fax: (626) 331-7065

Covina, CA Bakersfield, CA San Rafael, CA Centennial, CO Mesa, AZ

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SECTION 1 - INTRODUCTION

Foothill Municipal Water District (FMWD) currently provides member agencies with treated imported water supplied by Metropolitan Water District of Southern California (MWD). The member agencies within FMWD's service area include:

1) Crescenta Valley Water District (Crescenta Valley)
2) Kinneloa Irrigation District (Kinneloa)
3) La Cañada Irrigation District (La Cañada)
4) Las Flores Water Company (Las Flores)
5) Lincoln Avenue Water Company (Lincoln)
6) Mesa Crest Water Company (Mesa Crest)
7) Rubio Canon Land and Water Association (Rubio)
8) Valley Water Company (Valley)

FMWD receives water delivered by MWD through MWD's 116-inch-diameter Upper Feeder at turnout FM-1 located at the vicinity of Seco Street and Rosemont Avenue in Pasadena near the Rose Bowl. The turnout is nominally designed to deliver 40 cubic feet per second (cfs).

A second MWD connection for FMWD, discussed in Section 3 below, was proposed in FMWD's Master Plan to improve current and future water supply reliability. Current and future water demands from member agency are also discussed below.

This briefing paper has been prepared to provide basic data and a framework for a conceptual level screening of water supply alternatives to determine whether a second MWD connection, or an alternative water supply option, best meets the water reliability needs of FMWD and its member agencies. It is anticipated this briefing paper will be used by FMWD and its member agencies to identify two or three water supply alternatives that will then be studied in detail in the next phase of this process.

Water supply alternatives discussed in this briefing paper include:

- Groundwater
- Recycled Water
- San Gabriel Valley Municipal Water District/Raymond Basin Feeder
- Conservation
- Partnerships with Other Agencies / Transfers
- Interconnections
- Debris Basins

The discussions for each alternative will include a brief description of the water supply source and a review of cost, quantity, reliability, environmental issues, energy use, and green house gas considerations. Based on discussion with member agencies regarding

environmental issues, this briefing paper did not review the use of additional tunnels and surface water diversions as an alternate source of water supply due to the potentially limited amount of additional water that may be available and the significant resistance anticipated to potential projects from permitting and resource agencies.

SECTION 2 - MEMBER AGENCY WATER DEMANDS

The average, minimum, and maximum total water demands, in acre-feet per year (AFY) over the past five years (calendar years 2003 to 2007) are provided in Table 2-1 for each member agency. The average, minimum, and maximum water demands from FMWD for each member agency are also provided.

Table 2-1 Historical Water Demands (AFY)

		Local Water Supplies	FMWD Deliveries	Agency Retail Demands
Foothill Municipal Water District	**5 Yr Average**	9,488.1	12,652.6	21,170.3
	Min	8,128.4	11,836.0	20,553.7
	Max	10,662.9	14,236.9	22,330.4
Crescenta Valley Water District	**5 Yr Average**	3,101.6	2,447.4	5,549.0
	Min	2,602.5	1,714.6	5,323.6
	Max	3,609.0	3,132.9	5,735.4
Kinneloa Irrigation District	**5 Yr Average**	836.4	0.0	836.4
	Min	793.9	0.0	793.9
	Max	895.8	0.0	895.8
La Cañada Irrigation District	**5 Yr Average**	167.9	2,900.0	3,057.1
	Min	85.2	2,671.0	2,854.4
	Max	237.4	3,095.4	3,202.9
Las Flores Water Company	**5 Yr Average**	348.8	684.7	1,033.4
	Min	288.5	636.6	979.7
	Max	392.3	744.9	1,064.7
Lincoln Avenue Water Company	**5 Yr Average**	2,162.8	1,329.2	3,471.7
	Min	1,152.6	725.9	3,115.3
	Max	2,798.2	1,984.1	3,994.8
Mesa Crest Water Company	**5 Yr Average**	0.0	724.7	724.7
	Min	0.0	687.8	687.8
	Max	0.0	766.8	766.8
Rubio Canon Land & Water Assn.	**5 Yr Average**	1,508.8	1,061.3	2,467.8
	Min	1,399.8	859.9	2,287.7
	Max	1,578.7	1,169.0	2,686.1
Valley Water Company	**5 Yr Average**	1,361.8	3,482.1	4,007.0
	Min	1,094.4	3,115.0	3,726.9
	Max	1,614.4	3,767.1	4,243.4

Notes:

Agency water demands provided by FMWD and Kinneloa between calendar years 2003 and 2007

Kinneloa Irrigation data based on customer sales and leaking, flushing, and operation adjustments

Table 2-2 provides the average local water supply for each member agency as an annual quantity, in acre-feet (AF), and as a percentage of total local water supplies. The table also shows annual average FMWD deliveries to each member agency as an annual quantity and as a percentage of total FWD deliveries.

Table 2-2 Member Agency Water Supply Percentages

Water Agency	Local Water Demands		FMWD Demands	
	Quantity (AF)	Percent of Total Local Water (%)	Quantity (AF)	Percent of Total FMWD Deliveries (%)
Crescenta Valley Water District	3,101.6	32.7%	2,447.4	19.4%
Kinneloa Irrigation District	836.4	8.8%	0.0	0.0%
La Cañada Irrigation District	167.9	1.8%	2,900.0	23.0%
Las Flores Water Company	348.8	3.7%	684.7	5.4%
Lincoln Avenue Water Company	2,162.8	22.8%	1,329.2	10.5%
Mesa Crest Water Company	0.0	0.0%	724.7	5.7%
Rubio Land & Water Association	1,508.8	15.9%	1,061.3	8.4%
Valley Water Company	1,361.8	14.4%	3,482.1	27.6%
Total	9,488.1	100.0%	12,629.4	100.0%

Note: Quantities based on five year average (calendar years 2003 to 2007)

The projected future average annual water demands for each member agency are provided in Table 2-3.

Table 2-3 Member Agency Water Demand Projections (AFY)

	Demand from FMWD	Total System Demand	Demand from FMWD	Total System Demand	Demand from FMWD	Demand from FMWD
	2010		2015		2020	2025
Crescenta Valley Water District	2,275	5,625	2,310	5,661	3,144	3,463
Kinneloa Irrigation District	0	NA	300	NA	300	300
La Cañada Irrigation District	2,958	3,130	3,129	3,302	3,328	3,453
Las Flores Water Company	586	975	589	978	802	813
Lincoln Avenue Water Company	2,271	3,030	2,348	3,107	1,643	1,687
Mesa Crest Water Company	708	708	728	728	787	808
Rubio Canon Land & Water Association	1,150	2,487	1,155	2,493	1,306	1,323
Valley Water Company	3,826	4,623	4,048	4,845	3,658	3,718
Total	13,774	20,578	14,607	21,114	14,968	15,565

Notes:

NA = Not Available

2010 and 2015 demands from "FMWD Master Plan", November 2007, and from Kinneloa Irrigation District

2020 and 2025 demands from FMWD 2005 UWMP and from Kinneloa Irrigation District

2010 and 2015 demands from Master Plan are less than demands from UWMP

A statewide plan to reduce water consumption by 20 percent by the year 2020 is being proposed and is discussed in Section 7 - Conservation

The Local Agency Formation Commission for the County of Los Angeles (LAFCO) recently prepared a municipal service review to analyze service area overlaps and revisions for Crescenta, La Cañada, and the City of Glendale. No immediate changes have resulted from this review. Any future changes to the service areas of Crescenta and La Cañada may result in revisions to water demands within FMWD's service area.

SECTION 3 - SECOND MWD CONNECTION

A second MWD connection would provide water supply reliability and flexibility to FMWD's member agencies. A second MWD connection on the East Valley Feeder would allow FMWD to continue to receive imported treated water from MWD during scheduled or unscheduled outages on the Upper Feeder.

A second MWD connection would require the construction of approximately 27,000 feet of 24-inch transmission main, a 1,700 horsepower pumping plant, a 1 MG terminal reservoir, 3,200 ft of 18-inch looping connection to La Cañada's reservoir facilities, and an interconnection between La Cañada and Mesa Crest. This proposed MWD connection would provide an estimated 15.7 cfs in imported water supplies from an alternative source to FM-1. The total cost for the facilities associated with the proposed connection is estimated to total $19.8 million.

Cost

Based on a 30-year period at 6 percent interest, the annualized cost for the second MWD connection is approximately $1.44 million per year. Operations and maintenance (O&M) costs have been assumed at approximately $0.4 million per year. Additionally, the cost to purchase MWD water would need to be incorporated into any cost comparisons of this connection with other supplies. A simple projection of MWD Tier 1 water rates for the next 30 years is shown in Table 3-1. These rates assume that the current rate structure will be maintained. Please note that in addition to the Tier 1 water rate, FMWD agencies pay the readiness-to-serve charge, the capacity charge and at times the Tier 2 rate as well as the Foothill costs.

Table 3-1 Projected MWD Water Rates

	CY 2009	CY 2010	CY 2011	CY 2012	CY 2013	CY 2014	CY 2015	CY 2016	CY 2017	CY 2018
Tier 1	$ 579	$ 701	$ 785	$ 832	$ 865	$ 900	$ 936	$ 973	$ 1,012	$ 1,052
Assumed Percentage Increase		21%	12%	6%	4%	4%	4%	4%	4%	4%
	CY 2019	**CY 2020**	**CY 2021**	**CY 2022**	**CY 2023**	**CY 2024**	**CY 2025**	**CY 2026**	**CY 2027**	**CY 2028**
Tier 1	$ 1,095	$ 1,138	$ 1,184	$ 1,231	$ 1,280	$ 1,332	$ 1,385	$ 1,440	$ 1,498	$ 1,558
Assumed Percentage Increase	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%
	CY 2029	**CY 2030**	**CY 2031**	**CY 2032**	**CY 2033**	**CY 2034**	**CY 2035**	**CY 2036**	**CY 2037**	**CY 2038**
Tier 1	$ 1,620	$ 1,685	$ 1,752	$ 1,822	$ 1,895	$ 1,971	$ 2,050	$ 2,132	$ 2,217	$ 2,306
Assumed Percentage Increase	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%

The reasoning for a second connection has been that it is needed for shutdowns on the Upper Feeder or for an emergency. During the past ten years, FMWD's service connection on the Upper Feeder has been out of service a total of 13 days or 0.4 percent of the time. None of these shutdowns has been an emergency shutdown. Assuming that FMWD would have taken flows of 15 cfs normally without these shutdowns, total water taken during these days would have been 387 AF or an average of 39 AFY over the ten year period. If the second connection is only used for shutdowns and assuming the same shutdown scenario, the cost rate for the second MWD connection is approximately $47,584 per AF (or ($1.44 million + $0.4 million) per year / 39 AFY). The MWD water rate and other applicable charges would need to be added to this figure.

Another issue is the power costs associated with the second connection. The current lift from FMWD's Arroyo Pumping Plant to Crescenta Valley reservoirs is about 750 feet. The lift for this second connection is approximately 1,100 feet. The power rate to boost 15.7 cfs water is approximately $190 per AF compared to the current $124 per AF for that reservoir zone. Based on the power cost, and the projected cost for MWD Tier 1 of $579 per AF in calendar year 2009, the cost rate for any water lifted from the second connection would be approximately $769 per AF for FMWD. Foothill's costs and other rates and charges would need to be applied when selling this water to the member agencies.

In some instances, MWD will be able to provide water to service connection FM-1 during a shutdown on the Upper Feeder. MWD is able to move water from the Santa Monica Feeder to the Upper Feeder. This amount can range from 10 to 20 cfs depending upon demands on the Santa Monica Feeder as well as if Pasadena requests water at its service connection P-5. However, if MWD does a complete shutdown of the Upper Feeder that impacts the area around FM-1 or Eagle Rock, no water will be available from the Santa Monica Feeder. The next complete shut down will likely be when MWD is rehabilitating the gates at Eagle Rock Tower. At that time, MWD will not be able to provide water to FMWD.

Reliability

The second MWD connection would eliminate complete dependence on the Upper Feeder for FMWD's imported water deliveries. This would be an increase in reliability during planned and unplanned shutdowns of FMWD's existing facilities. However, since FMWD member agencies on the east side of FMWD's service area will not be able to receive water from the second MWD connection, it will not completely relieve dependence on FMWD's existing facilities.

