AGENDA REPORT

Meeting Date: August 18, 2015

Item Number: D-8

To: Honorable Mayor & City Council

From: Trish Rhay, Assistant Director of Public Works Services, Infrastructure & Field Operations

Michelle Tse, Senior Management Analyst

Subject: RESOLUTION OF THE COUNCIL OF THE CITY OF BEVERLY HILLS APPROVING THE BEVERLY HILLS WATER ENTERPRISE PLAN

Attachments: 1. Resolution

RECOMMENDATION

Staff recommends City Council adopt the Resolution of the Council of the City of Beverly Hills approving the Water Enterprise Plan.

INTRODUCTION

During the August 18, 2015 Study Session, staff provided supplemental information as requested by the City Council during the Water Enterprise Plan review process. The Water Enterprise Plan is a 10-year framework that defines the strategy related to the City's water supply and identifies the portfolio of actions and projects needed to meet this long term goal.

DISCUSSION

The Public Works Commission ("Commission") worked with consultant PSOMAS to review various water alternatives and strategies based on numerous considerations such as cost, reliability, implementation, local control, legal/institutional regulations, environmental factors and operational complexity. As a result of this process, the Commission felt that greater consideration should be given towards improving the City's water system reliability.

As part of the pre-analysis, the Commission agreed to reduce the City's reliance on MWD to 75% and increase the City's water supply reliability by looking at alternative water sources. This recommendation resulted from feasibility of water supply

technologies and cost effectiveness. Furthermore, the Commission agreed that the reliable water supply alternatives be further evaluated based on affordability. Based on the goal of a 25% non-MWD sourced supply reliability target, the Water Enterprise Plan includes capital projects for local groundwater development, water banking, and water conservation programs and reduced water purchases from Metropolitan Water District. The Commission's recommendation was presented to the City Council at its May 18, 2015 meeting. Supplemental information was presented to the City Council during the August 18, 2015 Study Session. If the City Council approves the Resolution, the document signifies the City Council's approval of the Water Enterprise Plan.

FISCAL IMPACT

Approval of the Resolution means the City Council is approving the Water Enterprise Plan framework. Costs related to each capital project identified in the Plan will be subject to separate review and approval by the City Council.

Approved By
Don Rhoads

Approved By
George Chavez

Attachment 1

RESOLUTION NO. ____

RESOLUTION OF THE COUNCIL OF THE CITY OF BEVERLY HILLS APPROVING THE BEVERLY HILLS WATER ENTERPRISE PLAN

WHEREAS, the City Council recognizes the significance for developing a ten year water plan strategy with the overall objective towards achieving greater water system reliability;

WHEREAS, the City Council acknowledges the importance of a diversified portfolio that achieves flexibility in water management for any given supply condition;

WHEREAS, the City receives approximately 90% of its water supply from Metropolitan Water District;

WHEREAS, the goal of the Water Enterprise Plan is to increase its non-Metropolitan Water District sourced supply by 25% in ten years;

WHEREAS, various water sources alternatives were evaluated and recommended by the Public Works Commission based on numerous considerations such as cost, reliability, implementation, local control, legal/institutional regulations, environmental factors, and operational complexity;

WHEREAS, the water source alternatives identified to achieving the greatest water system reliability includes local groundwater development, increased water conservation efforts, water banking, and gradually reducing water purchases from Metropolitan Water District to 75%; and

NOW AND THEREFORE, the Council of the City of Beverly Hills does hereby resolve as follows:

Section 1. The City Council hereby adopts the Water Enterprise Plan, in the form attached as Exhibit A hereto, which includes a ten year strategy towards increasing the City's water system reliability.

Section 2. The City Council of the City of Beverly Hills, California, hereby directs the Director of Public Works Services, or his or her designee, to implement the programs and strategies to the maximum extent possible.

Section 3. The City Council hereby determines that the public interest and necessity justify the adoption of the Beverly Hills Water Enterprise Plan.

Section 4. The City Clerk shall certify to the adoption of this resolution and shall cause this resolution and this certification to be entered in the Book of Resolutions of the council of the City.

Adopted:

JULIAN A. GOLD, M.D.
Mayor

ATTEST:

(SEAL)

BYRON POPE
City Clerk

APPROVED AS TO FORM:

LAURENCE S. WIENER
City Attorney

APPROVED AS TO CONTENT:

FOR

GEORGE CHAVEZ
Director of Public Works Services

EXHIBIT A

WATER ENTERPRISE PLAN

PSOMAS

City of Beverly Hills

Water Enterprise Plan

July 2015

CITY OF BEVERLY HILLS

WATER ENTERPRISE PLAN

JULY 2015

Prepared by:

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CITY OF BEVERLY HILLS WATER ENTERPRISE PLAN

EXECUTIVE SUMMARY

The Water Enterprise Plan recommends implementing the following water supply portfolio as presented by City staff at the May 18, 2015 Beverly Hills City Council meeting (these items are listed in no particular order):

1. **Optimizing the Current Hollywood Basin Production** – Improving the City's existing reverse osmosis plant to match the current Hollywood Basin well production potential of 1,120 acre-feet per year (AFY); this should be achievable through corrective actions at the plant and shallow groundwater development now being studied by other consultants under City staff direction. This action should be achievable within a two-year time frame. There is currently $2 million budgeted to develop two shallow groundwater wells at 342 Foothill Road. The City also recently awarded a project in the approximate amount of $2.3 million for rehabilitation of the reverse osmosis plant. The City is also working with Hazen and Sawyer to improve and optimize current operational processes within the plant and wells.

2. **Develop New Central Basin Wells** – Develop approximately 1,700 AFY of new groundwater in the unadjudicated portion of the Central Basin near Interstate 10, approximately four miles from Beverly Hills. Developing new wells in this area will be considerably more economical than developing new wells in the Hollywood Basin due primarily to anticipated low production rates in the Hollywood Basin (approximately 200-300 gallons per minute (gpm) per well vs. about 800 gpm in the Central Basin). Developing three new Central Basin wells will take approximately seven to eight years with an estimated cost ranging from $26.5 M to $56.9 million (in 2015 dollars).

   Significant aspects of this project include the following:

   - Retaining a design consultant;
   - Acquiring land for an initial site;
   - Drilling a pilot test hole that will be converted to a production well;
   - Addressing California Environmental Quality Act (CEQA) requirements;
   - Acquiring land for designing, drilling, and equipping two additional production wells;
   - Designing expanded treatment facilities and 24,000 feet of transmission pipelines;
   - Constructing all of the above facilities; and
   - Testing and permitting all three wells and treatment facilities.

3. **Increase Water Conservation** – Meet the conservation goals as outlined in SBx7-7[1], which is to reduce the per capita urban water use by 20 percent by December 2020, and strive to achieve additional conservation beyond mandated goals. By implementing a multi-pronged strategy including public/quasi-public analytic engagement programs (for parks, schools, civic center, greenbelts, hotels, etc.), residential analytic engagement programs, system loss reduction and operations programs, and enhanced rebate programs, the City should be able to realize nearly

[1] This 2009 legislative package requires a statewide 20% reduction in urban per capita water use by 2020. It requires that urban water retail suppliers determine baseline water use and set reduction targets according to specified requirements, and requires agricultural water suppliers prepare plans and implement efficient water management practices (definition extracted from the Association of California Water Agencies website).

1,200 AF in additional conservation over the next five years. All of the aforementioned conservation programs can be commenced over a six to twelve month period. Estimated costs range from $1.5 million to $3.2 million (in 2015 dollars).

4. **Water Banking** – Invest in a groundwater storage bank such as Willow Springs Water Bank, located in the Antelope Valley, to address a potential two-year shortage of 3,400 AF. This would provide the City with reserves in the event Metropolitan Water District (MWD) supplies are severely impacted by a lengthy drought. Subject to availability of purchased water (to place into the bank), this program can be set up within two years. Preliminary cost estimates for this approach are approximately $5.0 million to $7.6 million (in 2015 dollars). The variance in cost range is due to the varying nature in how water banking operations are set up.
5. **Metropolitan Water District (MWD)** – Continue to rely on MWD for purchase of approximately 75 percent (approximately 8,485 AFY) of City supplies. The estimated cost for this supply will be approximately $11 million annually.
6. **Water Resources Manager** – Although not a water supply alternative, consideration should be given to addressing a critical need by hiring a full-time water resources manager to oversee, manage and successfully execute the various strategies outlined in the Water Enterprise Plan.
7. **Water Conservation Administrator** – Consideration should be given to hiring a Water Conservation Administrator at this time.
8. **Additional City Staff Positions** – Consideration should also be given to hiring three senior engineering project managers, three water treatment plant operators, one pump/well mechanic, one pump/well electrician and one water distribution operator. All of these positions should be phased in over the next several years as the need arises.

In the event the above program does not result in Beverly Hills meeting its supply demands during a severe drought, the City could still purchase additional MWD water at penalty rates (approximately 2.5 times the current rate), subject to availability. While this water would be fairly expensive, it would nevertheless be less expensive than developing water under other short term options.

Based on the above-referenced framework, the City has the potential to decrease its MWD purchases from the current 12,495 AFY to approximately 8,485 AFY by FY 2024/25.

In addition to the water supply alternatives outlined above, the Public Works Commission recommends the City give consideration to incorporating projects such as the recycled water (purple pipe) system as part of the ongoing Santa Monica Boulevard street rehabilitation. The intent is to build infrastructure that will further support the City's conservation efforts when future recycled water infrastructure becomes available.

Additional detail on the above recommendations can be found in the Summary of Findings, Conclusions and Recommendations, which follows this Executive Summary and in the individual Technical Memorandums included in this Water Enterprise Plan.

Summary of Ten-Year Estimated Costs Recommended Portfolio

Ten-Year Projected costs were evaluated for the above recommend portfolio. In doing so, a three percent compounded annual inflation rate was factored in and escalated over the ten–year period (unless noted otherwise in the detailed spreadsheets presented in Appendix D). The ten-year costs also include projected operation and maintenance expenditures. In recognition of the preliminary nature of these estimates, high and low ranges for the projected costs utilizing widely accepted guidelines established by the AACE (formerly known as the Association for the Advancement of Cost Engineering) are presented

below. Those AACE suggest using (-30 percent) and (+50 percent) for the low and high ends of the range, respectively, for planning level projects in which no preliminary or final engineering design has been performed.

Additionally, ten-year cost spreadsheets for MWD water purchases and staffing were created. The MWD costs are based on MWD's currently adopted ten-year rates. Given that these are adopted rates (although still subject to change), no additional inflation factor was included. Staffing costs were also escalated by three percent per year (except as noted in Appendix D); however, the AACE high and low range factors to them were not applied to the projected staffing costs.

The overall ten-year escalated costs for the recommended portfolio are summarized in the Table 1 below. All costs have been rounded to the nearest $1,000. More refined estimates can be developed as feasibility studies and preliminary and final design documents are developed for the recommended projects.

Water banking costs shown in Table 1 exclude any up-front buy-in costs and assume Beverly Hills staff and their consultants can identify a water bank that will allow the City to join without payment of any such costs. If that is not possible, such buy-in costs could be $2.7 million or more. In that event, those buy-in costs should be added to the dollar amounts shown in this line item. Water banking costs are presented as a sample of current estimated costs to join the Willow Springs Water Bank (WSWB). The City is encouraged to initiate discussions and/or commence negotiations with WSWB and other applicable water banks to better define the exact costs associated with participation in a water bank.

ES Table 1

Summary of 10-Year Escalated Costs for the Recommended Portfolio

Proposed Portfolio Scenario	Sum of 10-Year Escalated Costs (Rounded to Nearest $1,000)
1. Water Conservation	$2,132,000
2. Water Banking	$5,042,000
3. Groundwater Development (La Brea Sub-Basin)	$37,919,000
4. *Subtotal of Items 1 though 3*	$45,082,000
5. MWD Water Purchases	$105,693,000
6. Staffing	$16,903,000
7. Subtotal of Proposed Portfolio Scenario (Items 4 + 5 + 6)	$167,689,000
Subtotal Less MWD and Staffing (Item 7 – Item 5 – Item 6)	$45,093,000
Low Range Cost (Item 4 – 30% plus Items 5 & 6	$154,161,000
High Range Cost (Item 4 + 50% plus Items 5 & 6)	$190,236,000

CITY OF BEVERLY HILLS WATER ENTERPRISE PLAN

SUMMARY OF FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

I. INTRODUCTION

Psomas was retained by the City of Beverly Hills on May 20, 2014 to prepare a Water Enterprise Plan (WEP) in conjunction with a series of interactive presentations and workshops with City staff and the Beverly Hills Public Works Commission (PWC). This summary encapsulates the fourteen Technical Memoranda (TM) comprising the City of Beverly Hills' 2015 WEP – they include the following presentations and/or workshops:

- June 12, 2014 – Initial presentation and facilitated discussion with PWC and staff
- September 11, 2014 – PWC Workshop 1: Screening of Water Resource Options
- October 9, 2014 – Continuation and completion of PWC Workshop 1
- January 8, 2015 – PWC Workshop 2: Finalize Alternatives for 10-Year Water Enterprise Plan
- January 13, 2015 – WEP Status Briefing with City Council
- January 22, 2015 – Continuation and completion of PWC Workshop 2

In addition to the above-referenced workshops and presentations, Psomas' WEP management staff also attended PWC meetings on July 8, August 13, November 13, and December 11, 2014; February 12 and February 26, 2015; and City Council meetings on April 21, 2015 and May 5, 2015. Psomas' WEP Management staff also attended the May 18, 2015 City Council meeting at which the WEP was adopted, as well as more than a dozen working meetings with City staff over the past 16 months.

Working with City staff and the PWC, Psomas produced and presented five TMs to the PWC between November 2014 and February 2015:

1. TM No. 1: Review of Beverly Hills Water Supply Alternatives and Recommendations for Proceeding with Further Detailed Analysis (including matrices and technical appendices)
2. TM No. 2: Emergency Storage Evaluation
3. TM No. 3: City Staff Augmentation Required to Address Water Enterprise Plan Recommendations
4. TM No. 4: Ten-Year Estimated Costs for Nine-Shortlisted Alternatives Including a Summary of Proposed Portfolio Scenario Costs
5. TM No. 5: Comparison of Ten-Year Estimated Costs for Nine-Shortlisted Alternatives with MWD Water Purchases in Lieu of Implementing those Alternatives (Note: this TM was originally named TM No. 4a)

These TMs are summarized below and included, in their entirety as Appendices A, B, C, D, and E to this WEP. Please note, at City staff request, all costs referenced in TM No. 4 were updated on August 7, 2015 to reflect new water conservation, water banking and staffing cost data that was not available when this TM was originally presented to the PWC. These updated costs are included in Appendix D.

Nine additional TMs were prepared during March, April, and May 2015:

6. TM No. 6: Establishing the Optimum Reliability Goal
7. TM No. 7: Central Basin Well Development
8. TM No. 8: Firming-up Hollywood Basin Groundwater
9. TM No. 9: Water Banking
10. TM No. 10: Water Conservation
11. TM No. 11: Metropolitan Water District (MWD)
12. TM No. 12: Recommended Water Supply Portfolio
13. TM No. 13: Long Term Water Supply Strategies and Recommendations
14. TM No. 14: Other Recommendations

These TMs are also summarized below, and are provided in their entirety in the sections, which follow this Summary.

II. REVIEW OF CITY OF BEVERLY HILLS WATER SUPPLY ALTERNATIVES AND RECOMMENDATIONS FOR PROCEEDING WITH FURTHER DETAILED ANALYSIS – TM NO. 1 (APPENDIX A)

We evaluated 19 potential water supply alternatives for increasing the reliability of the City's water system and/or conservation measures aimed at reducing system demands. These 19 alternatives are grouped into the following three categories:

- Twelve Baseline Water Supply Alternatives – These options included Metropolitan Water District (MWD) Supply, three Groundwater Development Options (Central Basin Wells, Hollywood Basin Wells and Spring Water Capture), three Recycled Water options (Regional, Scalping Plant and Greywater Approaches), three Reverse Osmosis Capture and Treatment options (for treating 4.5, 3.0 or 1.5 Million Gallons per Day [MGD]), Urban Runoff Capture and Treatment; and Ocean Desalination;

- Five Water Supply "Insurance" Alternatives – These options do not represent direct sources of water, but can provide reserve sources of supply into which the City can tap during times of drought, thereby increasing the overall reliability of the City's water supply. These included Water Banking, Transfers, Potable Water Exchanges, Recycled Water Exchanges and Antelope Valley Water Bank Drought Insurance; and

- Two Conservation Alternatives – These two options included Compliance with SBx7-7[1] and Tailoring a Conservation Plan to the Unique Characteristics of the City of Beverly Hills. (Note: these two alternatives were eventually combined into a single water conservation alternative.)

Please refer to Appendix F for one-page placement summaries of each of the 19 alternatives.

Eight criterion measures were identified for use in comparing the 19 alternatives. They included: Cost, Volume, Reliability, Timing, Local Control, Legal/Institutional, Environmental and Operational Complexity. Our project team, with input from City staff, assigned values to these criteria for each of the 19 alternatives. Overall weightings were then applied to each of the eight criteria categories to allow ranking of the 19 alternatives. A comprehensive Excel spreadsheet was developed to allow changes to be easily made to the values and weightings to determine how those changes would impact the overall rankings (See TM1 and accompanying Appendix to TM1 in Appendix A to this report).

While an infinite number of permutations could have been considered, we evaluated ten widely varying Weighting Scenarios. These Weighting Scenarios were developed in consultation with the PWC and City Staff. These scenarios included: (1) All eight criteria equally weighted; (2) "Timing" was eliminated from consideration with the other seven criteria equally weighted; (3) Cost, volume, and reliability were equally weighted with the other five criteria eliminated from consideration; (4, 5, 6 and 7) Four separate scenarios in which either cost, environment, reliability, or volume were weighted three times higher than the other seven criteria; (8) Cost, volume, reliability, and environment were weighted three times higher than the other criteria, with timing eliminated; (9) Volume, reliability, and local control were weighted three times higher than the other criteria with timing eliminated; and (10) Volume, reliability, local control, and environment were weighted five times higher than the other criteria with timing eliminated.

Based on the results of this analysis, we recommend proceeding with detailed evaluations of the following nine alternatives:

- MWD,
- Water Banking,
- Conservation (Tailored)
- Conservation (Mandated by Senate Bill SBx7-7)
- Development of Central Basin Wells
- Development of Hollywood Basin Wells
- Antelope Valley Drought Insurance,
- Potable Water Exchanges, and
- Ocean Desalination.

[1] This 2009 legislative package requires a statewide 20 percent reduction in urban per capita water use by 2020. It requires that urban water retail suppliers determine baseline water use and set reduction targets according to specified requirements, and requires agricultural water suppliers prepare plans and implement efficient water management practices (definition extracted from the Association of California Water Agencies website).

These nine alternatives consistently appeared among the top ranked alternatives for each of the ten weighted scenarios. The other ten alternatives consistently appeared in the bottom ten ranked alternatives regardless of which scenario was considered. The latter ten alternatives, with the concurrence of City staff and the PWC, were eliminated from further consideration.

III. EMERGENCY STORAGE EVALUATION – TM NO. 2 (APPENDIX B)

Although not directly tied to the WEP, the PWC requested that we evaluate the City's existing emergency reservoir storage and make recommendations to expand that storage, if appropriate. In response to that request, we first determined that the City's water distribution system includes ten active reservoirs located within thirteen pressure zones. Approximately 90 percent of Beverly Hills' water supply comes from two connections off of MWD's 54-inch diameter supply pipeline, which is typically fed from the Santa Monica Feeder and occasionally from the Sepulveda Feeder. The remaining 10 percent of the water supply comes from groundwater pumped from the City's four existing wells and then treated at the City's reverse osmosis treatment plant prior to distribution to water customers.

Water distribution systems rely on stored water for three major purposes including (1) helping equalize fluctuations between supply and demand (operational storage); (2) supplying sufficient water for firefighting (fire storage); and (3) meeting demands during an emergency or an unplanned outage of a major source of supply (emergency storage). In assessing the City system's significant reliance on imported water supply, we also considered MWD's recommended guideline, which calls for providing seven days of regional storage, during periodic shutdown of their feeders.

To determine what amount of additional storage may be required to meet this MWD 7-day guideline, we obtained total reservoir capacity and system demand data from the City's 2002 Water System Master Plan (WMP) and the 2010 Urban Water Management Plan. We then calculated emergency storage capacity using data summarized in Summary Table 1 below:

Summary Table 1
Summary Water System Data

Data	Value
Reservoir	(in MG)
Fire Storage	3.78
Operational Storage	2.76
Emergency Storage	36.46
Total Volume	**43.00**
Demand	
Average Daily Demand (ADD) in MGD	11.2
Maximum Daily Demand (MDD) in MGD	18.4
Groundwater Supply	
Water Treatment Plant (MGD)	1.1

Based on the Average Daily Demand (ADD) condition, the time required to fully deplete the emergency storage (36.46 MG) is approximately 3.5 days. This duration represents the amount of time the associated

demands can be sustained using only production from the wells/treatment plant and emergency storage. If service is to be maintained beyond this 3½ day period, the system demands must be reduced or an alternative supply source must be employed to maintain service at ADD flows.

To increase system durability, two additional scenarios were considered. The first scenario assumes the City will increase capacity of the existing water treatment plant (WTP) to its maximum. Based on the 2002 WMP, the full capacity of the plant is 2.7 MGD. Also, mandatory conservation measures should be implemented during such a short-term emergency condition, with a resultant significant reduction in water demands. Our analysis assumes a reasonable short-term ADD reduction of 40 percent. Using these factors, the City's emergency storage would last for approximately 7.8 days during off-peak periods (generally October through March), which exceeds MWD's 7-day guideline.

While this evaluation shows that an increase in the WTP capacity contributes to the sustainability of service in the event of an MWD outage, a more significant effect can be achieved by reducing system demand on a short-term emergency basis. This can be accomplished by advising residential and business customers within the first day or two of an emergency to curtail irrigation for the duration of the outage.

If the City wishes to provide enough emergency reservoir storage capacity to meet a seven-day demand during peak demand periods (generally April through September), while still assuming a 40 percent reduction in demand due to conservation efforts and a doubling of the current WTP capacity, then the City should consider the feasibility of adding 35.0 MG in storage to the existing system (i.e., in addition to the City's existing 43.0 MG in storage capacity).[2]

IV. CITY STAFF AUGMENTATION REQUIRED TO ADDRESS WATER ENTERPRISE PLAN RECOMMENDATIONS – TM NO. 3 (APPENDIX C)

The City currently imports an average of 90 to 95 percent of its water supply from MWD. To increase the City's supply reliability, we recommend reducing dependence on MWD to 75 percent. To accomplish this objective, we recommend implementing a series of water supply portfolio options including: (1) Developing three new wells in the unadjudicated Central Basin; (2) Addressing ongoing problems with the City's existing Reverse Osmosis (RO) Water Treatment Plant to allow treating water produced from two recently approved shallow groundwater wells in the Hollywood Basin; (3) Participating in a Water Bank allowing the City access to stored water during a drought; and (4) Implementing water conservation programs required to address State conservation legislation as well as mandatory conservation cutbacks associated with the ongoing drought.

Implementing these recommendations is projected to require augmenting current City staff levels with eleven new full-time positions including a Water Resources Manager, a Water Conservation Administrator, three Engineering Project Managers, three Water Treatment Plant Operators, a Pump/Well Mechanic, a Pump/Well Electrician, and a Water Distribution Operator. The first five positions are recommended to be filled beginning in the 2015/16 Fiscal Year. The remaining six positions should be filled once the new facilities (wells, pipelines, pumping plants, treatment plant upgrades, etc.) begin to come on-line in 2017/18.

[2] To avoid nitrification issues associated with large storage reservoirs, the 35 MG should be spread over several storage reservoirs.

V. TEN-YEAR ESTIMATED COSTS FOR NINE-SHORTLISTED ALTERNATIVES INCLUDING A SUMMARY OF PROPOSED PORTFOLIO SCENARIO COSTS – TM NO. 4 (APPENDIX D)

At the request of the PWC, we developed a series of spreadsheets identifying estimated costs over the next ten years for the nine shortlisted alternatives including the recommended Water Enterprise Plan portfolio.

In considering the actual costs that would be incurred for each of the nine shortlisted alternatives, we assumed a three percent compounded annual inflation rate over the ten-year period and escalated all costs by that factor (unless otherwise noted in the spreadsheets included in Appendix D), including projected operation and maintenance expenditures. In recognition of the preliminary nature of these estimates, we provided high and low ranges for the projected costs utilizing widely accepted guidelines established by the AACE (formerly known as the Association for the Advancement of Cost Engineering). Those guidelines suggest using (-30 percent) and (+50 percent) for the low and high ends of the range, respectively, for planning level projects in which no preliminary or final engineering design has been performed.

Additionally, we created ten-year cost spreadsheets for MWD water purchases and for staffing. The MWD costs are based on MWD's currently adopted ten-year rates. Because these are adopted rates (although still subject to change), we did not include any additional inflation factor. We escalated staffing costs by three percent per year, but did not apply AACE high and low range factors to them.

The overall ten-year escalated costs for the recommended portfolio are summarized in Summary Table 2 on the next page. Detailed copies of the respective spreadsheets are included in Appendix D.

Please note the costs reflected in Summary Table 2 were updated at City staff request on August 10, 2015 to include new financial information for water conservation, water banking and staffing, which was not available in January 2015 when TM No. 4 was originally presented to the PWC.

More refined estimates for each of the portfolio recommendations can be developed as feasibility studies and preliminary and final design documents are developed for the recommended projects. Water banking costs can be refined once the City begins negotiations with available water banks.

The costs presented in this and other TMs were developed over a one-year time frame and have been reviewed and discussed with City staff, Publics Works Commission and the City Council. The costs presented in the Executive Summary and Summary of Findings are the final costs and may vary from those in the TMs.

Summary Table 2

Annual Cost Summary For Recommended Portfolio[1]

	FISCAL YEAR										Total Rounded to Nearest $1,000
	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21	2021/22	2022/23	2023/24	2024/25	
Water Conservation	$ 348,550	$ 285,703	$ 281,404	$ 158,719	$ 163,480	$ 168,385	$ 173,436	$ 178,639	$ 183,998	$ 189,518	$ 2,132,000
Water Banking	$ -	$ 43,775	$ 1,262,471	$ 1,300,345	$ 47,834	$ 49,269	$ 50,747	$ 1,099,753	$ 1,132,746	$ 55,453	$ 5,042,000
Groundwater Development (LBSB)	$ 200,000	$ 2,446,000	$ 1,777,000	$ 2,841,000	$ 9,792,000	$ 9,390,000	$ 2,924,000	$ 2,766,000	$ 2,849,000	$ 2,934,000	$ 37,919,000
MWD Water Purchases	$ 10,723,750	$ 10,814,963	$ 10,234,680	$ 10,378,185	$ 10,551,264	$ 10,928,540	$ 11,360,160	$ 9,816,804	$ 10,231,146	$ 10,653,948	$ 105,693,000
Staffing	$ 763,561	$ 950,473	$ 1,709,761	$ 1,760,559	$ 1,812,881	$ 1,866,772	$ 1,922,280	$ 1,979,454	$ 2,038,342	$ 2,098,998	$ 16,903,000
Total	$ 12,035,861	$ 14,540,914	$ 15,265,316	$ 16,438,808	$ 22,367,459	$ 22,402,966	$ 16,430,623	$ 15,840,650	$ 16,435,233	$ 15,931,917	$ 167,689,000
								Subtotal (less MWD and Staffing)			$ 45,093,000
									Low Cost[2]	(- 30 %)	$ 154,161,000
									High Cost[2]	(+ 50%)	$ 190,236,000

[1] Costs are escalated at 3% annually, compounded with the exception of MWD Water Purchases which use MWD's currently adopted 10-year rates.
[2] Low and High Cost range calculated on sub-total of Water Conservation, Water Banking, and Groundwater Development only with MWD Water Purchase and Staffing Costs (no range applied) added directly.

VI. COMPARISON OF TEN-YEAR ESTIMATED COSTS FOR NINE SHORTLISTED ALTERNATIVES WITH MWD WATER PURCHASES IN LIEU OF IMPLEMENTING THOSE ALTERNATIVES – TM NO. 5 (APPENDIX E)

At the PWC's request, based on the information originally presented in TM No. 4, we determined the City's costs for purchasing MWD water in lieu of the proposed portfolio recommendations. We determined ten-year escalated costs for each of the proposed portfolio scenarios originally presented in TM No. 4. The actual cost the City would pay for additional MWD water is subject to possible wide fluctuation depending on whether the City is paying MWD's Tier 1 rates or penalty rates during MWD allocations. With this in mind, we estimated both low and high ranges for the MWD purchase costs based on the Tier 1 rate (the low range) and the penalty rate (the high range).

Summary Table 3 below summarizes costs for purchasing additional MWD water at both Tier 1 and penalty rates, if such water had to be purchased in lieu of implementing the designated alternative.

Summary Table 3

Comparison of 10-Year Escalated Alternative Costs with MWD Water Purchases

Proposed Portfolio Scenario	Annual Water Volume	Sum of 10-Year Escalated Costs (Rounded) for Implementing the Noted Alternative	10-Year MWD Purchase Cost Based on Tier 1 Rates (Rounded)	10-Year MWD Purchase Cost Based On Penalty Rates (Rounded)
Water Conservation (including Water Conservation Coordinator Salary)	Increases from 195 AFY in Year 1 to 1,180 AFY in Years 6-10 (Refer to Supporting Tables)	$2,132,000	$10,700,000	$34,100,000
Water Banking	1,700 AFY in Years 8 and 9 only	$5,042,000	$4,000,000	$12,800,000
Groundwater Development (La Brea Sub-Basin)	0 AFY in the first seven years; 1,708 AFY in years 8-10	$37,919,000	$6,200,000	$19,700,000
Continued Use of the Hollywood Basin	800 and 400 AFY in Years 1 & 2; 1,120 AFY in Years 3-10	Costs Indeterminate (Refer to Appendix E for further information)	$11,100,000	$35,200,000

It is important to keep in mind the primary intent of the WEP, i.e., to identify potential alternative water supply sources to increase the overall reliability of the City's water system. Over the years, MWD has always been a reliable source of supply for the City, but given the ongoing drought, the current 15 percent cutback in allocations, which took effect on July 1, 2015, and the potential for even higher future cutbacks, it is in the City's best interests to continue to seek alternatives for reducing the amount of water currently imported from MWD.

VII. ESTABLISHING THE OPTIMUM RELIABILITY GOAL – TM NO. 6

Utilizing available information, we established an optimum reliability goal for the City. The first step in establishing this optimum reliability goal was identifying the City's Senate Bill SBx7-7 mandated water demands in the year 2025 as 11,313 AFY. The next step was to review historical precipitation records for the past 120 years, which identified ten separate periods of drought ranging in length from three to seven years. While ten separate drought periods were identified, MWD only implemented mandatory cutbacks during two of those periods (17 and 10 percent cutbacks during the 1987-92 and 2007-09 droughts, respectively). MWD's Board also took action on April 15, 2015 to implement a new 15 percent cutback in allocated water effective on July 1, 2015. And lastly, the impacts of climate change and continued population growth within MWD's service area were taken into consideration. These combined factors portend higher percentage cutbacks by MWD in future years.

For the City to maintain water supply reliability at the established goal of 11,313 AFY in the face of probable MWD supply cutbacks in excess of 17 percent, alternative water sources must be independently developed. Recognizing that it would behoove the City to develop water supply sources that could exceed supply MWD supply cutbacks, we evaluated opportunities to develop independent water resources at both 25 and 40 percent levels. Twenty-five percent independence will require development of three new Central Basin groundwater wells along with expansion of the City's existing water treatment plant and construction of related transmission mains. The three new wells will eventually provide the City with approximately 1,708 AFY in new water. That 1,708 AFY, coupled with the 1,120 AFY of potential groundwater production from the existing and planned shallow groundwater wells in the Hollywood Basin, will supply approximately 25 percent of the City's total water demand by 2025 (this represents an approximate 15 percent increase over historical groundwater production over the past 20 years). Jumping from 25 percent to 40 percent independence will require development of three additional Central Basin wells (a total of six new wells) at an added cost of approximately $24 M. The additional $24 M is not cost-effective and the Central and Hollywood Basins may not be able to sustain the additional required production (another 1,700 AFY) needed to achieve 40 percent independence from MWD. A 25 percent optimum independent reliance goal is therefore recommended. Exceeding that level of independence will not be cost-effective.

VIII. CENTRAL BASIN WELL DEVELOPMENT – TM NO. 7

Historically, the City has developed groundwater in the La Brea Subarea (LBSA) of the unadjudicated portion of the Central Basin. The City has undertaken an evaluation process to review and enhance potential water supply alternatives that includes the development of groundwater in the Central Basin.

The current estimate for production from the LBSA is approximately 2,000 AFY (1,700 AFY net after treatment). Preliminary calculations indicate that three wells would be required, each producing approximately 800 gpm. The preliminary location for these wells would be similar to the area where the City historically operated wells near the confluence of Ballona Creek and U.S. Interstate 10 Freeway. In addition to the wells themselves, a forebay and pump station and approximately 23,000 feet of pipeline would be required to transport water from the production wells to the City's existing treatment plant. This source of water supply would increase reliability of the water delivered to the City.

Preliminary work, including a feasibility study and pilot test well study, could be completed in two years. Final design, construction, and system testing/permitting would require an additional five years. Assuming work commenced in January 2016, the system should be able to supply drinking water by 2023. Total cost for implementation is expected to range between $24M and $36M (in 2015 dollars).

IX. FIRMING-UP HOLLYWOOD BASIN GROUNDWATER – TM NO. 8

We evaluated development of shallow groundwater resources within the Hollywood Basin. Such development using new production wells was recently evaluated in a study conducted by Richard C. Slade & Associates LLC (RCS 2009). The concept was that shallow groundwater was not being captured by existing production wells and that continued production from parking garage dewatering systems could be utilized as a potential source of available groundwater (RCS 2009). The study estimated that flow from two new wells proposed to capture this groundwater would produce 0.6 MGD or approximately 400 gpm.

The City's treatment plant has sufficient capacity to treat the additional water supplied by the two new proposed shallow groundwater wells. The earliest that shallow groundwater could be supplied to the treatment plant from these two proposed wells would be January 2017 with an estimated cost of $1,500,000 (2009 dollars).

X. WATER BANKING – TM NO. 9

We evaluated the option of water banking for the City. A water bank stores a large volume of water to help meet shortfalls in supply caused by drought or catastrophe in the Bay-Delta, thus improving the City's water supply reliability. There are a number of existing water banks in Southern California, mostly located in Kern County, that have capacity available for purchase. Water banking is a long-term investment and is not intended to be part of a regular annual water supply. Water stored in a water bank should be purchased when the overall water supply is plentiful and surplus water is available for purchase and storage. Delivery to the City will take place by wheeling the water through the lower reaches of the State Water Project through MWD's water transport infrastructure. Approximately two years will be required to identify and negotiate a contract with a suitable water bank and another three to five years to purchase water and divert it to the identified bank for storage. As previously noted, water banking costs can vary depending on a variety of factors, current opportunities appear to exist for participation in some banks without payment of any up-front buy-in costs. The City is encouraged to initiate discussions and/or commence negotiations with applicable water banks to better define the exact costs for such participation.

XI. WATER CONSERVATION – TM NO. 10

The City is committed to meet the water conservation goal established by the requirements of Senate Bill SBx7-7, where certain per-capita water use targets are established for the year 2020. Meeting this goal will require an estimated 1,175 AFY reduction in current usage over the next six years. A cost-effective water conservation program tailored to the unique characteristics of Beverly Hills' water service area has been developed to meet this requirement. This recommended water conservation program consists of four major elements including: (1) an analytic/public engagement program for public and quasi-public customers; (2) an analytic/public engagement program for single family residential customers; (3) a system loss reduction/operational enhancement program; and (4) an enhanced supplemental rebate program. Additionally, we also recommended supplementing City staff by hiring a Water Conservation Administrator.

XII. METROPOLITAN WATER DISTRICT – TM NO. 11

The City began purchasing water from MWD in 1941-42. Purchases of MWD water supplemented the City's own groundwater production, which was the City's primary water supply source. In 1970 MWD water purchases began to exceed the City's groundwater production, a trend which has continued to this

day. In 1976, the City ceased operating its original water treatment plant and all of its wells. The wells remained out of service until 2003 when a new groundwater treatment plant and four wells were placed into operation. Since the new treatment plant came on line in 2003, the City has, on average, met 91.5 percent of its water demands through MWD purchases with the remaining 8.5 coming from City groundwater production. MWD water is still the most cost-effective supply source, but concerns over the ongoing drought and its impact on the future reliability of MWD's supply suggest it would be prudent for the City to identify alternative sources of supply to reduce its dependence on the regional water wholesaler.

XIII. RECOMMENDED WATER SUPPLY PORTFOLIO – TM NO. 12

TM Nos. 1, 2, and 4 describe the process used in evaluating, shortlisting, and recommending a water supply portfolio for the City. Nineteen initial alternatives were studied from which a shortlist of nine options was developed. Further refinement of that shortlist, including identifying estimated capital, operation and maintenance costs over the next ten years resulted in the following recommended water supply portfolio:

1. **Groundwater** – Developing three new groundwater wells capable of producing a total of approximately 1,700 AFY (net production) in the unadjudicated portion of the Central Basin.
2. **Water Treatment** – Rehabilitating the City's existing reverse osmosis water treatment plant to allow efficient treatment of water produced from two recently approved shallow groundwater wells and four existing City wells in the Hollywood Basin.
3. **Water Bank** – Participating in a regional water bank, allowing the City to access stored water during severe drought conditions.
4. **Water Conservation** – Implementing a Water Conservation program complying with both Senate Bill SBx7-7 and tailored to the unique characteristics of Beverly Hills.
5. **Metropolitan Water District (MWD)** – Continuing to rely on MWD purchases to meet the majority of the City's water demands.
6. **City Staffing** – Augmenting current City staff levels with eleven new full time positions to help implement the recommended water supply portfolio.

XIV. LONG TERM WATER SUPPLY STRATEGIES AND RECOMMENDATIONS – TM NO. 13

There are a number of short- and long-term actions the City can take over the coming years to keep abreast of opportunities to enhance the City's water supply picture. Short-term actions include monitoring and applying for available grants, abiding by the requirements of the Sustainable Groundwater Management Act of 2014, initiating discussions aimed at participation in a water bank, notifying the City of Los Angeles of the City's interest in participating in a future recycled water program when future construction approaches Beverly Hills, and staying on top of water rights issues and cessation filings. Long-term actions include revisiting the WEP at least every ten years (and possibly more frequently) and participating in the Los Angeles Recycled Water Program when transmission facilities approach Beverly Hills.

XV. OTHER RECOMMENDATIONS – TM NO. 14

Other recommendations include those relating to hiring a Water Resources Manager (or Water Czar) and the potential installation of "purple recycled water pipe" along a 1.8-mile segment of Santa Monica Boulevard in conjunction with a proposed street improvement project along that corridor.

The Water Resources Manager will be responsible for implementing the WEP, representing the City before all regional, state and federal agencies with jurisdiction over the City's water operations, and working effectively with other City Department Managers. He/she will also develop and recommend the water operations budget, assist in recommending water rates, oversee preparation of grant applications, participate in community outreach activities, and respond to and resolve citizen enquires and complaints. The ideal candidate should be a proven, innovative water resources leader skilled in infrastructure management, sustainability, and diversity. He/she should have a strong general knowledge in both water treatment and groundwater development and be able to appropriately interact and collaborate with project management experts in those two fields. The Water Resources Manager should also have strong written and verbal communication skills, be willing to embrace and implement change, and possess the needed skills to motivate employees and promote a customer service-oriented culture with the City's Water Department.

The City also has an opportunity to install "purple recycled water pipe" along a 1.8-mile stretch of Santa Monica Boulevard as part of a proposed street improvement project in that area. While no recycled water is currently available in this area, installing purple pipe now as part of the pending street improvements will avoid having to disrupt these same streets in future years. Construction options include replacing the entire existing irrigation system or just replacing those portions of the system that lie within street intersections (while deferring the construction of new piping in parks and medians to some future time when recycled water is available). Depending on the option chosen, conceptual level construction costs could range from $0.8M to $2.1M. This plan would entail placing potable water in new purple pipe until recycled water becomes available in this area. With that in mind, the City must obtain permission from the State Division of Drinking Water before proceeding with the installation of purple pipe.

XVI. FINANCIAL FORECAST

City staff prepared a financial forecast utilizing WEP recommendations summarized in this Executive Summary. That financial forecast was not a part of Psomas' scope of work and was therefore not incorporated into this report.

PSOMAS

TECHNICAL MEMORANDUM NO. 6

To: City of Beverly Hills – Trish Rhay, George Chavez and Steve Bucknam

From: Harvey R. Gobas, PE

Date: May 19, 2015

Subject: Establishing the Optimum Reliability Goal

EXECUTIVE SUMMARY

Utilizing available information, we established an optimum reliability goal for the City of Beverly Hills. The first step in establishing this optimum reliability goal was identifying the City's Senate Bill SBx7-7 mandated water demands in the year 2025 as 11,313 AFY. The next step was to review historical precipitation records for the past 120 years, which identified ten separate periods of drought ranging in length from three to seven years. While ten separate drought periods were identified, MWD only implemented mandatory cutbacks during two of those periods (17 and 10 percent cutbacks during the 1987-92 and 2007-09 droughts, respectively). MWD's Board also took action on April 15, 2015 to implement a new 15 percent cutback in allocated water effective on July 1, 2015. And lastly, the impacts of climate change and continued population growth within MWD's service area were taken into consideration. These combined factors portend higher percentage cutbacks by MWD in future years.

For the City to maintain water supply reliability at the established goal of 11,313 AFY in the face of probable MWD supply cutbacks exceeding 15 percent, alternative water sources must be independently developed. Recognizing that it would behoove the City to develop water supply sources that could exceed MWD supply cutbacks, we evaluated opportunities to develop independent water resources at both 25 and 40 percent levels. Twenty-five percent independence will require development of three new Central Basin groundwater wells along with expansion of the City's existing water treatment plant and construction of related transmission mains. The three new wells will eventually provide the City with approximately 1,708 AFY in new water. That 1,708 AFY, coupled with the 1,120 AFY of potential groundwater production from the existing and planned shallow groundwater wells in the Hollywood Basin, will supply approximately 25 percent of the City's total water demand by 2025 (this represents an approximate 15 percent increase over historical groundwater production over the past 20 years). Jumping from 25 percent to 40 percent independence will require development of three additional Central Basin wells (a total of six new wells) at an added cost of approximately $24 M. The additional $24 M is not cost-effective and the Central and Hollywood Basins may not be able to sustain the additional required production (another 1,700 AFY) needed to achieve 40 percent independence from MWD. A 25 percent optimum independent reliance goal is therefore recommended. Exceeding that level of independence will not be cost-effective.

INTRODUCTION AND OBJECTIVES

To establish the optimum water supply reliability goal for the City of Beverly Hills, it is first necessary to determine current and projected demands. Historic City water demand data for the years 1996 through 2014 was referenced in our January 8, 2015 Workshop No. 2 presentation to the City's Public Works Commission (refer to Appendix I). Average annual demands during that period varied between approximately 11,000 AFY and 14,000 AFY, with an actual demand in the most recent full year (2013/14) of 12,269 AF. The SBx7-7 water conservation legislation passed by the State Legislature and signed into law by the governor in 2009 mandates a 20 percent reduction in per capita water usage by

December 31, 2020 and a 10 percent interim reduction by December 31, 2015. The legislation allows several methods for calculating baseline usage from which targeted conservation goals can be established.

BACKGROUND INFORMATION

Beverly Hills' baseline water usage was determined to be 289.1 gallons per capita per day (gpcd) based on actual water usage during the ten-year period from 1996 through 2005 (Refer to Appendix J – Summary Water Production and Consumption FY 2007-14). A 20 percent reduction in that amount translates to a per capita usage of 231.3 by 2020 and an interim per capita usage of 260.2 by December 31, 2015. The City's actual per capita usage in the most recent full year (2013/14) was 255.6 gpcd, which is below the mandated targeted usage for 2015. Based on current and projected population estimates for the City's water service area (including the portion of West Hollywood served by Beverly Hills), the City's annual targeted demand for 2020 is 11,188 AFY. Factoring in an allowance for a slight increase in population between 2020 and 2025 will increase the targeted demand to 11,313 AFY by 2025.