The second MWD connection would not change FMWD's current level of dependence on the long term reliability of MWD water. The reliability of MWD's water supply sources has always been subject to variations in hydrology in the Colorado River watershed and the State Water Project. More recently the effects of global climate

change and potential impacts on current and future pumping operations from the State Water Project due to fishery protection measures in the Sacramento-San Joaquin Bay-Delta have created a much greater level of uncertainty regarding MWD's ability to always meet firm water demands in the future. Recent preliminary analysis of restrictions on pumping operations in the Bay-Delta indicate that MWD may be putting water into its storage programs far less often in the future and withdrawing water from storage and seeking other sources of supply far more often. Although there is no comprehensive current evaluation of MWD reliability, it appears it is now less reliable than it was only a short while ago. The reliability of MWD to meet firm demands has not been fully quantified at this time. The reliability of MWD supply compared to other available water supply sources can only be qualitatively compared and the benefit of having diversification of risks to reliability provided by having alternative sources of supply should be considered.

Institutional Issues

A large portion of the pipeline for the secondary connection is outside of FMWD's service area. MWD's policy is that MWD provides service to an agency's service area and it is the agency's responsibility for capital costs from that point. It is not likely that MWD will be willing to pay for this portion of the pipeline since recent connections with new pipelines have been predicated on not enough capacity being available from existing facilities.

Environmental Issues

There do not appear to be significant environmental issues associated with the proposed second MWD connection. The proposed connection includes construction of pipeline on existing streets. Water deliveries would likely go to meet municipal and industrial demands. Only typical construction related impacts are expected.

Energy Use and Greenhouse Gases

Construction and O&M of the proposed facilities may require moderate energy use and contribute to greenhouse gases. The lift of approximately 1,100 feet to pump this water to the service area is greater than the current lift of 736 feet to pump this water into the service area. Thus more energy will be required for pumping water through the second MWD connection.

Pros to Second Connection

A second connection provides a second source of water to portions of FMWD's service area. It would be greatly beneficial should there be a complete shutdown of the Upper Feeder or a combination of failures on the Upper Feeder and Santa Monica Feeder.

Cons to Second Connection

A second connection does not increase supply reliability during a drought or regulatory shortage. The capital costs of a second connection and the unit cost for water provided by the second connection are considerable. Energy use and impacts to greenhouse gas emissions are also more. In addition to the capital costs and power costs, FMWD will still need to take water from MWD at the rates that MWD has in effect at the time of delivery.

SECTION 4 - GROUNDWATER

Member agencies produce groundwater from two groundwater basins: the Raymond Basin and the Verdugo Basin. Groundwater production from each of the basins is discussed in this section.

Raymond Basin

The Raymond Basin is a groundwater basin of approximately 40 square miles that extends from La Cañada and the San Rafael hills to the west, the San Gabriel Mountain foothills to the north, the Santa Anita Canyon to the east, and the Raymond fault to the south. The groundwater basin is recharged by the Arroyo Seco, a tributary to the Los Angeles River, and by Eaton Wash, Santa Anita Wash, and other streams in the San Gabriel River watershed. Pumping rights to the Raymond Basin are adjudicated and are managed by the Raymond Basin Management Board. Sixteen parties have rights to pump from the Raymond Basin, which is separated into three major subareas: the Monk Hill Subarea, the Pasadena Subarea, and the Santa Anita Subarea. The Raymond Basin Judgment adjudicated groundwater rights based on a long-term average yield of the Raymond Basin. The Judgment allows a party to exceed its Decreed Right by no more than 10 percent, which will be deducted from the following year's total allowable extraction. Conversely, a party is not allowed to carryover more than 10 percent of its Decreed Right to a subsequent year.

In addition to Decreed Rights, each party has the right to spread diverted surface water and recapture up to 80 percent from groundwater wells located in the Monk Hill Subarea and the Pasadena Subarea

Six of eight FMWD member agencies have water rights in the Raymond Basin, including Valley, Rubio, Lincoln, Las Flores, La Cañada, and Kinneloa. Valley, Rubio, Lincoln, Las Flores, and La Cañada produce groundwater from the Monk Hill Subarea while Kinneloa produces groundwater from the Pasadena Subarea.

Decreed rights for each of FMWD's member agencies are provided below. The average, minimum, and maximum allowable extractions and water production over the past ten years (fiscal years 1997/98 to 2006/07) are provided in Table 4-1 for each member agency in the Monk Hill Subarea and the totals for all Monk Hill producers and in Table 4-2 for Kinneloa's pumping in the Pasadena Subarea and the totals for all the Pasadena Subarea producers.

Table 4-1 Member Agency Extractions in the Monk Hill Subarea (AFY)

		"Decreed Right 1955"	Net Leases	Allowable Extraction	Amount Extracted	Balance
Valley Water Company	**10 Yr Avg**	797.0	32.6	1,414.5	1,345.9	68.6
	Min	797.0	19.9	1,230.5	1,150.8	24.3
	Max	797.0	48.9	1,558.3	1,478.6	79.7
Rubio Canon Land & Water Assn.	**10 Yr Avg**	1,221.0	0.0	1,406.6	1,351.1	55.6
	Min	1,221.0	0.0	1,198.0	1,090.8	(66.4)
	Max	1,221.0	0.0	1,595.3	1,491.6	122.1
Lincoln Ave Water Company	**10 Yr Avg**	567.0	665.9	1,443.5	1,453.9	(10.3)
	Min	567.0	0.0	889.7	833.0	(273.5)
	Max	567.0	2,000.0	2,678.3	2,951.8	56.7
Las Flores Water Company	**10 Yr Avg**	249.0	(60.0)	309.7	297.4	12.3
	Min	249.0	(175.0)	188.3	181.7	0.0
	Max	249.0	0.0	419.0	419.0	24.9
La Cañada Irrigation District	**10 Yr Avg**	100.0	0.0	108.1	104.6	3.5
	Min	100.0	0.0	15.6	15.6	0.0
	Max	100.0	0.0	176.0	176.0	10.0
Monk Hill Subarea	**10 Yr Avg**	7,489.0	0.0	7,553.0	7,014.3	538.6
	Min	7,489.0	0.0	4,740.6	4,070.4	252.6
	Max	7,489.0	0.0	11,157.9	10,710.9	712.9

Table 4-2 Member Agency Extractions in the Pasadena Subarea (AFY)

		"Decreed Right 1955"	Net Leases	Allowable Extraction	Amount Extracted	Balance
Kinneloa Irrigation District	**10 Yr Avg**	516.0	(25.0)	653.1	660.9	(7.8)
	Min	516.0	(300.0)	431.1	379.5	(51.6)
	Max	516.0	150.0	930.3	930.0	51.6
Pasadena Subarea	**10 Yr Avg**	17,843.0	0.0	21,845.9	20,646.0	1,199.9
	Min	17,843.0	0.0	16,959.7	15,991.3	(340.8)
	Max	17,843.0	0.0	23,819.4	24,124.1	2,695.8

Member agencies are currently producing essentially the total amount of groundwater allowed under their existing water rights. The only opportunity to increase the use of groundwater is to increase recharge of water to the basin. Increasing the amount of diverted surface water recharged in the basin or introducing new sources of groundwater recharge (such as recycled water and imported surface water) may allow member agencies to produce additional water over their Decreed Rights. Sources of additional groundwater recharge supplies are discussed in other sections of this Briefing Paper.

It may be possible to significantly reduce dependence on FMWD facilities for a planned shut down or a short term emergency shut down by maximizing production from member agencies' existing groundwater wells and constructing additional wells for use during emergencies. Some member agencies have underutilized groundwater production capacity. Any unused groundwater from a member agency with capacity in excess of their demands could be delivered to other member agencies through existing interconnections, available FMWD's facilities, and/or proposed interconnections (See Section 9 - Interconnections). Additional groundwater pumping capacity will also be needed and is discussed below. Upon completion of repairs or maintenance to FMWD facilities, member agencies would rely on FMWD for water supply if full use of groundwater production capacity exhausts member agencies' water rights.

Member agencies on the west side of FMWD's service area (such as Valley and La Cañada) may be able to maximize groundwater production for deliveries to others, however, water quality concerns may limit the ability to utilize existing groundwater production capacity in this area. Valley has four groundwater wells with a combined capacity of over 4,000 gallons per minute (gpm) (with 797 AFY of groundwater rights). Based on the November 2007 FMWD Master Plan, the total well capacity may only be sufficient to meet Valley's average demands without deliveries from FMWD. La Cañada has two groundwater wells with a combined capacity of approximately 1,250 gpm (with 100 AFY of groundwater rights). However, La Cañada currently relies on FMWD for

over 90 percent of its total water supplies. Based on the well capacities of Valley and La Cañada, additional groundwater well capacity may be needed to provide sufficient water to other member agencies during emergency or planned shutdowns of FMWD facilities.

Member agencies on the east side of FMWD's service area (such as Lincoln, and Rubio) may be able to maximize groundwater production for deliveries to others. Lincoln has two groundwater wells with a combined capacity of Approximately 2,000 gpm (with 567 AFY of groundwater rights). Rubio has two groundwater wells with a combined capacity of approximately 2,750 gpm (with 1,221 AFY of groundwater rights). Although Rubio may have additional well capacity to provide water to others on a short term basis, additional groundwater well capacity may be needed to provide sufficient water to other member agencies during emergency or planned shutdowns of FMWD facilities.

If water quality concerns limit the ability to utilize Valley's and other member agency wells to supply water to other member agencies during a planned or emergency shutdown of FMWD's facilities it may be possible to construct new wells to provide emergency supplies for short periods in Las Flores' and Cresenta Valley's service areas with much less likelihood of water quality concerns.

The Foothill Conjunctive Use Project (CUP) will allow MWD to store up to 9,000 AF of available imported water in the Monk Hill Subarea of the Raymond Basin for subsequent withdrawal of up to 3,000 AFY during emergencies and droughts. Storing imported water in the groundwater basin would be accomplished through in-lieu deliveries to FMWD member agencies and injection.

Imported water deliveries taken on an in-lieu basis will be delivered at each member agency's treated water connection and credited to a storage account. The cost of water deliveries are deferred as no charges for these in-lieu deliveries are made at the time of delivery from MWD. However, when MWD requires the water to be produced during emergencies and droughts, produced groundwater will be invoiced at the current MWD treated water rate. Groundwater pumping costs will be reimbursed by MWD. Agencies that have participated in this type of storage approach include La Cañada, Valley, and Rubio.

There may not currently be storage capacity available in the Monk Hill Subarea to expand the CUP. However, Pasadena plans to significantly increase pumping in the Monk Hill Subarea when a new groundwater treatment plant is complete. Expansion of the CUP may be possible when Pasadena increases it's pumping.

Reliability

Some of the member agencies rely on groundwater treatment (and blending) to remove contamination to allow them to maintain groundwater production and serve the water to their customers. The spread of contamination may impact the ability of member

agencies to produce their entire Decreed Rights in the future which may reduce the reliability of a portion of the groundwater supply if suitable additional treatment cannot be implemented.

During a July 2008 meeting of the Pasadena Subarea Safe Yield Sub-Committee of the Raymond Basin Management Board, several items were agreed upon, including the following:

- Current groundwater production in the Pasadena Subarea is greater than natural recovery "Safe Yield"
- At some point overall production must be curtailed to reverse the declining levels until supplemental water for recharge is made available
- Long-term Supplemental water deliveries (replenishment) will be required if production levels are to continue at 1955 Decreed Right levels
- The Long-term Storage Program should be suspended as soon as possible

The Sub-Committee agreed that while most producers would have difficulty meeting current demands if production were reduced to required levels all at once, a phased reduction in water production along with other management practices would be the most desirable approach. It appears there may be temporary, phased reduction in groundwater production at some time in the future. This should be considered when evaluating future water supply alternatives.