The question now becomes, "How much of the anticipated 11,313 AFY 2025 demand can the City reasonably expect to produce?" To answer this question, it is necessary to first answer the following questions:

1. What balance between "independence from MWD" and seeking drought year reliability should the City strive for?
2. What is the depth of drought against which the City should be hedging?
3. What are the costs and tradeoffs of developing new supplies?
4. Is there a desire to use MWD water as the City's primary water supply when it is available?
5. Given the time it will take to develop new local water resources (five to ten years), are other near-term steps warranted?
6. How much supply diversity does Beverly Hills want to manage?

To provide historic perspective for these questions, we looked at California statewide precipitation records over the past 120 years (1895-2014). Those records revealed ten separate multi-year droughts varying in length from three to seven years. Until the MWD Board of Directors took action to set a 15 percent allocation reduction on April 14, 2015 (taking effect July 1, 2015), MWD has only implemented a reduction in water sales in five of the ten previous drought periods. One was a voluntary reduction (1976-77); two were mandatory reductions (17 percent in 1987-92 and 10 percent in 2007-09); and two were water supply alerts (2000-02 and the current drought). This historical data indicates there has never been a cutback from MWD exceeding 17 percent, which would suggest that any consideration of independence percentages should at least start at that 17 percent threshold. However, it would also be wise to take other factors into consideration, including the effects of climate change and the impacts of population increases throughout MWD's service area, and their resultant impacts on water demands. These additional impacts suggest cutbacks in future years will probably exceed those implemented over the past 120 years. While good demand management by MWD will help lower the risk of shortages, it is unlikely those risks will be eliminated. Given these additional impacts, it would be prudent to plan for something more than 17 percent independence from MWD.

The Intergovernmental Panel on Climate Change (IPCC) suggests the Colorado River Basin (from which MWD obtains a large portion of its supply) is likely to become drier and experience more severe

droughts.[1] Other recent studies also project stream flow changes in the Colorado River ranging from less than 10 percent to 45 percent by the middle of the 21st century.[2] And lastly, tree ring research conducted by the Woods Hole Oceanographic Institute suggests there is no three-year period over the past 1,200 years during which California's rainfall has been as low, and its temperatures as hot, as they have been from 2012-2014.[3] These climate change factors further suggest a reason to increase "independence" from MWD above the historical 17 percent cutbacks.

If the City does not supplement its supply with any additional water sources by 2025, but relies only on its existing four Hollywood Basin wells and two newly approved shallow groundwater wells with a total projected groundwater supply of 1,120 AFY[4], the balance of the projected SBx7-7 year 2025 demand of 11,313 AFY would have to be met by water purchased from MWD. That balance equates to 10,193 AFY. Assuming a potential 20 percent allocation cutback means a reduction in available MWD supplies from 10,193 AFY to 8,154 AFY. That supply, together with the 1,120 AFY of groundwater production from the Hollywood Basin, results in a total available supply of 9,274 AFY under this scenario, or an effective shortage of 18 percent over and above the year 2025 demand.

If the City were to develop an additional 1,000 AFY in groundwater supplies from the nearby unadjudicated portion of the Central Basin, the City would only need to purchase 9,193 AFY from MWD to meet the year 2025 11,313 AFY demand. A 20 percent allocation MWD cutback in that amount would reduce available imported supplies to 7,384 AFY. That imported supply, coupled with a total groundwater production of 2,120 AFY (1,120 AFY from the Hollywood Basin wells and 1,000 AFY from the new Central Basin wells), sums to 9,474 AFY, which would meet 84 percent of the year 2025 demand (9,474/11,313), thus resulting in an effective shortage of 16 percent.

On the other hand, if the City also implemented some "extraordinary supply" options such as water banking, MWD's current allocation formulas allow exclusion of those extraordinary supplies from the determination of available baseline supply. For example, it the City obtained 1,000 AFY from water bank participation during a drought year, MWD's calculation of a 20 percent allocation cutback (from an assumed typical year supply of 10,193 AFY) would result in a total available supply of 8,154 AFY year, assuming 1,120 AFY would still be developed from the Hollywood Basin. The 8,154 AFY plus the 1,120 AFY from the Hollywood Basin and the 1,000 AFY from water banking, translates into an effective shortage of only 9 percent. ([8,154 + 1,120 + 1,000]/11,313) thus, pointing out the additional benefit of developing "extraordinary supply" sources.

Returning now to the six questions posed above, we can begin to formulate some answers.

1. What balance between "independence from MWD" and seeking drought year reliability should the City strive for? *It should be something more than previous year's highest historical cutback (17 percent), which also takes the impact of population increases and the probable effects of climate change into account.*

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[1] Proceedings of the National Academy of Sciences, December 14, 2010 – http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3003012/

[2] American Meteorological Society January 2014 Journal – http://journals.ametsoc.org/doi/abs/10.1175/BAMS-D-12-00228.1

[3] Article published by the American Geophysical Union, December 2014 – http://onlinelibrary.wiley.com/doi/10.1002/2014GL062433/pdf

[4] Assumes rehabilitation of the City's existing groundwater treatment plant to allow treatment of up to 1,120 AFY.

2. What is the depth of drought against which the City should be hedging? *Something more than past droughts, based on the previously noted factors.*
3. What are the costs and tradeoffs of developing new supplies? *A significant and practical source of new supply is the development of new groundwater wells in the unadjudicated portion of the Central Basin. Taking into account the potential production from three new wells (around 1,708 AFY) and the costs associated with developing those wells (approaching $24M including feasibility studies, CEQA analyses, preliminary and final design, land acquisition, pilot wells, drilling and equipping the wells, expanding the treatment plant to treat the additional groundwater, and constructing related transmission mains) reveals a significant investment will be required to provide this additional supply. Developing additional wells (over and above these three) will result in significant additional costs, which cannot be economically justified. It is therefore prudent to consider developing three new wells in the Central Basin, but no more than that, given the high costs of groundwater development.*
4. Is there a desire to use MWD water as the City's primary water supply when it is available? *Yes, MWD water is the most cost-effective supply source and should be used when available.*
5. Given the time it will take to develop new local water resources (five to ten years), are other near-term steps warranted? *Yes, the City should consider possible participation in a water bank. This will provide some measure of drought relief in the short term before some of the longer term supply sources can be brought on-line and will also add more beneficial "extraordinary supplies" to the City's supply portfolio.*
6. How much supply diversity does Beverly Hills want to manage? *Adding too many sources to the supply mix also adds more complexity and increases the level of staffing required to manage those sources. The recommended supply portfolio should include additional groundwater development, which can be treated at an expanded water treatment plant, implementation of new water conservation measures and consideration of participation in a water bank.*

FINDINGS AND CONCLUSIONS

Based on the previously-referenced information, the City should strive to achieve more independence from MWD by developing water supplies that would exceed a 17 percent reduction in delivery of MWD-supplied water. Development of three additional groundwater wells in the Central Basin will supply approximately 1,708 AFY of additional water over and above the 1,120 AFY potential production from existing and planned Hollywood Basin wells. Meeting the Year 2025 demand of 11,313 AFY will therefore require the balance of the City's supply be imported from MWD. That equates to 8,485 AFY (11,313 – [1,708 + 1,120]), which is approximately 75 percent of the City's demand. That translates into 25 percent independence from MWD. Possible participation in a water bank as well as additional conservation (over and above SBx7-7 requirements) will serve to increase the City's overall independence from MWD by increasing the overall reliability of the City's water supply portfolio.

We also looked at the possibility of increasing independence from MWD from 25 to 40 percent. That will require production of another 1,700 AFY of new water. Under this scenario, the City's total groundwater production capability would be about 4,525 AFY (approximately 3,405 AFY from new wells in the Central Basin and 1,120 AFY from existing and planned wells in the Hollywood Basin). Unfortunately, there are a couple of major problems associated with this scenario. First, it is unknown, and at best, problematic, whether or not the two groundwater basins could sustain an annual production as high as 4,525 AFY. Secondly, this scenario would require developing a total of six new wells in the Central Basin

at an additional cost of approximately $24M (over and above the $24M required to develop the first three new wells). These additional expenditures are not cost-effective and are therefore not warranted.

RECOMMENDATION

The City of Beverly Hills should establish a goal of 25 percent independence from MWD. Higher levels of reliability are not cost-effective due to the significant additional costs associated the infrastructure required to implement those higher levels.

PSOMAS

TECHNICAL MEMORANDUM NO. 7

To: City of Beverly Hills – Trish Rhay, George Chavez and Steve Bucknam

From: Harvey R. Gobas, PE and Michael P. Donovan, PG, CHg

Date: May 19, 2015

Subject: Central Basin Well Development

EXECUTIVE SUMMARY

Historically, the City has developed groundwater in the La Brea Subarea (LBSA) of the unadjudicated portion of the Central Basin. The City has undertaken an evaluation process to review and enhance potential water supply alternatives that includes the development of groundwater in the Central Basin.

The current estimate for production from the LBSA is approximately 2,000 AFY (1,700 AFY net after treatment). Preliminary calculations indicate that three wells would be required, each producing approximately 800 gpm. The preliminary location for these wells would be similar to the area where the City historically operated wells near the confluence of Ballona Creek and U.S. Interstate 10 Freeway (see Appendix K). In addition to the wells themselves, a forebay and pump station and approximately 23,000 feet of pipeline would be required to transport water from the production wells to the City's existing treatment plant. This source of water supply would increase reliability of the water delivered to the City.

Preliminary work, including a feasibility study and pilot test well study, could be completed in two years. Final design, construction, and system testing/permitting would require an additional five years. Assuming work commenced in January 2016, the system should be able to supply drinking water by 2023. Total cost for implementation is expected to range between $24M and $36M (in 2015 dollars) (see Table 7-1).

INTRODUCTION AND OBJECTIVES

This technical memorandum provides an overview of the proposal to develop groundwater from the unadjudicated portion of the Central Basin as an alternative source of water for the City. Historically, the City has developed groundwater in the LBSA of the unadjudicated portion of the Central Basin. However, production from the LBSA was discontinued in 1976 (see Appendix K) and the City chose to largely rely on water purchased from MWD. The City has undertaken an evaluation process to review and enhance potential water supply alternatives. Development of groundwater in the Central Basin is one of those alternatives.

The objective of this memorandum is to provide a conceptual design basis for the development of groundwater in the LBSA that will guide future feasibility, design, and planning requirements.

BACKGROUND INFORMATION

The development of groundwater from the LBSA using three new production wells is based on the City's historical production from the LBSA (see Appendix K). Several groundwater aquifers are present within the Central Basin (see Appendix K) and the U.S. Geological Survey (USGS) has estimated average natural recharge into the adjacent Hollywood Basin (which discharges to the LBSA) at over 6,000 acre-feet per year (AFY) (see Appendix K). The current estimate for production from the LBSA would be

approximately 2,000 AFY. Preliminary calculations indicate a requirement for three wells, each producing approximately 800 gpm. The preliminary location would be similar to the previously installed wells near the intersection of Ballona Creek and the U.S. Interstate 10 Freeway. The concept would also require approximately 23,000 feet of pipeline from the production wells back to the existing treatment plant located at the Department of Public Works facility and depicted in Figure 7-1.

The treatment plant would need to expand its current capacity for finished total blended potable water of 2.35 million gallons per day (MGD) to 3.90 MGD. Based on preliminary information, the treatment plant capacity could be expanded to 4.7 MGD at its current location (see Appendix K).

EVALUATION CRITERIA

Details of the criteria, evaluation, and ranking used to assess the Central Basin water supply alternative are included in *Technical Memorandum No. 1 – Review of Beverly Hills Water Supply Alternatives and Recommendations for Proceeding with Further Detailed Analysis* (see Appendix K). The development of groundwater from the LBSA was ranked overall as No. 4 of the top ten alternatives.

IMPACT ON RELIABILITY

The proposed source of the water supply alternative is unrelated to water delivered by MWD (which largely relies on availability of water from the California State Aqueduct and the Colorado River Aqueduct). The proposed water source relies on natural recharge to underlying aquifers in the unadjudicated portion of the Central Basin. The LBSA, which constitutes a portion of the unadjudicated portion of the Central Basin, contains a quantity of water in storage and also receives (in an average year) approximately 6,000 AFY in mountain front recharge (see Appendix K). Utilization of this source of water supply would increase reliability of the water delivered to the City.

IMPACT ON CITY STAFFING

Developing three new wells in the Central Basin will take approximately seven years from inception to production, City staff will be required to manage design consultants during this extended period. Those staff members will also have to manage the design and construction of other new related infrastructure including pipelines, pumping facilities, and treatment plant upgrades. City staff will also have to manage related CEQA activities, acquisition of required land, testing and permitting. Given the extensive amount of work, we recommend two full time engineering project managers be added to current City staff. Both of these project managers should have a background in well and pipeline design with related construction management experience. These two staff positions will be needed by the beginning of the 2015/16 Fiscal Year.

In addition to the engineering managers, once the first well is in place, the City should augment its current production staff to include one-full-time pump/well mechanic, one full-time pump/well electrician and a full-time water distribution operator. The need for these three positions should commence during the 2017-18 Fiscal Year.

IMPLEMENTATION SCHEDULE

The implementation schedule anticipates that a Feasibility Study/Pilot Well Study could be completed by the end of 2017 with Final Design completed by June of 2019. Construction of the pipeline and wells, treatment plant upgrade, and system testing could be completed by June of 2022. A preliminary implementation timeline is presented in Figure 7-2.

COSTS

The estimated cost to implement the proposed development of groundwater in the LBSA is between $24,000,000 and $36,000,000 in 2015 dollars. Table 7-1 presents a summary of the proposed costs.

Table 7-1
La Brea Subarea Groundwater Development Costs

OPTION	ESTIMATED COST (2015 $)	
	Low	High
Feasibility Study	$600,000	$900,000
Land Acquisition/Pilot Well Study (1	$3,000,000	$4,500,000
CEQA	$300,000	$450,000
Preliminary & Final Design	$1,300,000	$1,950,000
Final Land Acquisition	$2,000,000	$3,000,000
Pipeline Construction	$4,600,000	$6,900,000
RO Plant Upgrade	$7,000,000	$10,500,000
Well Construction (2 additional wells)	$5,000,000	$7,500,000
System Permitting & Testing	$200,000	$300,000
TOTAL	**$24,000,000**	**$36,000,000**

FINDINGS AND CONCLUSIONS

The development of groundwater from the unadjudicated portion of the Central Basin is a viable water supply alternative for the City. The City has historically produced water from the LBSA in the Central Basin and the available quantities of groundwater appear to coincide with the City's desire to increase reliability of its water supply alternatives. A total of 2,000 AFY (1,700 AFY net after treatment) can be developed from the LBSA at a cost ranging from $24M to $36M (in 2015 dollars). It is expected that from start of the Feasibility Study to commencement of operations will take approximately seven years. Prior to implementation, Psomas recommends that a Feasibility Study be conducted to refine various elements of the proposed alternative including but not limited to:

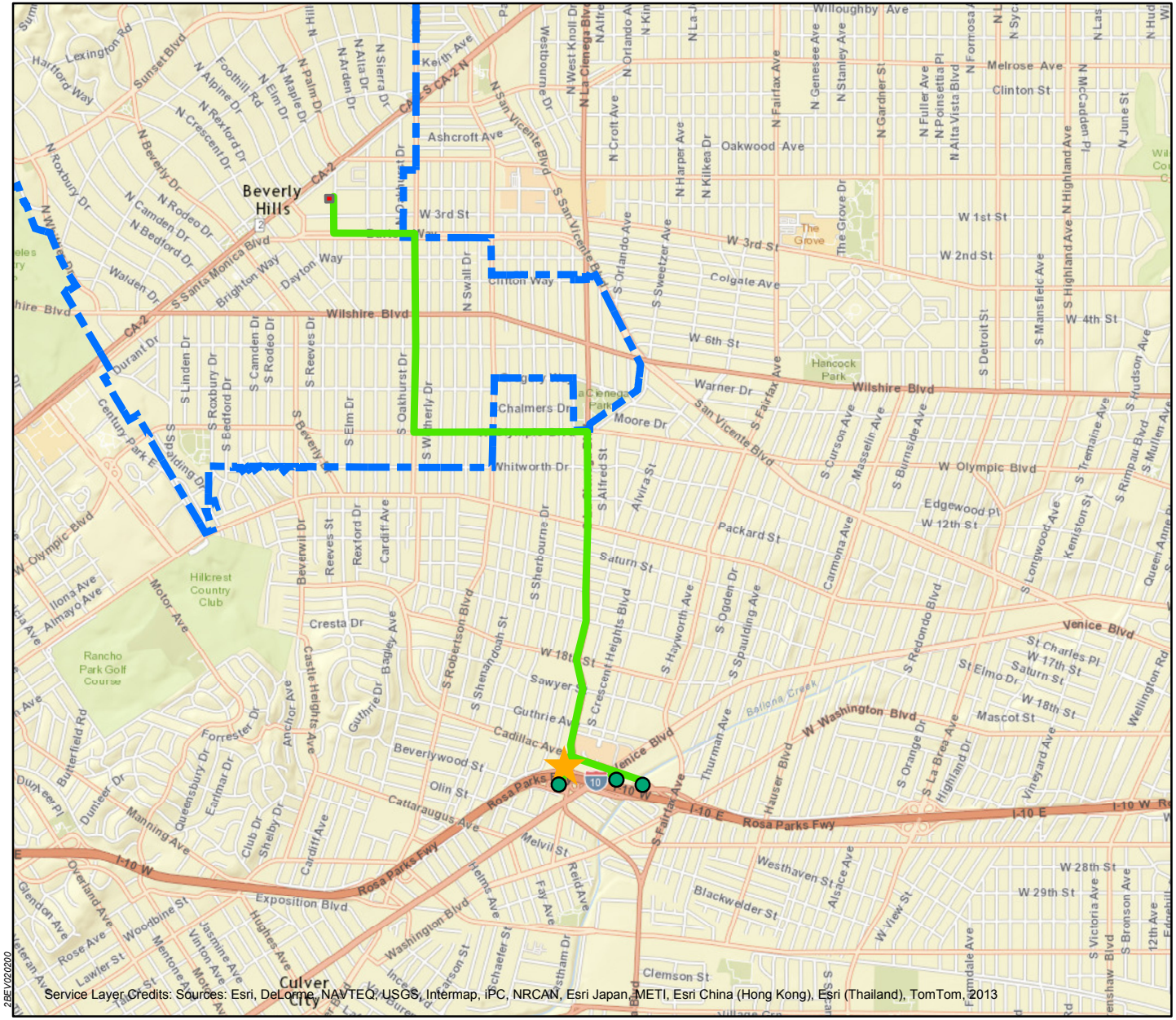
- Identification of probable locations for wells including:
  - Accessibility,
  - Minimum distances from potential sources of contamination as required by California Well Standards (74-81 and 74-90),

    - Minimum distances between production wells
    - Preliminary design of production wells
- Treatment plant upgrade requirements
- Alignment of the pipeline from:
    - The proposed well locations to the forebay/pump station
    - The forebay/pump station to the treatment plant

The Feasibility Study should be coupled with a proposed Pilot Test Well Study that would be used to conduct the following:

- Advance a pilot well (later turned into a production well) that would be used to refine well construction requirements and testing;
- Provide a more thorough understanding of the aquifer production capabilities and the number of wells required to meet system production requirements;
- Provide preliminary water quality data to assist in design of treatment plant upgrade requirements.

Lastly, an evaluation should be made concerning the unadjudicated portion of the Central Basin and compliance with the Sustainable Groundwater Management Act (see Appendix H).



Legend

- City of Beverly Hills City Limits
- New Central Basin Wells
- Existing Treatment Plant
- Forebay and Pump Station
- New Central Basin Pipelines

N W E S

0 1,000 2,000 4,000 6,000 8,000 Feet

CA State Plane, Zone 5, NAD 83

Proposed Location of La Brea Sub-Basin Groundwater Development Facilities

Figure 7.1

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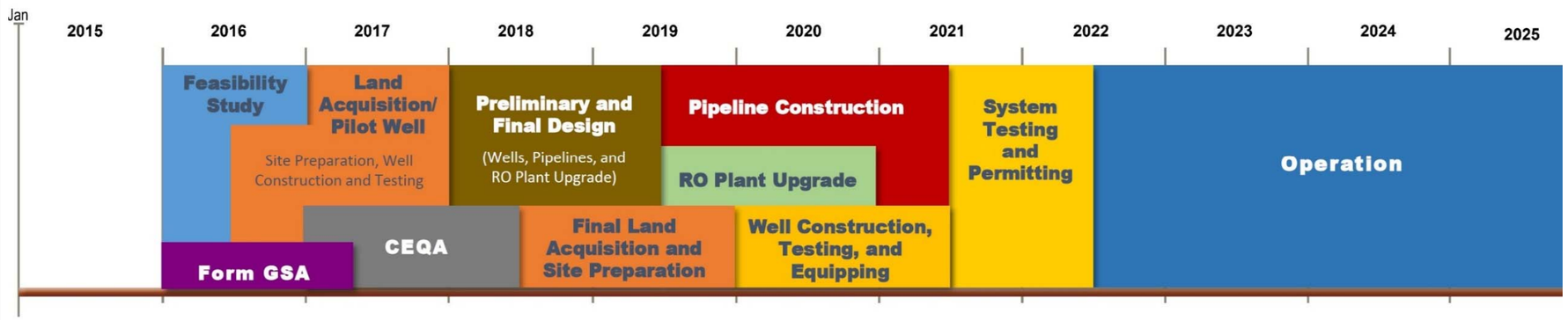


La Brea Subarea Well Implementation Timeline

PSOMAS

Figure 7.2

PSOMAS

TECHNICAL MEMORANDUM NO. 8

To: City of Beverly Hills – Trish Rhay, George Chavez and Steve Bucknam

From: Harvey R. Gobas, PE and Michael P. Donovan, PG, CHg

Date: May 19, 2015

Subject: Firming Up Hollywood Basin Groundwater

EXECUTIVE SUMMARY

The development of shallow groundwater resources within the Hollywood Basin was recently evaluated in a study conducted by Richard C. Slade & Associates LLC (RCS 2009). The concept was that shallow groundwater was not being captured by existing production wells and that continued production from parking garage dewatering systems could be utilized as a potential source of available groundwater (RCS 2009). The study estimated that flow from two new wells proposed to capture this groundwater would produce 0.6 MGD or approximately 400 gpm.

The City's treatment plant has sufficient capacity to treat the additional water supplied by the two new proposed shallow groundwater wells. The earliest that shallow groundwater could be supplied to the treatment plant from these two proposed wells would be January 2017 with an estimated cost of $1.5M (2009 dollars).

INTRODUCTION AND OBJECTIVES

This memorandum provides an overview of the proposal to develop shallow groundwater from the Hollywood Basin as an alternative water supply for the City. Historically, the City has developed groundwater in the Hollywood Basin using deep groundwater wells completed into the San Pedro Formation. RCS (2009) proposed that shallow, municipal-supply water wells near the existing treatment plant could be constructed, tested, and eventually supply water from the shallow zone groundwater system.

The objective of this memorandum is to document the on-going activities for the development of shallow groundwater in the Hollywood Basin. The concept is to provide additional groundwater to the existing treatment plant such that the plant can achieve its design capacity. In the event the quantity of shallow groundwater obtained does not result in achieving maximum output from the existing treatment plant (see TM7 – Central Basin Well Development), that may require modification of the design specifications of other alternatives including the design and planning requirements for the LBSA.

BACKGROUND INFORMATION

The development of shallow groundwater resources within the Hollywood Basin was recently evaluated in a study conducted by Richard C. Slade & Associates LLC (RCS 2009). The concept was that shallow groundwater was not being captured by existing production wells and that continued production from parking garage dewatering systems could be utilized as a potential source of available groundwater (RCS 2009). The study estimated that flow from two new wells proposed to capture this groundwater would produce 0.6 MGD or approximately 400 gpm.

The treatment plant has an existing current input capacity of 1,874 gpm and is currently operating with an input of 1,597 gpm (see TM7 – Central Basin Well Development). The addition of 400 gpm would allow the plant to operate at full capacity.

IMPACT ON RELIABILITY

The source of the proposed water supply alternative will not rely on water delivered by MWD (which largely relies on availability of water from the California State Aqueduct and the Colorado River Aqueduct). The water source relies on natural recharge to underlying aquifers in the Hollywood Basin. The Hollywood Basin contains a quantity of water in storage and receives approximately 5,800 AFY in mountain front recharge (see Appendix L). Tapping this source of water supply would increase reliability of the water delivered to the City.

IMPACT ON CITY STAFFING

It is not anticipated that any additional staff will be required as part of implementation of this proposal.

IMPLEMENTATION SCHEDULE

No schedule for implementation was provided by RCS. As of April 2015, the City has initiated design of the two production wells. Assuming the design can be finalized by June 2015, well installation completed by January 2016, and one year of required testing completed by the California Department of Water Resources, the wells could be ready to supply water to the treatment plant as early as January 2017 (assuming the design and installation of the pipeline is done concurrently with well installation and testing).

COSTS

Costs for implementing the proposed program was estimated at $1,472,800 (RCS, 2009) in 2009 dollars.

FINDINGS AND CONCLUSIONS

Development of a shallow groundwater system in the Hollywood Basin is a potential alternative for supplying water to the existing treatment plant. The design process has been initiated and the project could be online as early as January 2017.

RECOMMENDATIONS

It is recommended that implementation of this program be expedited to ensure that if the planned groundwater is not available, adjustments can be made to the other proposed water supply alternatives to ensure the City's overall water production goals can be achieved.

PSOMAS

TECHNICAL MEMORANDUM NO. 9

To: City of Beverly Hills – Trish Rhay, George Chavez and Steve Bucknam

From: Harvey R. Gobas, PE and John R. Thornton, PE

Date: July 29, 2015

Subject: Water Banking

EXECUTIVE SUMMARY

A water bank stores a large volume of water to help meet shortfalls in supply caused by drought or catastrophe in the Bay-Delta, thus improving the City's water supply reliability. There are a number of existing water banks, mostly located in Kern County, that have capacity available for purchase. Water banking is a long-term investment and is not intended to be part of a regular annual water supply. Water stored in a water bank should be purchased when the overall water supply is plentiful and surplus water is available for purchase and storage. Delivery to the City will take place by wheeling the water through the lower reaches of the State Water Project through MWD's water transport infrastructure. Approximately two years will be required to identify and negotiate a contract with a suitable water bank and another three to five years to purchase water and divert it to the identified bank for storage.

WHAT IS A WATER BANK?

Groundwater banking is a water management tool designed to increase water supply reliability. By using dewatered aquifer space to store water during wet years (years when there is abundant rainfall and surplus water available), it can be pumped and used during dry years (years with little rainfall and no surplus water). Water banking is a long-term investment of 30 years or more so participation in a bank should be a well thought-out decision.

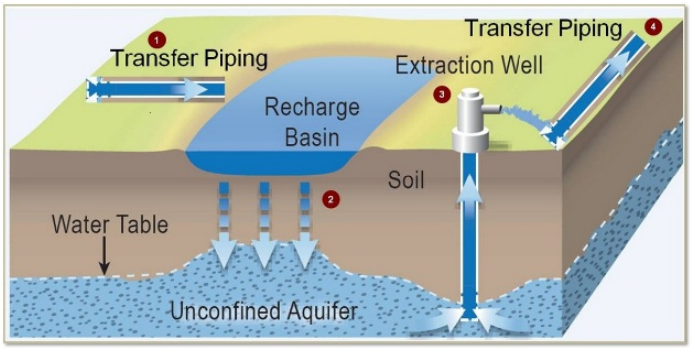


Figure 9-1

Groundwater banking is accomplished through in-lieu and direct recharge. In-lieu recharge is storing water by utilizing surface water "in-lieu" of pumping groundwater, thereby storing an equal amount in the groundwater basin. Direct recharge stores water by allowing it to percolate directly to storage in the groundwater basin. Figure 9-1 depicts how the groundwater banking process works.

Most of the available water banking programs in Southern California are located in Kern County. The map on the next page (Figure 9-2) illustrates the approximate location of the major banking projects.

In wet years when surface water is abundant, the Kern County water banks store water in the groundwater basin primarily through in-lieu recharge. The member district delivers surface water to farmers for irrigation in-lieu (or instead of) pumping groundwater. Surface water can be either State Project Water or runoff from local rivers. The banks also store water through direct recharge. Throughout the member agencies' service area, there are a number of recharge basins where water percolates to the groundwater basin.

CALIFORNIA STATE WATER PROJECT
STATE WATER PROJECT (SWP) FACILITIES
RIVERS
LAKES
CVP CANALS AND AQUEDUCTS
SWP AQUEDUCT
LOCAL EXTENSION
STATE-FEDERAL WATER PROJECT
CVP FACILITIES
STATE WATER PROJECT FACILITIES
STATE-FEDERAL WATER PROJECT FACILITIES
Kern County Groundwater Banking Programs
Willow Springs Water Bank
PACIFIC OCEAN
SAN FRANCISCO
SAN LUIS OBISPO
LOS ANGELES
SAN DIEGO
NORTH BAY AQUEDUCT
SOUTH BAY AQUEDUCT
COASTAL BRANCH AQUEDUCT
EAST BRANCH
WEST BRANCH
EAST BRANCH EXTENSION (UNDER CONSTRUCTION)
Shasta Dam and Lake
Oroville Dam & Lake Oroville
Folsom Dam and Lake
Patterson Dam & Reservoir
Clifton Court Dam & Forebay
Skinner Fish Facility
Banks Pumping Plant
Bethany Dam & Reservoir
Tracy Pumping Plant
Delta-Mendota Canal
O'Neill Dam & Forebay
Dos Amigos Pumping Plant
Friant Dam and Millerton Lake
Friant-Kern Canal
Madera Canal
Devil's Den Pumping Plant
Tank Site 2
Tank Site 1
Tank Site 5
Buena Vista Pumping Plant
Teerink Pumping Plant
Chrisman Pumping Plant
Edmonston Pumping Plant
Tehachapi Crossing
Tehachapi Afterbay
Alamo Powerplant
Oso Pumping Plant
Castaic Dam & Lake Lagoon
Cedar Springs Dam & Silverwood Lake
Devil Canyon Powerplant
Santa Ana Pipeline
Perris Dam & Lake Perris
Reid Gardner Powerplant (Nevada)
Scale in Miles
0 40 80
Kilometers
0 50 100

Figure 9-2

Whenever necessary, the "banked" water is returned to the State Water Project (SWP) to deliver to banking partners by a release of contract entitlement or, in some cases, through "pumpback" to the California Aqueduct. The California Aqueduct, part of the SWP, can deliver water to most of Southern California.

The SWP is water storage and delivery system composed of reservoirs, aqueducts, power plants and pumping plants. Its main purpose is to store water and distribute it to 29 urban and agricultural water suppliers in Northern California, the San Francisco Bay Area, the San Joaquin Valley, the Central Coast, and Southern California. The project delivers water to two-thirds of California's population and is maintained and operated by the California Department of Water Resources.

Participation in a water bank would provide the City with improved overall water supply reliability in times of drought, filling in shortfalls created by a reduction in delivery of MWD-sourced water. Access to a water bank would provide a supplemental water supply outside of MWD.

During wet periods, the City would purchase surplus water. That surplus water would be purchased either from the SWP, MWD, or another provider and then diverted to the water bank for storage. Water would be extracted and delivered to the City in times of drought, a reduction in MWD allocation, or during an outage of one or more wells. However, in most cases, the City would only be able draw out what it banked. Extraordinary supplies such as banked water are exempt from the MWD allocation formula during a period of allocation.

There are several different water banking operational, financial and management models. The example discussed here is from the Willow Springs Water Bank located in the Antelope Valley in southern Kern County. Figure 9-3 to the right is a conceptual illustration of the workings of water banks such as the Willow Springs Water Bank.

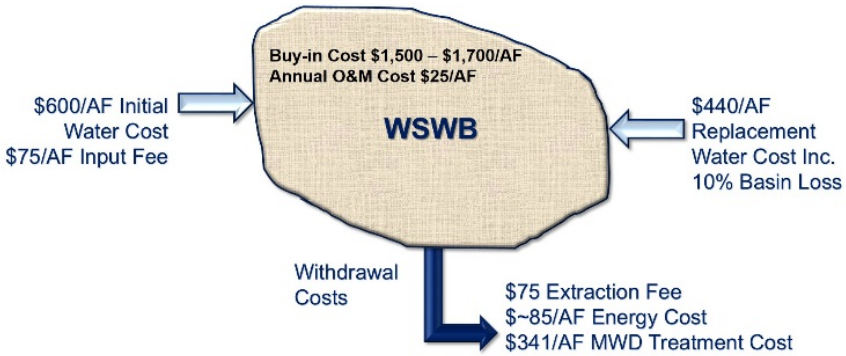


Figure 9-3

Figure 9-4

Water delivery to the City from the water bank would entail pumping from the water bank and transporting the water to the City via the SWP's California Aqueduct to MWD's delivery system, and then to the City. This delivery system is depicted in Figure 9-4 to the left.

COSTS ASSOCIATED WITH WATER BANKING

Table 9-1 shows the estimated costs (as of January 2015) the City would incur by opting to participate in the Willow Springs Water Bank. It should be noted that the costs reflected in Table 9-1 include up-front buy-in costs. However, since January 2015, some potential opportunities to participate in a water bank with no up-front costs have surfaced. Because the water banking market is in a constant state of flux, City staff is encouraged to initiate discussions and/or commence negotiations with potential water banks to better define the actual costs and lock them in.

Table 9-1
Example of Water Banking Cost for Willow Springs Water Bank Over 30 Year Project Life

Notes	Water Banking	Unit Cost	Unit	Initial Capital Cost	Initial Costs Annualized (cost per year)	Total 30 yrs	Draws $, 6 over 30 yrs	Replace, $, 6 over 30 yrs	Total $ over 30 yrs	Cost per AF over life of Proj.
1	Buy in Cost	$1,600	per AF	$2,720,000	$157,298	$4,718,936			$4,718,936	$231
2	Bank Shares	1700	AF							$0
3	Total in Storage	3400	AF							$0
4	Initial Water Purchase	$600	$/AF	$2,040,000	$117,973	$3,539,202			$3,539,202	$173
5	O&M	$25	$/AF/yr		$85,000	$2,550,000			$2,550,000	$125
6	Put or Take	$75	$/AF	$255,000	$14,747	$442,400.26	$1,530,000	$1,530,000	$3,502,400	$172
7	Replacement water	$440	$/AF					$8,976,000	$8,976,000	$440
8	Power	$85	$/AF				$1,734,000		$1,734,000	$85
9	Treat	$341	$/AF				$6,956,400		$6,956,400	$341
10	Life	30	Years							
11	Amortization Rate	0.04	%							
12	No. of Draws	6	# over 30 yrs							
13	No. of Replacements	6								
14	Total # of AF over 30 yrs	20400	AF							
	Totals			$5,015,000	$375,018	$11,250,538	$10,220,400	$10,506,000	$31,976,938	$1,567
	Cost per Acre Foot over 30 Year Project Life = $1,567.50 $/AF									

1	Buy in Cost	$1500-$1600 per AF per share - **NOTE: Buy-in Costs Excluded from Final Cost Analysis Per Request of PWC**
2	Bank Shares	1700 AF in and out allows for storage of 3 times
3	Total in Storage	Total Water Stored or 3400AF
4	Initial Water Purchase	Total water initially stored or 3400AF
5	O&M	Annual O&M based on water stored
6	Put or Take	Fee to put water in and take water out
7	Replacement water	Replace water plus 10% for losses
8	Power	Power cost to extract water
9	Treat	MWD Treatment cost
10	Life	Project life 30 years
11	Amortization Rate	4% per year
12	No. of Draws	12 based on two draw every five years
13	No. of Replacements	12 based on two water replacements every five years
14	Total # of AF over 30 yrs	Total AF extracted over 30 years 6*3400AF.

From this example, with six draws for two years at 1,700 acre feet per year (or 3,400 acre feet for two years) amortized over 30 years, the cost of water would be $1,567 per acre foot.

Other water banks with different operating criteria may not have an initial buy-in cost. In place of the buy-in cost, the bank gets 50% of the water put into storage by bank participants. This could reduce the average cost of water over the 30 year project life by $100-$250 per acre feet.

BANKING RECOMMENDATIONS AND IMPLEMENTATION TIMELINE

It is recommended the City participate in a water banking program to improve overall water supply reliability and offset any water supply shortfalls during drought periods. It will take at least two years to negotiate terms and conditions to join a water bank and make the initial purchase of banking water. It could take an additional three to five years to obtain low cost water to supply the bank. Figure 9-5 depicts the initial timeline for implementing a banking program.

Figure 9-5

PSOMAS

TECHNICAL MEMORANDUM NO. 10

To: City of Beverly Hills – Trish Rhay, George Chavez and Steve Bucknam

From: Harvey R. Gobas, PE and Michael D. Swan, PE

Date: May 19, 2015 / Revised August 10, 2015

Subject: Water Conservation

EXECUTIVE SUMMARY

The City is committed to meet the water conservation goal established by the requirements of Senate Bill SBx7-7, where certain per-capita water use targets are established for the year 2020. Meeting this goal will require an estimated 1,175 AFY reduction in current usage over the next six years. A cost-effective water conservation program tailored to the unique characteristics of Beverly Hills' water service area has been developed to meet this requirement. This recommended water conservation program consists of four major elements discussed in detail below along with the addition of a Water Conservation Coordinator to City staff.

INTRODUCTION AND OBJECTIVES

Water conservation should be a part of every California water agency's portfolio, as permanent reduction in demand stretches existing supply and makes it more reliable. Permanently reducing water demands by ten percent is more effective than obtaining an equivalent amount of additional water supply. And if some of that reduction is inside the home or business, it will also reduce the agency's sewage collection and treatment requirements. With the current focus on drought conditions in California and recent mandates for conservation as well as the SBx7-7 requirement for 20 percent reduction over baseline demands by the year 2020, the City has selected this SBx7-7 water use target as a conservative baseline for year 2020 demand, with hopes the water conservation program will actually result in even lower demands than this target, providing added water supply reliability. This memorandum will develop the amount of conservation required and a water conservation program tailored to Beverly Hills' unique situation to achieve or surpass this 20 x 2020 target.

SBx7-7 WATER USE BASELINE

The first part of developing a water supply portfolio is determining the actual demand being supplied. Early in the WEP process it was determined the mandatory SBx7-7 requirement of 20 percent reduction in demand by 2020 would be the target the City is attempting to achieve. The State Department of Water Resources (DWR) describes different methodologies that can be used to determine an agency's 2020 and interim 2015 targets, which are measured in terms of gallons per capita per day (gpcd). The City's 2010 Urban Water Management Plan (UWMP) developed those targets but some errors were discovered in the values utilized. Therefore, the baseline water use and new targets were re-calculated as a part of the WEP as summarized below (and described in detail in Appendix J).

The City's 2010 UWMP used a population estimate of 34,000 for the City of Beverly Hills and a total water service area population of 45,000, including the 11,000 people of West Hollywood within the Beverly Hills' water service area. State population estimates as of January 1, 2010 (middle of FY 2010)

show a population of 34,136 for Beverly Hills.[1] Using GIS files for the water service area obtained from the City and Census boundary information downloaded from the State's website, the City's water service area boundary was overlaid on the Census Block boundaries. From 2010 Census Block data, a population of 8,043 was generated for the portion of West Hollywood lying within the City of Beverly Hills water service area. Therefore, the total 2010 population within the City's water service area was 42,179 (34,136 + 8,043) and not 45,000 as reported in the 2010 UWMP. Using these revised numbers, the 2020 target conservation goal was recalculated at 231.3 gpcd, with a 2015 interim target of 260.2 gpcd. Using similar methods, the FY 2014 usage was determined to be 255.6 gpcd.

WATER CONSERVATION TARGET / SUPPLY REQUIREMENT

Going forward, Southern California Association of Governments population projections were utilized for Beverly Hills and West Hollywood to determine 2020 service area population. Using the 231.3 gpcd goal, a water supply volume of 11,188 AFY was generated based on a total 2020 water service area population of 43,187. Compared to FY 2014 usage of 255.6 gpcd, a reduction in usage or water conservation savings of 1,175 AFY is generated. This would require water conservation programs to save almost 200 AF of water each year for the next six years to achieve the 2020 per capita target use. Assuming no additional conservation beyond achieving the 231.3 gpcd goal in 2020 and accounting for some population growth, the 2025 water demand is estimated at 11,313 AFY.

RECOMMENDED WATER CONSERVATION PROGRAM

In order to reduce water demand within the service area by approximately 200 AFY each year for the next six years, the following types of programs should be pursued.

1. Analytic/Public Engagement Program for public and quasi-public customers
2. Analytic/Public Engagement Program for single-family residential customers
3. System Loss Reduction/Operational Enhancement Program
4. Enhanced Supplemental Rebate Program

The analytic/public engagement program for public and quasi-public customers targets large landscape irrigation users such as parks, schools, HOAs, and hotels. This program would provide site surveys, recommendations, set water budgets, and track progress/savings. Programs such as these have been shown to achieve 25 to 32 percent savings (estimated at 165 AFY for the City), which could be phased over three to five years.

The residential analytic/public engagement program targets single family households. It uses analytics and customer engagement and has been shown to provide up to 5 percent savings (estimated at 265 AFY for the City), which could be achieved after two years. Then additional savings in future years have been estimated to reach 325 AFY at five years out.

System loss reduction programs also have the advantage of enhancing the efficiency of operation and maintenance functions related to pipeline repair and replacement. These programs target unaccounted-for water or system leaks. The City's water system currently has an approximate 7 percent water loss rate, which could be reduced to 5 to 6 percent, for a savings of approximately 240 AFY over an approximate two-year timeframe from program initiation.

[1] State of California Department of Finance (DOF) E-4 Projections

Enhanced supplemental rebate programs would provide financial incentives, sometimes on top of MWD rebate programs, to encourage water conservation through various programs such as rotary sprinkler nozzle retrofits, smart irrigation controller installations, commercial high-efficiency toilet and waterless urinal installations, residential high-efficiency toilet installations, turf removal/landscape conversions, commercial plumbing, food service and cooling tower retrofits, and high-efficiency residential clothes washers. These enhanced rebate programs are estimated to save almost 100 AFY each and every year they are in effect.

The anticipated savings by program is illustrated in the pie chart below (Figure 10-1) and shown by year in the bar chart that follows (Figure 10-2).

Figure 10-1

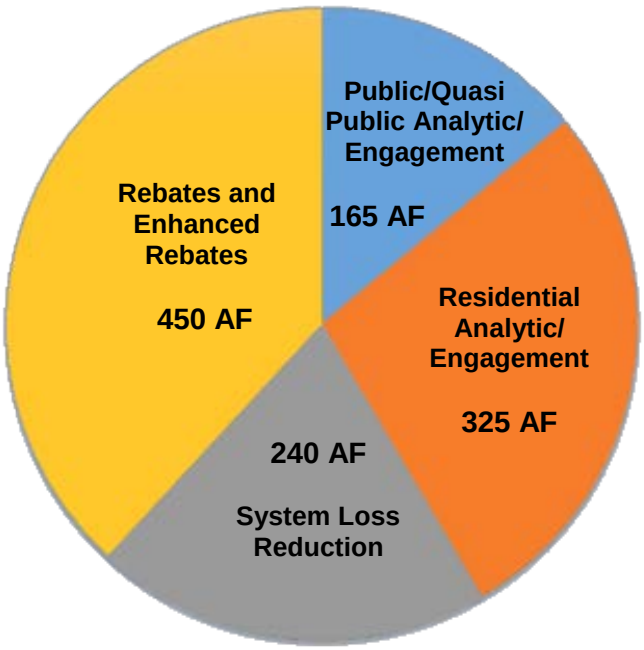
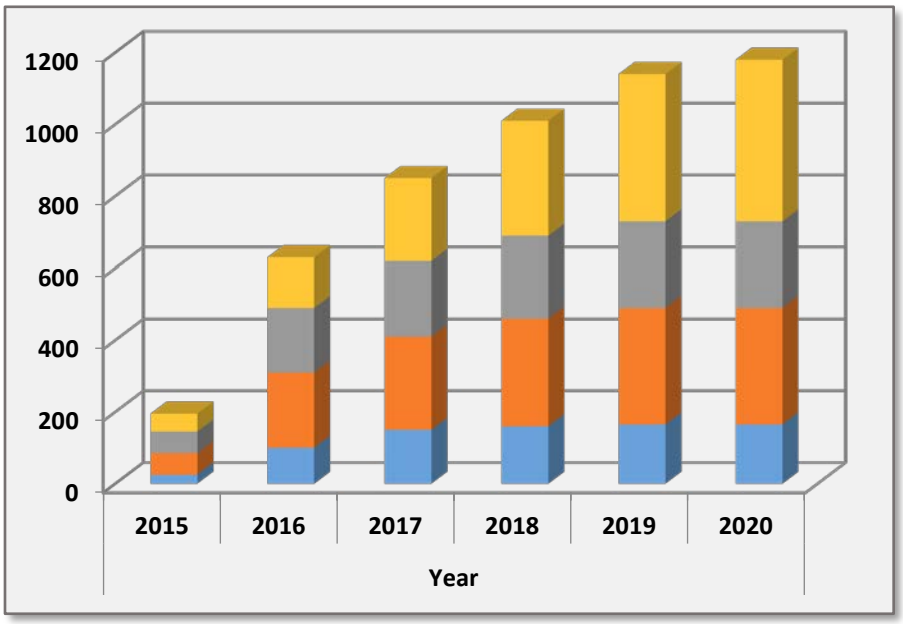


Figure 10-2



IMPACT ON RELIABILITY

The local portions of the City's water supply portfolio coming from groundwater are fairly fixed and not subject to fluctuation due to conditions outside the City's control. These conditions include reductions in imported supply from drought, which is dependent to a large degree on the reliability of the State Water Project and Colorado River Aqueduct systems. The more City demands can be reduced through conservation, the more reliable the City's portfolio will be since a permanent demand reduction will directly reduce the need for imported water, thus reducing the degree of reliance on that source.

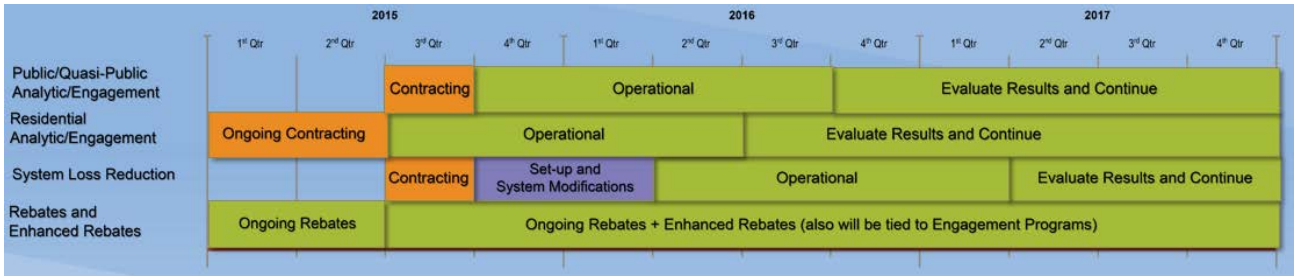
IMPACT ON CITY STAFFING

As a part of the recommended Water Conservation Program, the City should hire a full-time Water Conservation Coordinator. The duties of this position would be to oversee the entire water conservation program including coordinating with MWD on rebates and other conservation programs, analyzing funding sources such as grant programs, and monitoring and reporting progress to City managers, commissions, the Council, and the City's water users, as well as DWR.

IMPLEMENTATION SCHEDULE

Figure 10-3 provides an implementation schedule for the elements of the Water Conservation Program through 2017. These elements are envisioned to continue at least until 2020, but should be continually monitored, evaluated, and revised as necessary to achieve optimal results.

Figure 10-3
Water Conservation Implementation Schedule



COSTS

Costs for the program are summarized in Table 10-1 in 2015 dollars. Costs for the Water Conservation Administrator position include estimated salary and benefits. (Note: At City staff request, staffing costs for the Water Conservation Administrator were subsequently included in the separate staffing costs line items referenced in other sections of this report. At City staff request, $10,950 in water conservation program costs was also moved from FY2015/16 to FY2016/17 to match FY2015/16 budget line item approvals. Costs for the Water System Loss Reduction program are only included for three years as additional water savings beyond that period are thought to be minimal. Additionally, the system loss reduction program also provides operational benefits; if it proves warranted to continue beyond three years it should be funded through the O&M budget. The table only includes costs required to achieve 20 percent conservation goal by 2020. Once that goal has been achieved, it will no longer be necessary to

continue water conservation program spending, unless there is a desire to exceed the mandated 20 percent conservation goal. For that reason Table 10-1 only projects costs through 2020. However, the spreadsheets presented in TM No. 4 include projected water conservation program costs through 2025. These additional costs were included in TM No. 4 spreadsheets to maintain a conservative projection.

Table 10-1
Water Conservation Program Costs (2015 Dollars)

Program	2015	2016	2017	2018	2019	2020
Conservation Coordinator	$140,000	$140,000	$140,000	$140,000	$140,000	$140,000
Public/Quasi-Public Engagement	7,500	4,750	3,250	3,250	3,250	3,250
Residential Engagement	72,000	42,000	42,000	42,000	42,000	42,000
Water System Loss Reduction	180,000	120,000	120,000			
Enhanced Supplemental Rebates	100,000	100,000	100,000	100,000	100,000	100,000
Totals	**$499,500**	**$406,750**	**$405,250**	**$285,250**	**$285,250**	**$285,250**

FINDINGS AND CONCLUSIONS

As summarized in Table 10-1, total costs over the next six years to generate an estimated 1,175 AFY reduction in water demand and come into compliance with SBx7-7 are on the order of $1,800 per acre-foot, which is competitive with the recommended alternative for developing new supply from design and construction of three new Central Basin wells. The City is committed to complying with the SBx7-7 conservation goal by 2020 at a minimum.

RECOMMENDATIONS

Based on the City's commitment to meet or exceed the 20 x 2020 per-capita demand target and the relative cost-effectiveness and reliability benefits associated with the Water Conservation Program, it is recommended that the City proceed with the program described herein. This program should be monitored closely to measure effectiveness in water savings realized and actual costs incurred, as well as public support. Based on the results, adjustments should be made as necessary to ensure the City is making appropriate progress towards meeting or exceeding the SBx7-7 requirements by 2020.

PSOMAS

TECHNICAL MEMORANDUM NO. 11

To: City of Beverly Hills – Trish Rhay, George Chavez and Steve Bucknam

From: Harvey R. Gobas, PE

Date: May 19, 2015

Subject: Metropolitan Water District (MWD)

EXECUTIVE SUMMARY

The City began purchasing water from MWD in 1941-42. Purchases of MWD water supplemented the City's own groundwater production, which was the City's primary water supply source. In 1970 MWD water purchases began to exceed the City's groundwater production, a trend which has continued to this day. In 1976, the City ceased operating its original water treatment plant and all of its wells. The wells remained out of service until 2003 when a new groundwater treatment plant and four wells were placed into operation. Since the new treatment plant came on line in 2003, the City has, on average, met 91.5 percent of its water demands through MWD purchases, with the remaining 8.5 coming from City groundwater production. MWD water is still the most cost-effective supply source, but concerns over the ongoing drought and its impact on the future reliability of MWD's supply suggest it would be prudent for the City to identify alternative sources of supply to reduce its dependence on the regional water wholesaler.

INTRODUCTION AND OBJECTIVES

MWD is a wholesale water agency serving 19 million people in six Southern California counties. MWD was formed in 1928 and is composed of 26 member agencies including both cities and water districts. The City is one of 11 founding members and provides one of the 37 Directors who govern MWD. MWD provides water from the Colorado River and the State Water Project, and also obtains additional supplies from numerous storage, water transfers, exchanges, water banking, and fallowing projects. MWD's available supplies have adequately met its member agency's needs for the past 20 years. However, to cautiously preserve its supplies, MWD imposed allocations in 2009 and will likely impose them again in 2015 to address concerns stemming from the ongoing drought. Additionally, in the event of a severe emergency or a failure to agree on an allocation plan, MWD's Administrative Code requires allocations to be generally distributed based on "preferential rights" or cumulative fixed-fees paid. MWD's total minimum supply, absent impacts of a major earthquake or other natural or man-made disaster, is approximately 1.2 Million AFY. Beverly Hills' preferential rights share of that total supply is about 11,800 AFY.

BACKGROUND INFORMATION

Historically, the City's water supply has come from two sources, groundwater production and imported water purchased from MWD. According to available records, the City began purchasing water from MWD in 1941-42 Purchases of MWD water supplemented the City's own groundwater production, which was the City's primary water supply source. In 1970 MWD water purchases began to exceed the City's groundwater production, a trend which continues to this day. The City took its old groundwater treatment plant out of operation in 1976/77 and ceased pumping groundwater at that time. The City did not begin groundwater production again until 2003, when a new water treatment plant was placed into operation.

Table 11-1 below summarizes actual water supply data for the years 1996 through 2014, split between imported purchases from MWD and groundwater production. As previously noted, one hundred percent of the City's water supply was imported from MWD from 1996 through 2002. As reflected in Table 11-1, MWD water has supplied an average of 94.9 percent of the City's total demand since 1996. Since 2003 (the year the new water treatment plant was placed into service), the City has purchased an average of 91.5 percent of its water from MWD, with the remaining 8.5 percent coming from its own groundwater production.

Table 11-1
City of Beverly Hills Water Supply Breakdown: 1996 – 2014[1,2]

Year	Imported from MWD (in AF)	%	Groundwater Production (in AF)	%	Total Water Production (in AF)	%
1996	13,368	100	0	0	13,368	100
1997	13,659	100	0	0	13,659	100
1998	13,139	100	0	0	13,139	100
1999	13,545	100	0	0	13,545	100
2000	14,093	100	0	0	14,093	100
2001	13,598	100	0	0	13,598	100
2002	13,598	100	0	0	13,598	100
2003	13,178	97.0	405	3.0	13,583	100
2004	12,188	86.8	1,854	13.2	14,042	100
2005	11,918	89.7	1,362	10.3	13,280	100
2006	12,144	91.4	1,142	8.6	13,286	100
2007	12,775	91.2	1,231	8.8	14,007	100
2008	12,179	90.5	1,273	9.5	13,453	100
2009	11,801	93.3	852	6.7	12,653	100
2010	10,474	90.6	1,088	9.4	11,562	100
2011	10,249	92.6	819	7.4	11,068	100
2012	10,495	91.7	944	8.3	11,439	100
2013	11,114	93.4	779	6.6	11,893	100
2014	11,632	94.8	637	5.2	12,269	100
Average % 1996-2014		**94.9**		**5.1**		**100**
Average % 2004-2014		**91.5**		**8.5**		**100**

[1] All years reflect fiscal year data, beginning on July 1st of the prior year and ending on June 30th of the year noted.
[2] Data for years 1996 through 2010 was extracted from the City's 2005 and 2010 Urban Water Management Plans; data for years 2011 through 2014 was provided by City staff.

FINDINGS AND CONCLUSIONS

The primary reason the City has relied on MWD to supply most of its water since 1970 is because MWD water is more cost-effective than the combined cost of pumping and treating groundwater. However, even if groundwater pumping and treatment were more cost-effective, the City's four existing wells are not capable of reliably meeting more than 10 percent of the existing municipal water demand. As noted in TM-7 and TM-8, there are also limits to the amount of groundwater the Central Basin and the Hollywood Basin and can yield, even with the addition of more wells and expansion of the water treatment plant.

RECOMMENDATION

While the ongoing drought has raised concerns over the future reliability of MWD's supply, importing water from MWD is still more cost-effective than relying on alternative sources. Nevertheless, it would be prudent for the City to begin identifying alternative sources of supply that can be tapped in the event MWD begins reducing water allocations to its member agencies in the coming months and years.

PSOMAS

TECHNICAL MEMORANDUM NO. 12

To: City of Beverly Hills – Trish Rhay, George Chavez and Steve Bucknam

From: Harvey R. Gobas, PE

Date: May 19, 2015

Subject: Recommended Water Supply Portfolio

EXECUTIVE SUMMARY

Technical Memoranda Nos. 1, 2 and 4 describe the process used in evaluating, shortlisting and recommending a water supply portfolio for the City of Beverly Hills. Nineteen initial alternatives were studied from which a shortlist of nine options was developed. Further refinement of that shortlist, including identifying estimated capital, operation and maintenance costs over the next ten years resulted in the following recommended water supply portfolio:

1. **Groundwater** – Developing three new groundwater wells capable of producing a total of approximately 1,700 AFY (net production) in the unadjudicated portion of the Central Basin.
2. **Water Treatment** – Rehabilitating the City's existing reverse osmosis water treatment plant to allow efficient treatment of water produced from two recently approved shallow groundwater wells and four existing City wells in the Hollywood Basin.
3. **Water Bank** – Participating in a regional water bank, allowing the City to access stored water during severe drought conditions.
4. **Water Conservation** – Implementing a Water Conservation program complying with both SBx7-7 and tailored to the unique characteristics of Beverly Hills.
5. **Metropolitan Water District (MWD)** – Continuing to rely on MWD purchases to meet the majority of the City's water demands.
6. **City Staffing** – Augmenting current City staff levels with eleven new full time positions to help implement the recommended water supply portfolio.

INTRODUCTION AND OBJECTIVES

The following three Technical Memorandums (TM) provided detailed information on the process employed in identifying, shortlisting and recommending a water supply portfolio for the City of Beverly Hills:

1. TM No. 1 dated November 3, 2014 entitled "Review of Beverly Hills Water Supply Alternatives and Recommendations for Proceeding with Further Detailed Analysis."
2. TM No. 3 dated January 7, 2015 entitled "CBH Staff Augmentation Required to Address Water Enterprise Plan Recommendations."
3. TM No. 4 dated January 15, 2015 entitled "Ten Year Estimated Costs for Nine Shortlisted Alternatives Including a Summary of Proposed Portfolio Scenario Costs."

Copies of these three TMs are included in Appendices A, C and D, respectively. The three TMs are also summarized in the overall Executive Summary for this WEP. As noted in the appendices and the Executive Summary, the overall objective of the WEP is to identify water supply alternatives the City can implement to reduce overall dependence on MWD (over the past 11 years, on average, 91.5 percent of the City's water demands have been met through treated water purchased from MWD).

BACKGROUND INFORMATION

As noted in TM No. 1, 19 potential water supply alternatives were initially evaluated:

- Twelve Baseline Alternatives including:
  - Water purchased from MWD
  - Three groundwater development options (Central Basin and Hollywood Basin development, and Spring Water Capture)
  - Three Recycled Water options (Regional, Scalping Plant and Greywater approaches)
  - Three Reverse Osmosis Capture and Treatment Options (for treating 1.5 Million Gallons per Day (MGD), 3.0 MGD and 4.5 MGD)
  - Urban Runoff Capture and Treatment
  - Ocean Desalination.
- Five Water Supply Insurance Alternatives including:
  - Water Banking
  - Antelope Valley Water Bank Drought Insurance
  - Water Transfers
  - Potable Water Exchanges
  - Recycled Water Exchanges
- Two Conservation Alternatives including:
  - Compliance with SBx7-7[1]
  - Conservation tailored to the unique characteristics of Beverly Hills

Each of these 19 alternatives was evaluated using a series of eight criterion including Cost, Volume, Reliability, Timing, Local Control, Legal/Institutional, Environmental and Operation Complexity. Overall weightings were then applied to each of the eight criteria categories to allow ranking of the 19 alternatives. Using a series of Excel spreadsheets, ten widely-varying weighted scenarios were developed. This evaluation process identified the nine highest-ranked alternatives, which were separated by a

[1] This 2009 legislative package requires a statewide 20% reduction in urban per capita water usage by 2020. It requires that urban water retail suppliers determine baseline water use and set reduction targets according to specified requirements, and requires agricultural water suppliers prepare plans and implement efficient water management practices (definition extracted from the Association of California Water Agencies website).

significantly large statistical gap from the ten lowest ranked alternatives. The nine highest ranked alternatives in order included:

1. MWD
2. Water Banking
3. Conservation Tailored to the Unique Aspects of Beverly Hills
4. Groundwater – Development of Wells in the Central Basin
5. Conservation – Compliance with SBx7-7
6. Antelope Valley Water Bank Drought Insurance
7. Exchanges
8. Ocean Desalination
9. Groundwater – Development of Wells in the Hollywood Basin

Additional detailed information on the evaluation process can be found in Appendix A to this WEP.

FINDINGS AND CONCLUSIONS

TM No. 4 presents a series of cost spreadsheets developed for each of the nine shortlisted alternatives. The spreadsheets include estimates for capital, operation and maintenance costs, including a three percent compounded inflation factor over the next ten years. Given the preliminary nature of these estimates, a low and high range (-30% to +50%) for each alternative cost was identified using guidelines established by the American Association of Cost Estimators.

RECOMMENDATIONS

Based on the findings presented in TM No. 4, the following Water Supply Portfolio is recommended:

1. **Groundwater** – Develop three new groundwater wells capable of producing a total of approximately 1,700 AFY (as noted in TM No. 7, approximately 2,000 AFY would have to be produced to result in a net usable capacity of 1,700 AFY) in the unadjudicated portion of the Central Basin.
2. **Water Treatment Plant** – Address ongoing problems with the City's existing reverse osmosis water treatment plant to treat water produced from two recently-approved shallow groundwater wells and four existing City wells in the Hollywood Basin.
3. **Water Banking** – Participate in a regional water bank allowing the City to access stored water during severe drought conditions. Participation in a water bank with no up-front costs would be preferable to one with significant buy-in costs. Water banks are dynamic in nature and buy-in costs can vary considerably from one month to another; however, there may be a current opportunity to participate in an Irvine Ranch Water District Water Bank with no up-front costs.
4. **Water Conservation** – Implement a Water Conservation Program which complies with SBx7-7 and is also tailored to the City's unique characteristics.

5. **Metropolitan Water District –** Continue to rely on treated water purchased from MWD to meet the majority of the City's water demands.
6. **Staffing Enhancements –** Augment current City staff levels with 11 new full-time positions to help implement the recommended water supply portfolio. The 11 new positions include a Water Resources Manager (or Water Czar), a Water Conservation Coordinator, three Engineering Project Managers, three Water Treatment Plant Operators, a Pump/Well Mechanic, a Pump Well/Electrician and a Water Distribution Operator.

PSOMAS

TECHNICAL MEMORANDUM NO. 13

To: City of Beverly Hills – Trish Rhay, George Chavez and Steve Bucknam

From: Harvey R. Gobas, PE and John R. Thornton, PE

Date: May 19, 2015

Subject: Short- and Long-Term Water Supply Strategies

EXECUTIVE SUMMARY

There are a number of short- and long-term actions the City can take over the coming years to keep abreast of opportunities to enhance the City's water supply picture. Short term actions include monitoring and applying for available grants, abiding by the requirements of the Sustainable Groundwater Management Act of 2014, initiating discussions aimed at participation in a water bank, notifying the City of Los Angeles of the City's interest in participating in a future recycled water program when future construction approaches Beverly Hills, and staying on top of water rights issues and cessation filings. Long term actions include revisiting the WEP at least every ten years (and possibly more frequently) and participating in the Los Angeles Recycled Water Program when transmission facilities approach Beverly Hills.

SHORT TERM WATER SUPPLY STRATEGIES (ONE TO TEN YEARS)

- **Grant Funding**
  - Monitor funding opportunities and apply for those that make sense to the City including:
    - MWD Local Project Funding
    - MWD Conservation Program Funding
    - DWR and State Water Resources Control Board (SWRCB) Grants including Prop 1 and Prop 84 and other grant sources that may become available.
- **Sustainable Groundwater Management Act of 2014**
  - Meet with the Water Replenishment District of Southern California (WRDSC) and the Los Angeles Department of Water and Power (LADWP) to discuss the formation of a Groundwater Sustainability Agency (GSA). Key GSA milestone dates are:
    - <u>January 1, 2017</u>: DWR must publish best management practices for sustainable groundwater management. Agencies wishing to submit alternatives to groundwater sustainability plans must do so by this date.
    - <u>June 30, 2017</u>: Local agencies must establish GSAs by this date.
    - <u>After July 1, 2017</u>**:** The State Board can designate basins as probationary if no local agency has elected to be a groundwater sustainability agency and intends to develop a sustainability plan or has submitted an alternative.
    - <u>After July 1, 2017</u>: If, after this date, a GSA or County has not assumed responsibility for a groundwater basin, many water users will be subject to mandatory extraction reporting.

- January 31, 2020: High- and medium-priority basins must adopt a Groundwater Sustainability Plan (GSP) and begin managing the basins under the GSPs by this date.
- January 31, 2022: All other high- and medium-priority basins must be managed under a groundwater sustainability plan or plans.

- **Water Banking -** Decide on Water Banking alternative and contact at least the following entities to initiate negotiations for participating in a water bank:
  - Irvine Ranch Water District (IRWD) Water Bank
  - Willow Springs Water Bank
  - Rosedale Rio Bravo Water District
- **Recycled Water –** Initiate discussions with the City of Los Angeles regarding participation in Los Angeles' recycled water program when infrastructure approaches Beverly Hills. Beverly Hills should be able to participate in that system in a volume at least equal to that the City is sending into the City of Los Angeles's sewer system.
- **Water Rights –** Beverly Hills should continue to make annual Cessation fillings to the State Water Resource Control Board but will need to properly adjust the filing volumes once the proposed LBSA well field comes on-line.

LONG TERM WATER SUPPLY STRATEGIES (TEN YEARS AND BEYOND)

- **Revisit Water Enterprise Plan Recommendations**
  - Is the City achieving the level of reliability that it desires?
  - Is the level of independence from MWD being achieved?
  - Re-examine alternatives such as participation in an Ocean Desalination facility or a water transfer to improve reliability and water supply diversification.
- **Recycled Water –** Continue the dialogue with the City of Los Angeles. Recycled water could be an important component to Beverly Hills long-term water reliably and conservation strategy.

PSOMAS

TECHNICAL MEMORANDUM NO. 14

To: City of Beverly Hills – Trish Rhay, George Chavez and Steve Bucknam

From: Harvey R. Gobas, PE

Date: May 19, 2015

Subject: Other Recommendations

EXECUTIVE SUMMARY

This Technical Memorandum addresses the recommended hiring of a Water Resources Manager (or Water Czar) and the potential installation of "purple recycled water pipe" along a 1.8 mile segment of Santa Monica Boulevard in conjunction with proposed street improvement project planned for that corridor.

The Water Resources Manager will be responsible for implementing the WEP, representing the City before all regional, state and federal agencies having jurisdiction over the City's water operations, and working effectively with other City Department Managers. He or she will also develop and recommend the water operations budget, assist in recommending water rates, oversee preparation of grant applications, participate in community outreach activities, and respond and resolve citizen enquires and complaints. The ideal candidate should be a proven water resources leader committed to innovation, infrastructure management, sustainability, collaboration and diversity. He or she should have a strong general knowledge in both water treatment and groundwater development to be able to appropriately interact and collaborate with project management experts in those two fields. The Water Resources Manager should also have strong written and verbal communication skills, be willing to embrace and implement change, and possess the needed skills to motivate employees and promote a customer service-oriented culture with the City's Water Department.

The City also has an opportunity to install "purple recycled water pipe" along a 1.8 mile stretch of Santa Monica Boulevard as part of a proposed improvement project in that area. While there is no recycled water currently available in this area, installing purple pipe now as part of the pending street improvements will avoid having to disrupt the streets in this area in future years. Construction options include replacing the entire existing irrigation system or just replacing those portions of the system that lie within street intersections (while deferring the construction of new piping in less disruptive parks and medians to some future time when recycled water is available in this area). Depending on the option chosen, conceptual level construction costs could range from $0.8M to $2.1M. This plan would entail placing potable water in the new purple pipe until recycled water becomes available in this area. With that in mind, the City must obtain permission from the State Division of Drinking Water before proceeding with the installation of purple pipe.

WATER RESOURCES MANAGER (WATER CZAR) RECOMMENDATIONS

Reference is made to Technical Memorandum No. 3, which addresses overall staffing recommendations (refer to Appendix C) required to implement the WEP. One of the 11 recommended positions addressed in TM No. 3 is a Water Resources Manager or "Water Czar." The Water Resources Manager will work under the general guidance of the Public Works Commission and the City Council. In many jurisdictions, a Water Resources Manager typically provides oversight over both the agency's water and wastewater operations. However, given the significant water needs identified in the WEP, the Beverly Hills Water

Resources Manager's responsibilities and oversight should be limited to oversight over the City's water operations.

The Water Resources Manager will not only implement the WEP recommendations, but he/she will also represent the City before all regional, state and federal agencies having regulatory authority over the City's water operations (e.g., the California Division of Drinking Water, the Department of Water Resources, the Regional Water Quality Control Board, the Los Angeles County Health Department, the U.S. Environmental Protection Agency, etc.). The Water Resources Manager must ensure that those individuals reporting to him/her are aware of and follow all applicable policies, codes, and regulations of these governing bodies. Additionally, he/she must work effectively and collaborate with all other City Department Managers.

In addition to implementing the WEP, the Water Resources Manager will also be responsible for developing, justifying, and recommending the City's annual water operations budget, overseeing water-related grant applications and overall funding operations, and working closely with the City's Finance Department staff in evaluating and recommending water rates. Additionally, he/she will be responsible for soliciting, coordinating, and reviewing the work of consulting firms engaged in water planning and engineering studies. He/she will also be responsible for participating in appropriate community outreach activities, interacting with environmental organizations and other pertinent community groups, and responding to and resolving citizen enquiries and complaints.

The ideal candidate for this position will be a proven leader, committed to innovation, infrastructure management, sustainability, collaboration, and diversity, with a strong background in water resources management. Ideally, he/she should also have strong credentials in water treatment and groundwater development. However, it may be difficult finding candidates with strong credentials in water operations management as well as specialized technical expertise in both water treatment and groundwater development. This is the case because treatment experts generally have an engineering background while groundwater development experts are typically trained in the field of hydrogeology. In recognition of this fact, the Water Resources Manager should have a strong general knowledge in both water treatment and groundwater development along with experience in implementing and operating programs in these two important areas. Additionally, he/she should also have a good general knowledge of water rights issues.

The Water Resources Manager should have a bachelor's degree in civil or environmental engineering from an accredited college or university and a professional engineering license from the State of California. While the ideal candidate should have this educational background, the City may also wish to consider candidates with backgrounds in the natural or physical sciences, natural resources management, urban or regional planning or other closely related fields. A master's degree in engineering or public/business administration would also be desirable. Additionally, the Water Resources Manager should have at least 15 years progressive experience in managing large and complex water systems.

The ideal candidate will also have proven leadership capabilities, and be someone capable of seeing the big picture, someone who is willing to embrace and implement change, and who can motivate employees. The candidate should be intelligent, innovative and business-minded with a high degree of energy. He/she should be a creative team player with outstanding verbal and written communications skills who will promote a customer service-oriented culture within the City's Water Department.

TM No. 3 also recommends hiring three new Project Managers. At least one of these three Project Managers should be an expert in water treatment. One of the other two Project Managers should be a hydrogeologist with significant experience in implementing groundwater development programs. These

two individuals, along with the third recommended Project Manager, will report directly to the City's Water Resource Manager. By collaborating closely together as a team, the four of them should be able to effectively implement all management and technical aspects of the WEP.

RECYCLED WATER PURPLE PIPE RECOMMENDATIONS

The City is in the process of reconstructing North Santa Monica Boulevard from Doheny Drive to the City limits southwest of Wilshire Boulevard. The City is planning to rebuild the deteriorating roadway within this 1.8 mile stretch of Santa Monica Boulevard, upgrade the century-old drainage system, and address a number of other much-needed repairs along this heavily traveled corridor. These improvements encompass the Beverly Gardens Park located on the north side of this corridor as well as landscaped areas within the Santa Monica Boulevard medians.

The landscaped areas within the park and medians present the City with a unique opportunity to look proactively toward a future time when recycled water may be available to irrigate these areas. As of this writing, recycled water is not available, but the City of Los Angeles' concept plans call for introducing recycled water into this area in future years. While the infrastructure required for this service may not be constructed for 15-20 years, the City may wish to consider replacing existing irrigation pipe with new purple pipe[1] in these areas. By doing so, the City would avoid the necessity of replacing the irrigation system once recycled water becomes available in this area. Doing so at that time would require excavation within major street intersections, park and street medians and would be very disruptive to the community. It would therefore be preferable to install the purple pipe at this time, while other improvements are taking place. The City could either replace all the irrigation piping at this time or just replace those sections within major intersections, thus limiting future disruption to the park and medians and avoiding disruptions within the major intersections along the improvement corridor.

With this recommendation in mind, the potential cost for replacing existing irrigation pipe along the entire 1.8 mile (9,054 feet) length of the project along Santa Monica Boulevard was evaluated. Assuming an average irrigation piping diameter of 8-inches along this 1.8 mile stretch, a cost of $200/ foot would be estimated. However, since the streets along this alignment will already be torn up as part of the Santa Monica Boulevard Street Improvement project, the City should be able to install new purple pipe at a lower cost; probably about 25 percent lower (i.e., about $150/foot). The lower dollar figure generates a cost estimate of roughly $1.4M ($150/foot x 9,504 feet = $1,425,600). Given this is a planning level estimate, we recommend considering a -30 percent to +50 percent range or roughly a low-to-high range of $1.0M to $2.1M.

If the City only wishes to install purple pipe along Santa Monica Boulevard between Doheny Drive and Wilshire Blvd (a distance of 1.5 miles), this cost can be further reduced to a cost ranging from about $0.8M to $1.8M. The City can also achieve additional cost savings by installing purple pipe only in the intersections at this time and installing the rest of the pipe lying outside the street right-of-way (i.e., in Beverly Gardens Park or in street medians) at some future date. The approximate cost for this scenario is dependent on how much pipe is replaced in the intersections. While the total costs would be significantly less, those costs are difficult to project at this time without a further detailed analysis of the existing irrigation piping in each affected intersection.

[1] Division 104, Part 12, Chapter 5, Article 2, Section 116815(a) of the California Health and Safety Code states: "All pipes installed above or below the ground, on and after June 1, 1993, that are designed to carry recycled water, shall be colored purple or distinctively wrapped with purple tape."

It is not possible to prepare a more specific estimate of the overall replacement costs without knowing more about the City's existing potable water irrigation system. For example, does the existing system feed off of multiple points from the City's adjoining water system or off a single point? Configuration No. 1 in Figure 14-1 depicts a system fed off multiple points. In this scenario, the City might have a series of small individual irrigation systems fed off several separate meters with backflow devices and irrigation controllers. The Configuration No. 1 Schematic shows four individual systems, but there might be as many as 25-30 such separate systems.

Configuration No. 2 in Figure 14-1 depicts an irrigation system that starts at one end with pipe diameters reducing in size as it progresses toward the other end of the system. The Configuration No. 2 schematic depicts a hypothetical system that starts out with 12-inch diameter pipe and reduces to 6-inch diameter pipe at the far end. As previously noted, preparation of a more detailed cost estimate for installing purple pipe along Santa Monica Boulevard, is dependent on obtaining and reviewing specific system information including construction record drawings for the existing potable water irrigation piping system.

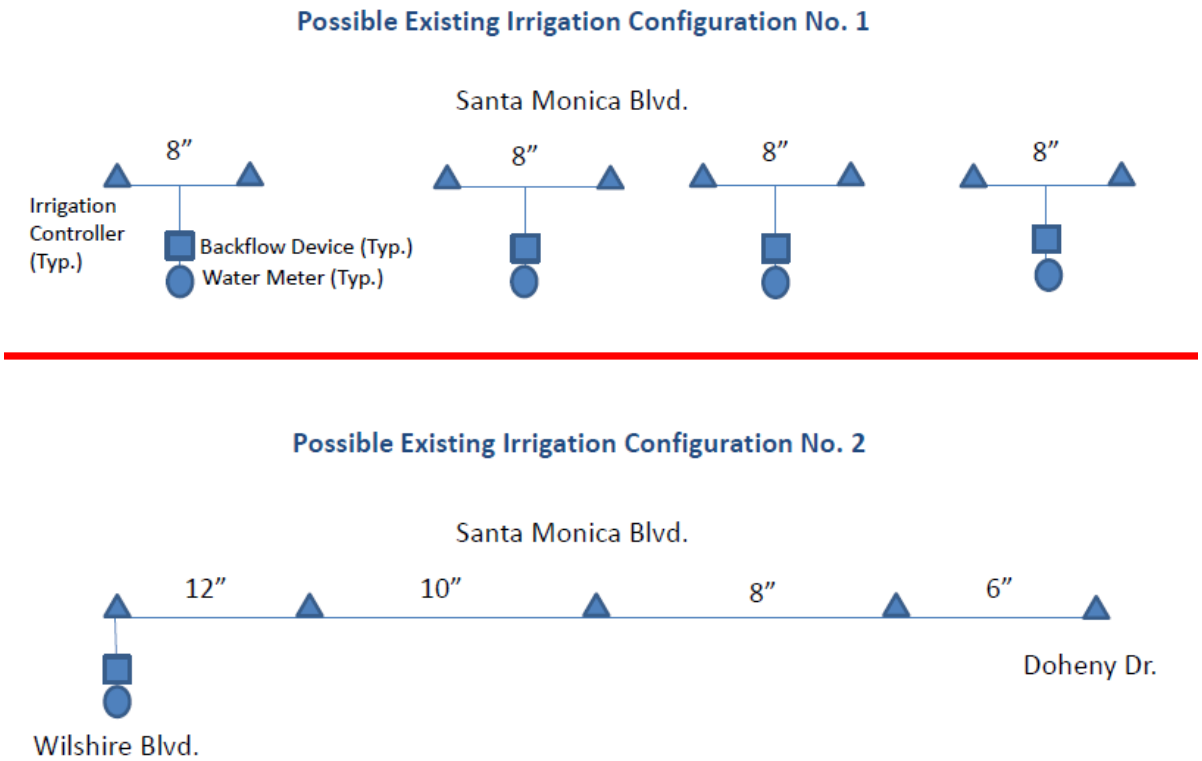


Figure 14-1

Appendix A

TM-1: Review of Beverly Hills Water Supply Alternatives and Recommendations for Proceeding with Further Detailed Analysis

PSOMAS

TECHNICAL MEMORANDUM NO. 1

To: Trish Rhay and Steve Bucknam

From: Harvey R. Gobas, PE

Date: November 3, 2014

Subject: Review of Beverly Hills Water Supply Alternatives and Recommendations for Proceeding with Further Detailed Analysis

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EXECUTIVE SUMMARY

Psomas was retained by the City of Beverly Hills to evaluate potential alternative water supply options for increasing the reliability of the City's water system and/or conservation measures that can be employed to reduce system demands. Nineteen (19) potential alternatives were identified. These 19 alternatives can be grouped into the following three categories:

- Twelve (12) Baseline Water Supply Alternatives – These options include Metropolitan Water District Supply, three (3) Groundwater Development Options (Central Basin Wells, Hollywood Basin Wells and Spring Water Capture), three (3) Recycled Water options (Regional, Scalping Plant and Greywater Approaches), three (3) Reverse Osmosis Capture and Treatment options (for treating 4.5, 3.0 or 1.5 Million Gallons per Day [MGD]), Urban Runoff Capture and Treatment; and Ocean Desalination;
- Five (5) Water Supply "Insurance" Alternatives – These options would not represent direct sources of water, but could provide reserves that the City can tap into during times of drought, thereby increasing the overall reliability of the City's water supply. These include Water Banking, Transfers, Exchanges (potable), Recycled Water Exchanges and Antelope Valley Water Bank Drought Insurance; and
- Two (2) Conservation Alternatives – These two options include Compliance with SBx7-7[1] and Tailoring a Conservation Plan to the Unique Characteristics of the City of Beverly Hills.

Eight (8) criterion measures were identified for use in comparing these 19 alternatives. They include: Cost, Volume, Reliability, Timing, Local Control, Legal/Institutional, Environmental and Operational Complexity. Our project team, with input from City staff, assigned values to these criteria for each of the 19 alternatives. Overall weightings were then applied to each of the eight criteria categories to allow ranking of the 19 alternatives. A comprehensive excel spreadsheet was developed to allow changes to be easily made to the values and weightings to determine how those changes would impact the overall rankings.

While an infinite number of permutations can be considered, we evaluated ten (10) widely varying **Weighting Scenarios.** They included the following scenarios: (1) All eight criteria equally weighted; (2) "Timing" was eliminated from consideration with the other seven criteria equally weighted; (3) Cost, volume and reliability were equally weighted with the other five criteria eliminated from consideration; (4, 5, 6 and 7) Four separate scenarios in which either cost, environment, reliability or volume were weighted three times higher than the other seven criteria; (8) Cost, volume, reliability and environmental were weighted three times higher than the other criteria, with timing eliminated; (9) Volume, reliability and local control were weighted three times higher than the other criteria with timing eliminated; and lastly (10) Volume, reliability, local control and environment were weighted five times higher than the other criteria with timing eliminated.

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[1] This 2009 legislative package requires a statewide 20% reduction in urban per capita water use by 2020. It requires that urban water retail suppliers determine baseline water use and set reduction targets according to specified requirements, and requires agricultural water suppliers prepare plans and implement efficient water management practices (definition extracted from the Association of California Water Agencies website).

Based on this analysis, we recommend proceeding with detailed evaluations of the following nine alternatives: MWD, Water Banking, Conservation (both Tailored and SBx7-7 Conservation), Development of Central Basin and Hollywood Basin Wells (although not necessarily together), Antelope Valley Drought Insurance, Exchanges and Ocean Desalination. These nine alternatives consistently appeared among the top ranked alternatives for each of the ten weighted scenarios. The other ten alternatives consistently appeared in the bottom ten ranked alternatives regardless of which scenario was considered. The remaining ten alternatives should therefore be eliminated from further consideration.

INTRODUCTION

Psomas was retained by the City of Beverly Hills to evaluate potential alternative water supply options for increasing the reliability of the City's water system and/or conservation measures that can be employed to reduce system demands. With that in mind, nineteen potential alternatives were identified for initial evaluation with the intent of narrowing the list to the most promising of those alternatives for further detailed evaluation. Those nineteen alternatives, several of which were grouped in similar categories (i.e., 4a, 4b, etc.) are shown in Table 1 below:

Table 1
Water Supply Reliability or Conservation Alternatives

No.	Alternative No.	Description
1	1	Metropolitan Water District of Southern California
2	2	Ocean Desalination
3	3	Urban Runoff – Capture and Treat Dry Weather Flows
4	4a	Recycled Water Regional Approach
5	4b	Recycled Water – Scalping Plant Approach
6	4c	Recycled Water – Greywater Approach
7	4d	Recycled Water Exchanges
8	5	Exchanges
9	6	Transfers
10	7	Water Banking
11	8	Antelope Valley Water Bank Drought Insurance
12	9a	Groundwater – Capture Spring Water
13	9b	Groundwater – Develop Hollywood Basin Wells
14	9c	Groundwater – Develop Central Basin (La Brea) Wells
15	10a	Conservation – Comply with SBx7-7
16	10b	Conservation – Tailor to Unique CBH Characteristics
17	11a	Capture and Treat RO Reject Water (1.5 MGD)
18	11b	Capture and Treat RO Reject Water (3.0 MGD)
19	11c	Capture and Treat RO Reject Water (4.5 MGD)

Eight criterion were then identified for the purpose of comparing the various alternatives. Those criterion along with a brief defining example, include:

1. **Cost** – The lower the cost, the greater the advantage
2. **Volume –** The higher the volume contributed by the resource, the greater the advantage
3. **Reliability** – The greater the hydrologic certainty (that the resource has a lower likelihood of being impacted by climatic changes or severity (e.g., drought)), the greater the advantage

4. **Timing** – The shorter the time required to implement, the greater the advantage
5. **Local Control** – The more control CBH has over the resource, the greater the advantage
6. **Legal/Institutional** – The less obstacles required to implement, the greater the advantage
7. **Environmental** – The less environmental impacts, the greater the advantage
8. **Operational Complexity** – The easier to operate and maintain, the greater the advantage

Each alternative was evaluated based upon technical information and/or team knowledge. The information was summarized in a series of spreadsheets.

Values were then assigned to these criteria for each of the 19 alternatives. These values were based on a 1 to 5 scale as defined in more detail in the Exhibit labeled "City of Beverly Hills Water Resource Alternative Options Ranking Criteria Details," which can be found in the Appendix to this Technical Memorandum. These values were assigned based on the extensive combined experience of our project team members as well as discussions with City management and staff.

Overall weightings were then applied for each of the criteria categories, which included the development of ten (10) Weighting Scenarios for further review and evaluation. A comprehensive spreadsheet encompassing all of the above factors was then prepared for the purpose of ranking the nineteen alternatives.

ALTERNATIVE RANKING

An initial ranking of all alternatives was prepared in which each of the eight criteria were equally weighted, i.e., each was assigned a relative weighting of 12.5% with the total summing to 100%. The results of Weighting Scenario 1 analysis are presented in Table 2 below:

Table 2
Weighting Scenario 1: Equal Weighting (12.5%) Assigned to Each Criterion

Ranking	Alternative No.	Description
1	1	Metropolitan Water District of Southern California
2	7	Water Banking
3	10b	Conservation – Tailor to Unique CBH Characteristics
4	10a	Conservation – Comply with SBx7-7
5	9c	Groundwater – Develop Central Basin (La Brea) Wells
6	8	Antelope Valley Water Bank Drought Insurance
7	9b	Groundwater – Develop Hollywood Basin Wells
8	5	Exchanges
9	2	Ocean Desalination
10	11c	Capture and Treat RO Reject Water (4.5 MGD)
11	11b	Capture and Treat RO Reject Water (3.0 MGD)
12	11a	Capture and Treat RO Reject Water (1.5 MGD)
13	6	Transfers
14	4a	Recycled Water Regional Approach
15	4d	Recycled Water Exchanges
16	4b	Recycled Water – Scalping Plant Approach
17	9a	Groundwater – Capture Spring Water
18	4c	Recycled Water – Greywater Approach
19	3	Urban Runoff – Capture and Treat Dry Weather Flows

Based on feedback received from the City of Beverly Hills Public Works Commissioners as well as input from City management and staff, nine additional scenarios were considered including:

- **Weighting Scenario 2** – The Timing criterion is established at zero weighting with the other seven criteria having equal weightings of 14.3% totaling to 100%.

- **Weighting Scenario 3** – Cost, Volume and Reliability are assigned equal weightings of 33.3% and all other criteria are assigned a zero weighting.

- **Weighting Scenario 4** – Cost is weighted three times higher (30%) than all other criteria which are weighted at 10%

- **Weighting Scenario 5** – Environment is weighted three times higher (30%) than all other criteria which are weighted at 10%

- **Weighting Scenario 6** – Reliability is weighted three times higher (30%) than all other criteria which are weighted at 10%%

- **Weighting Scenario 7** – Volume is weighted three times higher (30%) than all other criteria which are weighted at 10%

- **Weighting Scenario 8** – Cost, Volume, Reliability and Environmental are weighted three times higher (20%) than the other criteria, which are weighted at 6.7% except for Timing (0%), which is deleted from consideration

- **Weighting Scenario 9** – Volume, Reliability and Local Control are weighted three times higher (23.1% each) than other criteria (7.7% each) with Timing (0%) deleted from consideration

- **Weighting Scenario 10** – Volume, Reliability, Local Control and Environment are weighted five times higher (21.7% each) than other criteria (4.3% each) with Timing (0%) deleted from consideration.

It is evident at this point, that an infinite number of possible permutations could be identified and ranked using the excel spreadsheet created for this purpose. However, it is recommended to evaluate the results of the ten (10) scenarios set forth above, before proceeding with additional analyses. Those results are summarized in Tables 3 through 10 on the following pages. Additional detailed information on all ten scenarios is presented in the Appendix.