Lincoln operates a groundwater treatment facility as part of a cleanup effort to remove perchlorate and VOCs from groundwater in the Jet Propulsion Laboratory area. Lincoln leases approximately 1,000 AFY of groundwater rights from the City of Pasadena (Pasadena) in order to have adequate water rights to be able to continuously operate the treatment facility to support groundwater cleanup objectives for the groundwater basin. Pasadena is planning to construct a similar groundwater treatment facility. As a result, Pasadena may produce groundwater rights which would have been leased to Lincoln in the past. In anticipation of not being able to lease water rights from Pasadena in the future, and to continue operations at Lincoln's treatment facility, Lincoln has requested the Raymond Basin Management Board transfer a portion of the water rights held in Pasadena's Long Term Storage Account to Lincoln to purchase and use. If the transfer of rights from Pasadena's Long Term Storage Account is not accomplished, or if some other source of water rights does not become available to Lincoln, Lincoln may have to reduce its groundwater production by up to 1,000 AFY at some time in the future.

Verdugo Basin

The Verdugo Basin is a groundwater basin of approximately 5,000 acres located in the Crescenta Valley between the San Gabriel Mountains and the Verdugo Mountains.

The Basin was adjudicated in 1979 and two municipal producers, the City of Glendale

(Glendale) and Crescenta Valley Water District (Crescenta Valley), possess all production rights. Crescenta Valley has a right to produce 3,294 AFY and Glendale has a right to produce 3,856 AFY in the Verdugo Basin.

Excess pumping within the Verdugo Basin by either party is allowed as long as the total yield of 7,150 acre-feet annually is not exceeded. Over the past several years, Crescenta Valley has exceeded its Verdugo Basin pumping right. However, Glendale has not exercised all of its rights so Crescenta Valley has compensated Glendale for the over-pumping which encroaches on Glendale's rights. Glendale has never pumped its full water right from the Verdugo Basin. Glendale's pumping has been limited due to lack of well capacity. Pump tests from recently drilled pilot wells indicate low production capacities. Glendale also operates the Glendale Water Treatment Plant, designed to remove volatile organic compounds from groundwater produced by its wells, and the Verdugo Park Water Treatment Plant, designed to remove turbidity and bacteria.

Based on Glendale's 2005 UWMP, projected water production from 2010 to 2025 by Glendale from the Verdugo Basin is 2,300 AFY (or 1,556 AFY less than Glendale's production rights). However, the Upper Los Angeles River Area (ULARA) Watermaster's Groundwater Pumping and Spreading Plan, prepared July 2007, projects that Glendale will produce its entire Verdugo Basin pumping right of 3,856 AFY by water year 2008-09. The ULARA Plan indicates Glendale has been studying and evaluating various alternatives to increase pumping capacity. However, as discussed above, pump tests from recently drilled pilot wells indicate low production capacities. Since Glendale has so far been unsuccessful in adding well capacity it maybe possible that Crescenta Valley may continue to use Glendale's Verdugo Basin water rights and compensate Glendale over the short-term future. Crescenta Valley might also be able to negotiate a long-term agreement to use Glendale's unused production rights if Glendale does not anticipate the ability to add well capacity.

The only opportunity to increase the use of groundwater is to increase recharge of water to the Verdugo basin. Increasing the amount of diverted surface water recharged in the basin or introducing new sources of groundwater recharge (such as debris basin recharge) may allow Crescenta Valley to produce additional water over its pumping rights. However, the ability to spread and extract groundwater would need approval of the ULARA Watermaster and meet all required conditions. Sources of additional groundwater recharge supplies are discussed in other sections of this Briefing Paper.

Reliability

Although nitrate contamination is widespread in the basin, Crescenta Valley reduces nitrate levels through groundwater treatment and blending with treated and/or imported water supplies. Additional nitrate treatment may be needed if Crescenta Valley's pumping rights are increased by recharge of supplemental water. However, methyl tert-butyl ether (MTBE) contamination has caused a temporary shutdown of one of

Crescenta Valley's wells. Crescenta Valley is planning to install granular activated carbon treatment to remove MTBE from the groundwater.

Crescenta Valley can currently extract a portion of Glendale's pumping rights to the Verdugo Basin, with compensation to Glendale. Although this arrangement may continue in the short-term, Glendale may in the future pump its entire right to the Verdugo Basin, which would reduce the amount groundwater available to Crescenta Valley.

Cost

Groundwater that is of good quality can typically be produced at cheaper costs than purchasing water from MWD. The cost is typically the cost of power to pump the groundwater, the cost of O&M (typically a minimal amount), and the cost of the chlorine needed to treat the water before putting into the distribution system.

The problem with costs arises when water is of poor quality and must be treated prior to introduction into the distribution system. Treatment can often add a significant cost in the form of the capital needed for treatment, resin or chemicals that are needed, O&M including power costs, and also brine or sludge disposal. As an example, the cost to install a 5,000 gpm nitrate treatment (regenerative ion exchange) to remove nitrate contamination was recently estimated at approximately $5 million in capital costs (equipment, site work, brine discharge connection, and electrical) and $0.8 million per year in O&M (brine disposal and salt). These costs need to be compared on a case-by-case basis with MWD's water rates along with the risk each agency is willing to take on reliability when deciding on treatment.

Institutional Issues

FMWD is not part of either the Verdugo Basin or Raymond Basin adjudications. Thus, should it decide to pursue any projects that impact either basin such as the current conjunctive use project in the Raymond Basin, it must partner with the appropriate Watermaster and overlying producers.

Environmental Issues

There are currently no environmental issues connected with pumping groundwater from wells that exist. Typically new wells have not been a major cause of concern.

Energy Use and Greenhouse Gases

Typically, the amount of energy used to pump water of good quality is low compared to importing water. Treatment adds a higher level of energy usage.

Pros to Groundwater

There are several pros to groundwater. These include the low cost of producing good quality groundwater and the low use of energy compared to importing water. From a reliability standpoint, those producers in the Monk Hill Subarea at this point have not been impacted by the lower groundwater levels that are in evidence in the Pasadena Subarea. Thus, groundwater provides a high degree of reliability. Additionally, the groundwater basins act as reservoirs that can be called upon during a shutdown or emergency. The limiting factors to these "reservoirs" are production capability due to either not enough wells or water quality concerns and water rights.

Cons to Groundwater

FMWD is not a party to either the Raymond Basin or San Fernando adjudications. Thus, FMWD has no direct rights to the groundwater basins either for storage or production. Any groundwater program such as the Foothill Conjunctive Use Project (described above) will require coordination with the local producers and Watermasters of the respective basins.

Additionally, FMWD is considered a consecutive distribution system and received a Very Small System Waiver allowing it to circumvent extensive water quality testing. Should groundwater be introduced into FMWD's system, this waiver would no longer be applicable and extensive water quality testing would need to be performed costing FMWD a significant amount of money. Additionally, the operators would likely need to receive higher levels of treatment certifications than currently required. The only exception is during an emergency, FMWD would be able to take groundwater into its distribution system for a short period of time. Any program that on a regular basis introduces groundwater into FMWD's system would need to consider these costs versus the benefits.

SECTION 5 – RECYCLED WATER

Recycled water use can alleviate the amount of imported water supplies required by FMWD's member agencies. Recycled water in FMWD's service area can be used for nonpotable purposes, such as landscape, public parks, and golf course irrigation. Recycled water can also be used for groundwater recharge through spreading or injection into the groundwater aquifer to enhance ground water supplies.

Construction of a wastewater treatment facility (scalping plant) can be used to treat wastewater and deliver recycled water within FMWD's service area. FMWD's member agencies may also consider participating in a larger treatment plant to create a regional recycled water recharge project that might include all groundwater producers in the Raymond Basin.

Potential Available Wastewater Quantities

According to the City of La Cañada Flintridge (La Cañada Flintridge) staff, the peak ultimate wastewater discharges from the La Cañada Flintridge area are projected at approximately 14 MGD. Based on a wastewater peaking factor of 3.5, the ultimate average wastewater discharge is approximately 4 MGD. A majority of wastewater generated within the La Cañada Flintridge area overlaps the service areas of Valley, Crescenta, and La Cañada.

The potential quantity of wastewater generated can also be estimated based on projected population. According to FMWD's 2005 UWMP, the population within FMWD's service area will increase from 87,671 (in 2010) to 94,482 (in 2025). Based on a wastewater generation factor of 80 gallons per day per capita (Metcalf & Eddy, Wastewater Engineering), the projected amount of wastewater within FMWD's service area is approximately 7.0 MDG (in 2010) to 7.6 MGD (in 2025).

Potential Recycled Water Users

Based on discussions with FMWD's member agency staff, FMWD's "Preliminary Reclamation Assessment" (May 1996), and Crescenta's "Final Recycled Water Feasibility Study" (April 2004), potential large recycled water users were identified, including the following:

	Potential User	Potential Recycled Water Use
1.	Various CalTrans medians	Up to 52 AFY per median
2.	Two Strikes Park (LA County Parks)	23.6 AFY
3.	Flintridge Riding Club	34.6 AFY
4.	La Cañada Unified School District	60.8 AFY
5.	Descanso Gardens Guild	25.0 AFY
6.	Farnsworth County Park	30.0 AFY
7.	Loma Alta County Park	37.4 AFY
8.	Charles White County Park	15.2 AFY
9.	Mountain View Cemetery	91.0 AFY
10.	La Cañada-Flintridge Golf Course	59.9 AFY

A map showing the location of these potential recycled water users is shown in Figure 5-1.

Potential Wastewater Treatment Plant

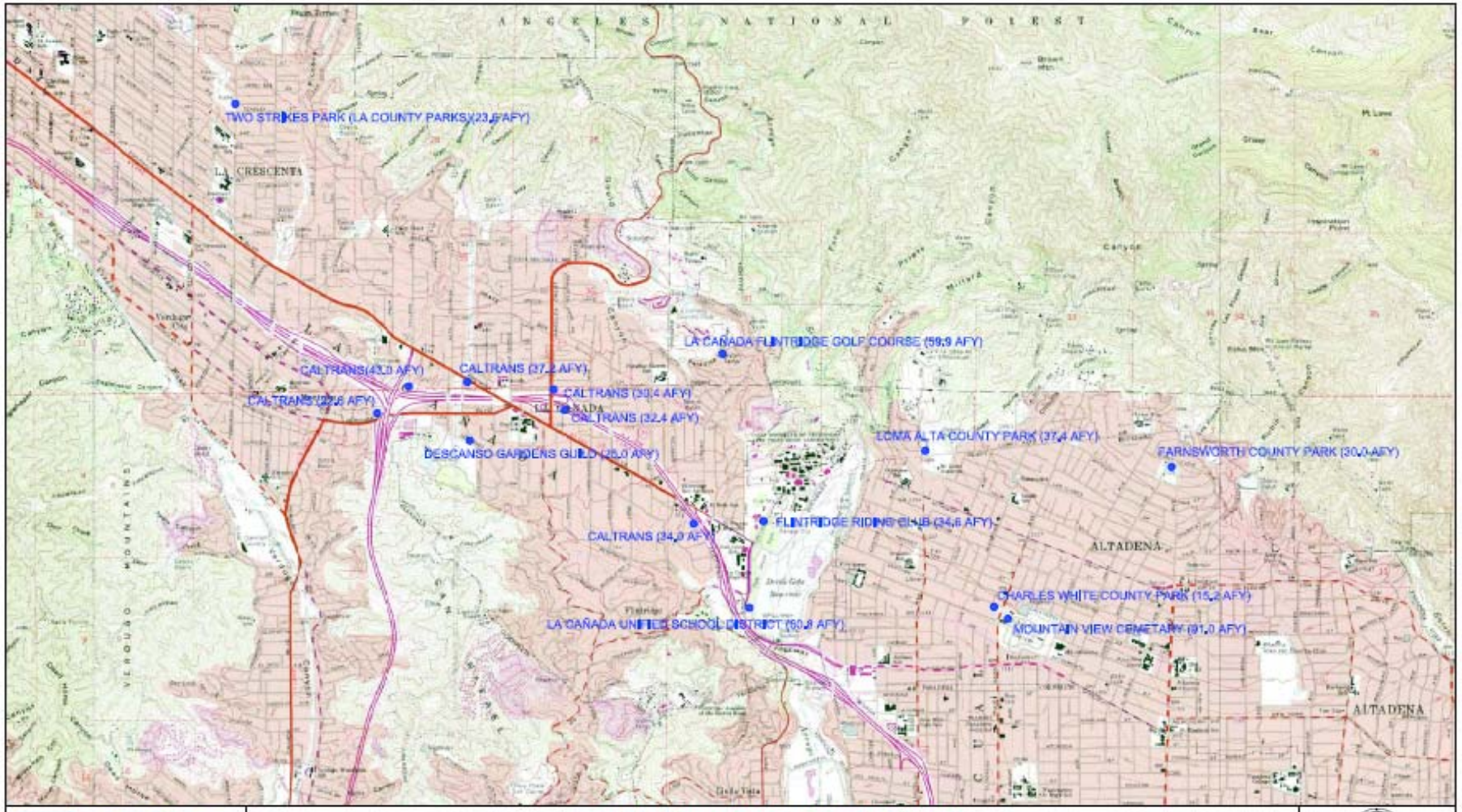
Title 22 of the California Code of Regulations provides the standards for levels of treatment and types of uses for recycled water. Membrane Bioreactor package treatment plants (MBR Plants) produce recycled water that meet Title 22 standards for irrigation and groundwater recharge by spreading. The use of MBR plants has been assumed for this evaluation of the use of recycled water.

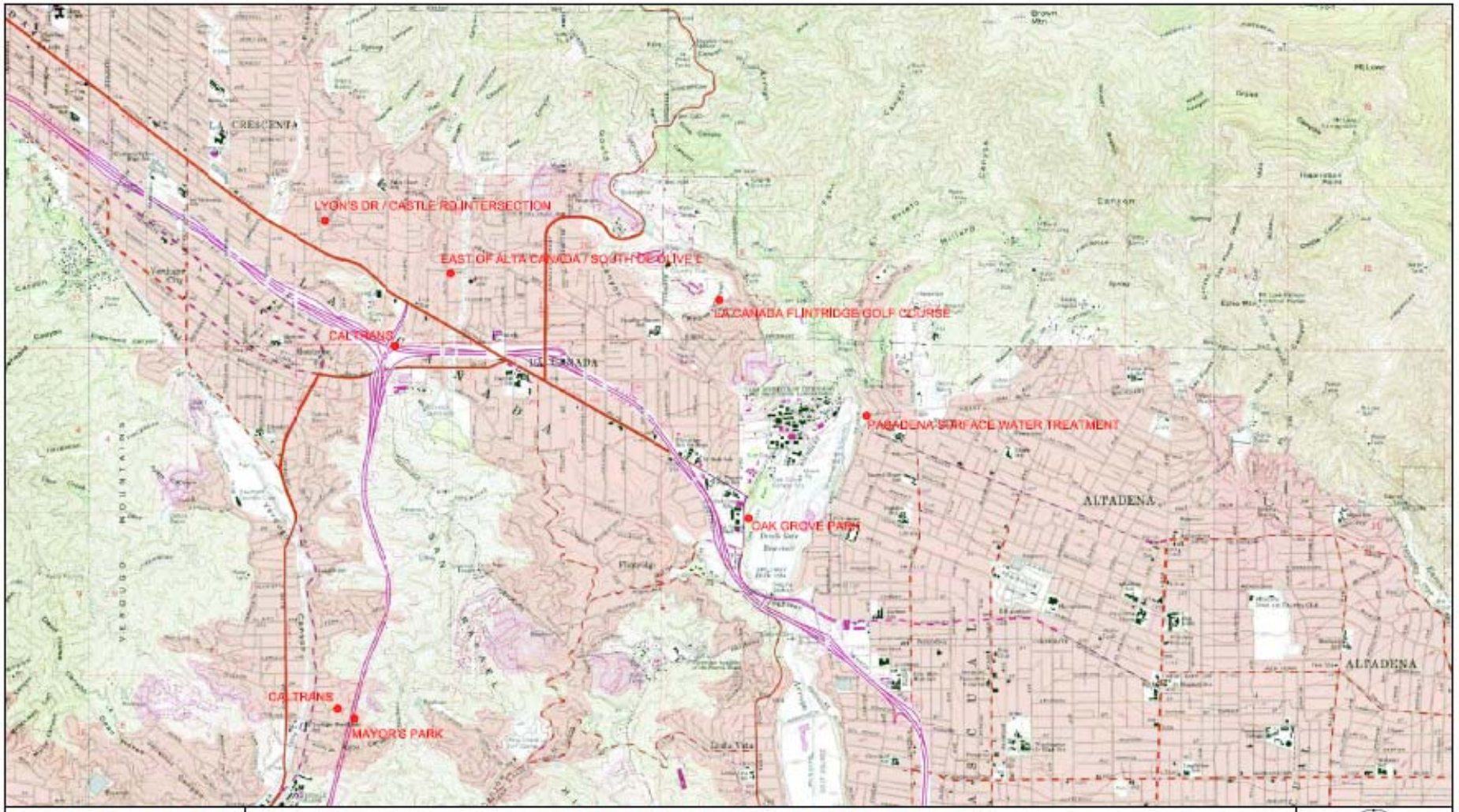
Based on discussions with FMWD's member agency staff, the following potential sites for a wastewater treatment plant were identified:

1. La Cañada Flintridge Golf Course
2. Pasadena Surface Water Treatment
3. Oak Grove Park
4. Mayor's Park
5. Lyon's Dr / Castle Rd intersection
6. East of Alta Canada / South of Olive Lane

A map showing the location of these potential wastewater plants is shown in Figure 5-2.

It has been assumed the capacity of a proposed treatment plant will be designed to meet the peak hour demands of all potential recycled water irrigation users. The peak hour flow has been assumed to be 3 times the maximum day demand. The maximum day demand has been assumed to be 2.5 the average day demand.


ANGELES NATIONAL FOREST
TWO STRIKES PARK (LA COUNTY PARKS) (23.4 AFY)
LA CRESCENTA
LA CAÑADA FLINTRIDGE GOLF COURSE (59.9 AFY)
CALTRANS (43.0 AFY)
CALTRANS (37.2 AFY)
CALTRANS (33.4 AFY)
CALTRANS (32.8 AFY)
CALTRANS (32.4 AFY)
DESCANSO GARDENS GUILD (26.0 AFY)
LOMA ALTA COUNTY PARK (37.4 AFY)
FARNSWORTH COUNTY PARK (30.0 AFY)
FLINTRIDGE RIDING CLUB (34.6 AFY)
CALTRANS (34.0 AFY)
ALTADENA
CHARLES WHITE COUNTY PARK (15.2 AFY)
LA CAÑADA UNIFIED SCHOOL DISTRICT (60.8 AFY)
MOUNTAIN VIEW CEMETARY (91.0 AFY)
VERDUGO MOUNTAINS
ALTADENA
STETSON ENGINEERS INC.
FOOTHILL MUNICIPAL WATER DISTRICT
POTENTIAL RECYCLED WATER USERS
APPROX. SCALE 1
FIGURE 5-1



STETSON ENGINEERS INC.

FOOTHILL MUNICIPAL WATER DISTRICT

POTENTIAL RECYCLED WATER TREATMENT SITES

APPROX. SCALE 1

FIGURE 5-2

Recycled Water Costs

The cost to provide recycled water to potential irrigation users within the Monk Hill Subarea was estimated using potential users located within close proximity to one another to minimize distribution pipeline costs. Two scenarios were analyzed, including: (Scenario 1) with four CalTrans sites near the 210 Freeway and Descanso Gardens; and (Scenario 2) with six CalTrans sites near the 210 Freeway, Descanso Gardens, Flintridge Riding Club, and the La Cañada Unified School District. The treatment plant sizes were 1.0 MGD in Scenario 1 and 2.0 MGD in Scenario 2. These scenarios were created as examples of small recycled water projects, also referred to as scalping plants, which might be implemented. Additional opportunities, such as a scalping plant to supply recycled water to the Charles White County Park and the Mountain View Cemetery exist within FMWD. In addition, a more detail recycled water study might be able to optimize the location of the plant, the irrigation customers to be served, and the size of the plant to achieve some reduction in cost

The treatment plants in both scenarios were sized to meet peak hour demands for potential irrigation users. It was assumed that recycled water that was not delivered to potential irrigation users would be delivered to the Arroyo Seco Spreading Grounds for groundwater recharge.

The total capital costs for a treatment plant and infrastructure (pipeline and boosters) is approximately $15.2 million for Scenario 1 and approximately $27.4 million for Scenario 2. Based on a 30-year period at 6 percent interest, the annualized costs are $1.1 million per year for Scenario 1 and $1.99 million for Scenario 2. Pumping and treatment O&M costs were estimated at approximately $0.9 million per year for Scenario 1 and approximately $1.5 million for Scenario 2. Additional information regarding recycled water facility cost estimates are provided in Appendix A.

The total recycled water use by potential irrigation users under Scenario 1 is 162 AFY, with the remaining 960 AFY flowing to the Arroyo Seco Spreading Grounds for recharge. The total cost of recycled water for Scenario 1 is approximately $1,750 per AF.

The total recycled water use by potential irrigation users under Scenario 2 is 320 AFY, with the remaining 800 AFY flowing to the Arroyo Seco Spreading Grounds for recharge. The total cost of recycled water for Scenario 2 is approximately $1,560 per AF.

The use of recycled water as a source of recharge water at the Arroyo Seco Spreading Grounds was also analyzed (Scenario 3). The treatment plant size for Scenario 3 is 4 MGD, which is sized to represent a regional groundwater recharge project for the Monk Hill Subarea of the Raymond Basin. The total capital costs for a treatment plant and infrastructure (pipeline and boosters) is approximately $40 million for Scenario 3. Based on a 30-year period at 6 percent interest, the annualized cost is approximately

$2.9 million per year. Pumping and treatment O&M costs were estimated at approximately $2.4 million per year. Approximately 3,360 AFY of recycled water would be provided to the Arroyo Seco Spreading Grounds for recharge, assuming the spreading grounds would be unavailable 25 percent of the time due to spreading of stormwater runoff, maintenance activities, and vector control considerations. The total cost of recycled water for Scenario 3 is approximately $1,580 per AF. A larger treatment plant or an additional treatment plant could be considered with groundwater producers in the Pasadena subarea to create a larger basin-wide project in the Raymond Basin.

Reliability

Recycled water use can alleviate the amount of imported water supplies required by FMWD's member agencies. The use of recycled water supplies for irrigation and for groundwater recharge to obtain additional groundwater rights can provide alternate sources of supply during planned or unplanned shutdown of FMWD's facilities. The use of recycled water supplies can also provide alternate sources of supply during periods of MWD delivery shortages.

Construction of a scalping plant or regional wastewater plant may reduce the amount of wastewater flow that would have been treated by existing downstream treatment plants. Coordination and cooperation with the Sanitation Districts of Los Angeles County would be required to implement a recycled water project.

Groundwater recharge of recycled water may allow member agencies to pump groundwater in excess of their existing pumping rights. However, member agencies may need to add well capacity to extract this additional groundwater. In addition, member agencies may need to add treatment if groundwater contamination is present.

Institutional Issues

Coordination with multiple entities will be required for a recycled water project. These will likely include the Sanitation Districts of Los Angeles County, CalTrans, Los Angeles County Parks and Recreation, Raymond Basin Watermaster and the City of Pasadena. Use of land (such as the Arroyo Seco Spreading Grounds and Pasadena Surface Water Treatment) owned by the City of Pasadena, which is in development of their own recycled water system, may also need to be resolved.

Spreading of recycled water in the Arroyo Seco Spreading Grounds for groundwater recharge may require a review of the impact on the US Environmental Protection Agency's (USEPA) Record of Decision regarding groundwater contamination in the vicinity.

Environmental Issues

The Regional Water Quality Control Board and California Department of Public Health criteria to avoid degradation of basin water quality would have to be met.

There may be opposition to placement of a wastewater treatment plant from nearby residents due to concerns about possible odors, aesthetic impacts, and noise from plant operations.

Water Quality Considerations

Groundwater recharge projects must meet the groundwater basin water quality objectives established by the Regional Water Quality Control Board, Los Angeles Region and the Raymond Basin Management Board's Criteria for the Delivery of Supplemental Water. The MBR Plants generally produce very high quality recycled water, however, additional water quality and treatment review would be required to determine the characteristics of the recycled water from these projects to review compliance with the specific water quality requirements for recharge in the Raymond Basin.

Energy Use and Greenhouse Gases

The operation of a proposed wastewater treatment plant to produce recycled water would require energy usage that may continuously contribute to greenhouse gases. However, operation of a proposed wastewater treatment plant would offset the need to treat the wastewater elsewhere, so implementation of a recycled water project to reuse the treated water might be considered to have no net increase in greenhouse gas emissions. Additionally, there would be reduced demands for MWD imported water and the pumping associated with moving that water on the State Water Project or Colorado River Aqueduct.