Table 3
Weighting Scenario 2: Timing Deleted (0%); All Other Criteria Equally Weighted (14.3%)

Ranking	Alternative No.	Description
1	1	Metropolitan Water District of Southern California
2	10b	Conservation – Tailor to Unique CBH Characteristics
3	10a	Conservation – Comply with SBx7-7
4	9c	Groundwater – Develop Central Basin (La Brea) Wells
5	7	Water Banking
6	9b	Groundwater – Develop Hollywood Basin Wells
7	8	Antelope Valley Water Bank Drought Insurance
8	5	Exchanges
9	2	Ocean Desalination
10	11c	Capture and Treat RO Reject Water (4.5 MGD)
11	4a	Recycled Water Regional Approach
12	11b	Capture and Treat RO Reject Water (3.0 MGD)
13	11a	Capture and Treat RO Reject Water (1.5 MGD)
14	6	Transfers
15	4d	Recycled Water Exchanges
16	4b	Recycled Water – Scalping Plant Approach
17	9a	Groundwater – Capture Spring Water
18	4c	Recycled Water – Greywater Approach
19	3	Urban Runoff – Capture and Treat Dry Weather Flows

Table 4
Weighting Scenario 3: Cost, Volume and Reliability Equally Weighted (33.3%); All Other Criteria Deleted (0%)

Ranking	Alternative No.	Description
1	7	Water Banking
2	5	Exchanges
3	2	Ocean Desalination
4	1	Metropolitan Water District of Southern California
5	9c	Groundwater – Develop Central Basin (La Brea) Wells
6	4a	Recycled Water Regional Approach
7	10b	Conservation – Tailor to Unique CBH Characteristics
8	10a	Conservation – Comply with SBx7-7
9	8	Antelope Valley Water Bank Drought Insurance
10	11c	Capture and Treat RO Reject Water (4.5 MGD)
11	9b	Groundwater – Develop Hollywood Basin Wells
12	6	Transfers
13	4d	Recycled Water Exchanges
14	11b	Capture and Treat RO Reject Water (3.0 MGD)
15	11a	Capture and Treat RO Reject Water (1.5 MGD)
16	4c	Recycled Water – Greywater Approach
17	4b	Recycled Water – Scalping Plant Approach
18	9a	Groundwater – Capture Spring Water
19	3	Urban Runoff – Capture and Treat Dry Weather Flows

Table 5
Weighting Scenario 4: Cost is Weighted 30% and All Other Criteria are Weighted 10%

Ranking	Alternative No.	Description
1	1	Metropolitan Water District of Southern California
2	10a	Conservation – Comply with SBx7-7
3	7	Water Banking
4	10b	Conservation – Tailor to Unique CBH Characteristics
5	9c	Groundwater – Develop Central Basin (La Brea) Wells
6	5	Exchanges
7	11c	Capture and Treat RO Reject Water (4.5 MGD)
8	11a	Capture and Treat RO Reject Water (1.5 MGD)
9	9b	Groundwater – Develop Hollywood Basin Wells
10	8	Antelope Valley Water Bank Drought Insurance
11	2	Ocean Desalination
12	11b	Capture and Treat RO Reject Water (3.0 MGD)
13	6	Transfers
14	4a	Recycled Water Regional Approach
15	4d	Recycled Water Exchanges
16	9a	Groundwater – Capture Spring Water
17	4b	Recycled Water – Scalping Plant Approach
18	4c	Recycled Water – Greywater Approach
19	3	Urban Runoff – Capture and Treat Dry Weather Flows

Table 6
Weighting Scenario 5: Environment is Weighted 30%; All Other Criteria are Weighted 10%

Ranking	Alternative No.	Description
1	1	Metropolitan Water District of Southern California
2	10b	Conservation – Tailor to Unique CBH Characteristics
3	10a	Conservation – Comply with SBx7-7
4	8	Antelope Valley Water Bank Drought Insurance
5	7	Water Banking
6	9c	Groundwater – Develop Central Basin (La Brea) Wells
7	9b	Groundwater – Develop Hollywood Basin Wells
8	5	Exchanges
9	11c	Capture and Treat RO Reject Water (4.5 MGD)
10	11b	Capture and Treat RO Reject Water (3.0 MGD)
11	11a	Capture and Treat RO Reject Water (1.5 MGD)
12	2	Ocean Desalination
13	6	Transfers
14	4a	Recycled Water Regional Approach
15	4d	Recycled Water Exchanges
16	4b	Recycled Water – Scalping Plant Approach
17	9a	Groundwater – Capture Spring Water
18	4c	Recycled Water – Greywater Approach
19	3	Urban Runoff – Capture and Treat Dry Weather Flows

Table 7
Weighting Scenario 6: Reliability is Weighted 30%; All Other Criteria are Weighted 10%

Ranking	Alternative No.	Description
1	7	Water Banking
2	1	Metropolitan Water District of Southern California
3	10b	Conservation – Tailor to Unique CBH Characteristics
4	10a	Conservation – Comply with SBx7-7
5	9c	Groundwater – Develop Central Basin (La Brea) Wells
6	8	Antelope Valley Water Bank Drought Insurance
7	2	Ocean Desalination
8	9b	Groundwater – Develop Hollywood Basin Wells
9	5	Exchanges
10	11c	Capture and Treat RO Reject Water (4.5 MGD)
11	4a	Recycled Water Regional Approach
12	11b	Capture and Treat RO Reject Water (3.0 MGD)
13	11a	Capture and Treat RO Reject Water (1.5 MGD)
14	4b	Recycled Water – Scalping Plant Approach
15	4d	Recycled Water Exchanges
16	6	Transfers
17	4c	Recycled Water – Greywater Approach
18	9a	Groundwater – Capture Spring Water
19	3	Urban Runoff – Capture and Treat Dry Weather Flows

Table 8
Weighting Scenario 7: Volume is Weighted 30%; All Other Criteria are Weighted 10%

Ranking	Alternative No.	Description
1	1	Metropolitan Water District of Southern California
2	7	Water Banking
3	8	Antelope Valley Water Bank Drought Insurance
4	9c	Groundwater – Develop Central Basin (La Brea) Wells
5	5	Exchanges
6	2	Ocean Desalination
7	10b	Conservation – Tailor to Unique CBH Characteristics
8	6	Transfers
9	4a	Recycled Water Regional Approach
10	10a	Conservation – Comply with SBx7-7
11	9b	Groundwater – Develop Hollywood Basin Wells
12	4d	Recycled Water Exchanges
13	11c	Capture and Treat RO Reject Water (4.5 MGD)
14	11b	Capture and Treat RO Reject Water (3.0 MGD)
15	11a	Capture and Treat RO Reject Water (1.5 MGD)
16	4b	Recycled Water – Scalping Plant Approach
17	9a	Groundwater – Capture Spring Water
18	4c	Recycled Water – Greywater Approach
19	3	Urban Runoff – Capture and Treat Dry Weather Flows

Table 9

Weighting Scenario 8: Cost, Volume, Reliability and Environment are Weighted 20%; All Other Criteria are Weighted 6.7% with Timing Deleted (0%) from Consideration

Ranking	Alternative No.	Description
1	1	Metropolitan Water District of Southern California
2	7	Water Banking
3	10b	Conservation – Tailor to Unique CBH Characteristics
4	10a	Conservation – Comply with SBx7-7
5	9c	Groundwater – Develop Central Basin (La Brea) Wells
6	8	Antelope Valley Water Bank Drought Insurance
7	5	Exchanges
8	2	Ocean Desalination
9	4a	Recycled Water Regional Approach
10	9b	Groundwater – Develop Hollywood Basin Wells
11	11c	Capture and Treat RO Reject Water (4.5 MGD)
12	6	Transfers
13	11b	Capture and Treat RO Reject Water (3.0 MGD)
14	11a	Capture and Treat RO Reject Water (1.5 MGD)
15	4d	Recycled Water Exchanges
16	4b	Recycled Water – Scalping Plant Approach
17	9a	Groundwater – Capture Spring Water
18	4c	Recycled Water – Greywater Approach
19	3	Urban Runoff – Capture and Treat Dry Weather Flows

Table 10

Weighting Scenario 9: Volume, Reliability and Local Control are Weighted 23.1% with All Other Criteria Weighted 7.7% and Timing Deleted (0%)

Ranking	Alternative No.	Description
1	9c	Groundwater – Develop Central Basin (La Brea) Wells
2	7	Water Banking
3	2	Ocean Desalination
4	1	Metropolitan Water District of Southern California
5	10b	Conservation – Tailor to Unique CBH Characteristics
6	9b	Groundwater – Develop Hollywood Basin Wells
7	8	Antelope Valley Water Bank Drought Insurance
8	5	Exchanges
9	4a	Recycled Water Regional Approach
10	10a	Conservation – Comply with SBx7-7
11	4d	Recycled Water Exchanges
12	11c	Capture and Treat RO Reject Water (4.5 MGD)
13	11b	Capture and Treat RO Reject Water (3.0 MGD)
14	6	Transfers
15	11a	Capture and Treat RO Reject Water (1.5 MGD)
16	4b	Recycled Water – Scalping Plant Approach
17	9a	Groundwater – Capture Spring Water
18	3	Urban Runoff – Capture and Treat Dry Weather Flows
19	4c	Recycled Water – Greywater Approach

Table 11
Weighting Scenario 10: Volume, Reliability, Local Control and Environment are Each Weighted 21.7%; All Other Criteria are Weighted 4.3% with Timing Deleted (0%)

Ranking	Alternative No.	Description
1	8	Antelope Valley Water Bank Drought Insurance
2	10b	Conservation – Tailor to Unique CBH Characteristics
3	9c	Groundwater – Develop Central Basin (La Brea) Wells
4	7	Water Banking
5	1	Metropolitan Water District of Southern California
6	10a	Conservation – Comply with SBx7-7
7	9b	Groundwater – Develop Hollywood Basin Wells
8	5	Exchanges
9	2	Ocean Desalination
10	4a	Recycled Water Regional Approach
11	4d	Recycled Water Exchanges
12	11c	Capture and Treat RO Reject Water (4.5 MGD)
13	11b	Capture and Treat RO Reject Water (3.0 MGD)
14	4b	Recycled Water – Scalping Plant Approach
15	6	Transfers
16	11a	Capture and Treat RO Reject Water (1.5 MGD)
17	9a	Groundwater – Capture Spring Water
18	3	Urban Runoff – Capture and Treat Dry Weather Flows
19	4c	Recycled Water – Greywater Approach

FINDINGS AND CONCLUSIONS

Table 12 on the next page, summarizes the results of the **Weighting Scenario** analysis. The column to the far left shows the overall ranking of the 19 alternatives from highest to lowest. These rankings are based on the average ranking of each alternative as reflected in the second column from the left. The average rankings were calculated by summing the rankings of the noted alternative for each **Weighting Scenario** and then dividing by ten (the total number of scenarios). The last two columns describe the alternative and list the type of alternative (i.e., supply, insurance or conservation).

As can be seen, there is a clear delineation between the top nine ranked alternatives and the bottom ten alternatives (as reflected in the large gap between the ninth and tenth ranked alternatives; the 2.2 gap is the largest gap between any two ranked alternatives). In addition to Table 12, a Tabular Color Coded Summary of Supply/Reliability Alternatives by Weighting Scenario is also included in the Appendix.

Table 12
Summary of Weighting Scenario Analysis

Order of Ranking	Average Ranking	Alternative	Type of Alternative
Top Nine Ranked Alternatives			
1	2.1	MWD	Supply
2	2.7	Water Banking	Insurance
3	3.8	Conservation - Tailored	Conservation
4	4.3	Groundwater – Develop Central Basin	Supply
5	5.4	Conservation - Comply with SBx7-7	Conservation
6	5.9	Antelope Valley Water Bank Drought Insurance	Insurance
7	6.9	Exchanges	Insurance
8	7.7	Ocean Desalination	Supply
9	8.2	Groundwater – Develop Hollywood Basin	Supply
Bottom Ten Ranked Alternatives Note the Large 2.2 Gap Between Alternative Ranking Nos. 9 and 10			
10	10.4	Capture and Treat RO Plant Reject Water (4.5 MGD)	Supply
11	10.7	Recycled Water - Regional Approach	Supply
12	12.4	Capture and Treat RO Plant Reject Water (3.0 MGD)	Supply
13	13.0	Transfers	Insurance
14	13.2	Capture and Treat RO Plant Reject Water (1.5 MGD)	Supply
15	13.7	Recycled Water Exchanges	Insurance
16	15.8	Recycled Water - Scalping Plant Approach	Supply
17	17.1	Groundwater - Capture Spring Water	Supply
18	17.9	Recycled Water - Greywater Approach	Supply
19	18.8	Urban Runoff - Capture and Treat Dry Weather Flows	Supply

The **10 Scenarios** evaluated differ widely in their criteria weightings, yet the highest ranked alternatives are fairly consistent across the various combinations of weightings. This demonstrates that our analysis is not subject to significant movement caused by changing the relative weightings of the various criteria, i.e., it passes the sensitivity test.

Several important results can be seen from our analysis as summarized below:

1. **Metropolitan Water District is ranked No. 1** in six of the 10 scenarios, second in one scenario, fourth in two scenarios and fifth in the remaining one;
2. **Water Banking is ranked either first or second** in six of the ten scenarios and is in the top five in all ten scenarios;
3. **Conservation – Tailored to Unique CBH Characteristics** is in the top three in seven of the ten scenarios and in the top seven in all ten scenarios;

4. **Groundwater – Develop Central Basin Wells** is ranked in the top six in all ten scenarios;
5. **Conservation – Comply with SBx7-7** is ranked in the top four in six of the ten scenarios and in the top ten in the other four scenarios. It should be noted that, while SBx7-7 will achieve conservation goals, it is not truly an alternative in the same sense at the other nine alternatives since it is mandated by State law;
6. **Antelope Valley Drought Insurance** is ranked in the top seven in eight of the ten scenarios and in the top ten in all ten scenarios;
7. **Exchanges (excluding Recycled Water Exchanges**) are ranked twice in the top five and in the top nine in all ten scenarios;
8. **Ocean Desalination** is ranked twice in the top three and in the top nine in eight of the ten scenarios; and
9. **Groundwater – Develop Hollywood Basin** is ranked five times in the top seven scenarios and never lower than 11 in the rest of the scenarios;
10. All of the other alternatives consistently rank in the bottom half of the 19 scenarios.

RECOMMENDATIONS

Based on the above-noted findings and conclusions, we recommend proceeding with detailed evaluations of the following nine (9) highly ranked alternatives:

1. Metropolitan Water District;
2. Water Banking;
3. Conservation – Tailor to Unique CBH Characteristics;
4. Groundwater – Develop Central Basin Wells;
5. Conservation – Comply with SBx7-7;
6. Antelope Valley Drought Insurance;
7. Exchanges;
8. Ocean Desalination; and
9. Groundwater – Develop Hollywood Basin.

Four of the above options are **Baseline Supply Alternatives** (MWD, Central Basin Wells, Ocean Desalination and Hollywood Basin Wells); three of the recommended options are forms of **Water Supply Insurance**, which, if implemented, could increase the City's supply reliability (Water Banking, Antelope Valley Drought Insurance and Exchanges); and the last two options are **Conservation Measures** (Tailored to Unique CBH Characteristics and Comply with SBx7-7).

All other alternatives should be eliminated from further consideration at this time.

Appendix

to

Technical Memorandum No.1

- Ranking Criteria Details
- Alternative Ranking by Weighting Scenario
- Tabular Color-Coded Summary of Supply/Reliability Alternatives by Weighting Scenario

CITY OF BEVERLY HILLS WATER RESOURCE ALTERNATIVE OPTIONS
RANKING CRITERIA DETAILS

COST

		NARRATIVE
The cost of the resource is greater than $2,500/AF	1	The criteria is based on the concept that the higher the cost, the greater the disadvantage. The bracketed cost ranges are based on 2014 dollars and are based on the expected ranges that would be anticipated for water sources that are evaluated for the CBH.
The cost of the resource is between $2,000-$2,500/AF	2	
The cost of the resource is between $1,500-$2,000/AF	3	
The cost of the resource is between $1,000-$1,500/AF	4	
The cost of the resource is less than $1,000/AF.	5	

VOLUME

The volume of the resource is less than 500 AFY.	1	The criteria is based on the concept that the higher the volume contributed by the resource, the greater the advantage. Small volumes <500 AFY are considered a significant disadvantage. Large volumes (>3,500 AFY) are considered a significant advantage.
The volume of the resource is between 500-1,500 AFY	2	
The volume of the resource is between 1,500-2,500 AFY	3	
The volume of the resource is between 2,500-3,500 AFY	4	
The volume of the resource is greater than 3,500 AFY	5	

RELIABILITY (Dependability)

The resource can be severely impacted.	1	The criteria is based on the concept of hydrologic certainty that "wet" water will be available. A source that is immune to current or future hydrologies would be considered as highly reliable (Number 5). An example would be ocean desalination as terrestrial hydrology would have a zero effect on the availability of the resource. Whereas State Project water can be highly dependent on Sierra Nevada snowpack and resulting hydrology of State Project dependent waters.
The resource can be moderately to severely impacted.	2	
The resource can be moderately impacted.	3	
The resource can be slightly impacted.	4	
The resource is not impacted and is always available.	5	

TIMING

The resource would take more than 20 years to develop and be available for consumptive use.	1	The criteria is based on the concept of the ability of the proposed resource and associated agreements, legal/institutional constraints, and/or the construction of the related infrastructure could be completed within a set amount of years. A low number of years to successfully implement and make use of a resource is considered favorable whereas as high number of years is a disadvantage.
The resource would take between 5 to 20 years to develop and be available for consumptive use.	3	
The resource would take less than 5 years to develop and be available for consumptive use.	5	

LOCAL CONTROL

		NARRATIVE
The resource is not within local control (under CBH) and is subject to external influences.	1	Local control refers to whether the CBH controls the resource from generation to delivery to the CBH. If the resource and delivery are not under the control of CBH, it is considered a serious disadvantage. However, if the generation and delivery are under the control of CBH, then it is considered a significant advantage.
The resource is under partial local control or agreements and potential adverse influences from external parties.	2	
The resource is under partial local control or agreements and limited adverse influences from external parties.	3	
Resource is under mostly local control but some external influences can impact the resource.	4	
Resource is totally under local control.	5	

LEGAL/INSTITUTIONAL

Requires local or state legislation or institutional changes in order to implement.	1	Legal/Institutional criteria refers to the degree of developing a particular resource will require legislation or institutional changes to be able to be implemented. It also includes the degree that litigation may occur as part of developing the resource. It does not pertain to CEQA impacts (that is covered in Environmental).
Requires moderate to substantial Local legislation or institutional changes in order to implement.	2	
Requires moderate permitting and institutional changes but are consistent with current State & Local requirements.	3	
Requires minor permitting and some institutional changes but are consistent with current State & Local requirements.	4	
No legal or institutional changes will be required to develop the resource.	5	

ENVIRONMENTAL

Will have adverse effects on the environment.	1	This criteria refers to the potential for developing the proposed resource and that environmental impacts will occur. Impacts that are adverse (unmitigable) are considered a serious disadvantage whereas a resource that poses little or no environmental impacts is considered a
Will have moderate impact to the environment.	3	
No impacts to the environment.	5	

OPERATIONAL COMPLEXITY (for CBH)

Will require dedicated additional personnel and/or substantial coordination with outside agencies to operate and maintain.	1	This criteria refers to the degree to which the CBH will be required to have dedicated additional personnel and/or substantial coordination to operate and maintain the resource. The concept is that the need for additional personnel indicates that the resource is complex to maintain and operate. Those resources that require substantial personnel are considered to be adverse (serious disadvantage) as opposed to those resources that require little or no staff (significant advantage).
Will require some additional or part-time personnel to coordinate and manage the resource.	3	
Does not require personnel for operations of the resource.	5	

Ranking Legend

Serious disadvantages	1
Some significant disadvantages	2
Issues but manageable	3
Some advantages	4
Significant advantages	5

NOTES:
AF=acre-feet; AFY=acre-feet per year, CBH= City of Beverly Hills; CEQA=California Environmental Quality Act;

ALTERNATIVES RANKED IN ORDER

Option	Water Resource Alternative	Weighting Score	Rank
1	Metropolitan Water District of Southern California	4.38	✓ 1
7	Water Banking	3.88	✓ 2
10b	Conservation – Tailor to Unique CBH Characteristics	3.75	✓ 3
10a	Conservation – Comply with SBx7-7	3.75	✓ 4
9c	Groundwater - Develop Central Basin (La Brea) Wells	3.75	✓ 5
8	Antelope Valley Water Bank Drought Insurance	3.75	✓ 6
9b	Groundwater - Develop Hollywood Basin Wells	3.50	✓ 7
5	Exchanges	3.50	✓ 8
2	Ocean Desalination	3.50	✗ 9
11c	Capture and Treat R.O. Reject Water - 4.5 MGD	3.38	✗ 10
11b	Capture and Treat R.O. Reject Water - 3.0 MGD	3.25	✗ 11
11a	Capture and Treat R.O. Reject Water - 1.5 MGD	3.25	✗ 12
6	Transfers	3.13	✗ 13
4a	Recycled Water - Regional Approach	3.13	✗ 14
4d	Recycled Water - Exchange	3.00	✗ 15
4b	Recycled Water - Scalping Plant Approach	2.75	✗ 16
9a	Groundwater - Capture Spring Water	2.63	✗ 17
4c	Recycled Water - Greywater Approach	2.25	✗ 18
3	Urban Runoff - Capture & Treat Dry Weather Flows	2.13	✗ 19

ALTERNATIVE LIST

Rank	Option	Water Resource Alternative	Weighting Score
✓ 1	1	Metropolitan Water District of Southern California	4.38
✗ 9	2	Ocean Desalination	3.50
✗ 19	3	Urban Runoff - Capture & Treat Dry Weather Flows	2.13
✗ 14	4a	Recycled Water - Regional Approach	3.13
✗ 16	4b	Recycled Water - Scalping Plant Approach	2.75
✗ 18	4c	Recycled Water - Greywater Approach	2.25
✗ 15	4d	Recycled Water - Exchange	3.00
✓ 8	5	Exchanges	3.50
✗ 13	6	Transfers	3.13
✓ 2	7	Water Banking	3.88
✓ 6	8	Antelope Valley Water Bank Drought Insurance	3.75
✗ 17	9a	Groundwater - Capture Spring Water	2.63
✓ 7	9b	Groundwater - Develop Hollywood Basin Wells	3.50
✓ 5	9c	Groundwater - Develop Central Basin (La Brea) Wells	3.75
✓ 4	10a	Conservation – Comply with SBx7-7	3.75
✓ 3	10b	Conservation – Tailor to Unique CBH Characteristics	3.75
✗ 12	11a	Capture and Treat R.O. Reject Water - 1.5 MGD	3.25
✗ 11	11b	Capture and Treat R.O. Reject Water - 3.0 MGD	3.25
✗ 10	11c	Capture and Treat R.O. Reject Water - 4.5 MGD	3.38

SCENARIO 1 - Baseline (All Criterion Equal Weighting - 12.5%)

Criterion Selection Matrix

Weighting Factor	Cost	Volume	Reliability	Timing	Local Control	Legal/ Institutional	Environmental	Operational Complexity	
Relative	1	1	1	1	1	1	1	1	
Actual	12.5%	12.5%	12.5%	12.5%	12.5%	12.5%	12.5%	12.5%	100.0%
---	5	5	3	5	2	5	5	5	
---	3	5	5	3	3	2	2	5	
---	1	2	3	3	5	1	1	1	
---	2	5	5	1	2	4	3	3	
---	1	2	5	3	4	3	3	1	
---	2	2	4	3	1	1	2	3	
---	1	5	4	3	3	2	3	3	
---	4	5	4	3	3	3	3	3	
---	3	5	2	3	3	3	3	3	
---	4	5	5	5	3	3	3	3	
---	2	5	4	5	3	3	5	3	
---	2	2	2	3	5	3	3	1	
---	3	3	4	3	5	4	3	3	
---	4	4	4	3	5	4	3	3	
---	5	2	4	3	4	4	5	3	
---	4	3	4	3	4	4	5	3	
---	4	1	4	3	4	4	3	3	
---	3	2	4	3	4	4	3	3	
---	4	2	4	3	4	4	3	3	

5	Significant advantages
4	Some advantages
3	Issues but manageable
2	Some significant disadvantages
1	Serious disadvantages

ALTERNATIVES RANKED IN ORDER

Option	Water Resource Alternative	Weighting Score	Rank
1	Metropolitan Water District of Southern California	4.29	✓ 1
10b	Conservation – Tailor to Unique CBH Characteristics	3.86	✓ 2
10a	Conservation – Comply with SBx7-7	3.86	✓ 3
9c	Groundwater - Develop Central Basin (La Brea) Wells	3.86	✓ 4
7	Water Banking	3.72	✓ 5
9b	Groundwater - Develop Hollywood Basin Wells	3.57	✓ 6
8	Antelope Valley Water Bank Drought Insurance	3.57	✓ 7
5	Exchanges	3.57	✓ 8
2	Ocean Desalination	3.57	✗ 9
11c	Capture and Treat R.O. Reject Water - 4.5 MGD	3.43	✗ 10
4a	Recycled Water - Regional Approach	3.43	✗ 11
11b	Capture and Treat R.O. Reject Water - 3.0 MGD	3.29	✗ 12
11a	Capture and Treat R.O. Reject Water - 1.5 MGD	3.29	✗ 13
6	Transfers	3.14	✗ 14
4d	Recycled Water - Exchange	3.00	✗ 15
4b	Recycled Water - Scalping Plant Approach	2.71	✗ 16
9a	Groundwater - Capture Spring Water	2.57	✗ 17
4c	Recycled Water - Greywater Approach	2.14	✗ 18
3	Urban Runoff - Capture & Treat Dry Weather Flows	2.00	✗ 19

ALTERNATIVE LIST

Rank	Option	Water Resource Alternative	Weighting Score
✓ 1	1	Metropolitan Water District of Southern California	4.29
✗ 9	2	Ocean Desalination	3.57
✗ 19	3	Urban Runoff - Capture & Treat Dry Weather Flows	2.00
✗ 11	4a	Recycled Water - Regional Approach	3.43
✗ 16	4b	Recycled Water - Scalping Plant Approach	2.71
✗ 18	4c	Recycled Water - Greywater Approach	2.14
✗ 15	4d	Recycled Water - Exchange	3.00
✓ 8	5	Exchanges	3.57
✗ 14	6	Transfers	3.14
✓ 5	7	Water Banking	3.72
✓ 7	8	Antelope Valley Water Bank Drought Insurance	3.57
✗ 17	9a	Groundwater - Capture Spring Water	2.57
✓ 6	9b	Groundwater - Develop Hollywood Basin Wells	3.57
✓ 4	9c	Groundwater - Develop Central Basin (La Brea) Wells	3.86
✓ 3	10a	Conservation – Comply with SBx7-7	3.86
✓ 2	10b	Conservation – Tailor to Unique CBH Characteristics	3.86
✗ 13	11a	Capture and Treat R.O. Reject Water - 1.5 MGD	3.29
✗ 12	11b	Capture and Treat R.O. Reject Water - 3.0 MGD	3.29
✗ 10	11c	Capture and Treat R.O. Reject Water - 4.5 MGD	3.43

SCENARIO 2 - Timing Deleted; All Other Criterion = 14.3%

Criterion Selection Matrix

Option	Weighting Factor	Cost	Volume	Reliability	Timing	Local Control	Legal/ Institutional	Environmental	Operational Complexity	
	Relative	1	1	1	0	1	1	1	1	
	Actual	14.3%	14.3%	14.3%	0.0%	14.3%	14.3%	14.3%	14.3%	100.0%
1	---	5	5	3		2	5	5	5	
2	---	3	5	5		3	2	2	5	
3	---	1	2	3		5	1	1	1	
4a	---	2	5	5		2	4	3	3	
4b	---	1	2	5		4	3	3	1	
4c	---	2	2	4		1	1	2	3	
4d	---	1	5	4		3	2	3	3	
5	---	4	5	4		3	3	3	3	
6	---	3	5	2		3	3	3	3	
7	---	4	5	5		3	3	3	3	
8	---	2	5	4		3	3	5	3	
9a	---	2	2	2		5	3	3	1	
9b	---	3	3	4		5	4	3	3	
9c	---	4	4	4		5	4	3	3	
10a	---	5	2	4		4	4	5	3	
10b	---	4	3	4		4	4	5	3	
11a	---	4	1	4		4	4	3	3	
11b	---	3	2	4		4	4	3	3	
11c	---	4	2	4		4	4	3	3	

5	Significant advantages
4	Some advantages
3	Issues but manageable
2	Some significant disadvantages
1	Serious disadvantages

ALTERNATIVES RANKED IN ORDER

Option	Water Resource Alternative	Weighting Score	Rank
7	Water Banking	4.67	✓ 1
5	Exchanges	4.33	✓ 2
2	Ocean Desalination	4.33	✓ 3
1	Metropolitan Water District of Southern California	4.33	✓ 4
9c	Groundwater - Develop Central Basin (La Brea) Wells	4.00	✓ 5
4a	Recycled Water - Regional Approach	4.00	✓ 6
10b	Conservation – Tailor to Unique CBH Characteristics	3.67	✓ 7
10a	Conservation – Comply with SBx7-7	3.67	✓ 8
8	Antelope Valley Water Bank Drought Insurance	3.67	✗ 9
11c	Capture and Treat R.O. Reject Water - 4.5 MGD	3.34	✗ 10
9b	Groundwater - Develop Hollywood Basin Wells	3.33	✗ 11
6	Transfers	3.33	✗ 12
4d	Recycled Water - Exchange	3.33	✗ 13
11b	Capture and Treat R.O. Reject Water - 3.0 MGD	3.00	✗ 14
11a	Capture and Treat R.O. Reject Water - 1.5 MGD	3.00	✗ 15
4c	Recycled Water - Greywater Approach	2.67	✗ 16
4b	Recycled Water - Scalping Plant Approach	2.67	✗ 17
9a	Groundwater - Capture Spring Water	2.00	✗ 18
3	Urban Runoff - Capture & Treat Dry Weather Flows	2.00	✗ 19

ALTERNATIVE LIST

Rank	Option	Water Resource Alternative	Weighting Score
✓ 4	1	Metropolitan Water District of Southern California	4.33
✓ 3	2	Ocean Desalination	4.33
✗ 19	3	Urban Runoff - Capture & Treat Dry Weather Flows	2.00
✓ 6	4a	Recycled Water - Regional Approach	4.00
✗ 17	4b	Recycled Water - Scalping Plant Approach	2.67
✗ 16	4c	Recycled Water - Greywater Approach	2.67
✗ 13	4d	Recycled Water - Exchange	3.33
✓ 2	5	Exchanges	4.33
✗ 12	6	Transfers	3.33
✓ 1	7	Water Banking	4.67
✗ 9	8	Antelope Valley Water Bank Drought Insurance	3.67
✗ 18	9a	Groundwater - Capture Spring Water	2.00
✗ 11	9b	Groundwater - Develop Hollywood Basin Wells	3.33
✓ 5	9c	Groundwater - Develop Central Basin (La Brea) Wells	4.00
✓ 8	10a	Conservation – Comply with SBx7-7	3.67
✓ 7	10b	Conservation – Tailor to Unique CBH Characteristics	3.67
✗ 15	11a	Capture and Treat R.O. Reject Water - 1.5 MGD	3.00
✗ 14	11b	Capture and Treat R.O. Reject Water - 3.0 MGD	3.00
✗ 10	11c	Capture and Treat R.O. Reject Water - 4.5 MGD	3.34

SCENARIO 3 - Cost, Volume & Reliability = 33.3%; All Other = 0%

Criterion Selection Matrix

Option	Weighting Factor	Cost	Volume	Reliability	Timing	Local Control	Legal/ Institutional	Environmental	Operational Complexity
	Relative	1	1	1	0	0	0	0	0
	Actual	33.3%	33.3%	33.3%	0.0%	0.0%	0.0%	0.0%	0.0%
7	---	5	5	3					
5	---	3	5	5					
2	---	1	2	3					
1	---	2	5	5					
9c	---	1	2	5					
4a	---	2	2	4					
10b	---	1	5	4					
10a	---	4	5	4					
8	---	3	5	2					
11c	---	4	5	5					
9b	---	2	5	4					
6	---	2	2	2					
4d	---	3	3	4					
11b	---	4	4	4					
11a	---	5	2	4					
4c	---	4	3	4					
4b	---	4	1	4					
9a	---	3	2	4					
3	---	4	2	4					

100.0%

5	Significant advantages
4	Some advantages
3	Issues but manageable
2	Some significant disadvantages
1	Serious disadvantages

ALTERNATIVES RANKED IN ORDER

Option	Water Resource Alternative	Weighting Score	Rank
1	Metropolitan Water District of Southern California	4.50	✓ 1
10a	Conservation – Comply with SBx7-7	4.00	✓ 2
7	Water Banking	3.90	✓ 3
10b	Conservation – Tailor to Unique CBH Characteristics	3.80	✓ 4
9c	Groundwater - Develop Central Basin (La Brea) Wells	3.80	✓ 5
5	Exchanges	3.60	✓ 6
11c	Capture and Treat R.O. Reject Water - 4.5 MGD	3.50	✓ 7
11a	Capture and Treat R.O. Reject Water - 1.5 MGD	3.40	✓ 8
9b	Groundwater - Develop Hollywood Basin Wells	3.40	✗ 9
8	Antelope Valley Water Bank Drought Insurance	3.40	✗ 10
2	Ocean Desalination	3.40	✗ 11
11b	Capture and Treat R.O. Reject Water - 3.0 MGD	3.20	✗ 12
6	Transfers	3.10	✗ 13
4a	Recycled Water - Regional Approach	2.90	✗ 14
4d	Recycled Water - Exchange	2.60	✗ 15
9a	Groundwater - Capture Spring Water	2.50	✗ 16
4b	Recycled Water - Scalping Plant Approach	2.40	✗ 17
4c	Recycled Water - Greywater Approach	2.20	✗ 18
3	Urban Runoff - Capture & Treat Dry Weather Flows	1.90	✗ 19

ALTERNATIVE LIST

Rank	Option	Water Resource Alternative	Weighting Score
✓ 1	1	Metropolitan Water District of Southern California	4.50
✗ 11	2	Ocean Desalination	3.40
✗ 19	3	Urban Runoff - Capture & Treat Dry Weather Flows	1.90
✗ 14	4a	Recycled Water - Regional Approach	2.90
✗ 17	4b	Recycled Water - Scalping Plant Approach	2.40
✗ 18	4c	Recycled Water - Greywater Approach	2.20
✗ 15	4d	Recycled Water - Exchange	2.60
✓ 6	5	Exchanges	3.60
✗ 13	6	Transfers	3.10
✓ 3	7	Water Banking	3.90
✗ 10	8	Antelope Valley Water Bank Drought Insurance	3.40
✗ 16	9a	Groundwater - Capture Spring Water	2.50
✗ 9	9b	Groundwater - Develop Hollywood Basin Wells	3.40
✓ 5	9c	Groundwater - Develop Central Basin (La Brea) Wells	3.80
✓ 2	10a	Conservation – Comply with SBx7-7	4.00
✓ 4	10b	Conservation – Tailor to Unique CBH Characteristics	3.80
✓ 8	11a	Capture and Treat R.O. Reject Water - 1.5 MGD	3.40
✗ 12	11b	Capture and Treat R.O. Reject Water - 3.0 MGD	3.20
✓ 7	11c	Capture and Treat R.O. Reject Water - 4.5 MGD	3.50

SCENARIO 4 - Cost = 30%; All Other Criterion = 10%

Criterion Selection Matrix

Weighting Factor	Cost	Volume	Reliability	Timing	Local Control	Legal/ Institutional	Environmental	Operational Complexity	
Relative	3	1	1	1	1	1	1	1	
Actual	30.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	100.0%
---	5	5	3	5	2	5	5	5	
---	3	5	5	3	3	2	2	5	
---	1	2	3	3	5	1	1	1	
---	2	5	5	1	2	4	3	3	
---	1	2	5	3	4	3	3	1	
---	2	2	4	3	1	1	2	3	
---	1	5	4	3	3	2	3	3	
---	4	5	4	3	3	3	3	3	
---	3	5	2	3	3	3	3	3	
---	4	5	5	5	3	3	3	3	
---	2	5	4	5	3	3	5	3	
---	2	2	2	3	5	3	3	1	
---	3	3	4	3	5	4	3	3	
---	4	4	4	3	5	4	3	3	
---	5	2	4	3	4	4	5	3	
---	4	3	4	3	4	4	5	3	
---	4	1	4	3	4	4	3	3	
---	3	2	4	3	4	4	3	3	
---	4	2	4	3	4	4	3	3	

5	Significant advantages
4	Some advantages
3	Issues but manageable
2	Some significant disadvantages
1	Serious disadvantages

ALTERNATIVES RANKED IN ORDER

Option	Water Resource Alternative	Weighting Score	Rank
1	Metropolitan Water District of Southern California	4.50	✓ 1
10b	Conservation – Tailor to Unique CBH Characteristics	4.00	✓ 2
10a	Conservation – Comply with SBx7-7	4.00	✓ 3
8	Antelope Valley Water Bank Drought Insurance	4.00	✓ 4
7	Water Banking	3.70	✓ 5
9c	Groundwater - Develop Central Basin (La Brea) Wells	3.60	✓ 6
9b	Groundwater - Develop Hollywood Basin Wells	3.40	✓ 7
5	Exchanges	3.40	✓ 8
11c	Capture and Treat R.O. Reject Water - 4.5 MGD	3.30	✗ 9
11b	Capture and Treat R.O. Reject Water - 3.0 MGD	3.20	✗ 10
11a	Capture and Treat R.O. Reject Water - 1.5 MGD	3.20	✗ 11
2	Ocean Desalination	3.20	✗ 12
6	Transfers	3.10	✗ 13
4a	Recycled Water - Regional Approach	3.10	✗ 14
4d	Recycled Water - Exchange	3.00	✗ 15
4b	Recycled Water - Scalping Plant Approach	2.80	✗ 16
9a	Groundwater - Capture Spring Water	2.70	✗ 17
4c	Recycled Water - Greywater Approach	2.20	✗ 18
3	Urban Runoff - Capture & Treat Dry Weather Flows	1.90	✗ 19

ALTERNATIVE LIST

SCENARIO 5 - Environmental = 30%; All Other Criterion = 10%

Criterion Selection Matrix

Rank	Option	Water Resource Alternative	Weighting Score	Weighting Factor	Cost	Volume	Reliability	Timing	Local Control	Legal/ Institutional	Environmental	Operational Complexity	
				Relative	1	1	1	1	1	1	3	1	
				Actual	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	30.0%	10.0%	100.0%
✓ 1	1	Metropolitan Water District of Southern California	4.50	---	5	5	3	5	2	5	5	5	
✗ 12	2	Ocean Desalination	3.20	---	3	5	5	3	3	2	2	5	
✗ 19	3	Urban Runoff - Capture & Treat Dry Weather Flows	1.90	---	1	2	3	3	5	1	1	1	
✗ 14	4a	Recycled Water - Regional Approach	3.10	---	2	5	5	1	2	4	3	3	
✗ 16	4b	Recycled Water - Scalping Plant Approach	2.80	---	1	2	5	3	4	3	3	1	
✗ 18	4c	Recycled Water - Greywater Approach	2.20	---	2	2	4	3	1	1	2	3	
✗ 15	4d	Recycled Water - Exchange	3.00	---	1	5	4	3	3	2	3	3	
✓ 8	5	Exchanges	3.40	---	4	5	4	3	3	3	3	3	
✗ 13	6	Transfers	3.10	---	3	5	2	3	3	3	3	3	
✓ 5	7	Water Banking	3.70	---	4	5	5	5	3	3	3	3	
✓ 4	8	Antelope Valley Water Bank Drought Insurance	4.00	---	2	5	4	5	3	3	5	3	
✗ 17	9a	Groundwater - Capture Spring Water	2.70	---	2	2	2	3	5	3	3	1	
✓ 7	9b	Groundwater - Develop Hollywood Basin Wells	3.40	---	3	3	4	3	5	4	3	3	
✓ 6	9c	Groundwater - Develop Central Basin (La Brea) Wells	3.60	---	4	4	4	3	5	4	3	3	
✓ 3	10a	Conservation – Comply with SBx7-7	4.00	---	5	2	4	3	4	4	5	3	
✓ 2	10b	Conservation – Tailor to Unique CBH Characteristics	4.00	---	4	3	4	3	4	4	5	3	
✗ 11	11a	Capture and Treat R.O. Reject Water - 1.5 MGD	3.20	---	4	1	4	3	4	4	3	3	
✗ 10	11b	Capture and Treat R.O. Reject Water - 3.0 MGD	3.20	---	3	2	4	3	4	4	3	3	
✗ 9	11c	Capture and Treat R.O. Reject Water - 4.5 MGD	3.30	---	4	2	4	3	4	4	3	3	

5	Significant advantages	2	Some significant disadvantages
4	Some advantages	1	Serious disadvantages
3	Issues but manageable		

ALTERNATIVES RANKED IN ORDER

Option	Water Resource Alternative	Weighting Score	Rank
7	Water Banking	4.10	✓ 1
1	Metropolitan Water District of Southern California	4.10	✓ 2
10b	Conservation – Tailor to Unique CBH Characteristics	3.80	✓ 3
10a	Conservation – Comply with SBx7-7	3.80	✓ 4
9c	Groundwater - Develop Central Basin (La Brea) Wells	3.80	✓ 5
8	Antelope Valley Water Bank Drought Insurance	3.80	✓ 6
2	Ocean Desalination	3.80	✓ 7
9b	Groundwater - Develop Hollywood Basin Wells	3.60	✓ 8
5	Exchanges	3.60	✗ 9
11c	Capture and Treat R.O. Reject Water - 4.5 MGD	3.50	✗ 10
4a	Recycled Water - Regional Approach	3.50	✗ 11
11b	Capture and Treat R.O. Reject Water - 3.0 MGD	3.40	✗ 12
11a	Capture and Treat R.O. Reject Water - 1.5 MGD	3.40	✗ 13
4b	Recycled Water - Scalping Plant Approach	3.20	✗ 14
4d	Recycled Water - Exchange	3.20	✗ 15
6	Transfers	2.90	✗ 16
4c	Recycled Water - Greywater Approach	2.60	✗ 17
9a	Groundwater - Capture Spring Water	2.50	✗ 18
3	Urban Runoff - Capture & Treat Dry Weather Flows	2.30	✗ 19

ALTERNATIVE LIST

Rank	Option	Water Resource Alternative	Weighting Score
✓ 2	1	Metropolitan Water District of Southern California	4.10
✓ 7	2	Ocean Desalination	3.80
✗ 19	3	Urban Runoff - Capture & Treat Dry Weather Flows	2.30
✗ 11	4a	Recycled Water - Regional Approach	3.50
✗ 14	4b	Recycled Water - Scalping Plant Approach	3.20
✗ 17	4c	Recycled Water - Greywater Approach	2.60
✗ 15	4d	Recycled Water - Exchange	3.20
✗ 9	5	Exchanges	3.60
✗ 16	6	Transfers	2.90
✓ 1	7	Water Banking	4.10
✓ 6	8	Antelope Valley Water Bank Drought Insurance	3.80
✗ 18	9a	Groundwater - Capture Spring Water	2.50
✓ 8	9b	Groundwater - Develop Hollywood Basin Wells	3.60
✓ 5	9c	Groundwater - Develop Central Basin (La Brea) Wells	3.80
✓ 4	10a	Conservation – Comply with SBx7-7	3.80
✓ 3	10b	Conservation – Tailor to Unique CBH Characteristics	3.80
✗ 13	11a	Capture and Treat R.O. Reject Water - 1.5 MGD	3.40
✗ 12	11b	Capture and Treat R.O. Reject Water - 3.0 MGD	3.40
✗ 10	11c	Capture and Treat R.O. Reject Water - 4.5 MGD	3.50

SCENARIO 6 - Reliability = 30%; All Other Criterion = 10%

Criterion Selection Matrix

Weighting Factor	Cost	Volume	Reliability	Timing	Local Control	Legal/ Institutional	Environmental	Operational Complexity	
Relative	1	1	3	1	1	1	1	1	
Actual	10.0%	10.0%	30.0%	10.0%	10.0%	10.0%	10.0%	10.0%	100.0%
---	5	5	3	5	2	5	5	5	
---	3	5	5	3	3	2	2	5	
---	1	2	3	3	5	1	1	1	
---	2	5	5	1	2	4	3	3	
---	1	2	5	3	4	3	3	1	
---	2	2	4	3	1	1	2	3	
---	1	5	4	3	3	2	3	3	
---	4	5	4	3	3	3	3	3	
---	3	5	2	3	3	3	3	3	
---	4	5	5	5	3	3	3	3	
---	2	5	4	5	3	3	5	3	
---	2	2	2	3	5	3	3	1	
---	3	3	4	3	5	4	3	3	
---	4	4	4	3	5	4	3	3	
---	5	2	4	3	4	4	5	3	
---	4	3	4	3	4	4	5	3	
---	4	1	4	3	4	4	3	3	
---	3	2	4	3	4	4	3	3	
---	4	2	4	3	4	4	3	3	

5	Significant advantages
4	Some advantages
3	Issues but manageable
2	Some significant disadvantages
1	Serious disadvantages