Pros to Recycled Water

Recycled water is actually "new" water that is added to supplies. The scalping plants would be in FMWD's service area offering greater reliability. By using the recycled water to recharge the groundwater basin, a greater degree of reliability on the potable side of demands is created. The costs of recycled water are cheaper than most other supplies that are available to FMWD. Once the capital facilities of the recycled water project have been paid off, there will be a drop in the rate for the water as only O&M and rehabilitation costs will apply. Comparing recycled water costs to projected MWD water costs in Table 3-1, recycled water will be cheaper for FMWD around calendar year 2028 or calendar year 2031 depending on the scenario chosen.

Cons to Recycled Water

One of the areas that will need to be addressed is the “not in my backyard” issue that arises from recycled water plants. Considerable outreach as well as good planning/siting must be performed before any project can move forward. Recycled water can only be used for nonpotable purposes. To increase reliability, recycled water needs to be spread and the appropriate production facilities must be in place for use during an emergency or shutdown.

SECTION 6 – SAN GABRIEL AND RAYMOND BASIN FEEDER

FMWD's member agencies are currently producing essentially the total amount of groundwater allowed under their existing water rights. As discussed in Section 4 (Groundwater), the only opportunity to increase the use of groundwater is to increase recharge of water to the basins. Increasing the amount of groundwater recharge, such as additional imported surface water discussed below, may allow member agencies to produce additional water over their existing water rights.

Increasing the availability of replenishment water can enhance spreading operations and extraction potential in the Raymond Basin. A potential source of additional spreading water is untreated, imported water delivered though San Gabriel Valley Municipal Water District's (SGVMWD) Devil Canyon-Azusa Pipeline, which begins at the State Water Project's (SWP) Devil Canyon afterbay and currently terminates in the City of Azusa. SGVMWD's untreated imported water facilities are used to deliver water for groundwater recharge and to make power approximately four to six months of each year (primarily in the summer) at the San Dimas hydroelectric facility. During those times, little or no water can be delivered westerly in the pipeline. The Foothill Water Coalition (FWC), which includes FMWD, is pursuing a program that would include construction of a pipeline extension from the Devil Canyon-Azusa Pipeline to deliver water from the terminus (City of Azusa) to the Raymond Basin (San Gabriel and Raymond Basin Feeder). The FWC and the Army Corps of Engineers will initiate a conceptual level study of the San Gabriel and Raymond Basin Feeder and other water supply reliability projects in the next few weeks.

To help ensure the availability of sufficient water supplies, a pipeline interconnection (Alosta Connection) between the Devil Canyon-Azusa Pipeline and MWD's facilities would need to be constructed. The cost to construct the Alosta Connection is estimated at $2.3 million. The annual cost at a repayment rate of 6 percent over 30 years is approximately $170,000 per year.

The Devil Canyon-Azusa Pipeline could be extended into the Raymond Basin to provide replenishment water. Phase 1 would provide water to the Santa Anita and Sierra Madre Spreading Grounds, located in the Santa Anita Subarea. Phase 2 would provide water to the Eaton Wash Spreading Grounds, located in the Pasadena Subarea, which may benefit Kinneloa. Phase 3 would provide water to the Arroyo Seco Spreading Grounds, located in the Monk Hill Subarea where the remainder of FMWD's member agencies with water rights produce groundwater. The capital cost of the Phase 1, 2 and 3 extension is about $31,300,000, including the Alosta Connection. The annual repayment over 30 years at 6 percent interest is approximately $2.29 million per year.

Although there have been no studies to determine the amount of potential deliveries from the proposed San Gabriel and Raymond Basin Feeder, for the purposes of this Briefing Paper, it has been assumed the water will be delivered to the four spreading

grounds associated with Phases 1, 2 and 3. The recharge rate of the Arroyo Seco represents approximately 40 percent of the total recharge rate of all four spreading grounds. Based on deliveries to the Arroyo Seco Spreading Grounds at 40 percent of the total cost, the Monk Hill Subarea users would need to pay approximately $12.5 million, or $0.9 million per year. Since the Monk Hill Subarea users are located within Phase 3 of the proposed San Gabriel and Raymond Basin Feeder, additional infrastructure and pumping costs associated with Phases 1 and 2 may be necessary.

Phase 3 of the proposed San Gabriel and Raymond Basin Feeder is still very conceptual at this time. A potential alternative has recently been suggested to the original proposal for a pipeline that would deliver imported water from the Eaton Canyon area to the Arroyo Seco. The concept of retaining stormwater for a longer period behind Devil's Gate Dam and pumping water through existing storm drains and some new pipelines to the Eaton Canyon Spreading Grounds has been proposed. This concept may allow delivery of imported water from the Phase 2 extension of the San Gabriel and Raymond Basin Feeder to the Arroyo Seco Spreading Grounds through the same network of storm drains and new pipelines. A preliminary feasibility study to be conducted jointly by the FWC and the Army Corps of Engineers will evaluate these options and as well as potential improvements to the Arroyo Seco Spreading Grounds that could result in the recharge of more storm water and provide more spreading capacity for recycled water if a recycled water project is developed.

Reliability

The current preliminary planned capacity of the Alosta Connection is approximately 30 cfs. The current percolation rate of the Arroyo Seco Spreading Grounds is approximately 18 cfs. Based on a 40 percent allocation discussed above, the Arroyo Seco Spreading Grounds could receive approximately 12 cfs from the proposed San Gabriel and Raymond Basin Feeder. Although there have been no studies to determine the amount of potential deliveries from the proposed San Gabriel and Raymond Basin Feeder, the Arroyo Seco Spreading Grounds should have sufficient capacity to percolate this assumed rate of delivery.

If member agencies with existing water rights can produce more groundwater, it would make capacity in FMWD's pipeline available to member agencies without water rights. Increased groundwater pumping would also increase the local supply of water that might be shared among member agencies during a planned or unplanned shut down of FMWD's facilities.

Delivery of imported water through the proposed San Gabriel and Raymond Basin Feeder project would increase the amount of groundwater available for recharge which may allow member agencies to produce additional water over their existing water rights. These additional water rights may allow member agencies to continue providing reliable water supplies during planned and unplanned shutdowns of FMWD facilities.

Although groundwater recharge of imported water may allow member agencies to pump groundwater in excess of their existing pumping rights, member agencies may need to add well capacity to extract this additional groundwater. In addition, member agencies may need to add treatment if groundwater contamination is present.

Cost

MWD has historically provided water for groundwater recharge at the untreated replenishment water rate (currently $258 per AF). However deliveries of this type of water are not guaranteed. According to recent discussions with MWD on availability, untreated replenishment water may be available only three out of the ten years in the immediate future and approximately five out of ten years in the future if some improvements to the Bay-Delta System are in place, easing current court ordered pumping restrictions. Based on MWD's estimated reliability, and assuming for this discussion replenishment water is available for three months of the year when it is available, a 12 cfs allocation to the Arroyo Seco Spreading Grounds is equivalent to annual average replenishment of approximately 430 AFY to 720 AFY from MWD. MWD may also be able to provide more reliable full service untreated water for recharge at Tier 1 (currently $351 per AF) or Tier 2 (currently $449 per AF) rates. MWD is currently reviewing whether full service Tier 1 and Tier 2 untreated water can be provided for recharge. Based on MWD's untreated replenishment water rate, FMWD will need to pay approximately $1,250 per AF ($258 per AF + ($0.9 million per year / 720 AFY)) to $2,350 per AF ($258 per AF + ($0.9 million per year / 430 AFY)) for water delivered to the Arroyo Seco Spreading Grounds.

Water delivered through the proposed San Gabriel and Raymond Basin Feeder may also be delivered directly to member agencies. However, there would be significant additional infrastructure costs, including a surface water treatment plant, pipelines, and booster stations.

Institutional Issues

FMWD will need to coordinate with the FWC, Pasadena and MWD for successful completion of the project.

Spreading of imported water in the Arroyo Seco Spreading Grounds for groundwater recharge may require a review of the impact on the USEPA's Record of Decision regarding groundwater contamination in the vicinity.

Environmental Issues

There do not appear to be significant environmental issues associated with the proposed San Gabriel and Raymond Basin Feeder project, however there may be some

moderate issues involved in crossing Eaton Canyon and possible constructing the pipeline in the Arroyo Seco Canyon. The Alosta Connection would be constructed within the existing San Dimas Wash area. The San Gabriel and Raymond Basin Feeder would be constructed on existing streets. Water deliveries would recharge into an existing spreading basin. Only typical construction related impacts are expected.

Energy Use and Greenhouse Gases

Construction and operations of the proposed San Gabriel and Raymond Basin Feeder and Alosta Connection may require moderate energy use and contribute to greenhouse gases in addition to the energy used to move water on the State Water Project.

Pros

As discussed above, if member agencies with existing water rights can produce more groundwater, it would make capacity in FMWD's pipeline available to member agencies without water rights. Increased groundwater pumping may also significantly increase the local supply of water that might be shared among member agencies during a planned or unplanned shut down of FMWD's facilities.

Cons

The FWC is comprised of many agencies interested in the extension of the San Gabriel and Raymond Basin Feeder. However, most of the agencies benefit from Phase 1 and 2 of the extension. For FMWD only Kinneloa benefits from Phase 2 of the extension. None of FMWD's other member agencies have a direct benefit. Most of the agencies benefiting from Phase 1 and 2 will not benefit from Phase 3. The FWC agreement stipulates that FMWD will share costs equally with the other agencies. The question arises if Phase 3 is not constructed and FMWD has paid costs equally with other agencies, what has FMWD gained from its participation? Additionally, the availability of MWD replenishment water is not guaranteed. There are also possibilities of revising the program which may impact operations.

SECTION 7 - CONSERVATION

Implementation of conservation measures within FMWD's service area can reduce the water demands on local and imported water supplies. Conservation measures can be grouped into two general categories: (1) "hardware" devices or equipment and (2) behavior or management practices. The implementation of comprehensive conservation programs to reduce long-term water demands typically includes both hardware- and behavior-driven measures. Although the two types of measures require different levels of effort, both are required to meet conservation goals. For example, outdoor water conservation programs include ongoing landscape management practices (such as shorter lawn watering times) and one-time hardware measures (such as turf replacement and improved irrigation system controllers).

Conservation Methods

The 2005 FMWD UWMP provides descriptions of several water conservation programs, or Best Management Practices (BMPs), that are currently being practiced within FMWD's service area. These BMPs include "Residential Plumbing Retrofit", "Large Landscape Conservation Programs and Incentives", "High-Efficiency Washing Machine Rebate Programs", "Public Information Programs", and "Conservation Pricing." The UWMP did not include information on the effectiveness or amount of water savings from these current conservation measures.

During the recent process to develop MWD's Water Shortage Allocation Plan MWD estimated the current total water savings from active and passive conservation measures within FMWD to be approximately 1,600 AFY. MWD has developed a methodology to estimate future potential water conservation savings within the MWD service area from active conservation programs, price induced savings, and code based savings. Projections for FMWD's service area from MWD's methodology were not available for this evaluation, however they may be available for future evaluations of potential water conservations savings. Based on discussions with the member agencies it appears there is the potential for additional water conservation savings from price induced programs, fixture rebates, and public education programs. Reduction in outdoor water use may represent the potential for significant water savings in some portions of FMWD's service area, although achieving those savings may be difficult. Some conservation measures (such as rate structures and irrigation controller rebates) may need to be combined with significant public education efforts for the programs to be successful. FMWD has also kicked off the Foothill Water Conservation Corps in an effort to develop conservation and public education further.

MWD (through the http://www.bewaterwise.com/ website), offers rebates for purchase and installation of high efficiency clothes washers ($135 to $400), high efficiency toilets ($30 to $100), weather-based irrigation controllers ($80 to $200), and synthetic turf

($0.30 to $0.80 per square foot). These devices can produce significant water savings. For example, high efficiency clothes washers can use up to 50 percent less water than standard clothes washers. High efficiency toilets can use up to 20 percent less water than standard toilets, and weather-based irrigation controllers can reduce typical household water use by as much as 10 percent.

Use of tiered water rates alone may not be effective for achieving conservation savings in some areas. Implementation of a water budget allocation system with tiered billing rates (or budget-based rate structure) may be a more successful method to encourage conservation. A budget-based rate structure estimates the amount of water use for each household and business by taking into account how many people are using water at the location and how much irrigation is required for the lot. When customers use more water than needed, they are given progressively expensive penalties (i.e. double or triple the normal rate, or more).

Implementation of budget-based rates requires significant up-front administrative costs for setup. In addition, it is a major undertaking to educate water customers to adapt to the new rate system. Use of water budget-based rate structures is not common due to the cost and effort required for implementation. Irvine Ranch Water District (IRWD), which switched to tiered budget-based rates in the early 1990s, saw a 61 percent reduction in average landscaping water use between 1992 and 2005. In addition, while the average water use in Orange County is 190 gallons per day (gpd) per person, IRWD customers use only 90 gpd per person.

According to IRWD's "Residential Runoff Reduction (R3) Study", prepared July 2004, weather-based irrigation controllers, which regulate landscape water use, resulted in water savings of 41 gpd in typical residential settings, or approximately 10 percent of total household water use, and 545 gpd for larger dedicated landscape irrigation accounts.

According to IRWD's "Is System Pressure Reduction a Valuable Water Conservation Tool?", prepared February 2003, a reduction in system pressure can significantly reduce residential water consumption, especially irrigation, without causing any significant costs in terms of increased customer complaints. In one of the treatment neighborhoods analyzed where pressure was reduced significantly by 17.6 percent, single-family consumption declined by 1.9 percent overall, and by 4.1 percent among those residences with greater-than-average landscapes.

Governor Schwarzenegger has proposed a plan to achieve a 20 percent reduction in per capita water use statewide by the year 2020. In March 2008 the State Water Resources Control Board organized the 20x2020 Agency Team to develop a plan to achieve a 20 percent reduction in per capita urban water use throughout California by 2020. The plan is anticipated for completion by the end of 2008. The plan, in conjunction with supporting legislation, may mandate water demand reductions through conservation. Since these proposals are preliminary they have not been incorporated in

the water demand projections presented in this briefing paper, however, these proposals emphasize the need for water conservation measures described herein.

Reliability

Based on the "Handbook of Water Use and Conservation", prepared by Amy Vickers in 2001, hardware measures are generally more reliable than behavior driven measures in achieving long-term water savings. Hardware measures typically need to be installed only once and do not require an ongoing effort to maintain water savings. For example, installation of a low-volume 1.6 gallon per flush (gpf) toilet to replace a leaking 3.5 gpf fixture will save considerable amounts of water over an operational life of at least 20 years without any additional effort beyond normal maintenance. In contrast, educating people to adopt low-water-use or native landscaping and irrigation practices, though essential to conserving outdoor water use, requires considerable time. In addition, ongoing reminders are necessary if these irrigation practices are to be maintained.

Costs

The cost effectiveness of conservation programs vary greatly. Water conservation savings and program costs reported for IRWD's early programs, including implementation of a tiered budget-based rate structure, irrigation workshops, water audits, and water saving fixture rebates showed average costs of approximately $75 per acre foot of water saved in year 2008 dollars. These low costs were probably greatly influenced by the large amount of inefficient water use that existed prior to these programs because there had not been any significant conservation efforts. The costs reflect what at the time were easily attainable water savings. Achieving greater levels of conservation after these programs are implemented becomes progressively more difficult and more expensive.

Documentation available on the City of Santa Monica's Ultra Low Toilet Retrofit Program shows costs of approximately $312 per acre foot of water savings in year 2008 dollars.

Environmental Issues

There do not appear to be any environmental issues associated with conservation measures. Installation of conservation saving devices would replace existing lower efficiency devices. Implementation of conservation programs would reduce water usage.

Energy Use and Greenhouse Gases

High efficiency devices, such as high efficiency clothes washers, use less energy. The implementation of conservation programs, such as a rebate program for high efficiency clothes washers, may reduce energy use throughout FMWD's service area, and reduce the amount of greenhouse gases.

Pros

Conservation can reduce the amount of water demands from local and imported water supplies. Conservation can be beneficial to member agencies which rely heavily on imported water supplies provided by FMWD during periods of MWD water shortages.

Cons

Conservation cannot act as independent sources of water supply and must be used in conjunction with other projects to increase reliability for member agencies during planned/unplanned shutdowns of FMWD facilities.

SECTION 8 – PARTNERSHIPS WITH OTHER AGENCIES/TRANSFERS

FMWD can obtain a new source of water supply by participation in the development of local resources with another agency. For discussion purposes, ocean desalination was chosen as the project for further analysis. FMWD can either enter into a take or pay contract to become a customer of a new ocean desalination plant, or FMWD can participate in funding the plant and obtain capacity as a project partner. It would be unfeasible to create the infrastructure for direct delivery of desalinated ocean water to FMWD's service area, but FMWD could exchange the desalinated ocean water with MWD for delivery of a like amount of water to FMWD.

An example of such a project is Poseidon Resources' proposed ocean water desalination plant along Carlsbad State Beach which received final approval from the California Coastal Commission in August 2008. The proposed $300 million plant will provide approximately 50 MGD of desalinated ocean waste. There are nine local water agencies in San Diego County which have already contracted to purchase the entire output of the proposed plant.

Reliability

Participation in an ocean desalination program does not result in new infrastructure for delivery of water to FMWD's service area and therefore does not increase the reliability of supply for FMWD during either a planned or an emergency shutdown of FMWD's facilities. Desalinated water would increase the reliability of FMWD's water supplies during a hydrological or regulatory shortage that reduced MWD's ability to provide water.

Through participation in an ocean desalination program, FMWD could exchange desalinated ocean water with MWD for delivery of exchanged water to FMWD. However, if MWD were to implement the recently approved, Shortage Allocation Plan during periods of water shortage. The benefit of participating in an ocean desalination program to protect FMWD against required shortage reductions would vary depending on the level of shortage called by MWD.

MWD's Shortage Allocation Plan includes two alternative calculations of the shortage allocation to each member agency to allow impacts on retail costumers and the local economy to be considered. The allocation method that would apply to FMWD is the Wholesale Minimum Allocation. The Wholesale Minimum Allocation calls for FMWD to reduce its MWD use by one and one-half times the shortage level declared by MWD. For example, if MWD declares a Level 2 or a 10 percent shortage. FMWD would be allocated 15 percent (10 percent x 1½) less than its base allocation. Table 6-1 and Table 6-2 present examples for two different shortage levels to illustrate the varying

degree of protection participation in an ocean desalination program would provide FMWD at two different shortage levels under MWD's Shortage Allocation Plan.

These examples assume water supplies for FMWD, without participation in an ocean desalination program, consist of 9,000 AFY of local supplies and 12,000 AFY of MWD supplies and for comparison that FMWD would participate in an ocean desalination program to obtain 5,000 AFY, which would change FMWD's breakdown of water supplies to 14,000 AFY of local supplies and 7,000 AFY of MWD supplies.

Table 8-1 shows the reduction in MWD water use required for a 10 percent and a 40 percent shortage level, without participation in an ocean desalination program.

Table 8-1 Reductions in MWD Deliveries (No Participation in a Desalination Program)

Without Shortage Allocation					
FMWD Imported Water Allocation	12,000	AF	12,000	AF	[A]
FMWD Other Supplies	9,000	AF	9,000	AF	
Total	21,000	AF	21,000	AF	
With Shortage Allocation					
MWD Shortage Level	10%		40%		
MWD Wholesale Reduction	15%		60%		
FMWD Imported Water Allocation	10,200	AF	4,800	AF	[B]
FMWD Other Supplies	9,000	AF	9,000	AF	
Total	**19,200**	**AF**	**13,800**	**AF**	
(Reduction in Imported Water Allocation)	**1,800**	**AF**	**7,200**	**AF**	**[A] - [B]**

Table 8-2 shows the reduction in MWD water use required for a 10 percent and a 40 percent shortage level, assuming participation in an ocean desalination program for 5,000 AFY.

Table 8-2 Reductions in MWD Deliveries (5,000 AFY Participation in a Desalination Program)

Without Shortage Allocation					
FMWD Imported Water Allocation	7,000	AF	7,000	AF	[C]
FMWD Other Supplies	14,000	AF	14,000	AF	
Total	21,000	AF	21,000	AF	
With Shortage Allocation					
MWD Shortage Level	10%		40%		
MWD Wholesale Reduction	15%		60%		
FMWD Imported Water Allocation	5,950	AF	2,800	AF	[D]
FMWD Other Supplies	14,000	AF	14,000	AF	
Total	**19,950**	**AF**	**16,800**	**AF**	
(Reduction in Imported Water Allocation)	**1,050**	**AF**	**4,200**	**AF**	**[C] - [D]**

The tables show that for the assumed circumstances, at a 10 percent shortage level, FMWD would have to reduce its MWD water purchase by 1,800 AFY without participation in an ocean desalination program, but FMWD would only have to reduce its MWD water purchase by 1,050 AFY with participation in an ocean desalination program.

The tables also show that for the assumed circumstances at a 40 percent shortage level, FMWD would have to reduce its MWD water purchases by 7,200 AFY without participation in an ocean desalination program, but FMWD would only have to reduce its MWD water purchase by 4,200 AFY with participation in an ocean desalination program.

Costs

A feasibility report produced for the proposed Dana Point Desalination Project in 2007 estimated the total cost of desalinated water would be $1,584 per AF. The Monterey Peninsula Water Management District's evaluation of desalination project costs in 2008 estimated costs ranging from $1,520 to $2,920 per AF for projects with a capacity from 7.5 MGD to 20 MDG.

FMWD's participation in a desalination plant would reduce the amount of overall imported water used, and therefore reduce the amount of imported water reductions imposed by MWD. According to available information regarding MWD's water shortage allocation plan, MWD's member agencies would need to pay the base rate and a penalty for any water exceeding imported water delivery allocations. The current planned penalty is two to four times the Tier 2 rate (or approximately $898 to $1,796 per AF). As discussed above, the cost to construct and operate a desalination plant may range from $1,520 to $2,920 per AF. Since penalties would be occasional and desalination costs would be continuous, desalination costs are significantly more than drought penalties under the current water shortage allocation plan.

However, MWD's rates continue to increase and developing a partnership with an agency where water is transferred to FMWD on a regular basis may be beneficial when comparing costs. A decision to partner with another entity on a local resource development project would need to be made on a case-by-case basis depending on the cost of the project and projected MWD rates.

Institutional Issues

Any partnering where supplies are exchanged on paper rather than physically moved through MWD's distribution system will require either modifications to MWD's Tier 1 contract for FMWD and the partnering agency or adding service connection FM-1 as a point of delivery to the partnering agency for "in-lieu" deliveries of Tier 1 water. Should MWD not be willing to accept either option or another creative option, FMWD would need to pay the wheeling rate to move the water it has paid to have developed.

Spot transfers are also an option from Northern or Central California and even possibly entities along the Colorado River which can be wheeled through MWD's system. However, this past year, MWD has had difficulties obtaining transfers and the cost has been higher than originally anticipated. The Governor's Drought Water Bank has been established and there is a preference that entities go through the Bank to purchase water. One requirement of the Bank is that entities be in a 20 percent reduction mode to qualify for a transfer. Additionally, should FMWD pursue transfers on its own, it is competing against MWD and likely raising the price of the transfer water. At this point, it is not recommended that FMWD pursue this type of transfer.

Environmental Issues

Depending on the project, environmental issues may vary. For this example, there are significant environmental issues associated with an ocean desalination plant, such as marine and aquatic life impacts. Approval of the construction and operation of an ocean desalination facility may include an extensive permitting process through various federal, state, and local agencies.

Energy Use and Greenhouse Gases

Depending on the project, energy use and greenhouse gas emissions will vary. For this example, the operation of an ocean desalination plant is an energy intensive process and may continuously contribute to greenhouse gases.

Pros

Partnering with another agency will allow FMWD to obtain more supply reliability and in the long-run may lower the costs of water in comparison to purchasing from MWD.

Cons

Partnering with another entity does not solve the reliability issue during shutdowns and emergencies since MWD's distribution system will need to be used to move the water to FMWD.