ALTERNATIVES RANKED IN ORDER

Option	Water Resource Alternative	Weighting Score	Rank
1	Metropolitan Water District of Southern California	4.50	✓ 1
7	Water Banking	4.10	✓ 2
8	Antelope Valley Water Bank Drought Insurance	4.00	✓ 3
9c	Groundwater - Develop Central Basin (La Brea) Wells	3.80	✓ 4
5	Exchanges	3.80	✓ 5
2	Ocean Desalination	3.80	✓ 6
10b	Conservation – Tailor to Unique CBH Characteristics	3.60	✓ 7
6	Transfers	3.50	✓ 8
4a	Recycled Water - Regional Approach	3.50	✗ 9
10a	Conservation – Comply with SBx7-7	3.40	✗ 10
9b	Groundwater - Develop Hollywood Basin Wells	3.40	✗ 11
4d	Recycled Water - Exchange	3.40	✗ 12
11c	Capture and Treat R.O. Reject Water - 4.5 MGD	3.10	✗ 13
11b	Capture and Treat R.O. Reject Water - 3.0 MGD	3.00	✗ 14
11a	Capture and Treat R.O. Reject Water - 1.5 MGD	2.80	✗ 15
4b	Recycled Water - Scalping Plant Approach	2.60	✗ 16
9a	Groundwater - Capture Spring Water	2.50	✗ 17
4c	Recycled Water - Greywater Approach	2.20	✗ 18
3	Urban Runoff - Capture & Treat Dry Weather Flows	2.10	✗ 19

ALTERNATIVE LIST

SCENARIO 7 - Volume = 30%; All Other Criterion = 10%

Criterion Selection Matrix

Rank	Option	Water Resource Alternative	Weighting Score	Weighting Factor	Cost	Volume	Reliability	Timing	Local Control	Legal/ Institutional	Environmental	Operational Complexity	
				Relative	1	3	1	1	1	1	1	1	
				Actual	10.0%	30.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	100.0%
✓ 1	1	Metropolitan Water District of Southern California	4.50	---	5	5	3	5	2	5	5	5	
✓ 6	2	Ocean Desalination	3.80	---	3	5	5	3	3	2	2	5	
✗ 19	3	Urban Runoff - Capture & Treat Dry Weather Flows	2.10	---	1	2	3	3	5	1	1	1	
✗ 9	4a	Recycled Water - Regional Approach	3.50	---	2	5	5	1	2	4	3	3	
✗ 16	4b	Recycled Water - Scalping Plant Approach	2.60	---	1	2	5	3	4	3	3	1	
✗ 18	4c	Recycled Water - Greywater Approach	2.20	---	2	2	4	3	1	1	2	3	
✗ 12	4d	Recycled Water - Exchange	3.40	---	1	5	4	3	3	2	3	3	
✓ 5	5	Exchanges	3.80	---	4	5	4	3	3	3	3	3	
✓ 8	6	Transfers	3.50	---	3	5	2	3	3	3	3	3	
✓ 2	7	Water Banking	4.10	---	4	5	5	5	3	3	3	3	
✓ 3	8	Antelope Valley Water Bank Drought Insurance	4.00	---	2	5	4	5	3	3	5	3	
✗ 17	9a	Groundwater - Capture Spring Water	2.50	---	2	2	2	3	5	3	3	1	
✗ 11	9b	Groundwater - Develop Hollywood Basin Wells	3.40	---	3	3	4	3	5	4	3	3	
✓ 4	9c	Groundwater - Develop Central Basin (La Brea) Wells	3.80	---	4	4	4	3	5	4	3	3	
✗ 10	10a	Conservation – Comply with SBx7-7	3.40	---	5	2	4	3	4	4	5	3	
✓ 7	10b	Conservation – Tailor to Unique CBH Characteristics	3.60	---	4	3	4	3	4	4	5	3	
✗ 15	11a	Capture and Treat R.O. Reject Water - 1.5 MGD	2.80	---	4	1	4	3	4	4	3	3	
✗ 14	11b	Capture and Treat R.O. Reject Water - 3.0 MGD	3.00	---	3	2	4	3	4	4	3	3	
✗ 13	11c	Capture and Treat R.O. Reject Water - 4.5 MGD	3.10	---	4	2	4	3	4	4	3	3	

5	Significant advantages
4	Some advantages
3	Issues but manageable
2	Some significant disadvantages
1	Serious disadvantages

SCENARIO 8 - Cost, Volume, Reliability & Environmental = 20%; Timing = 0%; All Others = 6.7%

ALTERNATIVES RANKED IN ORDER

Option	Water Resource Alternative	Weighting Score	Rank
1	Metropolitan Water District of Southern California	4.40	✓ 1
7	Water Banking	4.00	✓ 2
10b	Conservation – Tailor to Unique CBH Characteristics	3.93	✓ 3
10a	Conservation – Comply with SBx7-7	3.93	✓ 4
9c	Groundwater - Develop Central Basin (La Brea) Wells	3.80	✓ 5
8	Antelope Valley Water Bank Drought Insurance	3.80	✓ 6
5	Exchanges	3.80	✓ 7
2	Ocean Desalination	3.67	✓ 8
4a	Recycled Water - Regional Approach	3.60	✗ 9
9b	Groundwater - Develop Hollywood Basin Wells	3.40	✗ 10
11c	Capture and Treat R.O. Reject Water - 4.5 MGD	3.34	✗ 11
6	Transfers	3.20	✗ 12
11b	Capture and Treat R.O. Reject Water - 3.0 MGD	3.14	✗ 13
11a	Capture and Treat R.O. Reject Water - 1.5 MGD	3.13	✗ 14
4d	Recycled Water - Exchange	3.13	✗ 15
4b	Recycled Water - Scalping Plant Approach	2.73	✗ 16
9a	Groundwater - Capture Spring Water	2.40	✗ 17
4c	Recycled Water - Greywater Approach	2.33	✗ 18
3	Urban Runoff - Capture & Treat Dry Weather Flows	1.87	✗ 19

ALTERNATIVE LIST

Rank	Option	Water Resource Alternative	Weighting Score
✓ 1	1	Metropolitan Water District of Southern California	4.40
✓ 8	2	Ocean Desalination	3.67
✗ 19	3	Urban Runoff - Capture & Treat Dry Weather Flows	1.87
✗ 9	4a	Recycled Water - Regional Approach	3.60
✗ 16	4b	Recycled Water - Scalping Plant Approach	2.73
✗ 18	4c	Recycled Water - Greywater Approach	2.33
✗ 15	4d	Recycled Water - Exchange	3.13
✓ 7	5	Exchanges	3.80
✗ 12	6	Transfers	3.20
✓ 2	7	Water Banking	4.00
✓ 6	8	Antelope Valley Water Bank Drought Insurance	3.80
✗ 17	9a	Groundwater - Capture Spring Water	2.40
✗ 10	9b	Groundwater - Develop Hollywood Basin Wells	3.40
✓ 5	9c	Groundwater - Develop Central Basin (La Brea) Wells	3.80
✓ 4	10a	Conservation – Comply with SBx7-7	3.93
✓ 3	10b	Conservation – Tailor to Unique CBH Characteristics	3.93
✗ 14	11a	Capture and Treat R.O. Reject Water - 1.5 MGD	3.13
✗ 13	11b	Capture and Treat R.O. Reject Water - 3.0 MGD	3.14
✗ 11	11c	Capture and Treat R.O. Reject Water - 4.5 MGD	3.34

Criterion Selection Matrix

Weighting Factor	Cost	Volume	Reliability	Timing	Local Control	Legal/ Institutional	Environmental	Operational Complexity	
Relative	3	3	3	0	1	1	3	1	
Actual	20.0%	20.0%	20.0%	0.0%	6.7%	6.7%	20.0%	6.7%	100.0%
---	5	5	3		2	5	5	5	
---	3	5	5		3	2	2	5	
---	1	2	3		5	1	1	1	
---	2	5	5		2	4	3	3	
---	1	2	5		4	3	3	1	
---	2	2	4		1	1	2	3	
---	1	5	4		3	2	3	3	
---	4	5	4		3	3	3	3	
---	3	5	2		3	3	3	3	
---	4	5	5		3	3	3	3	
---	2	5	4		3	3	5	3	
---	2	2	2		5	3	3	1	
---	3	3	4		5	4	3	3	
---	4	4	4		5	4	3	3	
---	5	2	4		4	4	5	3	
---	4	3	4		4	4	5	3	
---	4	1	4		4	4	3	3	
---	3	2	4		4	4	3	3	
---	4	2	4		4	4	3	3	

5	Significant advantages
4	Some advantages
3	Issues but manageable
2	Some significant disadvantages
1	Serious disadvantages

SCENARIO 9 - Volume, Reliability & Local Control = 23.1%; Timing = 0%; All Others = 7.7%

Criterion Selection Matrix

ALTERNATIVES RANKED IN ORDER

Option	Water Resource Alternative	Weighting Score	Rank
9c	Groundwater - Develop Central Basin (La Brea) Wells	4.08	✓ 1
7	Water Banking	4.00	✓ 2
2	Ocean Desalination	3.92	✓ 3
1	Metropolitan Water District of Southern California	3.85	✓ 4
10b	Conservation – Tailor to Unique CBH Characteristics	3.77	✓ 5
9b	Groundwater - Develop Hollywood Basin Wells	3.77	✓ 6
8	Antelope Valley Water Bank Drought Insurance	3.77	✓ 7
5	Exchanges	3.77	✓ 8
4a	Recycled Water - Regional Approach	3.69	✗ 9
10a	Conservation – Comply with SBx7-7	3.62	✗ 10
4d	Recycled Water - Exchange	3.46	✗ 11
11c	Capture and Treat R.O. Reject Water - 4.5 MGD	3.39	✗ 12
11b	Capture and Treat R.O. Reject Water - 3.0 MGD	3.31	✗ 13
6	Transfers	3.23	✗ 14
11a	Capture and Treat R.O. Reject Water - 1.5 MGD	3.16	✗ 15
4b	Recycled Water - Scalping Plant Approach	3.15	✗ 16
9a	Groundwater - Capture Spring Water	2.77	✗ 17
3	Urban Runoff - Capture & Treat Dry Weather Flows	2.62	✗ 18
4c	Recycled Water - Greywater Approach	2.23	✗ 19

ALTERNATIVE LIST

Rank	Option	Water Resource Alternative	Weighting Score	Weighting Factor	Cost	Volume	Reliability	Timing	Local Control	Legal/ Institutional	Environmental	Operational Complexity	
				Relative	1	3	3	0	3	1	1	1	
				Actual	7.7%	23.1%	23.1%	0.0%	23.1%	7.7%	7.7%	7.7%	100.0%
✓ 4	1	Metropolitan Water District of Southern California	3.85	---	5	5	3		2	5	5	5	
✓ 3	2	Ocean Desalination	3.92	---	3	5	5		3	2	2	5	
✗ 18	3	Urban Runoff - Capture & Treat Dry Weather Flows	2.62	---	1	2	3		5	1	1	1	
✗ 9	4a	Recycled Water - Regional Approach	3.69	---	2	5	5		2	4	3	3	
✗ 16	4b	Recycled Water - Scalping Plant Approach	3.15	---	1	2	5		4	3	3	1	
✗ 19	4c	Recycled Water - Greywater Approach	2.23	---	2	2	4		1	1	2	3	
✗ 11	4d	Recycled Water - Exchange	3.46	---	1	5	4		3	2	3	3	
✓ 8	5	Exchanges	3.77	---	4	5	4		3	3	3	3	
✗ 14	6	Transfers	3.23	---	3	5	2		3	3	3	3	
✓ 2	7	Water Banking	4.00	---	4	5	5		3	3	3	3	
✓ 7	8	Antelope Valley Water Bank Drought Insurance	3.77	---	2	5	4		3	3	5	3	
✗ 17	9a	Groundwater - Capture Spring Water	2.77	---	2	2	2		5	3	3	1	
✓ 6	9b	Groundwater - Develop Hollywood Basin Wells	3.77	---	3	3	4		5	4	3	3	
✓ 1	9c	Groundwater - Develop Central Basin (La Brea) Wells	4.08	---	4	4	4		5	4	3	3	
✗ 10	10a	Conservation – Comply with SBx7-7	3.62	---	5	2	4		4	4	5	3	
✓ 5	10b	Conservation – Tailor to Unique CBH Characteristics	3.77	---	4	3	4		4	4	5	3	
✗ 15	11a	Capture and Treat R.O. Reject Water - 1.5 MGD	3.16	---	4	1	4		4	4	3	3	
✗ 13	11b	Capture and Treat R.O. Reject Water - 3.0 MGD	3.31	---	3	2	4		4	4	3	3	
✗ 12	11c	Capture and Treat R.O. Reject Water - 4.5 MGD	3.39	---	4	2	4		4	4	3	3	

5	Significant advantages
4	Some advantages
3	Issues but manageable
2	Some significant disadvantages
1	Serious disadvantages

SCENARIO 10 - Volume, Reliability, Local Control & Environment = 21.7%; Timing = 0%; All Others = 4.3%

Criterion Selection Matrix

ALTERNATIVES RANKED IN ORDER

Option	Water Resource Alternative	Weighting Score	Rank
8	Antelope Valley Water Bank Drought Insurance	4.04	1
10b	Conservation – Tailor to Unique CBH Characteristics	3.96	2
9c	Groundwater - Develop Central Basin (La Brea) Wells	3.96	3
7	Water Banking	3.91	4
1	Metropolitan Water District of Southern California	3.91	5
10a	Conservation – Comply with SBx7-7	3.78	6
9b	Groundwater - Develop Hollywood Basin Wells	3.70	7
5	Exchanges	3.70	8
2	Ocean Desalination	3.70	9
4a	Recycled Water - Regional Approach	3.65	10
4d	Recycled Water - Exchange	3.52	11
11c	Capture and Treat R.O. Reject Water - 4.5 MGD	3.31	12
11b	Capture and Treat R.O. Reject Water - 3.0 MGD	3.26	13
4b	Recycled Water - Scalping Plant Approach	3.26	14
6	Transfers	3.22	15
11a	Capture and Treat R.O. Reject Water - 1.5 MGD	3.09	16
9a	Groundwater - Capture Spring Water	2.87	17
3	Urban Runoff - Capture & Treat Dry Weather Flows	2.52	18
4c	Recycled Water - Greywater Approach	2.22	19

ALTERNATIVE LIST

Rank	Option	Water Resource Alternative	Weighting Score	Weighting Factor	Cost	Volume	Reliability	Timing	Local Control	Legal/ Institutional	Environmental	Operational Complexity	
				Relative	1	5	5	0	5	1	5	1	
				Actual	4.3%	21.7%	21.7%	0.0%	21.7%	4.3%	21.7%	4.3%	100.0%
5	1	Metropolitan Water District of Southern California	3.91	---	5	5	3		2	5	5	5	
9	2	Ocean Desalination	3.70	---	3	5	5		3	2	2	5	
18	3	Urban Runoff - Capture & Treat Dry Weather Flows	2.52	---	1	2	3		5	1	1	1	
10	4a	Recycled Water - Regional Approach	3.65	---	2	5	5		2	4	3	3	
14	4b	Recycled Water - Scalping Plant Approach	3.26	---	1	2	5		4	3	3	1	
19	4c	Recycled Water - Greywater Approach	2.22	---	2	2	4		1	1	2	3	
11	4d	Recycled Water - Exchange	3.52	---	1	5	4		3	2	3	3	
8	5	Exchanges	3.70	---	4	5	4		3	3	3	3	
15	6	Transfers	3.22	---	3	5	2		3	3	3	3	
4	7	Water Banking	3.91	---	4	5	5		3	3	3	3	
1	8	Antelope Valley Water Bank Drought Insurance	4.04	---	2	5	4		3	3	5	3	
17	9a	Groundwater - Capture Spring Water	2.87	---	2	2	2		5	3	3	1	
7	9b	Groundwater - Develop Hollywood Basin Wells	3.70	---	3	3	4		5	4	3	3	
3	9c	Groundwater - Develop Central Basin (La Brea) Wells	3.96	---	4	4	4		5	4	3	3	
6	10a	Conservation – Comply with SBx7-7	3.78	---	5	2	4		4	4	5	3	
2	10b	Conservation – Tailor to Unique CBH Characteristics	3.96	---	4	3	4		4	4	5	3	
16	11a	Capture and Treat R.O. Reject Water - 1.5 MGD	3.09	---	4	1	4		4	4	3	3	
13	11b	Capture and Treat R.O. Reject Water - 3.0 MGD	3.26	---	3	2	4		4	4	3	3	
12	11c	Capture and Treat R.O. Reject Water - 4.5 MGD	3.31	---	4	2	4		4	4	3	3	

5	Significant advantages
4	Some advantages
3	Issues but manageable
2	Some significant disadvantages
1	Serious disadvantages

Tabular Color-Coded Summary of Supply/Reliability Alternatives by Weighting Scenario

RANKING	Scenario No.									
	No. 1	No. 2	No. 3	No. 4	No. 5	No. 6	No. 7	No. 8	No. 9	No. 10
	All Equal	Timing Deleted, all others equal	Cost, Vol., Rel = 33%, all others=0	Cost=30%, all others=10%	Envir.=30%, all others=10%	Relia.=30%, all others=10%	Volume=30%, all others=10%	Cost, Vol., Rel. & Env.= 20%, all others=6.7%; timing=0	Vol., Rel., LC = 23.1%, all others=7.7%; timing=0	Vol., Rel., LC, Env. = 21.7%, all others=4.3%; timing=0
1	1	1	7	1	1	7	1	1	9c	8
2	7	10b	5	10a	10b	1	7	7	7	10b
3	10b	10a	2	7	10a	10b	8	10b	2	9c
4	10a	9c	1	10b	8	10a	9c	10a	1	7
5	9c	7	9c	9c	7	9c	5	9c	10b	1
6	8	9b	4a	5	9c	8	2	8	9b	10a
7	9b	8	10b	11c	9b	2	10b	5	8	9b
8	5	5	10a	11a	5	9b	6	2	5	5
9	2	2	8	9b	11c	5	4a	4a	4a	2
10	11c	11c	11c	8	11b	11c	10a	9b	10a	4a
11	11b	4a	9b	2	11a	4a	9b	11c	4d	4d
12	11a	11b	6	11b	2	11b	4d	6	11c	11c
13	6	11a	4d	6	6	11a	11c	11b	11b	11b
14	4a	6	11b	4a	4a	4b	11b	11a	6	4b
15	4d	4d	11a	4d	4d	4d	11a	4d	11a	6
16	4b	4b	4c	9a	4b	6	4b	4b	4b	11a
17	9a	9a	4b	4b	9a	4c	9a	9a	9a	9a
18	4c	4c	9a	4c	4c	9a	4c	4c	3	3
19	3	3	3	3	3	3	3	3	4c	4c

1	Metropolitan Water District of Southern California
2	Ocean Desalination
3	Urban Runoff – Capture and Treat Dry Weather Flows
4a	Recycled Water Regional Approach
4b	Recycled Water – Scalping Plant Approach
4c	Recycled Water – Greywater Approach
4d	Recycled Water Exchanges
5	Exchanges
6	Transfers
7	Water Banking
8	Antelope Valley Water Bank Drought Insurance
9a	Groundwater – Capture Spring Water
9b	Groundwater – Develop Hollywood Basin Wells
9c	Groundwater – Develop Central Basin (La Brea) Wells
10a	Conservation – Comply with SBx7-7
10b	Conservation – Tailor to Unique CBH Characteristics
11a	Capture and Treat RO Reject Water (1.5 MGD)
11b	Capture and Treat RO Reject Water (3.0 MGD)
11c	Capture and Treat RO Reject Water (4.5 MGD)

Appendix B

TM-2: Emergency Storage Evaluation

PSOMAS

TECHNICAL MEMORANDUM NO. 2

To: Trish Rhay, Mark Cuneo

From: Mike Swan, PE, Harvey Gobas, PE and Neha Gajjar, PE

Date: December 4, 2014

Subject: City of Beverly Hills Emergency Storage Evaluation

EXECUTIVE SUMMARY

The City of Beverly Hills (CBH) has ten (10) active reservoirs within thirteen (13) pressure zones in its water distribution system. Approximately 90% of the CBH's water supply comes from two (2) connections off of Metropolitan Water District's (MWD) 54-inch diameter supply pipeline, which is typically fed from the Santa Monica feeder and occasionally from the Sepulveda feeder. The remaining 10% of the water supply is from wells pumped from groundwater, which is treated at CBH's reverse osmosis treatment plant.

Water distribution systems rely on stored water to help equalize fluctuations between supply and demand (operational storage), supply sufficient water for firefighting (fire storage) and meet demands during an emergency or an unplanned outage of a major source of supply (emergency storage). In assessing the system's significant reliance on imported water supply and as part of MWD's recommended guidelines to meet seven (7) days of regional storage, during shutdown of their feeders, the City authorized this evaluation to determine the amount of additional storage required to meet a seven (7) day MWD outage.

Total reservoir capacity and system demands were obtained from the City's 2002 Water System Master Plan and the 2010 Urban Water Management Plan, whereas emergency storage capacity was calculated using data from these reports. The following table summarizes the data used in this storage analysis.

Table A
Summary Water System Data

Data	Value
Reservoir	(in MG)
Fire Storage	3.78
Operational Storage	2.76
Emergency Storage	36.46
Total Volume	**43.00**
Demand	
Average Daily Demand (in MGD)	11.2
Maximum Daily Demand (in MGD)	18.4
Groundwater Supply	
Water Treatment Plant (WTP) (MGD)	1.1

Based on the Average Daily Demand (ADD) condition and maintaining operational and fire storage in the reservoirs, the time required to fully deplete the emergency storage (36.46 MG) is approximately 3½ days. This duration represents the amount of time the associated demands can be sustained using only production from the wells/treatment plant and emergency storage. If service is to be maintained beyond this 3½ day period, the system demands must be reduced or an alternative supply source must be employed to maintain service at ADD flows.

To increase system durability, two additional scenarios were considered. The CBH may increase the capacity of the existing WTP to its full output capacity. Based on the 2002 WMP (Page 4-26), the full capacity of the plant is 2.7 MGD. Also, mandatory conservation and thereby a significant reduction in demand may be implemented during such a short-term emergency condition. An estimated reduction of 40% of the ADD was used. Based on the results of these calculations, for the off-peak condition and utilizing emergency storage in the reservoirs, the duration of time available is 7.8 days which could meet and exceed MWD guidelines.

With this evaluation it is evident that though an increase in the WTP capacity contributes to the sustainability of service in the event of an MWD outage, a more significant effect can be achieved by reducing system demand. This could be accomplished by advising residential and business customers within the first day or two of an emergency to curtail irrigation for the duration of the outage.

If the City wishes to provide enough emergency reservoir storage capacity to meet a seven (7) day demand during peak demand periods, while still assuming a 40% reduction in demand due to conservation efforts and a doubling of the current WTP capacity, then consideration should be given to adding another 35 MG in storage to the existing system (i.e., in addition to the City's existing 43 MG in storage capacity).[1]

INTRODUCTION

The CBH supplies its water distribution system primarily from MWD's 54-inch diameter pipeline which is typically fed from the Santa Monica feeder and occasionally from the Sepulveda feeder. This water enters the Central Control Building (CCB) from two adjacent MWD connections (BH-1 and BH-2) with capacities of 40 cubic feet per second (cfs) and 40 cfs; capable of delivering 26 MGD and 26 MGD, respectively. Approximately 90% of the City's water supply comes from this imported, purchased water.

A second supply source is groundwater from the Hollywood Subbasin. The City operates four (4) wells (Nos. 2, 4, 5 and 6) that pump water from the basin to its reverse osmosis WTP facility before it enters the distribution system. Approximately 10% of the City's yearly water supply is groundwater from this source.

The water from these supply sources is transferred via booster pumping stations or pressure reducing valves to ten (10) active reservoirs throughout the water system to distribute to customers. In assessing the City's current storage capacity and as part MWD's guideline to meet

[1] To avoid nitrification issues associated with large storage reservoirs, the 35 MG should be spread over several storage reservoirs.

the City's supply for seven (7) days with the MWD supply eliminated, this technical memorandum evaluates the system's ability to sustain this potential event.

BACKGROUND

Imported Water Supply and Capacity

Table 1 shows the MWD connection capacities at each of the two turnout locations. The total import capacity is 80 cfs (or 52 MGD) at an operating pressure of 154 psi when the source is the Santa Monica feeder. When there is an outage of the Santa Monica feeder, the 54-inch diameter pipeline is supplied by the Sepulveda feeder. However, when this occurs the operating pressure decreases to 85 psi affecting the deliverable zones in the distribution system, requiring CBH to operate pumps to boost water from Zone 4 to Zone 6.

Table 1
Summary of MWD Connection Data

MWD Connection	Capacity (cfs)	Capacity (MGD)	Operating Pressure (psi)	Zones Served
From Santa Monica Feeder				
BH-1	40	26	154	3, 4 and 6
BH-2	40	26	154	3, 4 and 6
From Sepulveda Feeder				
BH-1	40	26	85	3 and 4
BH-2	40	26	85	3 and 4

Groundwater Basin

The Hollywood Basin (Basin) underlies western Los Angeles County and is an un-adjudicated water supply currently managed by the CBH through municipal ordinances. Historically, CBH is one of three water agencies that have pumped groundwater from the Basin. Per the 2010 Urban Water Management Plan (UWMP), the sustainable yield of the Basin was estimated to be about 3,000 acre-feet/year (or 2.7 MGD). Since the basin does not receive artificial recharge, the annual pumping limits are equivalent to the sustainable yield.

Due to elevated concentrations of total dissolved solids, hydrogen sulfide, iron and manganese, the four active wells (Nos. 2, 4, 5 and 6) draw groundwater from the deep aquifer, which is treated in CBH's WTP before it is distributed into the water distribution system. The reverse osmosis treatment process loses approximately 25% of the volume due to the generation of reject water (brine). Therefore, the maximum output capacity of the WTP would be approximately 2.2 MGD. Per discussions with CBH's operations staff, the treatment facilities are currently running at approximately 50% capacity due to limited operational use (5 days a week) and reduced well production from drawdown towards the end of each week. This reduces the inflow of groundwater water supply to approximately 1.1 MGD.

Table 2 shows the total annual production by source from 2005 to 2014.

Table 2
Annual City-Wide Production by Source

Year	Annual Production (acre-feet)[1]		
	Imported from MWD	GW/WTP	Total
2005[2]	11,918	1,281	13,199
2006[2]	12,046	1,142	13,188
2007[2]	12,776	1,357	14,133
2008[2]	12,179	884	13,063
2009[2]	11,801	1,311	13,112
2010	10,473	1,089	11,562
2011	10,249	819	11,068
2012	10,495	944	11,439
2013	11,114	779	11,893
2014	11,632	637	12,269
Average	**11,468**	**1,024**	**12,493**

[1] Annual production is measured by fiscal year (July 1 to June 30)
[2] Source: Total historic purchases and groundwater production from City of Beverly Hills 2010 UWMP (Table 2.1 and Table 2.3). Data for Years 2010 through 2014 were obtained from CBH Summary of Water Production and Consumption spreadsheets.

Water Demand

As noted in Table 2, over the last ten years the average annual water demand fluctuated from a high of 14,133 acre-feet (12.6 MGD) in 2007 to a low of 11,068 acre-feet (9.9 MGD) in 2011 with an average usage of 12,493 acre-feet per year (11.2 MGD). The projected Year 2025 annual water demand is projected to be 11,313 acre-feet (10.1 MGD), based on complying with the City's SBx7-7 target.[2] Though the future demand is approximately 1 MGD less than the average ADD, the higher value of 11.2 MGD is used for the calculations in this memorandum.

To determine the water demands for conditions other than the average daily water use, a peaking factor for the Maximum Daily Demand (MDD) was calculated in the 2002 Water System Master Plan (WMP). The calculations were based on Year 1999's Supervisory Control and Data Acquisition (SCADA) records and yielded a MDD/ADD ratio of 1.64. However, Section 1.4.4 of the 2002 WMP indicates a peaking factor of 2.0 was utilized to provide a more conservative

[2] This 2009 legislative package requires a statewide 20% reduction in urban per capita water use by 2020. It requires that urban water retail suppliers determine baseline water use and set reduction targets according to specified requirements, and requires agricultural water suppliers prepare plans and implement efficient water management practices (definition extracted from the Association of California Water Agencies website).

hydraulic analysis. While this additional level of conservatism may be appropriate for analyzing transmission and distribution system piping sizing, it is deemed to be overly conservative in determining the appropriate amount of emergency storage in the system. Therefore this analysis utilizes the actual measured peaking factor of 1.64 for this emergency storage analysis, resulting in an existing MDD of 18.4 MGD (11.2 x 1.64).

EVALUATION

Available Storage Capacity

Water distribution systems rely on stored water to help equalize fluctuations between supply and demand (operational storage), supply sufficient water for firefighting (fire storage), and meet demands during an emergency or an unplanned outage of a major source of supply (emergency storage). CBH currently has ten (10) active reservoirs with a total nominal storage capacity of 43 MG. The reservoirs include above ground steel tanks and above ground and underground concrete storage tanks.

Table 3 shows the various reservoirs and their capacities.

Table 3
Summary of Reservoir Capacity

Reservoir	Type	Zone Served	Overflow Elevation	Capacity (MG)
7	Steel A/G[1]	15	1502	1.5
6	Steel A/G	13	1292	1.0
5	Steel A/G	11	1052	1.0
4B	Steel A/G	8	800	1.0
4A	Conc A/G	8	800	2.2
Greystone	Conc U/G[2]	6	628	19.4
3A	Steel A/G	6	628	0.81
Woodland	Conc A/G	4	454	1.71
Coldwater	Conc U/G	4	454	8.3
Sunset	Conc U/G	3	384	6.0
Total Capacity				**42.92**
Total Capacity (Rounded)				**43**

[1] A/G – Above Ground
[2] U/G – Under Ground

Storage Requirements

The 2002 WMP calculated the storage availability in each reservoir and then assessed the volume of emergency storage for the system by grouping the reservoirs into regions. Each region was then evaluated for emergency storage. However, this method is conservative in that it does not consider the ability of a storage reservoir in upper pressure zones to supply water resources to the lower pressure zones in the system.

For this analysis, the emergency storage volume is calculated by assessing the maximum fire flow volumes required to supply each pressure zone and then determining the required operational volume of the system. These volumes are then subtracted from the total volume of the reservoirs to estimate the emergency storage availability.

Evaluating the hydraulic profile of the CBH's system, it was determined that maintaining fire volume in four (4) reservoirs (3A, 7, Coldwater and Greystone) could serve the fire flow demands of any of the 13 pressure zones with the use of booster pumping stations and pressure reducing valves. Reservoirs 3A and 7 must have a fire volume of 0.24 MG to supply the maximum fire flow demands of Zone 9 and Zones 11/13/15/16, respectively. Coldwater reservoir must have a minimum fire volume of 1.5 MG to supply Zones 8 or WH3. Greystone reservoir must have a minimum fire volume of 1.65 MG to supply Zones 3, 4, 5 or WH 5.

Based on the 2002 WMP, the operational storage volume was calculated to be 15% of the MDD. However, Section 4.9.1 of the 2002 WMP indicates a more conservative allowance of 30% was used to account for the operational mode used at the Greystone and hillside reservoirs (4A, 4B, 5, 6 and 7) to mitigate nitrification. While this additional level of conservatism may be appropriate for analyzing the system for the long term, it may be too conservative to determine the appropriate amount of storage in the system during a short term emergency condition where nitrification is not expected to be a major concern. Therefore we have utilized the actual measured value of 15% of MDD to calculate the operational storage volume of 2.76 MG (0.15 x 18.4[3]). Table 4 on the next page, summarizes the fire and operational volumes and shows the resulting emergency storage volume of 36.5 MG.

[3] 18.4 MGD is the calculated MDD from the Water Demand Section of this TM

Table 4
Existing System Water Storage Requirements

	Fire Volume (MG)	Operational Volume (MG)	Total Volume (MG)	Available Emergency Volume (MG)*
Reservoirs				
Reservoir 3A	0.24			
Reservoir 7	0.24			
Coldwater Reservoir	1.65			
Greystone Reservoir	1.65			
Total System	**3.78**	**2.76**	**43**	**36.46**
Total System (Rounded)				**36.5**

* Available Emergency Volume = Total System Volume – (Operation Volume + Fire Volume)

ANALYSIS AND CONCLUSIONS

To determine the CBH's ability to meet MWD's guideline to maintain service during a projected seven (7) day outage, various potential scenarios were reviewed. The first scenario is if the event occurs during the average or off-peak demand periods (typically October through March). In this condition, the ADD was evaluated utilizing the availability of only emergency storage in the reservoirs. The second scenario evaluated was with the outage event occurring during the peak demand periods (typically April through September) where the MDD was used.

With MWD supplies unavailable during this period of time, the CBH's wells will be able to provide some of the required water supply. In this analysis, the groundwater treatment plant output of 1.1 MGD was used. The results of these calculations are shown in Table 5.

Table 5
Analysis Results for Emergency Scenarios 1 & 2

Scenario	Demand (MGD)	Available Supply from WTP (MGD)[1]	Emergency Storage Volume (MG)	Duration of Emergency Storage Available (Days)
1	ADD			
Off-Peak Months	11.2	1.1	36.5	3.6
2	MDD			
Peak Months	18.4	1.1	36.5	2.1

[1] Assumes 24/7 operation of the WTP; the plant is currently only being operated five days per week, therefore 1.1 MGD would not be available on days when the plant is not operational.

As seen in Table 5, the maximum amount of time available is approximately 3-1/2 days in the off-peak condition utilizing emergency storage in the reservoirs. This duration represents the

amount of time that the associated demands can be sustained using emergency storage and production from the wells. Prior to the end of this period, the system demands must be reduced or an alternative supply source must be employed to maintain service.

To increase system durability, three additional scenarios were considered. The first (Scenario 3A) is if the ADD was reduced by 40%. In this condition, the maximum duration of emergency storage available is a little over 6 days, which is reduced to almost 4 days if we use MDD and reduce it similarly by 40% (Scenario 4A).

The next set of scenarios (Scenario 3B and 4B) considers this demand reduction but also an increase in the capacity of the existing WTP to its full capacity of 2.2 MGD.[4] This condition resulted in meeting a little over 7½ days of emergency storage for average months, but during peak months we were only able to provide about 4 days of emergency storage.

The last set of scenarios (Scenario 3C and 4C), evaluates the conditions with the WTP capacity increased to 2.2 MGD, but with demands remain unchanged (no reduction based on communication to customers to curtail irrigation uses). These results yielded the shortest duration of emergency storage, 4 days for ADD and 2 days for MDD. Table 6 denotes the results of these additional analyses using 60% of ADD and 60% of MDD (or a demand reduction of 40 percent) based on early and effective communication with customers (A&B Scenarios) and with no reduction of ADD and MDD (C Scenarios).

Table 6
Analysis Results for Emergency Scenarios 3 & 4

Scenario	Demand (MGD)	Available Supply from WTP (MGD)	Emergency Storage Volume (MG)	Duration of Emergency Storage Available (Days)
3A	60% ADD			
Off-Peak Months	6.9	1.1	36.5	6.3
3B	60% ADD			
Off-Peak Months	6.9	2.2	36.5	7.8
3C	ADD			
Off-Peak Months	11.2	2.2	36.5	4.0
4A	60% MDD			
Peak Months	11.0	1.1	36.5	3.7
4B	60% MDD			
Peak Months	11.0	2.2	36.5	4.1
4C	MDD			
Peak Months	18.4	2.2	36.5	2.3

[4] The City has retained two other consultants (GHD and Hazen & Sawyer) to study feasibility and costs associated with increasing existing plant production from 1.1 MGD to full design capacity. This TM assumes it will be feasible to increase the WTP capacity to 2.2 MGD, but we defer to the other consultants for a final decision on that matter.

Based on the results of these calculations, it is evident that though an increase in the WTP capacity to full capacity contributes to the sustainability of the required regional storage, the most significant effect is to reduce the demand during such an outage by conducting a swift, effective communication campaign to curtail irrigation uses and other non-essential water uses.

RECOMMENDATIONS

CBH can effectively meet MWD's recommended guideline of providing seven (7) days of emergency storage during off-peak periods. However, assuming an outage occurs during peak periods, and demands during that period can be reduced through an effective public relations campaign to conserve water, CBH can only meet demands for approximately 3.7 to 4.1 days (with the latter figure assuming a doubling of the existing groundwater treatment plant capacity). If the City wishes to provide enough emergency storage to meet a seven day demand during peak demand periods, assuming a 40% reduction in demand due to conservation efforts and a doubling of the current WTP capacity, then consideration should be given to adding another 35 MG in storage to the existing system.

Appendix C

TM-3: City Staff Augmentation Required to Address Water Enterprise Recommendations

PSOMAS

TECHNICAL MEMORANDUM NO. 3

To: Trish Rhay and Steve Bucknam

From: Harvey R. Gobas, PE

Date: January 7, 2015

Subject: CBH Staff Augmentation Required to Address Water Enterprise Plan Recommendations

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EXECUTIVE SUMMARY

The City of Beverly Hills currently imports an average of 90 to 95 percent of its water supply from the Metropolitan Water District (MWD). To increase the City's supply reliability, we recommend reducing dependence on MWD to 75 percent. To accomplish this objective, we recommend implementing a series of water supply portfolio options including: (1) Developing three new wells in the unadjudicated Central Basin; (2) Addressing on-going problems with the City's existing Reverse Osmosis (RO) Water Treatment Plant to allow treating water produced from two recently approved shallow groundwater wells in the Hollywood Basin; (3) Participating in a Water Bank allowing the City to access stored water during a drought; and (4) Implementing water conservation programs required to address State conservation legislation.

Implementing these recommended projects and programs will require augmenting current City staff with eleven new full-time positions including a Water Conservation Coordinator, three Engineering Project Managers, a Water Resources Manager, three Water Treatment Plant Operators, a Pump/Well Mechanic, a Pump/Well Electrician and a Water Distribution Operator. The first five positions should be filled beginning in the 2015/16 Fiscal Year. The last six positions should be filled once the new facilities (wells, pipelines, pumping plants, treatment plant upgrades, etc.) begin to come on-line in 2017/18. The estimated salary cost (including employee benefits) to fund these eleven positions in 2015 dollars is approximately $1.6 million.

INTRODUCTION

Psomas was retained by the City of Beverly Hills to evaluate potential options for enhancing the City's water supply reliability. Following a series of detailed evaluations, we recommended a portfolio of options aimed at decreasing the City's reliance on MWD from the current 90 to 95 percent level to 75 percent. To accomplish this objective, we recommend implementing the following options:

1. Central Basin – Developing three new wells in the unadjudicated portion of the Central Basin (La Brea Sub-basin) capable of producing approximately 1,700 AFY;
2. Hollywood Basin – Addressing on-going problems with the City's existing Reverse Osmosis (RO) Water Treatment Plant, which together with the drilling of two new shallow groundwater wells in the Hollywood Basin, will allow the City to produce and treat up to 1,120 AFY at the RO plant;
3. Water Bank – Participating in a Water Bank with the ability to store and access up to 3,400 AF during a two-year shortage;
4. Water Conservation – Implementing Water Conservation programs with the intent of conserving up to 1,180 AF;
5. MWD – Continuing to rely on MWD for up to 75 percent of the City's total water annual supply or approximately 8,485 AFY.

REQUIRED STAFFING TO ADDRESS WEP RECOMMENDATIONS

Achieving the above-noted objectives will require a concerted effort on the part of City staff. To manage these projects and programs, City staff should be augmented with eleven new positions as described below.

Central Basin Staffing Requirements

The development of three new wells in the Central Basin will take seven to eight years from inception to production and will require City staff management of design consultants during this extended period. Those staff members will also have to manage the design of other new related infrastructure including pipelines, pumping facilities and treatment plant upgrades. City staff will also have to manage related CEQA activities, acquisition of required land, testing and permitting. Given the extensive amount of work, we recommend two full time engineering project managers be added to current City staff. Both of these project managers should have a background in well and pipeline design with related construction management experience. These two staff positions will be needed by the beginning of the 2015/16 Fiscal Year.

In addition to the Engineering Managers, once the first well is in place, the City should augment its current production staff to include one-full-time pump/well mechanic, one full-time pump/well electrician and a full-time water distribution operator. The need for these three positions should commence during the 2017-18 Fiscal Year.

Hollywood Basin and RO Plant Staffing Requirements

The additional work associated with the management, drilling, equipping, testing and permitting of two new shallow groundwater wells and associated improvements and upgrades to the existing RO plant will require a full time engineering project manager over the next several years. The need for this staff position is immediate.

Once the treatment plant has been successfully upgraded, it should be capable of being operated on a 24/7 basis (as opposed to the current Monday-Friday operation). This will require round-the-clock operation and will necessitate the hiring of three new full-time treatment plant operators at least one of whom has a Grade 5 Treatment Plant Operator certification. The hiring of three additional plant operators will allow the City to fully staff the plant during both weekdays and weekends and will provide back-up staffing during holiday periods or when the primary operator is on vacation or out sick.

Water Banking Staffing Requirements

We also recommend the hiring a full-time Water Resources Manager to oversee all of the City's water programs and infrastructure. This individual will also play a key role in the negotiation and execution of a water banking agreement. The position should be filled during the 2015-16 Fiscal Year.

Water Conservation Staffing Requirements

We have recommended implementing a number of water conservation programs including separate analytic engagement programs addressing both public and quasi-public users as well as residential users, system loss reduction and operations enhancement, and continuation and enhancement of on-going rebate programs. The management of all of these programs will require a full time water conservation

coordinator, which will also satisfy Demand Management Measure (DMM) 12 of the California Urban Water Management Planning Act. The position should be filled during the 2015-16 Fiscal Year.

MWD Staffing Requirements

No additional staffing is required to continue 75 percent reliance upon MWD.

FUNDING TO STAFF THE RECOMMENDED POSITIONS

As noted in the previous section, we are recommending augmenting City staff with 11 new positions. Several of these positions should be filled during the 2015-16 Fiscal Year, while others will not be needed until the recommended facilities have been constructed and placed into service. The eleven positions are summarized in the Table 1 below. The table also notes the fiscal year in which each position should be filled and the estimated loaded cost in 2015 dollars (i.e., salary and benefits) for the designated employee. Once all eleven positions are filled, the annual loaded salary costs are estimated to be approximately $1.6 million.

Table 1
Recommended Staffing to Address WEP Recommendations

Recommended Staffing Position	FY Needed	Loaded Salary in 2015 Dollars
Water Conservation Coordinator (One Full-Time)	2014/15	$140,000
Project Managers (3 Full-Time)	2014/15 to 2015/16	$525,000
Water Resources Manager (One Full-Time)	2015/16	$200,000
Water Treatment Operators (3 Full-Time)	2017/18	$400,000
Pump/Well Mechanic (One Full-Time)	2017/18	$100,000
Pump/Well Electrician (One Full-Time)	2017/18	$100,000
Water Distribution Operator (One Full-Time)	2017/18	$100,000
Total Recommended Staffing Costs		**$1,565,000**

Appendix D

TM-4: Ten-Year Estimated Costs for Nine Shortlisted Alternatives Including a Summary of Proposed Portfolio Scenario Costs

PSOMAS

TECHNICAL MEMORANDUM NO. 4

To: Trish Rhay and Steve Bucknam

From: Harvey R. Gobas, PE

Date: Originally Presented January 15, 2015 / Revised August 10, 2015

Subject: Ten-Year Estimated Costs for Nine Shortlisted Alternatives Including a Summary of Proposed Portfolio Scenario Costs

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In response to questions from the Public Works Commissioners, we have created a series of spreadsheets identifying the estimated costs over the next ten years for the proposed Water Enterprise Plan portfolio scenario as well as for the other short-listed alternatives not included in our recommendations. At the request of City staff, those spreadsheets were update on August 10, 2015 to include water conservation, water banking and staffing costs data that was not available when the original TM was prepared in January 2015.

In considering the actual costs that would be incurred for each of the nine shortlisted alternatives, we assumed three percent compounded annual inflation over the ten year period and escalated costs by that factor for each year (unless otherwise noted in the spreadsheets that follow). All of the costs also now include projected operation and maintenance expenditures. Given the preliminary nature of these estimates, we have also provided high and low ranges for the projected costs utilizing the widely accepted guidelines established by the AACE (formerly known as the Association for the Advancement of Cost Engineering). Those guidelines suggest using (-30%) and (+50%) for the low and high ends of the range, respectively, for planning level projects in which no preliminary or final engineering design has been performed.

Additionally, we have created 10-year cost spreadsheets for MWD water purchases and for staffing. The MWD costs are based on MWD's currently adopted 10-year rates and thus, do not include any additional inflation factor. We have escalated the staffing costs by three percent per year, but have not applied the AACE high and low range factors to them.

The overall, 10-year escalated costs for the recommended portfolio are summarized below. Detailed copies of the respective spreadsheets follow this page.

Proposed Portfolio Scenario	Sum of 10-Year Escalated Costs (Rounded to Nearest $1,000)
1. Water Conservation	$2,132,000
2. Water Banking	$5,042,000
3. Groundwater Development (La Brea Sub-Basin)	$37,919,000
4. *Subtotal of Items 1 though 3*	$45,082,000
5. MWD Water Purchases	$105,693,000
6. Staffing	$16,903,000
7. Subtotal of Proposed Portfolio Scenario (Items 4 + 5 + 6)	$167,689,000
Subtotal Less MWD and Staffing (Item 7 – Item 5 – Item 6)	$45,093,000
Low Range Cost (Item 4 – 30% plus Items 5 & 6	$154,161,000
High Range Cost (Item 4 + 50% plus Items 5 & 6)	$190,236,000

Annual Cost Summary For Recommended Portfolio[1]

	FISCAL YEAR										Total Rounded to Nearest $1,000
	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21	2021/22	2022/23	2023/24	2024/25	
Water Conservation	$ 348,550	$ 285,703	$ 281,404	$ 158,719	$ 163,480	$ 168,385	$ 173,436	$ 178,639	$ 183,998	$ 189,518	$ 2,132,000
Water Banking	$ -	$ 43,775	$ 1,262,471	$ 1,300,345	$ 47,834	$ 49,269	$ 50,747	$ 1,099,753	$ 1,132,746	$ 55,453	$ 5,042,000
Groundwater Development (LBSB)	$ 200,000	$ 2,446,000	$ 1,777,000	$ 2,841,000	$ 9,792,000	$ 9,390,000	$ 2,924,000	$ 2,766,000	$ 2,849,000	$ 2,934,000	$ 37,919,000
MWD Water Purchases	$ 10,723,750	$ 10,814,963	$ 10,234,680	$ 10,378,185	$ 10,551,264	$ 10,928,540	$ 11,360,160	$ 9,816,804	$ 10,231,146	$ 10,653,948	$ 105,693,000
Staffing	$ 763,561	$ 950,473	$ 1,709,761	$ 1,760,559	$ 1,812,881	$ 1,866,772	$ 1,922,280	$ 1,979,454	$ 2,038,342	$ 2,098,998	$ 16,903,000
Total	$ 12,035,861	$ 14,540,914	$ 15,265,316	$ 16,438,808	$ 22,367,459	$ 22,402,966	$ 16,430,623	$ 15,840,650	$ 16,435,233	$ 15,931,917	**$ 167,689,000**
								Subtotal (less MWD and Staffing)			**$ 45,093,000**
									Low Cost[2]	(- 30 %)	**$ 154,161,000**
									High Cost[2]	(+ 50%)	**$ 190,236,000**

[1] Costs are escalated at 3% annually, compounded with the exception of MWD Water Purchases which use MWD's currently adopted 10-year rates.
[2] Low and High Cost range calculated on sub-total of Water Conservation, Water Banking, and Groundwater Development only with MWD Water Purchase and Staffing Costs (no range applied) added directly.

Water Conservation Program Costs (PROPOSED)

	FISCAL YEAR										Total
	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21	2021/22	2022/23	2023/24	2024/25	
Water Conservation											
Capital Programs	$ 348,550	$ 285,703	$ 281,404	$ 158,719	$ 163,480	$ 168,385	$ 173,436	$ 178,639	$ 183,998	$ 189,518	
Staffing (Included in Staffing Spreadsheet)	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	
O&M[1]	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	
Total	$ 348,550	$ 285,703	$ 281,404	$ 158,719	$ 163,480	$ 168,385	$ 173,436	$ 178,639	$ 183,998	$ 189,518	**$ 2,131,832**
Capital Programs Backup											
Waterfluence	$ 7,272	$ 4,900	$ 3,250	$ 3,250	$ 3,250	$ 3,250	$ 3,250	$ 3,250	$ 3,250	$ 3,250	
Triton	$ 69,807	$ 43,700	$ 42,000	$ 42,000	$ 42,000	$ 42,000	$ 42,000	$ 42,000	$ 42,000	$ 42,000	
TaKaDu[2]	$ 174,517	$ 124,682	$ 120,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	
Enhanced Rebates	$ 96,954	$ 104,100	$ 100,000	$ 100,000	$ 100,000	$ 100,000	$ 100,000	$ 100,000	$ 100,000	$ 100,000	
Totals (2015 Dollars)	$ 348,550	$ 277,382	$ 265,250	$ 145,250	$ 145,250	$ 145,250	$ 145,250	$ 145,250	$ 145,250	$ 145,250	**$ 1,907,932**
Escalated Totals	$ 348,550	$ 285,703	$ 281,404	$ 158,719	$ 163,480	$ 168,385	$ 173,436	$ 178,639	$ 183,998	$ 189,518	**$ 2,131,832**
									Low Cost	(- 30 %)	**$ 1,492,283**
									High Cost	(+ 50%)	**$ 3,197,749**
Annual Inflation	3.0%										
Cost Escalation Factor	1.000	1.030	1.061	1.093	1.126	1.159	1.194	1.230	1.267	1.305	

[1] Assumes O&M for Water Conservation Programs is minor with exception of Water Conservation Coordinator and O&M to repair leaks discovered utilizing TaKaDu or similar system would be incurred anyway, but would just be more efficient.

[2] Assumes TaKaDu or similar program would justify itself, or not, after 3 years and if continued would not be allocated to WEP after this time.

Water Banking Annual Estimate of Costs (PROPOSED)

			FISCAL YEAR										Total
			2015/16	2016/17	2017/18	2018/19	2019/20	2020/21	2021/22	2022/23	2023/24	2024/25	
Total in Storage		AF			1,700	3,400	3,400	3,400	3,400	1,700			
Draw		AF/Yr								1,700	1,700		
Replacement water		AF											
Initial Water Purchase					1,700	1,700							
Total Shares	1700												
Buy in Cost	$1,600	/Share											
Initial Water Purchase	$600	/AF			$ 1,082,118	$ 1,114,582							
Initial Put Cost	$75	/AF			$ 135,265	$ 139,323							
O&M	$25	/Share		$ 43,775	$ 45,088	$ 46,441	$ 47,834	$ 49,269	$ 50,747	$ 52,270	$ 53,838	$ 55,453	
Draw Take	$75	/AF								$ 156,809	$ 161,513		
Power	$85	/AF								$ 177,717	$ 183,048		
Treat	$341	/AF								$ 712,958	$ 734,347		
Replacement Water	$440	/AF											
Replacement Put	$75	/AF											
Total Annual Costs			$ -	$ 43,775	$ 1,262,471	$ 1,300,345	$ 47,834	$ 49,269	$ 50,747	$ 1,099,753	$ 1,132,746	$ 55,453	**$ 5,042,393**
											Low Cost	(- 30 %)	**$ 3,529,675.10**
											High Cost	(+ 50%)	**$ 7,563,589.50**
Annual Inflation	3.0%												
Cost Escalation Factor			1.000	1.030	1.061	1.093	1.126	1.159	1.194	1.230	1.267	1.305	

Notes:

1. Original unit costs are in 2015 Dollars. All other costs are inflated at 3% per year starting in 2016.
2. Unit costs based on estimates provided by the Willow Springs Water Storage Bank and assume there will be no up-front buy-in costs.
3. Based on having a significant reduction in supply caused by drought condition once each decade
4. Similar costs to those incurred in years 1 - 10, will also be incurred in years 11 - 20 and 12 - 30.
5. All costs in this table are estimates and are presented only as a sample of what current costs to join the Willow Springs Water Bank may be. City staff is encouraged to initiate discussions and/or commence negotiations with Willow Springs Water Bank and other water banks to obtain more definitive cost information.

Water Drought Insurance Annual Estimate of Costs (NOT PROPOSED)

				FISCAL YEAR										Total
				2015/16	2016/17	2017/18	2018/19	2019/20	2020/21	2021/22	2022/23	2023/24	2024/25	
Insurance Water		AF		3400	3400	3400								
Draw on Insurance		AF					3400							
Term in years	4	Yrs												
Annual Fee	120	AF/Yr												
Water Insurance	3400	AF												
Loan Fee	$600	/AF												
Pay back Fee	$660	/AF												
Power	$85	/AF												
Wheeling	$257	/AF												
Treatment	$341	/AF												
Annual Fee				$ 408,000	$ 420,240	$ 432,847	$ 445,833							
Loan Fee				$ 2,040,000										
Energy Cost (est.)							$ 315,798							
MWD Wheeling Cost							$ 954,825							
MWD Treatment Cost							$ 1,266,908							
Bank Pay Back Cost										$ 2,679,453				
Total Annual Costs				$ 2,448,000	$ 420,240	$ 432,847	$ 2,983,363	$ -	$ -	$ 2,679,453	$ -	$ -	$ -	**$ 8,963,904**
Total Costs inflated over 10 years			$ 17,927,808									Low Cost	(- 30 %)	**$ 6,274,733**
Total Water Obtained			$ 3,400	Acre Feet								High Cost	(+ 50%)	**$ 13,445,856**
Annual Inflation	3.0%													
Cost Escalation Factor				1.000	1.030	1.061	1.093	1.126	1.159	1.194	1.230	1.267	1.305	

[1] Original unit costs are in 2015 Dollars. All other costs are inflated at 3% per year starting in 2016.

[2] Unit costs based on estimates provided by the Willow Springs Water Storage Bank and program limited to four year term.

[3] Water is to be repaid within 3 years of draw.

[4] Based on having a significant reduction in supply caused by drought condition once each decade

Water Spot Loan Estimate of Costs (NOT PROPOSED)

					FISCAL YEAR										Total
					2015/16	2016/17	2017/18	2018/19	2019/20	2020/21	2021/22	2022/23	2023/24	2024/25	
Loan water Available	3400	AF													
Draw on Loan		AF						3400							
Term in years	4	Yrs													
Loan Fee	$1,100	AF													
Water, af	3400	AF													
Pay back Fee	$660	/AF													
Power	$85	/AF													
Wheeling	$257	/AF													
Treatment	$341	/AF													
Loan Fee					$ 3,740,000										
Energy Cost (est.)								$ 315,798							
MWD Wheeling Cost								$ 954,825							
MWD Treatment Cost								$ 1,266,908							
Bank Pay Back Cost											$ 2,679,453				
Total Annual Costs					$ 3,740,000			$ 2,537,531			$ 2,679,453				**$ 8,956,984**
Total Costs inflated over 10 years				$ 17,913,968									Low Cost	(- 30 %)	**$ 6,269,889**
Total Water Obtained				$ 3,400	Acre Feet								High Cost	(+ 50%)	**$ 13,435,476**
Annual Inflation	3.0%														
Cost Escalation Factor		0.030			1.000	1.030	1.061	1.093	1.126	1.159	1.194	1.230	1.267	1.305	

[1] Original unit costs are in 2015 Dollars. All other costs are inflated at 3% per year starting in 2016.

[2] Unit costs based on estimates provided by the Willow Springs Water Storage Bank and program limited to four year term.

[3] Water is to be repaid within 3 years of draw.

[4] Based on having a significant reduction in supply caused by drought condition once each decade

Water Insurance Annual Estimate of Costs - Exchange from Central Basin with LADWP (NOT PROPOSED)

					FISCAL YEAR										Total
					2015/16	2016/17	2017/18	2018/19	2019/20	2020/21	2021/22	2022/23	2023/24	2024/25	
Production per well	1,000	gpm													
Annual Production	1,200	AF													
Land required	0.25	Acres													
Life of Wells for Production Estimate	40	Years													
Total production over life of wells	48000	AF													
CAPITAL COSTS															
Production Well:															
Purchase Water Rights in Main Central Basin	$15,000	per AF	1200	AFY	$18,540,000										
Land (cost per 0.25 acre)	$625,000	per 1/4 acre	1		$643,750										
Well installation & equipping	$2,500,000	per well	1					$1,406,886	$1,449,093						
Well permitting/Engineering	$375,000		1			$198,919	$204,886								
Forebay and Pump Station:															
Cost for Pump Station	$625,000	each	1					$703,443.01							
Permitting/Engineering for pipeline	$93,750		0				$81,955								
Pipeline:															
Cost for Pipeline	$250,000	$200 per foot	1000	LF					$289,819						
Permitting/Engineering for pipeline	$37,500		1					$42,207							
25% Contingencies in all costs	25%														
O & M COSTS															
Well O&M Cost (5% of Capital costs)		$1,075,000								$1,283,606	$1,322,114	$1,361,778	$1,402,631	$1,444,710	
Well Power Costs		$98,092								$117,126	$120,640	$124,259	$127,987	$131,827	
Forebay & Pump Station O&M Costs (5%)		$35,938								$42,911	$44,199	$45,525	$46,890	$48,297	
Forebay & Pump Station Power Costs ($)		$85,830								$102,486	$105,560	$108,727	$111,989	$115,348	
Pipeline O&M Costs (5% of Capital)		$14,375								$17,165	$17,679	$18,210	$18,756	$19,319	
WRD RA		$402,000								$480,009	$494,409	$509,242	$524,519	$540,254	
LADWP Wheeling @$200/AF		$300,000								$358,216	$368,962	$380,031	$391,432	$403,175	
Total Annual Costs					$19,183,750	$198,919	$286,841	$2,152,536	$1,738,911	$2,401,519	$2,473,564	$2,547,771	$2,624,204	$2,702,931	**$36,310,945**
													Low Cost	(- 30 %)	**$25,417,662**
													High Cost	(+ 50%)	**$54,466,418**
Annual Inflation	3.0%														
Cost Escalation Factor		0.03			1.030	1.061	1.093	1.126	1.159	1.194	1.230	1.267	1.305	1.344	

[1] Original unit costs are in 2015 Dollars. All other costs are inflated at 3% per year starting in 2016.

[2] Estimate of first ten years of the project.

Groundwater Development Estimate of Costs (La Brea Sub-Basin PROPOSED; Hollywood Basin Not Proposed)

PROPOSED OPTION	ESTIMATED COST (2015 $)		FISCAL YEAR 2015/2016	2016/2017	2017/2018	2018/2019	2019/2020	2020/2021	2021/2022	2022/2023	2023/2024	2024/2025	Total
La Brea Sub-Basin Groundwater	$23,850,000		Cost for Implementation ($)										
Feasibility Study	$500,000		200,000	300,000									$500,000
Land Acquisition/Pilot Well Study (1 well)	$3,000,000			2,000,000	1,000,000								$3,000,000
CEQA	$250,000			75,000	175,000								$250,000
Preliminary & Final Design	$1,300,000				500,000	800,000							$1,300,000
Final Land Acquisition	$2,000,000					1,800,000	200,000						$2,000,000
Pipeline Construction	$4,600,000						1,500,000	3,100,000					$4,600,000
RO Plant Upgrade	$7,000,000						5,000,000	2,000,000					$7,000,000
Well Construction (2 add'l wells)	$5,000,000						2,000,000	3,000,000					$5,000,000
System Permitting & Testing	$200,000								200,000				$200,000
	Capital Cost Sub-Total ($)		$ 200,000	$ 2,375,000	$ 1,675,000	$ 2,600,000	$ 8,700,000	$ 8,100,000	$ 200,000	$ -	$ -	$ -	$ 23,850,000
O&M (3,000 AFY GW)[1] Rate/Volume	$1,027/AF	2,190 AFY	$ -	$ -	$ -	$ -	$ -	$ -	$ 2,249,130	$ 2,249,130	$ 2,249,130	$ 2,249,130	$ 8,996,520
Sub-Total (2015 dollars)	---	---	$ 200,000	$ 2,375,000	$ 1,675,000	$ 2,600,000	$ 8,700,000	$ 8,100,000	$ 2,449,000	$ 2,249,000	$ 2,249,000	$ 2,249,000	**$ 32,846,000**
Adjusted for Inflation	---	---	$ 200,000	$ 2,446,000	$ 1,777,000	$ 2,841,000	$ 9,792,000	$ 9,390,000	$ 2,924,000	$ 2,766,000	$ 2,849,000	$ 2,934,000	**$ 37,919,000**
												Low Cost (- 30 %)	**$ 26,543,300**
												High Cost (+ 150%)	**$ 56,878,500**
Annual Inflation		3.0%											
Cost Escalation Factor			1.000	1.030	1.061	1.093	1.126	1.159	1.194	1.230	1.267	1.305	

OPTION NOT PROPOSED	ESTIMATED COST (2015 $)		FISCAL YEAR 2015/2016	2016/2017	2017/2018	2018/2019	2019/2020	2020/2021	2021/2022	2022/2023	2023/2024	2024/2025	Total
Hollywood Basin Groundwater	$33,350,000		Cost for Implementation ($)										
Feasibility Study	$600,000		300,000	300,000									$600,000
Land Acquisition/Pilot Well Study (2 wells)	$6,000,000			4,000,000	2,000,000								$6,000,000
CEQA	$250,000			75,000	175,000								$250,000
Preliminary & Final Design	$2,000,000				500,000	1,500,000							$2,000,000
Final Land Acquisition	$4,000,000					3,600,000	400,000						$4,000,000
Pipeline Construction	$4,800,000						2,500,000	2,300,000					$4,800,000
RO Plant Upgrade	$7,000,000						5,000,000	2,000,000					$7,000,000
Well Construction (4 add'l wells)	$8,500,000						3,000,000	5,500,000					$8,500,000
System Permitting & Testing	$200,000								200,000				$200,000
	Capital Cost Sub-Total ($)		$ 300,000	$ 4,375,000	$ 2,675,000	$ 5,100,000	$ 10,900,000	$ 9,800,000	$ 200,000	$ -	$ -	$ -	$ 33,350,000
O&M (1,500 AFY GW)[2] Rate/Volume	$1,572/AF	1,500 AFY	$ -	$ -	$ -	$ -	$ -	$ -	$ 2,358,000	$ 2,358,000	$ 2,358,000	$ 2,358,000	$ 9,432,000
Sub-Total (2015 dollars)	---	---	$ 300,000	$ 4,375,000	$ 2,675,000	$ 5,100,000	$ 10,900,000	$ 9,800,000	$ 2,558,000	$ 2,358,000	$ 2,358,000	$ 2,358,000	**$ 42,782,000**
Adjusted for Inflation	---	---	$ 300,000	$ 4,506,000	$ 2,838,000	$ 5,573,000	$ 12,268,000	$ 11,361,000	$ 3,054,000	$ 2,900,000	$ 2,987,000	$ 3,077,000	**$ 48,864,000**
												Low Cost (- 30 %)	**$ 34,204,800**
												High Cost (+ 50%)	**$ 73,296,000**
Annual Inflation		3.0%											
Cost Escalation Factor			1.000	1.030	1.061	1.093	1.126	1.159	1.194	1.230	1.267	1.305	

[1] La Brea Sub-Basin has maximum production capability of 3,000 AFY netting 2,340 AFY supply after Plant reject. However, O&M cost based on 2,190 AFY groundwater production netting 1,708 AFY. This volume along with 1.0 MGD net from existing HB shallow wells/Plant would provide 25% reliability.

[2] Hollywood Basin assumed capable of producing an additional 1,500 AFY (average sustainable) netting 1,170 AFY supply after Plant reject. This volume along with 1.0 MGD net from existing HB shallow wells/Plant would provide a total of 2,290 AFY or an approximate 20% reliability.

Estimated Unsubsidized Cost of Huntington Beach Desalinization Plant Water at CBH Service Connection (NOT PROPOSED)

OPTION	Cost / AF	Cost Without $250/AF LRP	Summary 2015 Costs/AF	FISCAL YEAR[4] 2015/16	2016/17	2017/18	2018/19	2019/20	2020/21	2021/22	2022/23	2023/24	2024/25	10-Year Total (Assuming plant on-line in 2020/21)
Quoted HB Desal Plant Cost[1]	######	**$ 1,674**												
Plus MWD LRP Subsidy	$ 250													
Capital Component (assumed 1/2 of cost and not subject to escalation)			$ 837						$ 837	$ 837	$ 837	$ 837	$ 837	
Operating Component (subject to 3% CPI escalation)			$ 837						$ 999	$ 1,029	$ 1,060	$ 1,092	$ 1,125	
Pipelines (Regional South Delivery System)	$ 138	$ 138	$ 138						$ 138	$ 138	$ 138	$ 138	$ 138	
Wheeling through MWD System[2]														
System Access Rate	$ 243													
Water Stewardship Rate	$ 41	$ 445	$ 445						$ 531	$ 547	$ 564	$ 581	$ 598	
Power Costs	$ 161													
			Sub-Total ($/AF)						$ 2,506	$ 2,552	$ 2,599	$ 2,648	$ 2,698	
Annual Cost for Total AF Commitment of		1,700							$ 4,259,818	$ 4,337,887	$ 4,418,299	$ 4,501,123	$ 4,586,431	**$ 22,103,557**
												Low Cost	(- 30 %)	**$ 15,472,490**
												High Cost	(+ 50%)	**$ 33,155,336**
Annual Inflation	3.0%													
Cost Escalation Factor				1.000	1.030	1.061	1.093	1.126	1.159	1.194	1.230	1.267	1.305	

[1] Source = 2013 Huntington Beach Plant Term Sheet
[2] May be avoidable with negotiations
[3] 3% escalation applied to operating and capital costs per term sheet (assumed annual cost split 50:50 between capital and operating costs)
[4] The absolute earliest the plant could come on-line is 2020/21; 10 yr cost total assumes plant is on-line in 2020/21 (last 5 years only)

MWD Purchase Costs (PROPOSED)

	FISCAL YEAR										Total
	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21	2021/22	2022/23	2023/24	2024/25	
Water Supply Breakdown											
Total Water Demand (AF)	12,495	12,325	12,350	12,375	12,328	12,340	12,380	12,420	12,460	12,493	
Less Cumulative Conservation (AF)	195	630	850	1,010	1,140	1,180	1,180	1,180	1,180	1,180	
Less HB GW (AF)	800	400	1,120	1,120	1,120	1,120	1,120	1,120	1,120	1,120	
Less La Brea Sub-Basin (AF)	0	0	0	0	0	0	0	1,708	1,708	1,708	
MWD Supply Required (AF)	11,500	11,295	10,380	10,245	10,068	10,040	10,080	8,412	8,452	8,485	
MWD Tier 1 Treated Rate ($/AF)[1]	$933	$958	$986	$1,013	$1,048	$1,089	$1,127	$1,167	$1,211	$1,256	
Total MWD Purchase Cost	$ 10,723,750	$ 10,814,963	$ 10,234,680	$ 10,378,185	$ 10,551,264	$ 10,928,540	$ 11,360,160	$ 9,816,804	$ 10,231,146	$ 10,653,948	**$ 105,693,440**

[1] MWD rate is average of calendar year Full Service Tier 1 Treated Volumetric Cost ($/AF) from Attachment 10 to 4/8/2014 MWD Board Meeting Package. Inflation built into these rates.

Recommended Staffing (PROPOSED)

	FISCAL YEAR										Total
	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21	2021/22	2022/23	2023/24	2024/25	
Eleven Staff Positions[1]											
Project Manager 1	$ 184,801	$ 190,345	$ 196,055	$ 201,937	$ 207,995	$ 214,235	$ 220,662	$ 227,282	$ 234,100	$ 241,123	
Vehicle/Cell Allowance	$ 4,900	$ 4,900	$ 4,900	$ 4,900	$ 4,900	$ 4,900	$ 4,900	$ 4,900	$ 4,900	$ 4,900	
Computer Expense (1 time exp)	$ 10,000										
Subtotal Project Manager 1	$ 199,701	$ 195,245	$ 200,955	$ 206,837	$ 212,895	$ 219,135	$ 225,562	$ 232,182	$ 239,000	$ 246,023	
Project Manager 2	$ 184,801	$ 190,345	$ 196,055	$ 201,937	$ 207,995	$ 214,235	$ 220,662	$ 227,282	$ 234,100	$ 241,123	
Vehicle/Cell Allowance	$ 4,900	$ 4,900	$ 4,900	$ 4,900	$ 4,900	$ 4,900	$ 4,900	$ 4,900	$ 4,900	$ 4,900	
Computer Expense (1 time exp)	$ 10,000										
Subtotal Project Manager 2	$ 199,701	$ 195,245	$ 200,955	$ 206,837	$ 212,895	$ 219,135	$ 225,562	$ 232,182	$ 239,000	$ 246,023	
Project Manager 3	$ 184,801	$ 190,345	$ 196,055	$ 201,937	$ 207,995	$ 214,235	$ 220,662	$ 227,282	$ 234,100	$ 241,123	
Vehicle/Cell Allowance	$ 4,900	$ 4,900	$ 4,900	$ 4,900	$ 4,900	$ 4,900	$ 4,900	$ 4,900	$ 4,900	$ 4,900	
Computer Expense (1 time exp)	$ 10,000	$ 10,000									
Subtotal Project Manager 3	$ 199,701	$ 205,245	$ 200,955	$ 206,837	$ 212,895	$ 219,135	$ 225,562	$ 232,182	$ 239,000	$ 246,023	
Subtotal Project Managers	$ 599,103	$ 595,735	$ 602,866	$ 620,511	$ 638,685	$ 657,405	$ 676,686	$ 696,546	$ 717,001	$ 738,070	
Less Budget Adjustment (1st Yr Only)	$ 200,000										
Total for Project Managers	$ 399,103	$ 595,735	$ 602,866	$ 620,511	$ 638,685	$ 657,405	$ 676,686	$ 696,546	$ 717,001	$ 738,070	$ 6,342,609
Water Conservation Administrator[2]	$ 153,171	$ 157,766	$ 162,499	$ 167,374	$ 172,395	$ 177,567	$ 182,894	$ 188,381	$ 194,032	$ 199,853	
Annual Expense	$ 900	$ 900	$ 900	$ 900	$ 900	$ 900	$ 900	$ 900	$ 900	$ 900	
Computer Expense (1 time exp)	$ 10,000										
Subtotal Water Conserv Administer	$ 164,071	$ 158,666	$ 163,399	$ 168,274	$ 173,295	$ 178,467	$ 183,794	$ 189,281	$ 194,932	$ 200,753	$ 1,774,934
Water Resource Manager[3]	$ 189,487	$ 195,172	$ 201,027	$ 207,058	$ 213,269	$ 219,667	$ 226,257	$ 233,045	$ 240,036	$ 247,238	
Annual Expense	$ 900	$ 900	$ 900	$ 900	$ 900	$ 900	$ 900	$ 900	$ 900	$ 900	
Computer Expense (1 time exp)	$ 10,000										
Subtotal Water Resources Manager	$ 200,387	$ 196,072	$ 201,927	$ 207,958	$ 214,169	$ 220,567	$ 227,157	$ 233,945	$ 240,936	$ 248,138	$ 2,191,256
Water Treatment Operator 1			$ 141,100	$ 145,333	$ 149,693	$ 154,183	$ 158,809	$ 163,573	$ 168,480	$ 173,535	$ 1,254,706
Water Treatment Operator 2			$ 141,100	$ 145,333	$ 149,693	$ 154,183	$ 158,809	$ 163,573	$ 168,480	$ 173,535	$ 1,254,706
Water Treatment Operator 3			$ 141,100	$ 145,333	$ 149,693	$ 154,183	$ 158,809	$ 163,573	$ 168,480	$ 173,535	$ 1,254,706
Pump/Well Mechanic			$ 106,090	$ 109,273	$ 112,551	$ 115,927	$ 119,405	$ 122,987	$ 126,677	$ 130,477	$ 943,388
Pump/Well Electrician			$ 106,090	$ 109,273	$ 112,551	$ 115,927	$ 119,405	$ 122,987	$ 126,677	$ 130,477	$ 943,388
Water Distribution Operator			$ 106,090	$ 109,273	$ 112,551	$ 115,927	$ 119,405	$ 122,987	$ 126,677	$ 130,477	$ 943,388
Total Staffing Cost	$ 763,561	$ 950,473	$ 1,709,761	$ 1,760,559	$ 1,812,881	$ 1,866,772	$ 1,922,280	$ 1,979,454	$ 2,038,342	$ 2,098,998	**$ 16,903,081**
Annual Inflation	3.0%										
Cost Escalation Factor	1.000	1.030	1.061	1.093	1.126	1.159	1.194	1.230	1.267	1.305	

[1] Assumes Water Resource Manager and Water Conservation Administrator are retained beginning in the FY2015/16; assumes three Project Managers are retained beginning in FY2017/18 and are phased out or re-assigned as construction of WEP facilities is completed in FY2021/22; assumes three water treatment plant operators, pump/well mechanic, pump/well electrician and water distribution operator are retained beginning in the FY2017/18

[2] First year loaded cost for Water Conservation Administrator (Step 3) was provided by City staff on 7/29/15 and includes both salary and benefits.

[3] First year loaded cost for Water Resources Manager (Step 3) was provided by City staff on 7/29/15 and includes both salary and benefits.

Appendix E

TM-5: Cost Comparison of Proposed Portfolio Recommendations with MWD Water Purchases

PSOMAS

TECHNICAL MEMORANDUM NO. 5
(Formerly Temporary TM No. 4a)

To: Trish Rhay and Steve Bucknam

From: Harvey R. Gobas, PE

Date: Originally Presented February 19, 2015 / Revised August 10, 2015

Subject: Comparison of Ten-Year Estimated Costs for Nine Shortlisted Alternatives with MWD Water Purchases in Lieu of Implementing those Alternatives

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In response to questions from the Public Works Commission, we have utilized information originally presented in our Technical Memorandum No. 4 (Ten-Year Estimated Costs for Nine Shortlisted Alternatives) and updated at City staff request on August 7, 2015 to include new financial data that was not available in February 2015. We then compared these costs to MWD water purchases that would need to be made in lieu of implementing those recommended alternatives.

All assumptions stated in TM No. 4 still apply for each of the designated alternatives. The overall 10-Year escalated costs developed for each of the proposed portfolio scenarios, as originally presented in TM No. 4, updated on August 7, 2015, are repeated below in Table 1.

Table 1
Summary of 10-Year Escalated Costs for Proposed Portfolio Scenario Alternatives

Proposed Portfolio Scenario	Sum of 10-Year Escalated Costs (Rounded to Nearest $1,000)
1. Water Conservation	$2,132,000
2. Water Banking	$5,042,000
3. Groundwater Development (La Brea Sub-Basin)	$37,919,000
4. *Subtotal of Items 1 though 3*	$45,082,000
5. MWD Water Purchases	$105,693,000
6. Staffing	$16,903,000
7. Subtotal of Proposed Portfolio Scenario (Items 4 + 5 + 6)	$167,689,000
Subtotal Less MWD and Staffing (Item 7 – Item 5 – Item 6)	$45,093,000
Low Range Cost (Item 4 – 30% plus Items 5 & 6)	$154,161,000
High Range Cost (Item 4 + 50% plus Items 5 & 6)	$190,236,000

Comparison of 10-Year Alternative Costs with MWD Water Purchase Costs

At the request of the Public Works Commission, we compared the 10-Year Costs of each of the three proposed alternatives (water conservation, water banking and groundwater development of the La Brea Sub-Basin) with the cost of purchasing MWD water in lieu of implementing these individual alternatives. These comparisons are based on the costs derived in TM No. 4 for Water Conservation (refer to page 3 of TM No. 4), Water Banking (refer to page 4 of TM No. 4) and Groundwater Development of the La Brea Sub-Basin (refer to the upper portion of page 8 of TM No. 4). These costs were then compared with the cost of purchasing the same amount of MWD water (based on the factors presented on page 10 of TM No. 4).

The actual cost the City would have to pay for this additional MWD water is subject to possible wide fluctuation. A relatively low cost would apply if MWD's Tier 1 rates were in effect at the time of the purchase. However, it is unlikely that the City would be in a position to pay Tier 1 rates during times of drought and possible allocations. It is more likely, at least during some of these years, the City would have to pay MWD's penalty rate.[1] With that in mind, we have estimated both low and high ranges for the MWD purchase costs based on the Tier 1 rate (the low range) and the penalty rate (the high range). These calculations are presented in the attached Tables 2, 3, 4 and 5. The only thing we can state with any certainty is the actual cost paid for additional MWD water purchased in place of implementing the given alternative, would lie somewhere between the low and high ends of the range.

We also calculated the cost of additional MWD purchases that would be required if the City's four existing Hollywood Basin (HB) wells were shut down and the two newly proposed shallow groundwater wells were not developed. In these latter instances involving the HB wells, we do not have any baseline costs from which to compare the additional MWD purchase.[2]

Table 2 below summarizes the costs for purchasing additional MWD water at both Tier 1 and penalty rates, if such water had to be purchased in lieu of implementing the designated alternative.

Table 2
Comparison of 10-Year Escalated Alternative Costs with MWD Water Purchases

Proposed Portfolio Scenario	Annual Water Volume	Sum of 10-Year Escalated Costs (Rounded) for Implementing the Noted Alternative	10-Year MWD Purchase Cost Based on Tier 1 Rates (Rounded)	10-Year MWD Purchase Cost Based On Penalty Rates (Rounded)
Water Conservation (including Water Conservation Coordinator Salary)	Increases from 195 AFY in Year 1 to 1,180 AFY in Years 6-10 (Refer to Supporting Tables)	$2,132,000	$10,700,000	$34,100,000
Water Banking	1,700 AFY in Years 8 and 9 only	$5,042,000	$4,000,000	$12,800,000
Groundwater Development (La Brea Sub-Basin)	0 AFY in the first seven years; 1,708 AFY in years 8-10	$37,919,000	$6,200,000	$19,700,000
Continued Use of the Hollywood Basin	800 and 400 AFY in Years 1 & 2; 1,120 AFY in Years 3-10	Costs Indeterminate (Not Included in Previous WEP Studies)[3]	$11,100,000	$35,200,000

[1] Set at $2,960/AF, per MWD Board Action Memorandum dated 12/9/2014; we have assumed this penalty rate will escalate over the next 10 years at the same rate as MWD's Tier 1 projected rates (refer to Tables 2, 3, 4 and 5).

[2] The current operating costs for the four existing Hollywood Basin Wells, the two newly proposed shallow groundwater wells and the existing reverse osmosis treatment plant have been excluded from all previous WEP studies. There is therefore no basis on which to compare the additional MWD purchase costs presented in Table 6. We defer to City staff and to their consultants (Hazen and Sawyer and GHD) for a more accurate assessment of those HB groundwater production and treatment costs.

[3] See Footnote 2

Please note the costs presented in Table 6 assume only the noted portfolio option is eliminated and replaced with MWD purchased water (e.g., water conservation is eliminated and replaced with MWD purchases). There are actually 24 separate permutations that would be possible given the designated four alternatives. We believe presenting costs for each of those permutations extends well beyond the scope of the Commission's request and have therefore not included that level of detail in this TM.

Summary of Findings

It is important to keep in mind the primary intent of the Water Enterprise Plan, i.e., to identify potential alternative water supply sources to increase the overall reliability of the City's water system. Over the years, MWD has always been a reliable source of supply for the City, but given the on-going drought and the potential for future allocations, it is in the City's best interests to continue to seek alternatives for reducing the amount of water currently imported from MWD (approximately 90% of the City's total water supply over the past four decades).

Given the potential for future drought allocations, the actual dollar amount the City would have to pay to purchase additional water from MWD is uncertain at best. In plentiful times, Tier 1 rates would be in effect, but in water scares times, penalty rates would apply. As noted in Table 2, these costs could vary from a low of $4 M to a high of $35.2 M, depending on the alternative evaluated and the actual MWD rate in effect at the time of purchase.

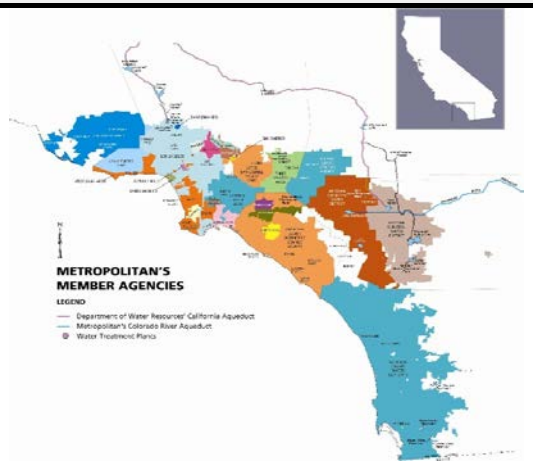
Appendix F | Placemat Summaries of 19 Water Supply Alternatives

1: Metropolitan Water District of Southern California

Concept Description:

Metropolitan Water District of Southern California (MWD) is a wholesale water agency made up of 26 member agency. The CBH is a founding member and provides one of the 35 directors that govern MWD. MWD supplies include the State Water Project, The Colorado River, and numerous storage, water transfers, exchanges, fallowing projects, and banking projects. The MWD available supply, including storage has been adequate to meet MWD's needs for the last 20 years. However, to cautiously preserve its supplies MWD imposed allocations in 2009 and is considering imposing them again next year. In addition, in the event of a severe emergency or failure to agree on an allocation plan, MWD's code requires allocations to be generally distributed based upon "preferential rights" or cumulative fixed fees paid. Beverly Hills preferential rights is 0.98% of whatever water MWD has available. Minimum supplies, absent a major earthquake, are about 1.2 million AF/ year. The CBH share would be about 11,900 AF/year.

Location



Attributes

Advantages	Disadvantages
Proven, reliable sources	Reliability may degrade with time
Stable cost structure	Lack of local control
Excellent quality	SDCWA lawsuit could significantly impact cost
No additional facilities needed	Must have sufficient storage to plan for 7-day outage
All constructed	

Schedule

Already in service

Ranking

Selection Criteria	Rating
Cost	5
Volume	5
Reliability	3
Timing	5
Local Control	2
Legal/Institutional	5
Environmental	5
Operational Complexity	5

Ranking Legend

Serious disadvantages	1
Some significant disadvantages	2
Issues but manageable	3
Some advantages	4
Significant advantages	5

Cost:

Full Service Treated (2014) Tier 1 $890/AF

Full Service Treated (2014) Tier 2 $1,032/AF

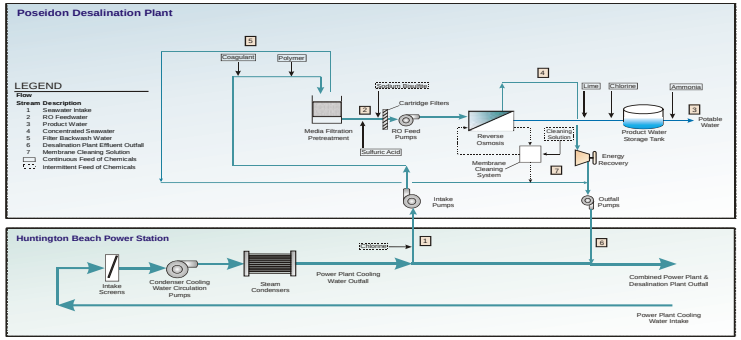
2: Ocean Desalination

Concept Description:

While the City of Beverly Hills (CBH) does not have direct ocean desalination opportunities, it is theoretically possible to "buy into" a planned coastal desalination plant and have water delivered by "exchange" through current Metropolitan service connections. The Huntington Beach desalination plant being planned by Poseidon Resources is closest to permitting and construction and is actively looking for water contractors. CBH would contract for a fixed amount of water for a specific term at a specific price. The water likely incur a "wheeling charge" for delivery/exchange by Metropolitan.

Location

The Plant is located in Huntington Beach, CA on the site of the AES Generating Station adjacent to Pacific Coast Highway



Attributes

Advantages	Disadvantages
Drought proof supply	Must pay MWD System Access Rate to move the water by Exchange to COBH
Provides baseload supply	Must be purchased irrespective of need
No direct operational responsibility	Requires first of its kind agreement for ocean desalination wheeling
Water would be by exchange, representing MWD's current water quality	Not clear plant will subscribe sufficiently to be cost-effective
The water supply would be controlled by the current HB City Council	The environmental community and current City Council oppose the plant
	Plant may have to change intake approach, incurring significant extra cost
	Local agencies have not committed to purchasing the water as of yet due to cost

Schedule

The Plant is currently awaiting approval by the CCC who have raised concerns over the proposed intake system. Studies are underway to assess use of beach wells. Such wells, if required, would add substantial cost to the project Assuming permits are issued and construction is initiated in the next 2 years, the Plant would come on line in approximately 2018-2020.

Ranking

Selection Criteria	Rating
Cost	3
Volume	5
Reliability	5
Timing	3
Local Control	3
Legal/Institutional	2
Environmental	2
Operational Complexity	5

Ranking Legend

Serious disadvantages	1
Some significant disadvantages	2
Issues but manageable	3
Some advantages	4
Significant advantages	5

Cost:

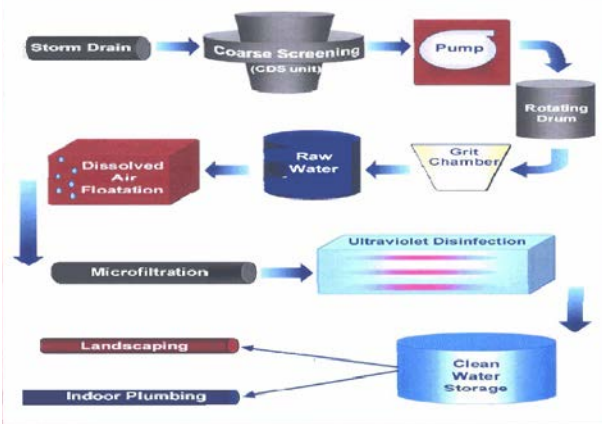
Poseidon Resources, the developer of the Huntington Beach plant has quoted a price of $1,424/ AF (Jan 2013 dollars, Huntington Beach Project) to local agencies to subscribe capacity of the plant. CBH would have to also negotiate and pay the Metropolitan Water District's Wheeling Rate which, under the current rate structure, is the System Access Rate ($243/AF) and Water Stewardship Rate ($41/AF), Treatment Surcharge (not applicable here) and power costs (at least $161/AF) for wheeling transactions. Total cost of this supply would be in excess of $1,900/AF (assuming the 2013 Poseidon pricing structure would continue to be honored).

3: Urban Runoff - Capture and Treat Dry Weather Flows

Concept Description:

Dry weather urban runoff in major storm channels can be collected, treated and reused to irrigate parks and open spaces. This alternative could be in competition with recycled water alternatives. It would require a separate distribution system and storage in addition to a treatment plant. The diversion would likely have to be in County of Los Angeles Flood Control Facility and coordination efforts would be involved with that agency.

Santa Monica Urban Runoff Recycling Facility



Attributes

Advantages	Disadvantages
Free source of water that is fairly reliable and drought proof	High capital and O&M cost
Reduces potable water demand	Requires land for treatment and storage
Environmental community support	Requires a separate distribution system
Removing and cleaning up source of somewhat polluted water	Depending on location could be competing with recycled water alternative
Potential grant or funding assistance available	Construction impacts due to treatment plant and new pipeline construction
	Conversion of existing irrigation systems sometimes difficult
	Could be some isolated community opposition due to treatment plant siting
	Diversion of tributary water to Ballona Cr.

Schedule

Could be implemented as soon as funding is available, however, planning, siting, design and construction could take at least 5 years.

Ranking

Selection Criteria	Rating
Cost	1
Volume	2
Reliability	3
Timing	3
Local Control	5
Legal/Institutional	1
Environmental	1
Operational Complexity	1

Ranking Legend

Serious disadvantages	1
Some significant disadvantages	2
Issues but manageable	3
Some advantages	4
Significant advantages	5

Cost:

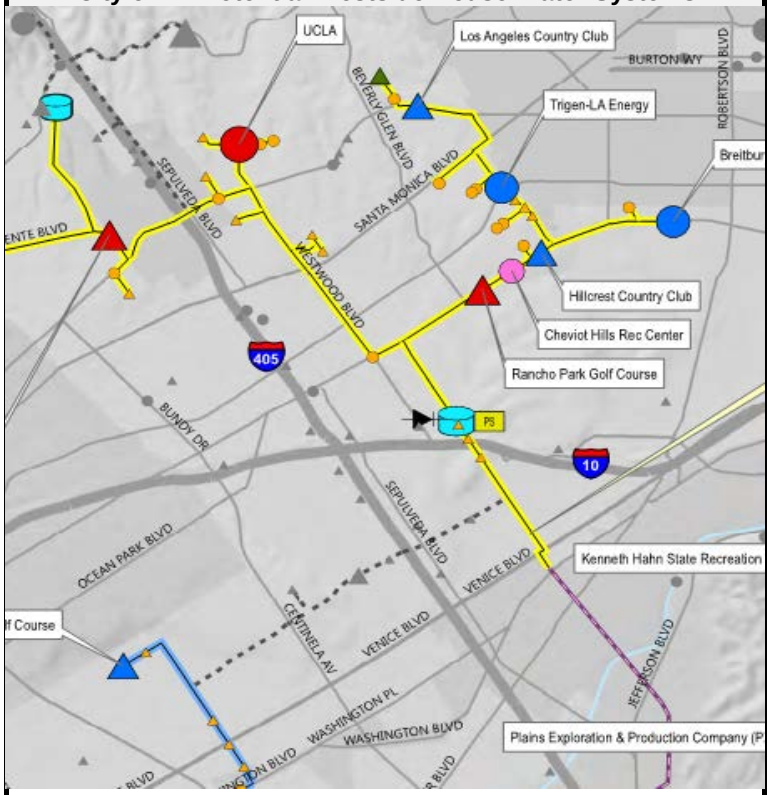
Estimated at greater than $2,500/AF.