SECTION 9 - INTERCONNECTIONS

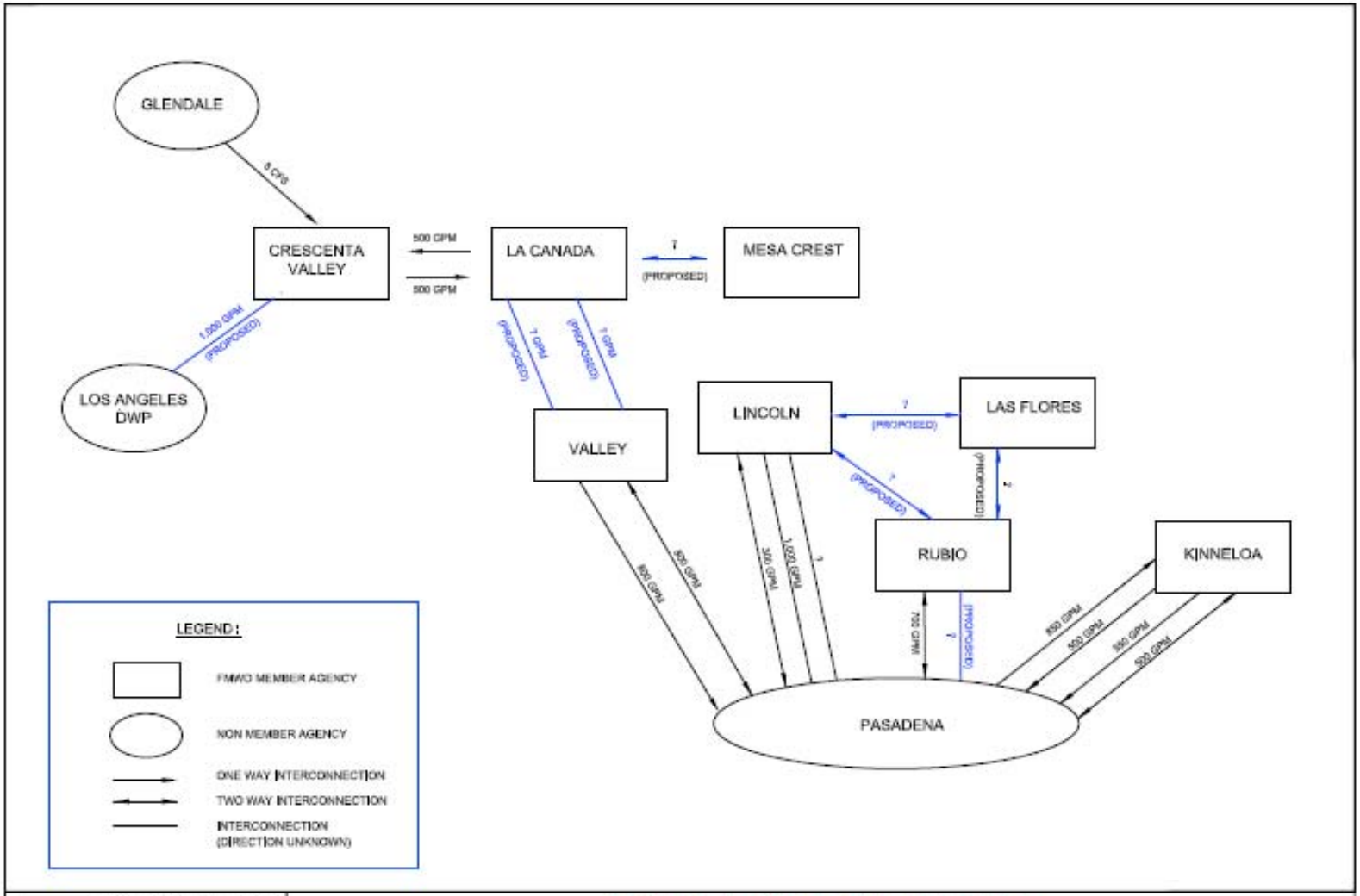
Emergency interconnections are distribution system connections between water purveyors for use during critical situations where one system is temporarily unable to provide sufficient potable water to meet minimum health and/or fire protection needs. An emergency interconnection will allow a water purveyor to continue serving water during critical situations such as local water supply shortages as a result of earthquakes, fires, prolonged power outages, and droughts. FMWD member agencies can increase water supply reliability by constructing additional proposed future emergency interconnection with other agencies.

FMWD has two emergency water interconnections with the City of Pasadena. One can provide a flow of 10 cfs to FMWD. The second connection provides water to Pasadena. In addition, FMWD's member agencies have interconnections with one another and outside agencies, as shown in Figure 9-1.

Proposed Interconnections

Additional interconnections will increase water supply reliability for the member agencies during emergency situations or planned/unplanned shutdowns of imported water supplies delivered through FMWD facilities. Proposed interconnections were identified through discussion with FMWD member agency staff and from the 2007 FMWD Master Plan. These proposed interconnections within FMWD's service area are also shown in Figure 9-1.

A recently completed interconnection between Crescenta and Los Angeles Department of Water and Power (LADWP) will allow Crescenta to obtain up to 1,000 gpm during emergency situations. However, LADWP staff has indicated the interconnection with Crescenta is located near the edge of LADWP's service area and it is unlikely any significant additional capacity is available for interconnections between Crescenta and LADWP without significant improvements to LADWP's system.



STETSON ENGINEERS INC.

FOOTHILL MUNICIPAL WATER DISTRICT

MEMBER AGENCY INTERCONNECTIONS

FIGURE 9-1

F:\JOBS\2277\SECTION7\INTERCONNECTIONS\FIGURE 9-1.DWG

Reliability

Interconnections increase reliability of member agencies during emergency situations or planned/unplanned shutdowns of imported water supplies.

Interconnections with multiple agencies can be beneficial to member agencies which rely heavily on imported water supplies provided by FMWD. However, interconnections cannot act as independent sources of water supply and must be used in conjunction with conservation and other projects to increase reliability for member agencies during planned/unplanned shutdowns of FMWD facilities.

The proposed interconnections (indicated by member agencies' staff and the 2007 FMWD Master Plan) between La Cañada and Mesa Crest, La Cañada and Valley, Lincoln and Las Flores, Las Flores and Rubio, Rubio and Pasadena, and Rubio and Lincoln will increase FMWD member agency reliability during a planned shutdown of FMWD's imported water facilities.

In addition to the previously identified proposed interconnections, this Briefing Paper recommends the capacity of Crescenta's existing interconnection to La Cañada may need to be increased, or an additional interconnection may be needed. La Cañada, which relies on a relatively large amount of imported water supplies, can currently obtain some water from Crescenta Valley during a shutdown of FMWD's existing MWD interconnection. Crescenta Valley has recently constructed a 5 cfs interconnection with Glendale, and will be able to obtain up to 1,000 gpm with a new interconnection with LADWP. These interconnections, along with Crescenta Valley's groundwater wells in the Verdugo Basin, may allow Crescenta Valley to provide some additional water to La Cañada to increase reliability during planned or unplanned shutdowns of FMWD's system.

This Briefing Paper also recommends that an interconnection between Mesa Crest and La Cañada may increase reliability. Mesa Crest, which is entirely dependent on imported water supplies, has proposed an interconnection with La Cañada to obtain some water during a shutdown of FMWD's existing MWD interconnection.

Valley has an 800 gpm interconnection from Pasadena, has recently completed an interconnection with La Cañada and has proposed another interconnection with La Cañada. These interconnections, along with Valley's groundwater production wells, may allow Valley to provide some additional water to La Cañada to increase reliability.

Existing and proposed interconnections can increase reliability during planned shutdowns of FMWD's system. However, based on discussion with member agencies, interconnections will not provide sufficient supplies during extended shutdowns and emergency periods for member agencies which significantly depend on imported water supplies.

Costs

Costs depend on the location of the connection and the amount of piping and other appurtenant facilities needed to construct the interconnection.

Environmental Issues

There do not appear to be significant environmental issues associated with the installation of new interconnections. Interconnections would be installed on existing streets.

Energy Use and Greenhouse Gases

There does not appear to be any significant energy use or contribution to greenhouse gases associated with the installation of new interconnections.

Pros

In many instances, an interconnection is a cost-efficient method of increasing reliability during a shutdown or emergencies. In addition to the previously identified proposed interconnections, Crescenta's existing interconnection to La Cañada may need to be increased, or an additional interconnection may be needed, and a new interconnection between Mesa Crest and La Cañada may increase reliability.

Cons

Not enough capacity has been identified through interconnections to sustain agencies during an extended shutdown or emergency. For the most part, service from an interconnection would be secondary to the needs of the agency providing the water. If the agency does not need the water or has enough capacity to provide the water during a shutdown or emergency, then it will. Otherwise, the agency receiving the water has no benefits from the interconnection.

SECTION 10 – DEBRIS BASINS

Debris basins are typically located at the mouth of canyons where rainfall runoff is concentrated and as a result, are potential areas to capture and retain runoff for groundwater recharge. By modifying existing debris basins into recharge basins, these basins can retain and recharge water which otherwise would flow to the ocean.

Geomatrix's "Final Report Verdugo Basin Groundwater Recharge, Storage, and Conjunctive Use Feasibility Study", prepared May 2005, analyzed the use of debris basins for groundwater recharge. Debris basins reviewed include the Verdugo Debris Basin and the Pickens and Dunsmuir Debris Basins based on large tributary areas and flows. Proposed increased maintenance for these debris basins and outlet structures included removal of debris, the regrading of berms, and scarification of the basin bottom which will require heavy construction equipment and debris hauling. The Geomatrix report used a percolation rate of 1 foot per day along with hydrologic data on monthly average rainfall capture and percentage (75 percent) usable area for recharge to model the expected recharge volumes for the debris basins.

Based on information from the Geomatrix report, the recharge capacity of debris basins within the Raymond Basin can be estimated for this conceptual level screening of water supply sources. A simple analysis of six existing debris basins (including Bigbrier, Cooks, Gould, Upper Gould, Halls, and Lincoln) located in the Monk Hill Subarea of the Raymond Basin was conducted to determine the possible volumes that could be recharged. The analysis also makes use of data developed in the Los Angeles County Department of Public Works "Hydrologic Report" of 1992-1993 regarding sizes and capacities of the six basins. Although the hydrologic data used for the Geomatrix Report is not available for the analysis of the Monk Hill Subarea basins, assumptions were made to prorate the extra days of retention based on the relative sizes of the surface areas of the debris basins. Based on these assumptions, the estimated average recharge for the six debris basins analyzed is approximately 30 AFY per debris basin in the Raymond Basin.

Reliability

Debris basins can provide additional recharge water into the Raymond Basin, which may increase the amount of Decreed Rights for FMWD member agencies. This additional water may provide increased reliability to member agencies during planned and unplanned shutdowns of FMWD facilities. However, this additional water may not be sufficient to act as an independent source of water supply and must be used in conjunction with conservation and other projects to increase reliability for member agencies during planned/unplanned shutdowns of FMWD facilities. In addition, similar to spreading diverted surface water, member agencies may only be able to recapture up to 80 percent water recharged from the debris basins.

Although the debris basins can be maintained to allow increased recharge, there are no available studies to determine the ability to produce water recharged in these areas. Additional studies would be required to determine how much net water would be saved as a result of maintenance. Safe yield studies to determine the impact of groundwater recharge from the debris basins into the Raymond Basin may also be required.

Groundwater recharge of debris basin water may allow member agencies to pump groundwater in excess of their existing pumping rights. However, member agencies may need to add well capacity to extract this additional groundwater. In addition, member agencies may need to add treatment if groundwater contamination is present.

Costs

Proposed improvements to the Verdugo Debris Basin were estimated by Geomatrix to cost $300,000 with an annual O&M cost of $242,000. Proposed improvements to the Pickens and Dunsmuir Debris Basins were estimated by Geomatrix to cost a total of $308,000 with an annual total O&M cost of $352,000. On average, the total annualized cost (6 percent over 30 years) for improvements plus annual maintenance costs per debris basin is approximately $320,000 per year. Based on an annual average yield of approximately 30 AFY per debris basin in the Raymond Basin, the estimated cost of water recharged by improved debris basins is approximately $10,700 per AF. Based on an estimated recharge rate of 30 AFY per debris basin in the Raymond Basin, and assuming 15 debris basins within the Monk Hill Subarea can be improved, the total Raymond Basin recharge capacity from debris basins is potentially 450 AFY.