4a: Recycled Water - Regional Approach

Concept Description:

While a recycled water source is currently not available to CBH, LADWP in their 2012 Non-Potable Reuse Master Planning Report includes a recycled water distribution system running up to the CBH's westerly boundary to serve LA Country Club. This facility is a part of DWP's "Potential Westside Service Area System". The assumption is made an agreement could be negotiated with DWP to provide additional capacity in this system and to extend it into CBH by running it easterly in San Vicente and Santa Monica Boulevards to serve landscaping along that corridor and potentially other uses such as parks and schools by extending pipelines off this main. This system is DWP's last tier of recycled water supply with a 20-year plan to develop a total of 59,000 AFY including their Existing, Proposed and Potential Non-Potable Reuse Systems along with 30,000 AFY of Groundwater Reuse so CBH has no control over when, and even if, it will actually occur.

City of LA Potential Westside Reuse Water Systems



Attributes

Advantages	Disadvantages
Reliable, drought proof supply	Fairly high up front capital cost
Reduces potable water demand	Construction impacts due to new pipeline installation
Environmental community support	Conversion of existing irrigation systems sometimes difficult
Low O&M costs	DWP negotiation and coordination required
Potential grant or funding assistance available	Limited local control

Schedule

Since CBH is on the end of DWP's Westside System, and that system will likely be one of the last phases of their distribution system, it may be 2035 before recycled water is available.

Ranking

Selection Criteria	Rating
Cost	2
Volume	5
Reliability	5
Timing	1
Local Control	2
Legal/Institutional	4
Environmental	3
Operational Complexity	3

Ranking Legend

Serious disadvantages	1
Some significant disadvantages	2
Issues but manageable	3
Some advantages	4
Significant advantages	5

Cost:

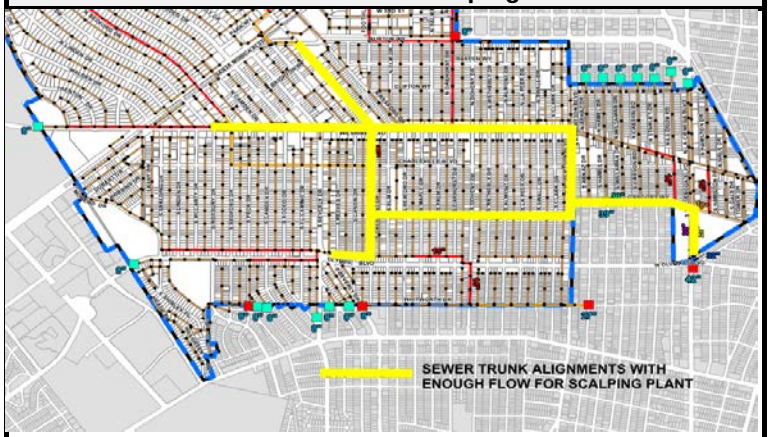
City of LA DWP's cost for Westside System was approximately $1,600/AF and assuming CBH can buy into that system for the same unit cost, extending it approximately 2.3 miles to serve local irrigation demands should run approximately $500 - $600/AF for a total of around $2,100-$2,200/AF.

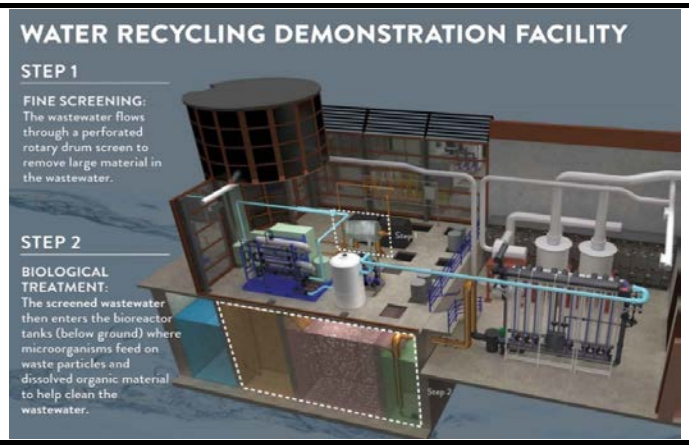
4b: Recycled Water - Scalping Plant Approach

Concept Description:

The CBH could construct small wastewater reclamation plant(s) along sewer trunks to "scalp" sewage, treat it to tertiary standards, return the solids to the trunk sewer, and pump the recycled water to a distribution system for irrigation of parks, greenbelts and schools.

Wastewater Reuse Scalping Plant





Attributes

Advantages	Disadvantages
Reliable, drought proof supply	Very high up front capital cost
Reduces potable water demand	Requires land for treatment plant
Environmental community support	High O&M cost
Local control	Construction impacts due to treatment plant and new pipeline construction
Requires a treatment plant site	Conversion of existing irrigation systems sometimes difficult
Potential grant or funding assistance available	Could be some isolated community opposition due to treatment plant siting
	The exact need and areas that be converted for use of recycled water need to be identified

Schedule

Would take approximately 5 years to plan, obtain a site, design, finance, construct, and permit a scalping plant. The irrigation system could be constructed to coincide with the availability of recycled water.

Ranking

Selection Criteria	Rating
Cost	1
Volume	2
Reliability	5
Timing	3
Local Control	4
Legal/Institutional	3
Environmental	3
Operational Complexity	1

Ranking Legend

Serious disadvantages	1
Some significant disadvantages	2
Issues but manageable	3
Some advantages	4
Significant advantages	5

Cost:

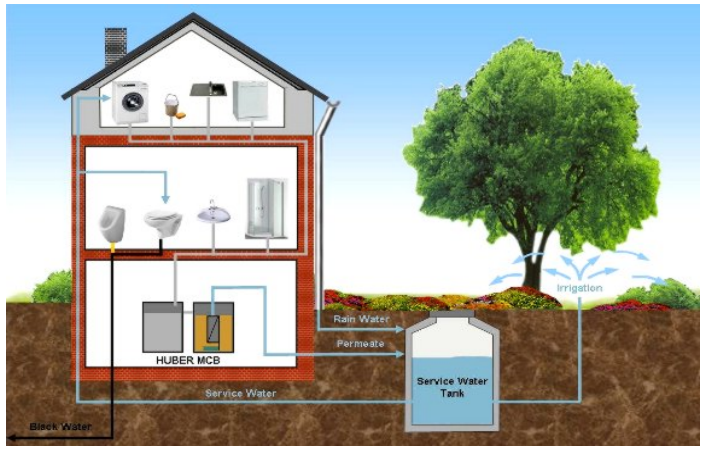
While large, regional wastewater reclamation plants are more prevalent, scalping plants are a way to obtain local control and avoid substantial pumping and distribution system costs. However, capital and O&M costs per acre-foot are substantially higher than regional systems due to the lost economies of scale for treatment. Another southern California City recently completed a demonstration scalping plant with total costs for amortized capital and O&M in the $7,500/AF range.

4c: Recycled Water - Greywater Approach

Concept Description:

Greywater recycling would involve local residents and businesses installing separate plumbing systems to capture greywater from washing machines, showers/baths and basins and then constructing tanks and pumps to enable them to utilize this water on their individual properties for irrigation of landscape. Greywater systems can be as simple as diverting washing machine water into a holding tank and from there sending it by gravity to drip irrigation systems or as complex as re-plumbing a home to capture water from basins, showers and washing machines, running it through a package treatment system, to a storage tank and pumping it to an irrigation system.

Greywater System



Attributes

Advantages	Disadvantages
No cost to CBH unless incentive rebate offered	High cost to homeowner or business owner
Reduces potable water demand	High cost per acre-foot
Reliable drought proof supply	Requires public support for implementation
Lower discharge to LA San District	

Schedule

Could be implemented immediately but since these would be private systems implementation is out of City control

Ranking

Selection Criteria	Rating
Cost	2
Volume	2
Reliability	4
Timing	3
Local Control	1
Legal/Institutional	1
Environmental	2
Operational Complexity	3

Ranking Legend

Serious disadvantages	1
Some significant disadvantages	2
Issues but manageable	3
Some advantages	4
Significant advantages	5

Cost:

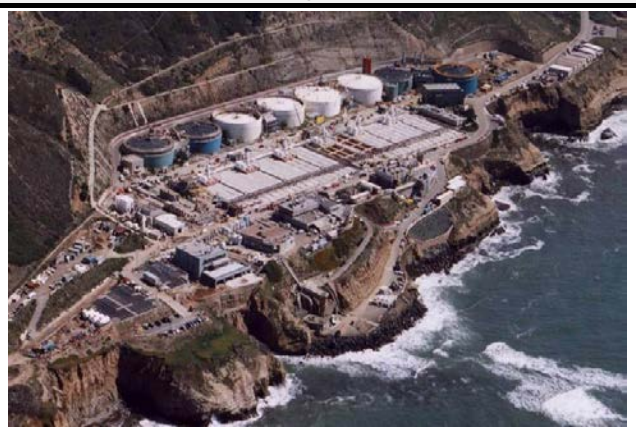
Costs for a simple system can be as low as $1,000 or less if installed by the owner to as much as tens of thousands of dollars if major re-plumbing and a treatment unit is professionally installed. Even a simple system could take over 10 years to recover the capital costs in water savings. If incentives were offered as in some states and municipalities, reduced pay-back could make these systems more prevalent. However, it would take thousands of them to result in an appreciable water savings as the average homeowner would save on the order of 0.1 to 0.2 AFY putting the cost in the range of $2,000 to $5,000/AF, assuming a 10-year life. However, since these are private systems, there is no cost to the City, with the exception of possible incentive rebates that could be offered.

4d: Recycled Water - Exchange

Concept Description:

With a regional project that would bring recyled water to CBH far from implementation, CBH could participate in another recycled water project and exchange that water for potable water. Pure Water San Diego is the City of San Diego's 20-year program to provide 90,000 AFY of potable reuse water from their Point Loma Wastewater Treatment Plant. A 15 MGD initial facility is planned to be operational by 2023 with the long term goal of producing 83 MGD by 2035. This alternative assumes the City of San Diego would allow CBH to financially participate in the project, exchanging the recylced water yield for an equivalent supply from MWDSC. The exchange would be subject to wheeling charges by MWDSC and the San Diego County Water Authority.

System



The City of San Diego's Point Loma Wastewater Treatment Plant

Attributes

Advantages	Disadvantages
Reliable, drought proof supply	Must pay MWDSC & SDCWA System Access Rates to move the water by Exchange to CBH
Provides benefits to Southern California region by providing funding to help move regional project along	Requires first of its kind agreement for recycled water wheeling
Potential grant of funding assistance available	High cost per AF
No direct operational responsibility	Multiple agencies involved including MWDSC, SDCWA and City of San Diego
Could potentially phase participation	

Schedule

First phase scheduled to be available by 2023, with future phase(s) planned

Ranking

Selection Criteria	Rating
Cost	1
Volume	5
Reliability	4
Timing	3
Local Control	3
Legal/Institutional	2
Environmental	3
Operational Complexity	3

Ranking Legend

Serious disadvantages	1
Some significant disadvantages	2
Issues but manageable	3
Some advantages	4
Significant advantages	5

Cost:

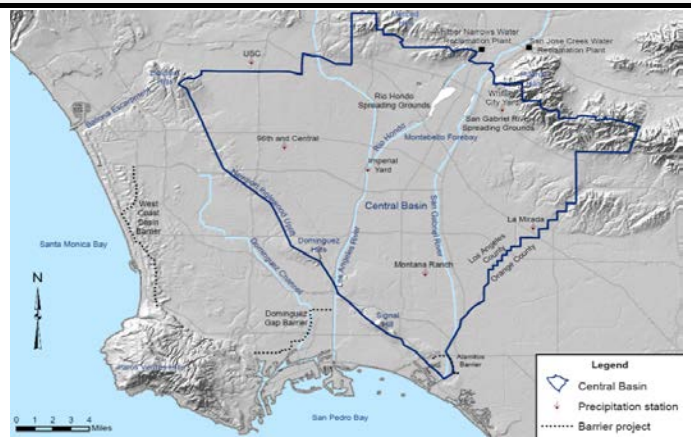
Current cost estimates for the San Diego project are upwards of $1,900/AF and we have assumed there would be a $100 incentive charge. CBH would have to negotiate and pay the Metropolitan Water District's Wheeling Rate which, under the current rate structure, is the System Access Rate ($243/AF) and Water Stewardship Rate ($41/AF), Treatment Surcharge and power costs (at least $161/AF) for wheeling transactions. In addition, San Diego County Water Authority would charge their "Transportation Rate", which is $101/AF for 2015. Based on the above, total cost of this supply would be in excess of $2,500/AF.

5: Exchanges

Concept Description:

Water exchanges are occasionally used to minimize capital investments or operating costs. One potential source of water for The CBH is the acquisition of water rights in the adjudicated portion of the Central Basin. While groundwater rights may be able to be purchased in this basin, the wells to extract the water would be a long distance from CBH, and much closer to the LADWP. Since the water would be of potable quality, it cannot be comingled with any facilities to take with from the unadjudicated portion of the Central Basin. Potentially, BH could purchase the water rights, construct the wells, and construct delivery facilities to the nearest connection to the LADWP system. The LADWP could then exchange the water to CBH at the current interconnection with the CBH and LADWP would charge administrative charge to compensate for the transaction. CBH would pay the capital and operating costs for the well pump station, pipelines meter connections and any upgrade needed at the existing connection.

Central Basin



Attributes

Advantages	Disadvantages
Southern California supply (local)	May be objections from other Central Basin pumpers
Reasonable cost	Rights may not be available
Two agency transaction	High initial capital outlay

Schedule

Three or more years from initiation.

Ranking

Selection Criteria	Rating
Cost	4
Volume	5
Reliability	4
Timing	3
Local Control	3
Legal/Institutional	3
Environmental	3
Operational Complexity	3

Ranking Legend

Serious disadvantages	1
Some significant disadvantages	2
Issues but manageable	3
Some advantages	4
Significant advantages	5

Cost:

Approximately $1,100/AF.

6: Transfers

Concept Description:

A Water Transfer could provide an alternative source of supplemental water to the CBH. A water transfer is a contractual transfer of a block of water from an agency or individual which either has a legal water supply or water right that is in surplus to its needs and has the legal right and ability to sell or lease all or a portion of that water supply. Most of the current water transfer water is outside and north Los Angeles County. A water transfer would be wheeled through MWD using existing facilities and service connections including its capacity in the State Water Project facilities. CBH would contract for a fixed annual amount of water over a fixed period of time for a specific term and specific price. (i.e. a permanent long term annual supply or a fixed short term annual supply) Storing some or all the transferred water in a water bank is also an option and using in a time of need. In addition to the cost of the water, there will be wheeling charges for delivery, and exchange by MWD.

Location

Attributes

Advantages	Disadvantages
Water can be banked and used when needed	Must pay wheeling charges
Process and procedure well known and documented	Usually requires a take or pay contract
No direct operational responsibility	Usually a fixed multi year term contract
Can usually be arranged within one or two years	Wheeling subject to wheeling capacity availability in facilities
Take delivery through existing MWD connections	Availability of water for transfer could be limited
No water quality issues	May require a CEQA process
Subject to vulnerability of MWD facilities	May take several years to implement

Schedule

There is a limited amount of water available for transfer due to the drought. It will likely take one to two years to find transfer water, negotiate a contract and wheeling agreements as well as CEQA documentation. Could have in place in the 2016/17 time frame.

Ranking

Selection Criteria	Rating
Cost	3
Volume	5
Reliability	2
Timing	3
Local Control	3
Legal/Institutional	3
Environmental	3
Operational Complexity	3

Ranking Legend

Serious disadvantages	1
Some significant disadvantages	2
Issues but manageable	3
Some advantages	4
Significant advantages	5

Cost:

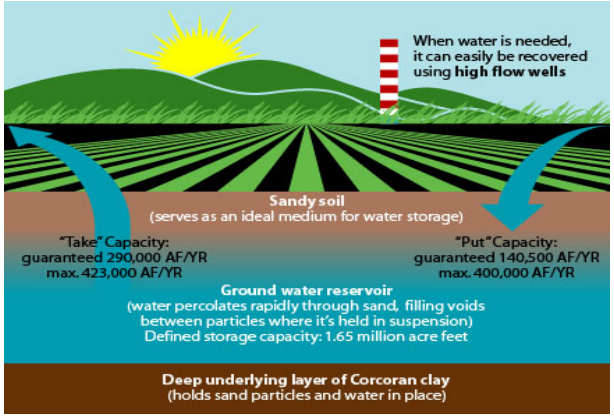
Assuming a 20 to 30 year term with an agency such as Rosedale Rio Bravo Water Storage District, cost would be in the range of $1,200 to $2,000.

7: Water Banking

Concept Description:

A water bank is a managed set of facilities for storing water in an underground basin in times of surplus for subsequent extraction in time of shortage. Southern California has pioneered this water management tool with the Kern Water Bank, the Semitropic Water Bank and the Antelope Valley Water Bank as prime examples. Each requires that the managing entity has the right to store and extract water, and requires access to a source of water, construction of pipelines, canals and pump stations to move the water to the bank, spreading basins to facilitate recharging the water into the ground, wells for extractions of the water when needed, and pipelines and pump stations to move the water to a regional water transportation facility such as the State Water Project. Agencies desiring to store water in the bank pay a buy-in fee for investment for capital facilities. This gives them the right to store water. The agency is charged a per acre foot charge for water deposited into the bank and is subject to a water loss factor. There is normally an annual storage fee and sometimes an annual loss factor. Upon call on the water, there is an extraction fee and a power cost to move the water. If the water is transported to the Metropolitan Water District, it will be subject to MWD's wheeling fee unless it is MWD water to begin with. Water banks currently soliciting participation include the Semitropic Bank and Antelope Valley Bank.

Location



Attributes

Advantages	Disadvantages
Own stored water	Extensive coordination
Considered exempt to MWD's allocations	Distance from Beverly Hills
Proven technique	Initial buy-in fee of $1,500/AF
Water available when SWP allocations are low	In extreme drought, there has to be water in the SWP in order to move the water
	Have to buy water in advance and store in bank

Schedule

One to two years to purchase water and set up in bank.

Ranking

Selection Criteria	Rating
Cost	4
Volume	5
Reliability	5
Timing	5
Local Control	3
Legal/Institutional	3
Environmental	3
Operational Complexity	3

Ranking Legend

Serious disadvantages	1
Some significant disadvantages	2
Issues but manageable	3
Some advantages	4
Significant advantages	5

Cost:

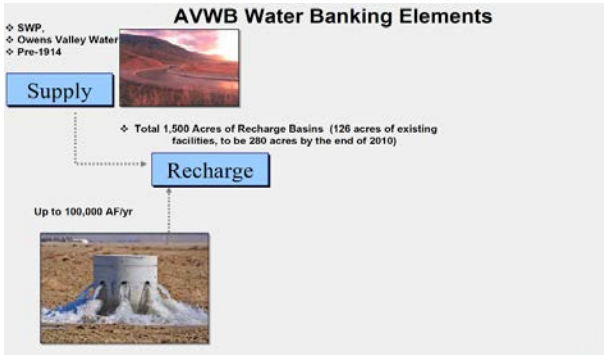
Put Fee - $78/ac-ft; Annual storage fee - $25/AF; agreed loss or leave behind of 10%; Take fee - $78/AF; Energy Fee - $80/AF; MWD water - $600/AF (no wheeling fee); Treatment cost 341/AF.
Approximately $1,300 per acre foot (based on banking and delivery of 1,000 ac-ft over a 5-year period).
An additional $1,500,000 initial fee that is presumed to be an asset and could be sold at a later date.

8: Antelope Valley Water Bank Drought Insurance

Concept Description:

The Antelope Valley Water Bank (AVWB) is a small (15,000 AF currently in storage) water bank in Kern County. The water in the bank is not saleable permanently outside of Kern County due to the regional wholesaler and county ordinances. State law does allow the loan of surface water for up to 5 years, as long as it is repaid at that time. AVWD is proposing two approaches to help mitigate the drought using its facilities. 1) A loan of the water to be repaid in 5 years; 2) Drought insurance whereby you pay an annual fee and exercise an option to take water when needed.
This scenario will cover the drought insurance option. Process = The City of Beverly Hills and AVWB would execute a 10-year agreement for 1,000 AF of water to be delivered in any year needed and repaid within 5 years. Multiple calls are permitted.

Antelope Valley Water Bank



Attributes

Advantages	Disadvantages
No capital outlay	Institutional complexity
Flexible call	Unproven
Considered extraordinary in MWD allocations	
Price is negotiable for initial purchaser	

Schedule

Could be implemented withis one year

Ranking

Selection Criteria	Rating
Cost	2
Volume	5
Reliability	4
Timing	5
Local Control	3
Legal/Institutional	3
Environmental	5
Operational Complexity	3

Ranking Legend

Serious disadvantages	1
Some significant disadvantages	2
Issues but manageable	3
Some advantages	4
Significant advantages	5

Cost:

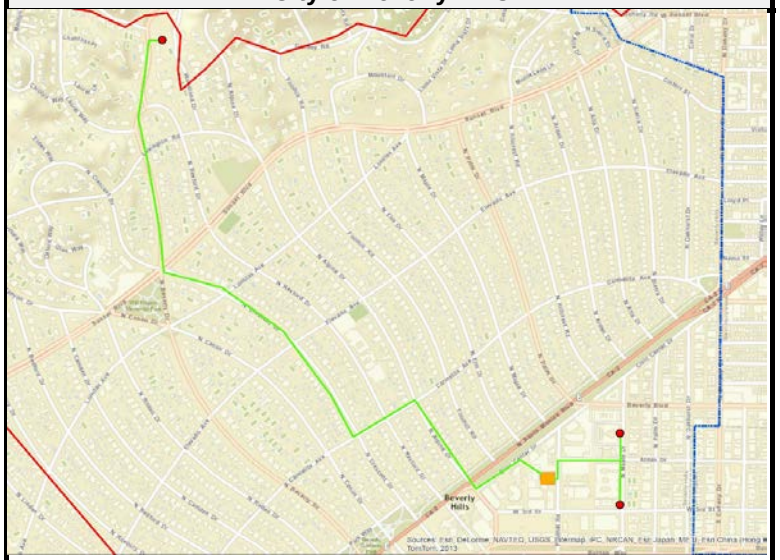
Annual insurance cost $120/AF or $120,000 for 1,000 AF (assume for 5 years or $600,000
Cost of water when delivered $600 AF plus Metropolitan wheeling cost ($243/AF).
Cost of replacement water depends on source $600 per AF
Total cost of AF used 1 times in 5yrs is: $120,000 x 5 = $600,000 + ($600 x 1,000 =) $600,000 +other costs; Total = $1.98 million
With 10% loss
Cost/AF = $1.98 million/900 AF = $2,200 AF

9-a: Groundwater - Capture Spring Water

Concept Description:

Historically, the area in east Beverly Hills and the City of West Hollywood has experienced shallow groundwater conditions that required the installation of collection systems that collected the water and discharged the water to local storm drain system for any below grade structures such as parking garages. The concept is to collect this groundwater, treat (to recycled water requirements) and distribute to recycled water end users. The current concept is to develop approximately 1,000 acre-feet (600 gpm). The concept would also require approximately 12,000 feet of pipeline from the collection areas and back to a new water treatment plant located at the Department of Public Works facility. In addition, would require 30,000 feet of recycle line from plant to distribution areas (LA Country Club, Burton Way, Park in southwest corner of CBH.

City of Beverly Hills



Attributes

Advantages	Disadvantages
Local control of water resources supply	Long-term maintenance and operational cost to operate plant & collection system
Assists in maintaining historical rights in Hollywood Basin	Would be highly susceptible to anthropogenic effects from residential, commercial & industrial activities.
Low vulnerability to external influences	Requires a separate plant and distribution system
Utilization of a resource currently being discharged to the ocean	Volume produced would be unreliable and would likely decrease in summer months
Potential grant or funding assistance available	Conversion of existing irrigation systems sometimes difficult
	Would likely require agreement with private parties to acquire water
	Construction impacts due to new pipeline installation

Schedule

Both the collection system and the recycled water distribution systems are not present in the CBH or West Hollywood. Collection system and treatment plant would take approximately 3 years. Distribution system would take approximately 2 years

Ranking

Selection Criteria	Rating
Cost	2
Volume	2
Reliability	2
Timing	3
Local Control	5
Legal/Institutional	3
Environmental	3
Operational Complexity	1

Ranking Legend

Serious disadvantages	1
Some significant disadvantages	2
Issues but manageable	3
Some advantages	4
Significant advantages	5

Cost:

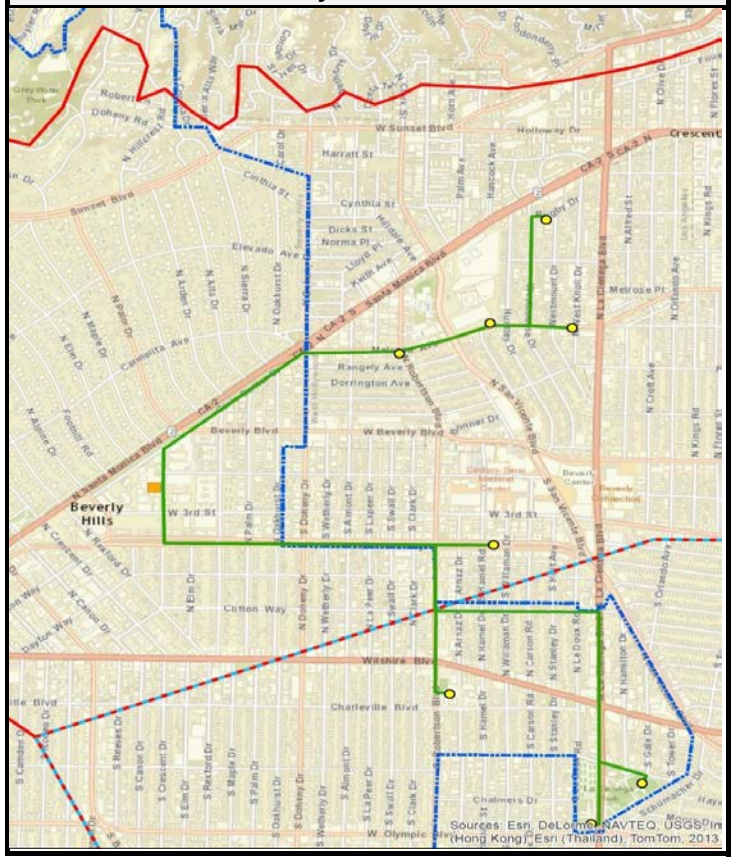
Preliminary costs for the proposed concept would indicate approximately $2,400/AF with a life expectancy of the system at approximately 30 years.

9-b: Groundwater - Develop Hollywood Basin Wells

Concept Description:

Historically, the City of Beverly Hills (CBH) has developed groundwater in the Hollywood Basin. This concept would develop groundwater resources within the Hollywood Basin using new production wells. Estimated sustainable yield is 2,000 to 3,000 AFY with the CBH currently extracting 1,000 AFY. The current concept is to develop an additional 1,500 AFY for a total of 2,500 AFY. Preliminary calculations indicate a requirement for six to eight wells each producing approximately 200-300 gallons per minute. The preliminary location would be similar to the previously installed wells near the eastern boundary of CBH. The concept would also require approximately 24,000 feet of pipeline from the production wells back to the existing treatment plant located at the Department of Public Works facility.

Hollywood Basin



Attributes

Advantages	Disadvantages
Less susceptible to short-term drought conditions	Long-term maintenance and operational cost to operate & maintain wells
Local control of water resource supply	Does not prevent other parties from developing resource
Assists in maintaining historical rights in Hollywood Basin	Would require upgrade of existing treatment plant
Potential grant or funding assistance available	Construction impacts due to new pipeline installation

Schedule

Five to ten years to implement

Ranking

Selection Criteria	Rating
Cost	3
Volume	3
Reliability	4
Timing	3
Local Control	5
Legal/Institutional	4
Environmental	3
Operational Complexity	3

Ranking Legend

Serious disadvantages	1
Some significant disadvantages	2
Issues but manageable	3
Some advantages	4
Significant advantages	5

Cost:

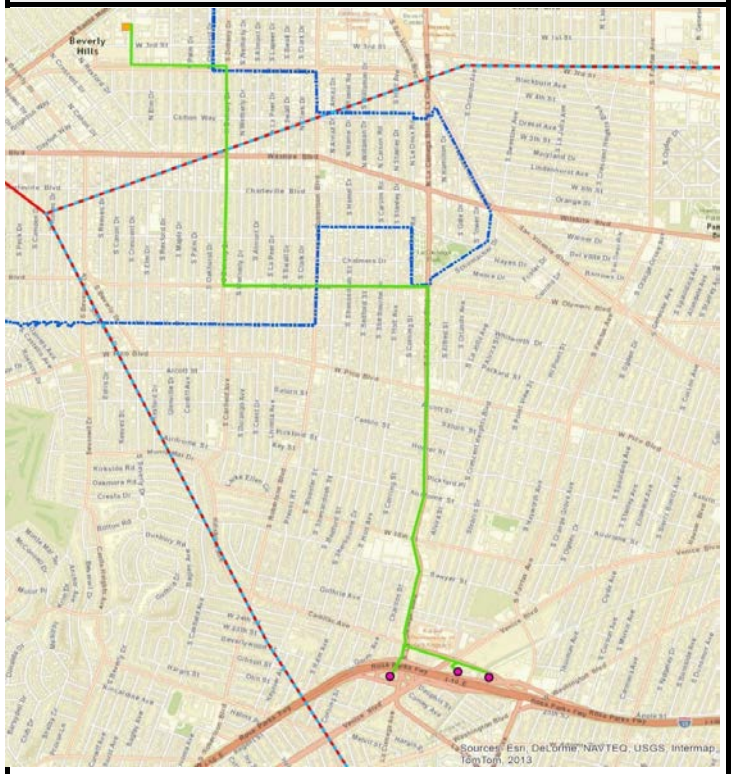
Preliminary costs for the proposed concept would indicate approximately $1,600/AF (2014) with a life expectancy of the wells at approximately 30 years.

9-c: Groundwater - Develop Central Basin (La Brea Sub-Basin) Wells

Concept Description:

Historically, the City of Beverly Hills (CBH) has developed groundwater in the La Brea Sub-Basin portion of the Central Basin (LBSB). This concept would develop groundwater resources within the LBSB using new production wells. Estimated sustainable yield in the LBSB is 3,000 AFY. The current concept is to develop 3,000 AFY in the LBSB and maintain 1,000 AFY in the Hollywood Basin (HB) for a total of 4,000 AFY from both the HB and LBSB. Preliminary calculations indicate a requirement for three wells each producing approximately 800 gallons per minute. The preliminary location would be similar to the previously installed wells near the confluence of Ballona Creek and the I-10 Freeway. The concept would also require approximately 23,000 feet of pipeline from the production wells back to the existing treatment plant located at the Department of Public Works facility.

La Brea Sub-Basin Portion of Central Basin



Attributes

Advantages	Disadvantages
Less susceptible to short-term drought conditions	Long-term maintenance and operational cost to operate & maintain wells
Local control of water resources supply	Does not prevent other parties from developing resource
Assists in maintaining historical rights in Central Basin	Would require upgrade of existing treatment plant
Potential grant or funding assistance available	Construction impacts due to new pipeline installation

Schedule

Five to ten years to implement

Ranking

Selection Criteria	Rating
Cost	4
Volume	4
Reliability	4
Timing	3
Local Control	5
Legal/Institutional	4
Environmental	3
Operational Complexity	3

Ranking Legend

Serious disadvantages	1
Some significant disadvantages	2
Issues but manageable	3
Some advantages	4
Significant advantages	5

Cost:

Preliminary costs for the proposed concept would indicate approximately $1,200/AF (2014) with a life expectancy of the wells at approximately 30 years.

10a: Conservation - Comply with SBx7-7

Concept Description:

The CBH desires to comply with SBx7-7 requiring a 20% reduction from the 10-year baseline average by Year 2020 as a minimum conservation goal. From the SBx7-7 update presented herein this results in a goal of 231 gallons per capita per day (gpcd) by 2020 with an interim target of 260 gpcd by 2015. Current water supply within the service area is 12,269 AFY (FY 2014) and current population is estimated at 42,858 resulting in a current use of 256 gpcd. Based on current usage a reduction of 1,175 AFY or 9.5% would be required utilizing the projected population for 2020. This would require additional conservation measures from water users in the service area averaging almost 200 AF each year for the next 6 years.

Water Use Efficiency

Attributes

Advantages	Disadvantages
This level of conservation meets State DWR guidelines	Revenue is reduced due to reduced sales
Permanent conservation results in permanent water demand reduction	Residents and businesses must be convinced to practice conservation
Demand reduction is reliable and drought proof	May require CBH to provide rebate incentives
Potential grant or funding assistance available	Landscaping palettes may need to be modified

Schedule

Would need to be implemented by 2020 to meet SBx 7-7 guidelines.

Ranking

Selection Criteria	Rating
Cost	5
Volume	2
Reliability	4
Timing	3
Local Control	4
Legal/Institutional	4
Environmental	5
Operational Complexity	3

Ranking Legend

Serious disadvantages	1
Some significant disadvantages	2
Issues but manageable	3
Some advantages	4
Significant advantages	5

Cost:

Costs to an agency for water use efficiency programs have been shown to vary from the neighborhood of $50/AF to $2,500/AF conserved of the useful life. However, the customer would also incur certain costs which could be offset by savings on their water bills on many of the programs. Customer costs are not included. Indoor savings from such programs as washing machine and dishwasher replacement rebates also save City on sewer discharge fees.

10b: Conservation - Tailor to Unique CBH Characteristics

Concept Description:

Recognizing the CBH unique characteristics, a suite of conservation practices could be developed to attain the State mandated SBx7-7 requirements plus some additional conservation reaching a total demand reduction over current levels of approximately 18% by 2025. This could be achieved by continuing to conserve 200 AF each year beyond 2020 to 2025 and could involve such programs and devices as large landscape surveys, pay for performance incentives, public spaces program, smart timers, rotary nozzles, computerized irrigation controllers, turf removal, HEF washers and toilets, UL or waterless urinals, cooling tower retrofits, etc.

Water Use Efficiency

Attributes

Advantages	Disadvantages
This level of conservation exceeds State DWR guidelines	Revenue is reduced due to reduced sales
Permanent conservation results in permanent water demand reduction	Customers must be convinced to participate and practice conservation
Demand reduction is reliable and drought proof	Will require CBH to provide some level of rebates and incentives
Potential grant or funding assistance available	Landscaping palettes may need to be modified

Schedule

231 gallons per capita day would need to be attained by 2020 to meet SBx7-7 guidelines. Additional conservation could be implemented over the next 5 years to 2025 equating to a total savings of over 18% and a per capita rate of 210.7.

Ranking

Selection Criteria	Rating
Cost	4
Volume	3
Reliability	4
Timing	3
Local Control	4
Legal/Institutional	4
Environmental	5
Operational Complexity	3

Ranking Legend

Serious disadvantages	1
Some significant disadvantages	2
Issues but manageable	3
Some advantages	4
Significant advantages	5

Cost:

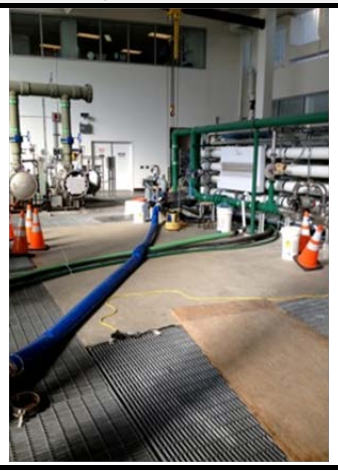
Costs to an agency for water use efficiency programs have been shown to vary from the neighborhood of $50/AF to $2,500/AF conserved of the useful life. However, the customer would also incur certain costs which could be offset by savings on their water bills on many of the programs. Customer costs are not included. Indoor savings from such programs as washing machine and dishwasher replacement rebates also save City on sewer discharge fees.

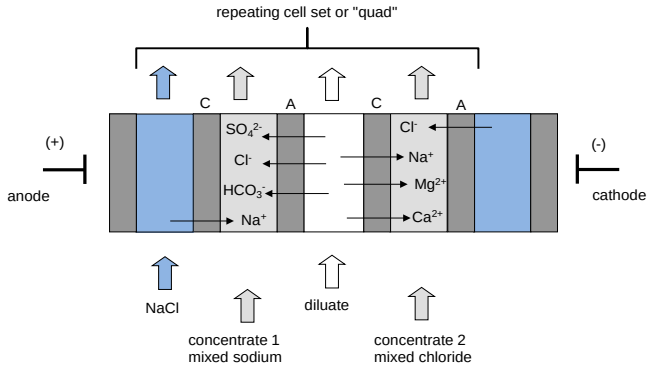
11a: Capture and Treat R.O. Reject Water - 1.5 MGD Plant Size

Concept Description:

Desalination with reverse osmosis (RO) membranes can be used to diversify and expand municipal water supplies, but desalination generates a concentrate byproduct that must be managed. Sustainable and environmentally responsible management of RO concentrate will be a prerequisite to expanded use of brackish and recycled water. For many inland communities, sustainable management of RO concentrate will require zero liquid discharge (ZLD) desalination. In ZLD desalination, concentrate is treated to recover it as product water, and there is no discharge of liquid waste from the plant. A new electrodialysis technology, electrodialysis metathesis (EDM), has emerged that offers the potential to reduce the costs and energy requirements for ZLD. The concept is to apply this technology to the RO concentrate from the CBH RO plant to try and capture the wastewater for beneficial use. Plant size is 1.5 MGD

Existing RO Treatment Plant





Attributes

Advantages	Disadvantages
Eliminate discharge of wastewater from RO plant	Operational complexity
Maximizes yield from existing facility	Unproven technology that has not been commercially demonstrated
Potential grant or funding assistance available	Handling and disposal of concentrate
	High energy requirement
	Space requirements
	Quantity of water generated dependent on plant throughput
	Increase to per unit discharge cost of waste stream to sewer system.

Schedule

Unknown. Further product development and commercial backing is needed to bring the EDM technology to market

Ranking

Selection Criteria	Rating
Cost	4
Volume	1
Reliability	4
Timing	3
Local Control	4
Legal/Institutional	4
Environmental	3
Operational Complexity	3

Ranking Legend

Serious disadvantages	1
Some significant disadvantages	2
Issues but manageable	3
Some advantages	4
Significant advantages	5

Cost:

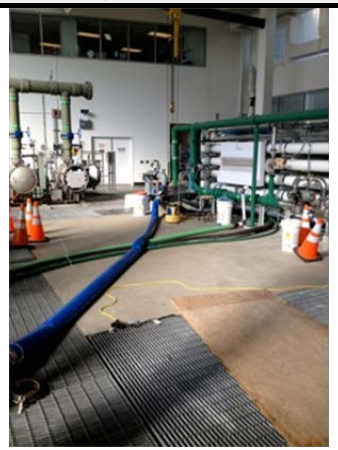
$840 to $1,300/AF

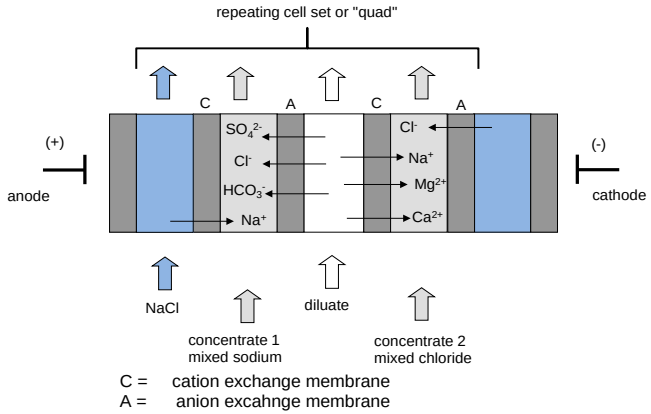
11b: Capture and Treat R.O. Reject Water - 3.0 MGD Plant Size

Concept Description:

Same concept as 11a except plant throughput has increased to maximum capacity of 3.0 MGD. The project anticipates that Option 9b, Groundwater Production from the Hollywood Basin would be required to achieve the plant capacity of 3.0 MGD.

Existing RO Treatment Plant





Attributes

Advantages	Disadvantages
Eliminate discharge of wastewater from RO plant	Operational complexity. Would require expanding capacity of existing plant.
Potential grant or funding assistance available	Unproven technology that has not been commercially demonstrated
	Handling and disposal of concentrate
	High energy requirement
	Space requirements
	Quantity of water generated dependent on plant throughput
	Increase to per unit discharge cost of waste stream to sewer system.

Schedule

Unknown. Further product development and commercial backing is needed to bring the EDM technology to market

Ranking

Selection Criteria	Rating
Cost	3
Volume	2
Reliability	4
Timing	3
Local Control	4
Legal/Institutional	4
Environmental	3
Operational Complexity	3

Ranking Legend

Serious disadvantages	1
Some significant disadvantages	2
Issues but manageable	3
Some advantages	4
Significant advantages	5

Cost:

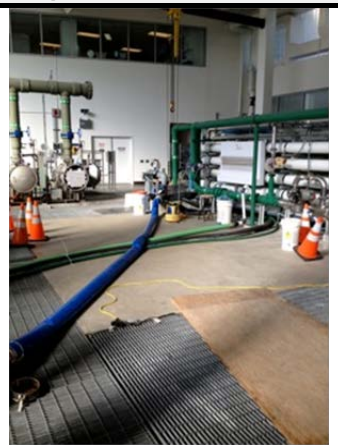
$1,300 to $1,600/AF

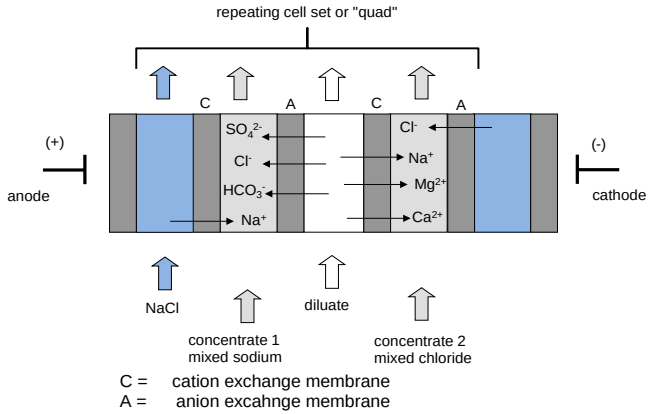
11c: Capture and Treat R.O. Reject Water - 4.5 MGD Plant Size

Concept Description:

Same concept as 11a except plant throughput increased to maximum capacity of 4.5 MGD. The project anticipates that Option 9c, Groundwater Production from the Central Basin (unadjudicated part) would be required to achieve the plant capacity of 4.5 MGD.

Expand RO Treatment Plant





Attributes

Advantages	Disadvantages
Eliminate discharge of wastewater from RO plant	Operational complexity
Maximizes yield from existing facility	Unproven technology that has not been commercially demonstrated
Potential grant or funding assistance available	Handling and disposal of concentrate
	High energy requirement
	Space requirements
	Quantity of water generated dependent on plant throughput
	Increase to per unit discharge cost of waste stream to sewer system.

Schedule

Unknown. Further product development and commercial backing is needed to bring the EDM technology to market

Ranking

Selection Criteria	Rating
Cost	4
Volume	2
Reliability	4
Timing	3
Local Control	4
Legal/Institutional	4
Environmental	3
Operational Complexity	3

Ranking Legend

Serious disadvantages	1
Some significant disadvantages	2
Issues but manageable	3
Some advantages	4
Significant advantages	5

Cost:

$1,100 to $1,400/AF.

Appendix G | Cessation or Reduction in Groundwater Extraction

APPENDIX G

CESSATION OR REDUCTION IN GROUNDWATER EXTRACTION

State law provides a means for owners of water rights to pump groundwater to protect those rights when they substitute water from an alternate non-tributary source for previously pumped groundwater. Before the passage of these statutes, many groundwater pumpers in overdrawn and depleted basins were reluctant to reduce pumping and substitute other water for fear of losing their groundwater rights.