The Geomatrix report indicates a recharge capacity of the Verdugo Debris Basin (into the Verdugo Basin) of approximately 430 AFY and a recharge capacity of the Pickens and Dunsmuir Debris Basins (into the Verdugo Basin) of approximately 110 AFY. The debris basins in the Verdugo Basin can recharge more water per basin than the debris basins in Raymond Basin due to their larger sizes and their location. In addition, the Verdugo Debris Basin allows capture of some residential runoff in addition to runoff from unimproved hill sides. The greater yield of the debris basins in the Verdugo Basin results in costs per acre foot of water recharged lower than in the Raymond Basin. The estimated cost of water recharged by the improved Verdugo Basin debris basins ranges from approximately $750 per AF to $2,900 per AF.

Institutional Issues

Coordination will be required with Los Angeles County Department of Public Works, the Watermasters of the respective groundwater basins, California Department of Fish and Game (DFG) and United States Fish and Wildlife Service (USFW).

Environmental Issues

The proposed maintenance of the debris basins may be regulated by environmental permits from the DFG and USFW. In addition, maintenance requires ponding of surface water in existing debris basins; creating potential wildlife habitat and increased vegetation growth. The proposed maintenance also includes more-frequent grading and clearing of vegetation on debris basin bottoms and sides than currently occurs. As a result, the permitting requirements will include modifications to the existing maintenance permits issued by DFG, which currently limits the maintenance within the debris basins to protect established wildlife and vegetation. The permits limit maintenance activities to specific agreed-upon areas and timing. Additionally, debris accumulation must meet a certain threshold before it can be removed.

Energy Use and Greenhouse Gases

On-going maintenance of debris basins will lead to removal of debris and cleanup of debris basins on an annual basis. The hauling of debris may contribute to greenhouse gases.

Pros

The expansion of the use of the debris basins will increase the recharge of the groundwater basins and yield from those groundwater basins. The debris basins overlying the Verdugo Basin may be more cost effective to develop and have less environmental constraints.

Cons

The costs for expansion of the debris basins overlying the Raymond Basin is high. There may be significant environmental issues associated with the modification and maintenance of the debris basins .

SECTION 11 - SUMMARY

At the March 24, 2008 meeting, FMWD's Board developed the following matrix to preliminarily rate the various resource alternatives.

Weighting	1	0.9	0.9	1	0.8	
	Emergency Reliability	**Rate Mitigation**	**Reliability of Infrastructure**	**Supply Shortage (Drought)**	**Other Challenges**	**Priority**
Recycled Water	3		4	6	5	16.6
Groundwater	6		5	5	2	17.1
Transfers	1		1	4	3	8.3
San Gabriel Pipeline	4		2	1.5	1	8.1
Conservation	2		3	3	6	12.5
Interties	5		6	1.5	4	15.1

The resource alternative is shown in the first column on the left. The second from the top row reflects the various needs that FMWD would like addressed with the resource alternative. "Emergency Reliability" is for emergency outages on both the imported water system and on FMWD's system. The "Rate Mitigation" category was not completed but means in comparison to MWD's rates, which alternatively provides for lower costs and/or rates. "Reliability of Infrastructure" is for overall operational reliability, versatility and for flexibility during replacement of pipelines and other infrastructure. "Supply Shortage" is based on imported water supply shortages where more reliability would occur with the development of a particular supply alternative. "Other Challenges" is challenges such as institutional, legal, environmental, etc. Each category is ranked from 1 through 6 with number 1 being the lowest in meeting the category requirement and number 6 being the highest. The weighting of each need is shown on the top row above the need. The total of the ranking and weighting is shown in the column furthest to the right.

Stetson has modified or added additional water resources and further broken down the categories. Based on review of the alternative water supplies discussed in this Briefing Paper, Stetson has revised some of the preliminary ratings in the matrix above. A summary of the project alternatives, including costs and potential yields for each project, is provided below to facilitate the screening process. In addition, preliminary scorings for environmental issues and reliability have been included. Consideration should be given at the workshop to weighing all the criteria.

Weighting	1	0.9	0.9	1	1	0.9	0.8	
	Emergency Reliability	**Rate Mitigation**	**Reliability of Infrastructure**	**Supply Shortage (Drought)**	**Environmental Impacts**	**Energy Use Greenhouse Gases**	**Other Challenges**	**Priority**
Second MWD Interconnection	3	1	3	1	4	2	3	15.8
Recycled Water	4	5	4	6	3	3	5	27.8
Groundwater	6	3	5	5	5	4	2	28.4
Partnering/Transfers (Desalination)	1	4	1	5	3	3	3	18.6
San Gabriel Pipeline	4	2	3	1	3	2	1	15.1
Conservation	2	4	2	3	6	6	5	25.8
Interties	4	5	4	1	5	4	4	24.9
Debris Basins	3	4	2	3	3	5	2	20.5

The rankings in red are those that Stetson has added or changed as a recommendation. Based on these rankings, there is no one solution to the problem. However, there are some water resource alternatives that rise to the top for more detailed evaluation, including:

1. Developing recycled water for reliability due to a drought or regulatory event. The development of recycled water will require partnership and coordination with several entities but will increase the reliability of Foothill's agencies significantly. Public outreach will also need to be done to ensure the successful completion of project(s). It appears that over time, recycled water will be cheaper than Metropolitan water.

2. Developing facilities to optimize groundwater resources for shutdowns and emergencies. This development of additional facilities would need to be done working with member agencies. Ideally additional well capacity could be added in either the Monk Hill Basin or the Verdugo Basin where water quality meets California Department of Public Health (CDPH) standards. During a shutdown or emergency, this water would be put into Foothill's distribution system and delivered to those agencies that need water. The water could be the retail agencies adjudicated rights that are produced from the well or could be an exchange of water that is pre-stored or returned through imported water deliveries once the emergency or shutdown is over. This operation would need to be vetted through CDPH to ensure that it meets their requirements without adding significant costs to FMWD operations and water quality testing.

   In addition retail agencies should look into additional well capacity and also wellhead treatment for contaminants so that an agency can sustain a shutdown or emergency outage. Because of brine disposal issues, bioremediation should be reviewed as an appropriate treatment. There should be an investigation of whether it would be more advantageous for Foothill to spearhead the treatment of groundwater and work on a contractual basis with retail agencies to operate the system(s).

3. Developing more interconnections or increasing the size of interconnections so that agencies may sustain a shutdown or emergency outage for a short length of time. Look into adding another interconnection with Pasadena for emergencies.

4. Increasing conservation for supply reliability. This would entail developing a process for FMWD and the retail agencies to provide outreach and funding for more conservation. The funding could be developed through identifying grants for conservation and partnering with Metropolitan.

If sufficient funds for evaluating additional alternatives are available, the following options might also provide water supply reliability benefits:

1. Explore partnerships with other agencies or water transfers on a case-by-case basis as they arise to determine if the opportunity increases FMWD's reliability at a reasonable cost.

2. Supporting Crescenta Valley in any efforts to modify debris basins in the Verdugo Basin to recharge storm water.

Additionally, the following recommendations are made:

1. Although the San Gabriel Valley Pipeline Phase III project should not be pursued, the Raymond Basin Watermaster has put into the FWC study being performed with the Army Corps of Engineers the feasibility of expanding the capacity at the Arroyo Spreading Grounds. FMWD should support this aspect of the study and negotiate with the Watermaster and the City of Pasadena on this process recognizing that the Monk Hill Producers are paying for the San Gabriel Valley Pipeline project through their groundwater assessments.

2. The second connection due to costs and inadequate benefits should be dropped from further consideration.

The Board at its workshop in October 2008 had an opportunity to revisit the rankings and make its own decisions on the values assigned to each water resource alternative/need. They agreed with the rankings provided by Stetson. Additionally, the Board agreed with the recommendations as listed above. In November 2008, the Board directed staff to:

1. Proceed with a study for FMWD interconnections with the City of Pasadena.
2. Hire John Morris to assist in applying for a State Water Resources Control Board planning grant for recycled water, and
3. Meet with member agencies to continue to refine the concept of introducing groundwater into FMWD's distribution system.

The Board felt that at this point, FMWD should wait to proceed with developing a formal conservation program until the results of the 20X2010 process and a region-wide conservation program to be possibly developed by Los Angeles County Integrated Regional Water Management Plan are known. However, it continues to support conservation through FMWD efforts with the FWCC and the member agencies.

Additionally, FMWD's member agencies felt that they would be able to develop interconnections without the need of any further studies and will proceed in that direction as opportunities occur.

Appendix A

Reclaimed Water Facility
Cost Estimates

RAYMOND BASIN - MONK HILL SUBAREA
Reclaimed Water Facility Cost Estimates

Basin Name	Peak Flowrate (MGD)	Average Flowrate (MGD)	Average Flowrate (AFY)
District 2	1.86	0.531	596
District 3B	1.35	0.386	432
TOTALS	3.210	0.917	1,028
Users			
Caltrans 1	0.151	0.020	22.6
Caltrans 2	0.268	0.036	43.0
Caltrans 3	0.249	0.033	37.2
Caltrans 4	0.203	0.027	30.4
Caltrans 5	0.217	0.029	32.4
Caltrans 6	0.227	0.030	34.0
Descanso Gardens	0.167	0.022	25.0
Flintridge Riding Club	0.231	0.031	34.6
La Canada USD	0.407	0.054	60.8
TOTALS	2.141	0.285	320.0

Interceptor peak = 3.5 average flow
(per Metcalf & Eddy)

ADD x 2.5 = MDD
MDD x 3 = MPH
(per Arcadia Recycled Water Report)

	Trenching G 1030 807-13	Pipe 33 11 13.15	Bedding G 1030 815-	02 41 13.17-5050 Demolition	Resurface 32 11 23.23-	Disposal 0100; 32 1	Misc Costs	Project Burden		
8" DIP	$4.87	$34.02	$2.85	$2.53	$13.63	$1.00	$5.00	15%	$73.49	/LF
									$388,041	/Mile
	Trenching G 1030 807-14	Pipe 33 11 13.15-	Bedding G 1030 815-	02 41 13.17-5050 Demolition	Resurface 32 11 23.23-	Disposal 0100; 32 12	Misc 16.13-0200,-0460			
12" DIP	$10.45	$46.96	$7.47	$3.38	$16.18	$1.25	$7.00	15%	$106.91	/LF
									$575,052	/Mile

Scenario 1

1.0 MGD Plant	$14.5 M	[1]	
12" DIP Pipeline	$0.71 M	$707,924	1.23 Miles
	$15.2		
A/P:6%, 30Y	0.0726		
	$1.10 M/Y		
Annual O&M	$0.85 M/Y	Based on Source [1] + $50,000 for pumping	
	$1.95 M/Y		
Annual Reclaimed	1120.0 AFY	160.2 AFY for users	(Caltrans 1 + Caltrans 2 + Caltrans 3 + Caltrans 5 + Descanso Gardens)
	$1,744.73 /AFY		

Scenario 2

2 MGD Plant	$26.0 M	[1]	
12" DIP Pipeline	$0.71 M	$707,924	1.23 Miles
8" DIP Pipeline	$0.70 M	$696,160	1.80 Miles
	$27.4 M		
A/P:6%, 30Y	0.0726		
	$1.99 M/Y		
Annual O&M	$1.50 M/Y	Based on Source [1] + $100,000 for pumping	
	$3.49 M/Y		
Annual Reclaimed	2240.0 AFY	320 AFY for users	(All users listed in above table)
	$1,557.89 /AFY		

Scenario 3

4 MGD Plant	$37.2 M	[1]	
12" DIP Pipeline	$1.42 M	$1,415,848	2 x Scenario 2 Miles
8" DIP Pipeline	$1.40 M	$1,396,361	1.80 Miles
	$40.0		
A/P:6%, 30Y	0.0726		
	$2.90 M/Y		
Annual O&M	$2.40 M/Y	Based on Source [1] + $200,000 for pumping	
	$5.30 M/Y		
Annual Reclaimed	3360.0 AFY	4 MGD at 75% of the time	
	$1,578.84 /AFY		

Source:

[1] Final Draft, "Hunters Point Shipyard Decentralized Wastewater Treatment Study", San Francisco Public Utilities Commission, Oct 2004