To qualify, a water user must have at one time pumped groundwater under some claim of right and put it to beneficial use and subsequently to have reduced or ceased pumping such water and substituted water from a different source, such as imported water or water released from storage reservoirs.

Sections 1005.1 and 1005.2 of the California Water Code apply only to the counties of San Luis Obispo, Santa Barbara, Ventura, Los Angeles, Orange, San Diego, Imperial, Riverside, and San Bernardino. Section 1005.3 applies to specific water basins, and Section 1005.4 applies to the remaining counties in California.

DESCRIPTION OF THE PROGRAM

Groundwater users who wish to avail themselves of the water right protection provided under California Water Code Sections 1000. through 1005.4, must first file a statement on the prescribed form (Form 60-B) with the State Water Resources Control Board.

After the first statement is filed on Form 60-B, subsequent statements may be filed on the shorter annual statement form (Form 60-C). These annual statements must be filed by December 31st of each year.

The City of Beverly Hills ceased pumping groundwater in 1976. In July and August of 1977 the City made a request to the California State Water Resource Control Board (SWRCB) to participate in the Cessation program. The City stated:

> *"Since 1958 Beverly Hills has followed a policy that the use of Metropolitan Water District water as an alternate non-tributary source and the cessation or reduction of extraction of ground water from the City's wells shall constitute a reasonable beneficial use of ground water, and be equivalent to the extraction of ground water to the extent of such cessation or reduction.*
>
> *Pursuant to this policy of permitting replenishment of the ground water sources, we have reduced production from the City's wells to the point of complete cessation of extractions in 1976.*
>
> *The City records show that Beverly Hills has been effectively complying with the spirit and objectives of the Water Code."*

The City and Psomas have searched both the City's files and requested the SWRCB to search theirs. There are gaps of information in both files. This above-referenced letter dated August 1, 1977 served as the City's initial filling and was followed on November 18, 1977 with the first annual statement. These documents were accepted by the SWRCB and assigned a file number of S-79. There is a gap in both sets of records with the next record of a filing dated November 20, 1990 under file number 190026C. This set of records runs through November 25, 2013. A copy of these records follows.

APPENDIX G (continued)

Copies of the City of Beverly Hills and SWRCB file of Cessation or Reduction in Groundwater Extraction Statements

77 AUG -2 AM11 08

BEVERLY HILLS, CALIFORNIA 90210
550-4656

CITY OF BEVERLY HILLS

5-79

August 1, 1977

State Water Resources Control Board
Division of Water Rights
107 South Broadway, Room 3009
Los Angeles, California 90012

GROUND WATER EXTRACTIONS - CITY OF BEVERLY HILLS

This letter is intended to supplement our letter dated July 29, 1977 from which we inadvertently omitted information essential to our claim.

The City of Beverly Hills intends to file with the State Water Resources Control Board, in accordance with Water Code Sections 1005.1 and 1005.2, Statements of Cessation or Reduction in the Extraction of Ground Water by the Owner of a Right to Extract, as the Result of the Use of an Alternate Supply of Water from Non-Tributary Source.

Since 1958 Beverly Hills has followed a policy that the use of Metropolitan Water District water as an alternate non-tributary source and the cessation or reduction of extraction of ground water from the City's wells shall constitute a reasonable beneficial use of ground water, and be equivalent to the extraction of ground water to the extent of such cessation or reduction.

Pursuant to this policy of permitting replenishment of the ground water sources, we have reduced production from the City's wells to the point of complete cessation of extractions in 1976.

The City records show that Beverly Hills has been effectively complying with the spirit and objectives of the Water Code.

5-8-81

GROUND WATER EXTRACTIONS - CITY OF BEVERLY HILLS

During the five years prior to 1958, the City's annual extractions from ground water were as follows:

Year	Annual Extractions (in acre feet)
1953	7452.77
1954	7656.94
1955	6606.21
1956	6382.05
1957	8883.00

After the City's reductions began in 1958, the extractions and the purchases from the alternate, non-tributary source have been as follows:

Year	Annual Extractions (in acre feet)	MWD Purchases (in acre feet)
1958	9403.0	2150.30
1959	8082.00	3327.20
1960	8381.00	3177.00
1961	6583.00	3989.50
1962	5450.00	5694.80
1963	8850.00	3176.70
1964	5963.00	6459.80
1965	6440.00	5979.40
1966	6176.00	5878.10
1967	7199.00	4719.80
1968	7627.40	5553.20
1969	7481.65	6298.10
1970	6222.41	8292.70
1971	5448.40	9245.70
1972	5599.49	9684.60
1973	4509.59	11852.80
1974	3763.31	10563.80
1975	1918.32	11852.80
1976	1082.28	11163.60

It is the City's position that, but for its purchases from MWD, its extractions would have equalled the total of both the

GROUND WATER EXTRACTIONS - CITY OF BEVERLY HILLS

amount of the City's extractions plus its purchases for each given year.

We would very much appreciate receiving from your office the forms presently approved or recommended by the Division of Water Rights for use in formal filings in accordance with Sections 1005.1 and 1005.2 of the Water Code in order to pursue the City's statutory rights.

Thomas L. Thorpe

THOMAS L. THORPE
Water Operations Manager

CERTIFIED MAIL NO. 840012
RETURN RECEIPT REQUESTED

STATE OF CALIFORNIA
RESOURCES AGENCY
STATE WATER RESOURCES CONTROL BOARD

------oOo------

ANNUAL
STATEMENT OF CESSATION OR REDUCTION IN THE EXTRACTION OF GROUND WATER BY THE OWNER OF A RIGHT TO EXTRACT, AS THE RESULT OF THE USE OF AN ALTERNATE SUPPLY OF WATER FROM A NONTRIBUTARY SOURCE
(Sections 1005.1, 1005.2 and 1005.4 of the Water Code)

FOR WATER YEAR ENDING SEPTEMBER 30, 1977

1. City of Beverly Hills, Water Department
(Name of owner of ground water right)

450 N. Crescent Drive, Beverly Hills, Ca. 90210
(Address)

2. Name of the irrigation district, reservoir, stream, river, etc., from which the alternate non-tributary water was received or diverted.

Metropolitan Water District of Southern California

3. Amount of water used from the alternate non-tributary source.

13,496.13 acre feet

4. Amount of water pumped from wells. None

5. Amount of reduction in extraction of groundwater.

100% reduction in ground extraction

6. Remarks - Please state any other facts you think may clarify your statement.

As part of the City Council's decision to have "All M.W.D. Water Supply", to the System, City-owned wells were abandoned and ground water extractions ceased on October 4, 1976.

Date: November 18, 1977 Signed C. F. Fueconcillo
CELSO F. FUECONCILLO

THIS IS A SHORT FORM AND SHOULD BE USED ONLY BY THOSE WHO HAVE A STATEMENT FOR A PREVIOUS YEAR ALREADY ON FILE.

-2810

DIVISION OF WATER RIGHTS
25 19TH STREET
RAMENTO, CALIFORNIA 95818

In Reply Refer
to: 341:WJM

August 29, 1977

City of Beverly Hills
Water Department
Room 600
450 N. Crescent Drive
Beverly Hills, CA 90210

WATER CODE SECTION 1005.4
REDUCTION IN GROUND WATER USE

STATEMENT No. 3-79

Your statement of reduction in ground water use as a result of use of water from a nontributary source has been received and assigned the above number. You should refer to this number in any correspondence to this office regarding the statement.

Please notify us of any change in address or change in ownership.

Statements claiming a reduction in ground water use should be filed at the end of each water year. We will send you the necessary forms when they become due.

D. W. Sabiston
Supervising Engineer

SWRCB 60G (2/77)

CI

STATE WATER RESOURCES CONTROL BOARD
2013 DEC -2 PM 12:05
CITY OF BEVERLY HILLS
SACRAMENTO

State of California
State Water Resources Control Board
DIVISION OF WATER RIGHTS
P.O. Box 2000, Sacramento, CA 95812-2000
Info: (916) 341-5802, FAX: (916) 341-5400, E-mail: http://www.waterboards.ca.gov/waterrights

ANNUAL STATEMENT
CESSATION OR REDUCTION IN THE EXTRACTION OF GROUNDWATER

19-0026C
City of Beverly Hills
342 N. Foothills Road
Beverly Hills, CA 90210

FOR ALL COUNTIES, EXCEPT THOSE LISTED BELOW, FROM OCTOBER 1, 2012 THROUGH SEPTEMBER 30, 2013

FOR THE COUNTIES OF IMPERIAL, ORANGE, VENTURA, SANTA BARBARA, LOS ANGELES, SAN DIEGO, SAN LUIS OBISPO, RIVERSIDE, AND SAN BERNARDINO FROM NOVEMBER 1, 2012 THROUGH OCTOBER 31, 2013

THIS IS THE ANNUAL FORM AND SHOULD ONLY BE USED BY THOSE WHO HAVE PREVIOUSLY FILED A "FIRST STATEMENT OF CESSATION OR REDUCTION" IN GROUNDWATER EXTRACTIONS. IF YOU NEED A FIRST STATEMENT FORM PLEASE CALL (916) 341-5801 or email colleen.ingram@waterboards.ca.gov

1. Name of the water purveyor, reservoir, stream, river, etc., from which the alternate non-tributary water was received or diverted
Metropolitan Water District of Southern California
2. Amount of water used from the alternate non-tributary source 11,189.1 acre-feet per annum.
3. Amount of water pumped from wells 747.15 acre-feet per annum.
4. Amount of reduction in extraction of groundwater 232.75 acre-feet per annum.
5. Please state any change that has occurred and other facts you think may clarify your statement.

There was 232.75 acre-feet less in extraction of groundwater due to down time for maintenance in the water treatment plant.

Signed: [signature] Date: 11-25-13

THIS FORM IS DUE NO LATER THAN DECEMBER 31, 2013

AH

STATE WATER RESOURCES CONTROL BOARD
2012 DEC 31 AM 10:35
DIV OF WATER RIGHTS SACRAMENTO

State of California
State Water Resources Control Board
DIVISION OF WATER RIGHTS
P.O. Box 2000, Sacramento, CA 95812-2000
Info: (916) 322-8465, FAX: (916) 341-5400, E-mail: http://www.waterboards.ca.gov/waterrights

ANNUAL STATEMENT
CESSATION OR REDUCTION IN THE EXTRACTION OF GROUNDWATER

19-0026C
City of Beverly Hills
342 N. Foothills Road
Beverly Hills, CA 90210

FOR ALL COUNTIES, EXCEPT THOSE LISTED BELOW, FROM OCTOBER 1, 2011 THROUGH SEPTEMBER 30, 2012

FOR THE COUNTIES OF IMPERIAL, ORANGE, VENTURA, SANTA BARBARA, LOS ANGELES, SAN DIEGO, SAN LUIS OBISPO, RIVERSIDE, AND SAN BERNARDINO FROM NOVEMBER 1, 2011 THROUGH OCTOBER 31, 2012

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1. Name of the water purveyor, reservoir, stream, river, etc., from which the alternate non-tributary water was received or diverted
metropolitan water district of Southern California

2. Amount of water used from the alternate non-tributary source 9,743.6 acre-feet per annum.

3. Amount of water pumped from wells 979.9 acre-feet per annum.

4. Amount of reduction in extraction of groundwater 42.1 acre-feet per annum.

5. Please state any change that has occurred and other facts you think may clarify your statement.
There was 42.1 Acre-feet less in extraction of groundwater due to down time to replace pump & motor in one well.

Signed: Kevin O Motm Date: 12-26-12

THIS FORM IS DUE NO LATER THAN DECEMBER 31, 2012

AN
1/2/13

AH

STATE WATER RESOURCES CONTROL BOARD
2012 DEC 27 AM 11:53
DIV OF WATER RIGHTS SACRAMENTO

State of California
State Water Resources Control Board
DIVISION OF WATER RIGHTS
P.O. Box 2000, Sacramento, CA 95812-2000
Info: (916) 322-8465, FAX: (916) 341-5400, E-mail: http://www.waterboards.ca.gov/watertights

ANNUAL STATEMENT
CESSATION OR REDUCTION IN THE EXTRACTION OF GROUNDWATER

19-0026C
City of Beverly Hills
342 N. Foothills Road
Beverly Hills, CA 90210

FOR ALL COUNTIES, EXCEPT THOSE LISTED BELOW, FROM OCTOBER 1, 2011 THROUGH SEPTEMBER 30, 2012

FOR THE COUNTIES OF IMPERIAL, ORANGE, VENTURA, SANTA BARBARA, LOS ANGELES, SAN DIEGO, SAN LUIS OBISPO, RIVERSIDE, AND SAN BERNARDINO FROM NOVEMBER 1, 2011 THROUGH OCTOBER 31, 2012

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metropolitan water district of Southern California
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3. Amount of water pumped from wells 979.9 acre-feet per annum.
4. Amount of reduction in extraction of groundwater 42.1 acre-feet per annum.
5. Please state any change that has occurred and other facts you think may clarify your statement.
There was 42.1 Acre-feet less in extraction of groundwater due to down time to replace pump & motor in one well.

Signed: Kevin @ [illegible] Date: 12-26-12

THIS FORM IS DUE NO LATER THAN DECEMBER 31, 2012

AH
1/2/13

STATE WATER RESOURCES CONTROL BOARD
2012 DEC 27 AM 11:53
DIV OF WATER RIGHTS SACRAMENTO

State of California
State Water Resources Control Board
DIVISION OF WATER RIGHTS
P.O. Box 2000, Sacramento, CA 95812-2000
Info: (916) 322-8465, FAX: (916) 341-5400, E-mail: http://www.waterboards.ca.gov/waterrights

ANNUAL STATEMENT
CESSATION OR REDUCTION IN THE EXTRACTION OF GROUNDWATER

19-0026C
City of Beverly Hills
342 N. Foothills Road
Beverly Hills, CA 90210

FOR ALL COUNTIES, EXCEPT THOSE LISTED BELOW, FROM OCTOBER 1, 2011 THROUGH SEPTEMBER 30, 2012

FOR THE COUNTIES OF IMPERIAL, ORANGE, VENTURA, SANTA BARBARA, LOS ANGELES, SAN DIEGO, SAN LUIS OBISPO, RIVERSIDE, AND SAN BERNARDINO FROM NOVEMBER 1, 2011 THROUGH OCTOBER 31, 2012

THIS IS THE ANNUAL FORM AND SHOULD ONLY BE USED BY THOSE WHO HAVE PREVIOUSLY FILED A "FIRST STATEMENT OF CESSATION OR REDUCTION" IN GROUNDWATER EXTRACTIONS. IF YOU NEED A FIRST STATEMENT FORM PLEASE CALL (916) 322-8465 or email LDeller@waterboards.ca.gov.

1. Name of the water purveyor, reservoir, stream, river, etc., from which the alternate non-tributary water was received or diverted
metropolitan water district of Southern California
2. Amount of water used from the alternate non-tributary source 9,743.6 acre-feet per annum.
3. Amount of water pumped from wells 979.9 acre-feet per annum.
4. Amount of reduction in extraction of groundwater 42.1 acre-feet per annum.
5. Please state any change that has occurred and other facts you think may clarify your statement.
There was 42.1 acre-feet less in extraction of groundwater due to down time to replace pump & motor in one well.

Signed: Kevin O Morton Date: 12-26-12

THIS FORM IS DUE NO LATER THAN DECEMBER 31, 2012

AH
12/28/12

file

STATE WATER RESOURCES
CONTROL BOARD

2011 DEC -8 AM 11: 12

DIV OF WATER RIGHTS
SACRAMENTO

State of California
State Water Resources Control Board
DIVISION OF WATER RIGHTS
P.O. Box 2000, Sacramento, CA 95812-2000
Info: (916) 341-5365, FAX: (916) 341-5400, E-mail: http://www.waterboards.ca.gov/waterrights

ANNUAL STATEMENT
CESSATION OR REDUCTION IN THE EXTRACTION OF GROUNDWATER

19-0026C
City of Beverly Hills
342 N. Foothills Road
Beverly Hills, CA 90210

FOR ALL COUNTIES, EXCEPT THOSE LISTED BELOW, FROM OCTOBER 1, 2010 THROUGH SEPTEMBER 30, 2011

FOR THE COUNTIES OF IMPERIAL, ORANGE, VENTURA, SANTA BARBARA, LOS ANGELES, SAN DIEGO, SAN LUIS OBISPO, RIVERSIDE, AND SAN BERNARDINO FROM NOVEMBER 1, 2010 THROUGH OCTOBER 31, 2011

THIS IS THE ANNUAL FORM AND SHOULD ONLY BE USED BY THOSE WHO HAVE PREVIOUSLY FILED A "FIRST STATEMENT OF CESSATION OR REDUCTION" IN GROUNDWATER EXTRACTIONS. IF YOU NEED A FIRST STATEMENT FORM PLEASE CALL (916) 322-8465 or email LDeller@waterboards.ca.gov.

1. Name of the water purveyor, reservoir, stream, river, etc., from which the alternate non-tributary water was received or diverted
Metropolitan Water District of Southern California

2. Amount of water used from the alternate non-tributary source 10,309.3 acre-feet per annum.

3. Amount of water pumped from wells 1,022 acre-feet per annum.

4. Amount of reduction in extraction of groundwater 315 acre-feet per annum.

5. Please state any change that has occurred and other facts you think may clarify your statement.

There was 315 Acre-feet less in extraction of groundwater due to down time to replace pump and motor in two wells.

Signed: Kevin O Watson Date: 12-05-11

THIS FORM IS DUE NO LATER THAN DECEMBER 31, 2011

State of California
State Water Resources Control Board
DIVISION OF WATER RIGHTS
P.O. Box 2000, Sacramento, CA 95812-2000
Info: (916) 322-8465, FAX: (916) 341-5400, E-mail: http://www.waterboards.ca.gov/waterrights

ANNUAL STATEMENT
CESSATION OR REDUCTION IN THE EXTRACTION OF GROUNDWATER

19-0026C
City of Beverly Hills
342 N. Foothills Road
Beverly Hills, CA 90210

FOR ALL COUNTIES, EXCEPT THOSE LISTED BELOW, FROM OCTOBER 1, 2009 THROUGH SEPTEMBER 30, 2010

FOR THE COUNTIES OF IMPERIAL, ORANGE, VENTURA, SANTA BARBARA, LOS ANGELES, SAN DIEGO, SAN LUIS OBISPO, RIVERSIDE, AND SAN BERNARDINO FROM NOVEMBER 1, 2009 THROUGH OCTOBER 31, 2010

THIS IS THE ANNUAL FORM AND SHOULD ONLY BE USED BY THOSE WHO HAVE PREVIOUSLY FILED A "FIRST STATEMENT OF CESSATION OR REDUCTION" IN GROUNDWATER EXTRACTIONS. IF YOU NEED A FIRST STATEMENT FORM PLEASE CALL (916) 322-8465 or email Cnease@waterboards.ca.gov.

1. Name of the water purveyor, reservoir, stream, river, etc., from which the alternate non-tributary water was received or diverted
   Metropolitan Water District of Southern California
2. Amount of water used from the alternate non-tributary source 10,255.9 acre-feet per annum.
3. Amount of water pumped from wells 1,337.4 acre-feet per annum.
4. Amount of reduction in extraction of groundwater 252.56 acre-feet per annum.
5. Please state any change that has occurred and other facts you think may clarify your statement.
   There was 252.56 Acre-feet less in extraction of ground water.

Signed: [illegible] Date: 12-14-10

THIS FORM IS DUE NO LATER THAN DECEMBER 31, 2010

CN

State of California
State Water Resources Control Board
DIVISION OF WATER RIGHTS
P.O. Box 2000, Sacramento, CA 95812-2000
Info: (916) 341-5300, FAX: (916) 341-5400, E-mail: http://www.waterboards.ca.gov/waterrights

2009 DEC -9 AM 11:24

ANNUAL STATEMENT
CESSATION OR REDUCTION IN THE EXTRACTION OF GROUNDWATER

19-0026C
City of Beverly Hills
342 N. Foothills Road
Beverly Hills, CA 90210

FOR ALL COUNTIES, EXCEPT THOSE LISTED BELOW, FROM OCTOBER 1, 2008 THROUGH SEPTEMBER 30, 2009

FOR THE COUNTIES OF IMPERIAL, ORANGE, VENTURA, SANTA BARBARA, LOS ANGELES, SAN DIEGO, SAN LUIS OBISPO, RIVERSIDE, AND SAN BERNARDINO FROM NOVEMBER 1, 2008 THROUGH OCTOBER 31, 2009

THIS IS THE ANNUAL FORM AND SHOULD ONLY BE USED BY THOSE WHO HAVE PREVIOUSLY FILED A "FIRST STATEMENT OF CESSATION OR REDUCTION" IN GROUNDWATER EXTRACTIONS. IF YOU NEED A FIRST STATEMENT FORM PLEASE CALL (916) 341-5300 OR (916) 322-8465.

1. Name of the water purveyor, reservoir, stream, river, etc., from which the alternate non-tributary water was received or diverted. Metropolitan Water District of Southern California
2. Amount of water used from the alternate non-tributary source 10,870.3 acre-feet per annum.
3. Amount of water pumped from wells 1,589.96 acre-feet per annum.
4. Amount of reduction in extraction of groundwater 0 acre-feet per annum.
5. Please state any change that has occurred and other facts you think may clarify your statement.

There was 559.5 Acre-feet more in extraction of groundwater.

Signed: Kevin O Watson Date: 11-30-09

THIS FORM IS DUE NO LATER THAN DECEMBER 31, 2009

California Environmental Protection Agency

Recycled Paper

GW-ANN-C&R (10/09)

State of California
State Water Resources Control Board

DA

DIVISION OF WATER RIGHTS

P.O. Box 2000, Sacramento, CA 95812-2000

Info: (916) 341-5300, FAX: (916) 341-5400, E-mail: http://www.waterrights.swrcb.ca.gov

ANNUAL STATEMENT
CESSATION OR REDUCTION IN THE EXTRACTION OF GROUNDWATER

STATE WATER RESOURCES CONTROL BOARD
2008 DEC 24 AM 10:49
DIV OF WATER RIGHTS SACRAMENTO

19-0026C
City of Beverly Hills
c/o ~~Shara~~ Epstein Shana
342 N. Foothills Road
Beverly Hills, CA 90210

FOR ALL COUNTIES, EXCEPT THOSE LISTED BELOW, FROM OCTOBER 1, 2007 THROUGH SEPTEMBER 30, 2008

FOR THE COUNTIES OF IMPERIAL, ORANGE, VENTURA, SANTA BARBARA, LOS ANGELES, SAN DIEGO, SAN LUIS OBISPO, RIVERSIDE, AND SAN BERNARDINO FROM NOVEMBER 1, 2007 THROUGH OCTOBER 31, 2008

THIS IS THE ANNUAL FORM AND SHOULD ONLY BE USED BY THOSE WHO HAVE PREVIOUSLY FILED A "FIRST STATEMENT OF CESSATION OR REDUCTION" IN GROUNDWATER EXTRACTIONS. IF YOU NEED A FIRST STATEMENT FORM PLEASE CALL (916) 341-5300 OR (916) 341-5448.

1. Name of the water purveyor, reservoir, stream, river, etc., from which the alternate non-tributary water was received or diverted
   Metropolitan Water District of Southern California
2. Amount of water used from the alternate non-tributary source 12,345.5 acre-feet per annum.
3. Amount of water pumped from wells 1,030.5 acre-feet per annum.
4. Amount of reduction in extraction of groundwater 534.1 acre-feet per annum.
5. Please state any change that has occurred and other facts you think may clarify your statement.
   The plant was shut down for approximately three months while work was being done to the Sunset Reservoir.

Signed: Kevin O Watson Date: 12-11-08

THIS FORM IS DUE NO LATER THAN DECEMBER 31, 2008

California Environmental Protection Agency

Recycled Paper

GW-ANN-C&R (10-08)

State of California
State Water Resources Control Board

DIVISION OF WATER RIGHTS

P.O. Box 2000, Sacramento, CA 95812-2000

Info: (916) 341-5300, FAX: (916) 341-5400, E-mail: http://www.waterrights.swrcb.ca.gov

ANNUAL STATEMENT
CESSATION OR REDUCTION IN THE EXTRACTION OF GROUNDWATER

19-0026C
City of Beverly Hills
c/o Shara Epstein
342 N. Foothills Road
Beverly Hills, CA 90210

FOR ALL COUNTIES, EXCEPT THOSE LISTED BELOW, FROM OCTOBER 1, 2006 THROUGH SEPTEMBER 30, 2007

FOR THE COUNTIES OF IMPERIAL, ORANGE, VENTURA, SANTA BARBARA, LOS ANGELES, SAN DIEGO, SAN LUIS OBISPO, RIVERSIDE, AND SAN BERNARDINO FROM NOVEMBER 1, 2006 THROUGH OCTOBER 31, 2007

THIS IS THE ANNUAL FORM AND SHOULD ONLY BE USED BY THOSE WHO HAVE PREVIOUSLY FILED A "FIRST STATEMENT OF CESSATION OR REDUCTION" IN GROUNDWATER EXTRACTIONS. IF YOU NEED A FIRST STATEMENT FORM PLEASE CALL (916) 341-5300 OR (916) 341-5376.

1. Name of the water purveyor, reservoir, stream, river, etc., from which the alternate non-tributary water was received or diverted
   Metropolitan Water District of Southern California
2. Amount of water used from the alternate non-tributary source 12,660.5 acre-feet per annum.
3. Amount of water pumped from wells 1,574.6 acre-feet per annum.
4. Amount of reduction in extraction of groundwater _____ acre-feet per annum.
5. Please state any change that has occurred and other facts you think may clarify your statement.
   There was an increase of 131 Acre-Feet per annum.

Signed: Kevin Watson Date: 12-18-07

THIS FORM IS DUE NO LATER THAN DECEMBER 31, 2007

California Environmental Protection Agency

Recycled Paper

GW-ANN-C&R (11-07)

DCL

State of California
State Water Resources Control Board
DIVISION OF WATER RIGHTS
P.O. Box 2000, Sacramento, CA 95812-2000
Info: (916) 341-5300, FAX: (916) 341-5400, E-mail: http://www.waterrights.swrcb.ca.gov

ANNUAL STATEMENT
CESSATION OR REDUCTION IN THE EXTRACTION OF GROUNDWATER

19-0026C
City of Beverly Hills
c/o Shara Epstein
342 N. Foothills Road
Beverly Hills, CA 90210

2006 DEC 28 PM 1:19

FOR ALL COUNTIES, EXCEPT THOSE LISTED BELOW, FROM OCTOBER 1, 2005 THROUGH SEPTEMBER 30, 2006

FOR THE COUNTIES OF IMPERIAL, ORANGE, VENTURA, SANTA BARBARA, LOS ANGELES, SAN DIEGO, SAN LUIS OBISPO, RIVERSIDE, AND SAN BERNARDINO FROM NOVEMBER 1, 2005 THROUGH OCTOBER 31, 2006

THIS IS THE ANNUAL FORM AND SHOULD ONLY BE USED BY THOSE WHO HAVE PREVIOUSLY FILED A "FIRST STATEMENT OF CESSATION OR REDUCTION" IN GROUNDWATER EXTRACTIONS. IF YOU NEED A FIRST STATEMENT FORM PLEASE CALL (916) 341-5300 OR (916) 341-5448.

1. Name of the water purveyor, reservoir, stream, river, etc., from which the alternate non-tributary water was received or diverted
   Metropolitan Water District of Southern California
2. Amount of water used from the alternate non-tributary source 12,263.9 acre-feet per annum.
3. Amount of water pumped from wells 1,443.6 acre-feet per annum.
4. Amount of reduction in extraction of groundwater 180.5 acre-feet per annum.
5. Please state any change that has occurred and other facts you think may clarify your statement.
   The water treatment plant had undergone some maintenance that resulted in a reduction in extraction.

Signed: Kevin O. Tabor Date: 12-20-06

THIS FORM IS DUE NO LATER THAN DECEMBER 31, 2006

California Environmental Protection Agency

Recycled Paper

GW-ANN-C&R (12-06)

KSN

State of California
State Water Resources Control Board

DIVISION OF WATER RIGHTS

P.O. Box 2000, Sacramento, CA 95812-2000

Info: (916) 341-5300, FAX: (916) 341-5400, E-mail: http://www.waterrights.swrcb.ca.gov

ANNUAL STATEMENT

19-0026C

Mr Ed Osuka
City of Beverly Hills
342 N Foothills Rd
Beverly Hills Ca 90210

CESSATION OR REDUCTION IN THE EXTRACTION OF GROUNDWATER FOR OCTOBER 1st through SEPTEMBER 30th * for 2000-2001

THIS IS THE ANNUAL FORM AND SHOULD ONLY BE USED BY THOSE WHO HAVE PREVIOUSLY FILED A "FIRST STATEMENT OF CESSATION OR REDUCTION" IN GROUNDWATER EXTRACTIONS. IF YOU NEED A FIRST STATEMENT FORM PLEASE CALL (916) 341-5366.

1. Name of the water purveyor, reservoir, stream, river, etc., from which the alternate non-tributary water was received or diverted
(City of Beverly Hills) Metropolitan Water District of Southern Calif.

2. Amount of water used from the alternate non-tributary source 13,426.7 acre-feet per annum.

3. Amount of water pumped from wells 0 acre-feet per annum.

4. Amount of reduction in extraction of groundwater 0 acre-feet per annum.

5. Please state any change that has occurred and other facts you think may clarify your statement.
City owned wells were abandoned and groundwater extractions ceased on October 4, 1976 as part of City Council decision to import all Metropolitan Water District supply.

Signed: E. Osuka Date: 2.26.02

* The water year is November 1 through October 31 for the Counties of Imperial, Orange, Ventura, Santa Barbara, Los Angeles, San Diego, San Luis Obispo, Riverside, and San Bernardino in accordance with the Water Code section 1005.2.

THIS FORM IS DUE NO LATER THAN FEBRUARY 28, 2002

"The energy challenge facing California is real. Every Californian needs to take immediate action to reduce energy consumption. For a list of simple ways you can reduce demands and cut your energy costs, see our web-site at: http://waterrights.ca.gov."

State of California
State Water Resources Control Board
DIVISION OF WATER RIGHTS
P.O. Box 2000, Sacramento, CA 95812-2000
Info: (916) 341-5300, FAX: (916) 341-5400, E-mail: http://www.waterrights.swrcb.ca.gov

02 FEB 27 PM 1:45
DIV. OF WATER RIGHTS
SACRAMENTO

ANNUAL STATEMENT

Mr Ed Osuka
City of Beverly Hills
342 N Foothills Rd
Beverly Hills Ca 90210

CESSATION OR REDUCTION IN THE EXTRACTION OF GROUNDWATER FOR OCTOBER 1st through SEPTEMBER 30th * for 2000-2001

THIS IS THE ANNUAL FORM AND SHOULD ONLY BE USED BY THOSE WHO HAVE PREVIOUSLY FILED A "FIRST STATEMENT OF CESSATION OR REDUCTION" IN GROUNDWATER EXTRACTIONS. IF YOU NEED A FIRST STATEMENT FORM PLEASE CALL (916) 341-5366.

1. Name of the water purveyor, reservoir, stream, river, etc., from which the alternate non-tributary water was received or diverted
(City of Beverly Hills) Metropolitan Water District of Southern Calif.

2. Amount of water used from the alternate non-tributary source 13,426.7 acre-feet per annum.

3. Amount of water pumped from wells 0 acre-feet per annum.

4. Amount of reduction in extraction of groundwater 0 acre-feet per annum.

5. Please state any change that has occurred and other facts you think may clarify your statement.
City owned wells were abandoned and groundwater extractions ceased on October 4, 1976 as part of City Council decision to import all Metropolitan Water District supply.

Signed: [illegible] Date: 2.26.02

* The water year is November 1 through October 31 for the Counties of Imperial, Orange, Ventura, Santa Barbara, Los Angeles, San Diego, San Luis Obispo, Riverside, and San Bernardino in accordance with the Water Code section 1005.2.

THIS FORM IS DUE NO LATER THAN FEBRUARY 28, 2002

"The energy challenge facing California is real. Every Californian needs to take immediate action to reduce energy consumption. For a list of simple ways you can reduce demands and cut your energy costs, see our web-site at: http://waterrights.ca.gov."

GW-ANN-C&R (3-01)

STATE WATER RESOURCES
CONTROL BOARD

02 FEB 27 PM 1:45

DIV. OF WATER RIGHTS
SACRAMENTO

KSN

facsimile transmittal

To: Koso Nodohara **Fax:** (916) 341.5400

State Water Resources Control Board

From: Ed Otsuka **Date:** 02/27/02

City of Beverly Hills

Re: Cessation of Ground Water Extractions Form **Pages:** 2 including this page

CC

X **Urgent** ☐ **For Review** ☐ **Please Comment** ☐ **Please Reply** ☐ **Please Recycle**

Notes: Original will be sent by mail. If you should have any questions or desire additional information, please do not hesitate to contact me at (310) 285.2495.

KSN

State of California
State Water Resources Control Board
DIVISION OF WATER RIGHTS
P.O. Box 2000, Sacramento, CA 95812-2000
Info: (916) 341-5300, FAX: (916) 341-5400, E-mail: http://www.waterrights.swrcb.ca.gov

STATE WATER RESOURCES CONTROL BOARD
2000 DEC 28 AM 11:08
DIV. OF WATER RIGHTS SACRAMENTO

ANNUAL STATEMENT

19-0026C
City of Beverly Hills
Water Div., Public Works Dept.
342 N Foothill Rd
Beverly Hills CA 90210-3713

CESSATION OR REDUCTION IN THE EXTRACTION OF GROUNDWATER FOR OCTOBER 1st through SEPTEMBER 30th * for 1999-2000

THIS IS THE ANNUAL FORM AND SHOULD ONLY BE USED BY THOSE WHO HAVE PREVIOUSLY FILED A "FIRST STATEMENT OF CESSATION OR REDUCTION" IN GROUNDWATER EXTRACTIONS. IF YOU NEED A FIRST STATEMENT FORM PLEASE CALL (916) 341-5366.

1. Name of the water purveyor, reservoir, stream, river, etc., from which the alternate non-tributary water was received or diverted
   City of Beverly Hills - Public Works Department

2. Amount of water used from the alternate non-tributary source 13,737 acre-feet per annum.

3. Amount of water pumped from wells 0 acre-feet per annum.

4. Amount of reduction in extraction of groundwater 0 acre-feet per annum.

5. Please state any change that has occurred and other facts you think may clarify your statement.

   City-owned wells were abandoned and groundwater extractions ceased on Oct. 4, 1976 as part of City Council decision to import all MWD supply.

Signed: E. Ortega Date: 12-26-00

* The water year is November 1 through October 31 for the Counties of Imperial, Orange, Ventura, Santa Barbara, Los Angeles, San Diego, San Luis Obispo, Riverside, and San Bernardino in accordance with the Water Code section 1005.2.

THIS FORM IS DUE NO LATER THAN FEBRUARY 28, 2001

State of California
State Water Resources Control Board
DIVISION OF WATER RIGHTS
P.O. Box 2000, Sacramento, CA 95812-2000
Info: (916) 341-5300, FAX: (916) 341-5400, E-mail: http://www.waterrights.swrcb.ca.gov

STATE WATER RESOURCES CONTROL BOARD
2005 DEC 19 PM 12:05
DIVISION OF WATER RIGHTS SACRAMENTO

ANNUAL STATEMENT
CESSATION OR REDUCTION IN THE EXTRACTION OF GROUNDWATER

19-0026C
City of Beverly Hills
c/o Shara Epstein
342 N. Foothills Road
Beverly Hills, CA 90210

FOR ALL COUNTIES, EXCEPT THOSE LISTED BELOW, FROM OCTOBER 1, 2004 THROUGH SEPTEMBER 30, 2005

FOR THE COUNTIES OF IMPERIAL, ORANGE, VENTURA, SANTA BARBARA, LOS ANGELES, SAN DIEGO, SAN LUIS OBISPO, RIVERSIDE, AND SAN BERNARDINO FROM NOVEMBER 1, 2004 THROUGH OCTOBER 31, 2005

THIS IS THE ANNUAL FORM AND SHOULD ONLY BE USED BY THOSE WHO HAVE PREVIOUSLY FILED A "FIRST STATEMENT OF CESSATION OR REDUCTION" IN GROUNDWATER EXTRACTIONS. IF YOU NEED A FIRST STATEMENT FORM PLEASE CALL (916) 341-5315.

1. Name of the water purveyor, reservoir, stream, river, etc., from which the alternate non-tributary water was received or diverted
   Southern California Metropolitan Water District (MWD)

2. Amount of water used from the alternate non-tributary source 12,247 acre-feet per annum.

3. Amount of water pumped from wells 1,683 acre-feet per annum.

4. Amount of reduction in extraction of groundwater 276.3 acre-feet per annum.

5. Please state any change that has occurred and other facts you think may clarify your statement.

The City of Beverly Hills currently extracts water from the Hollywood Basin and maintains water rights as well to the Central Basin, even though the City is currently not extracting water from the Central Basin

Signed: [signature] Date: December 14, 2005

THIS FORM IS DUE NO LATER THAN DECEMBER 31, 2005

"The energy challenge facing California is real. Every Californian needs to take immediate action to reduce energy consumption. For a list of simple ways you can reduce demands and cut your energy costs, see our web-site at: http://waterrights.ca.gov."

GW-ANN-C&R (11-05)

State of California
State Water Resources Control Board

DIVISION OF WATER RIGHTS

P.O. Box 2000, Sacramento, CA 95812-2000

Info: (916) 341-5300, FAX: (916) 341-5400, E-mail: http://www.waterrights.swrcb.ca.gov

ANNUAL STATEMENT

19-0026C
City of Beverly Hills
c/o ~~Ed Osuka~~ Shara Epstein * please note new contact
342 N. Foothills Road
Beverly Hills, CA 90210

CIR GW list labels SW 11/16/05

CESSATION OR REDUCTION IN THE EXTRACTION OF GROUNDWATER
OCTOBER 1st through SEPTEMBER 30th * for 2003-2004

THIS IS THE ANNUAL FORM AND SHOULD ONLY BE USED BY THOSE WHO HAVE PREVIOUSLY FILED A "FIRST STATEMENT OF CESSATION OR REDUCTION" IN GROUNDWATER EXTRACTIONS. IF YOU NEED A FIRST STATEMENT FORM PLEASE CALL (916) 341-5315.

1. Name of the water purveyor, reservoir, stream, river, etc., from which the alternate non-tributary water was received or diverted
   MWD Metropolitan Water District of Southern California
2. Amount of water used from the alternate non-tributary source 12,262.7 acre-feet per annum.
3. Amount of water pumped from wells 1959.3 acre-feet per annum.
4. Amount of reduction in extraction of groundwater 0 acre-feet per annum.
5. Please state any change that has occurred and other facts you think may clarify your statement.
   The water treatment plant for the wells went online in April 2003.

Signed: [signature] Date: 12/29/04

* The water year is November 1 through October 31 for the Counties of Imperial, Orange, Ventura, Santa Barbara, Los Angeles, San Diego, San Luis Obispo, Riverside, and San Bernardino in accordance with the Water Code section 1005.2.

THIS FORM IS DUE NO LATER THAN DECEMBER 31, 2004

"The energy challenge facing California is real. Every Californian needs to take immediate action to reduce energy consumption. For a list of simple ways you can reduce demands and cut your energy costs, see our web-site at: http://waterrights.ca.gov."

City of Beverly Hills

FACSIMILE COVER SHEET

Public Works Department
342 N. Foothill Road
Beverly Hills, Ca. 90210
FAX: 310-278-1838

TO: Susan J Wilson

COMPANY: Water Rights Processing Unit

PHONE: 916 341 5315

FAX: 916 . 341.5400

Of Pages Including Cover Sheet: 2

FROM: Shana Epstein (please note new contact)

DEPT: City of Beverly Hills / Public Works / Environmental Utilities

PHONE: 310. 285. 2570

COMMENTS:

If you have received this communication in error, please notify the sender by phone immediately.

State of California
State Water Resources Control Board
DIVISION OF WATER RIGHTS
P.O. Box 2000, Sacramento, CA 95812-2000
Info: (916) 341-5300, FAX: (916) 341-5400, E-mail: http://www.waterrights.swrcb.ca.gov

ANNUAL STATEMENT

19-0026C
City of Beverly Hills
c/o Ed Osuka
342 N. Foothills Road
Beverly Hills, CA 90210

CESSATION OR REDUCTION IN THE EXTRACTION OF GROUNDWATER
OCTOBER 1st through SEPTEMBER 30th * for 2003-2004

THIS IS THE ANNUAL FORM AND SHOULD ONLY BE USED BY THOSE WHO HAVE PREVIOUSLY FILED A "FIRST STATEMENT OF CESSATION OR REDUCTION" IN GROUNDWATER EXTRACTIONS. IF YOU NEED A FIRST STATEMENT FORM PLEASE CALL (916) 341-5315.

1. Name of the water purveyor, reservoir, stream, river, etc., from which the alternate non-tributary water was received or diverted
MWD Metropolitan Water District of Southern California
2. Amount of water used from the alternate non-tributary source 12,262.7 acre-feet per annum.
3. Amount of water pumped from wells 1959.3 acre-feet per annum.
4. Amount of reduction in extraction of groundwater 0 acre-feet per annum.
5. Please state any change that has occurred and other facts you think may clarify your statement.
The water treatment plant for the wells went online in April 2003.

Signed: [signature] Date: 12/29/04

* The water year is November 1 through October 31 for the Counties of Imperial, Orange, Ventura, Santa Barbara, Los Angeles, San Diego, San Luis Obispo, Riverside, and San Bernardino in accordance with the Water Code section 1005.2.

THIS FORM IS DUE NO LATER THAN DECEMBER 31, 2004

"The energy challenge facing California is real. Every Californian needs to take immediate action to reduce energy consumption. For a list of simple ways you can reduce demands and cut your energy costs, see our web-site at: http://waterrights.ca.gov."

KSM

State of California
State Water Resources Control Board
DIVISION OF WATER RIGHTS
P.O. Box 2000, Sacramento, CA 95812-2000
Info: (916) 341-5300, FAX: (916) 341-5400, E-mail: http://www.waterrights.swrcb.ca.gov

ANNUAL STATEMENT

19-0026C
City of Beverly Hills
c/o Ed Osuka
342 N. Foothills Road
Beverly Hills, CA 90210

CESSATION OR REDUCTION IN THE EXTRACTION OF GROUNDWATER FOR OCTOBER 1st through SEPTEMBER 30th * for 2002-2003

THIS IS THE ANNUAL FORM AND SHOULD ONLY BE USED BY THOSE WHO HAVE PREVIOUSLY FILED A "FIRST STATEMENT OF CESSATION OR REDUCTION" IN GROUNDWATER EXTRACTIONS. IF YOU NEED A FIRST STATEMENT FORM PLEASE CALL (916) 341-5366.

1. Name of the water purveyor, reservoir, stream, river, etc., from which the alternate non-tributary water was received or diverted
MWD of Southern California

2. Amount of water used from the alternate non-tributary source 12,608.2 acre-feet per annum.

3. Amount of water pumped from wells 1118.8 acre-feet per annum.

4. Amount of reduction in extraction of groundwater Ø acre-feet per annum.

5. Please state any change that has occurred and other facts you think may clarify your statement.
Beverly Hills started extracting and utilizing local groundwater sources for potable water supply on April 22nd, 2003

Signed: [signature] Date: 2/17/04

* The water year is November 1 through October 31 for the Counties of Imperial, Orange, Ventura, Santa Barbara, Los Angeles, San Diego, San Luis Obispo, Riverside, and San Bernardino in accordance with the Water Code section 1005.2.

THIS FORM IS DUE NO LATER THAN FEBRUARY 27, 2004

"The energy challenge facing California is real. Every Californian needs to take immediate action to reduce energy consumption. For a list of simple ways you can reduce demands and cut your energy costs, see our web-site at: http://waterrights.ca.gov."

KSN

State of California
State Water Resources Control Board

DIVISION OF WATER RIGHTS
P.O. Box 2000, Sacramento, CA 95812-2000
Info: (916) 341-5300, FAX: (916) 341-5400, E-mail: http://www.waterrights.swrcb.ca.gov

STATE WATER RESOURCES CONTROL BOARD
2002 DEC 10 AM 11:45
DIV OF WATER RIGHTS SACRAMENTO

ANNUAL STATEMENT

19-0026C
City of Beverly Hills
c/o Ed Osuka
342 N. Foothills Road
Beverly Hills, CA 90210

CESSATION OR REDUCTION IN THE EXTRACTION OF GROUNDWATER FOR OCTOBER 1st through SEPTEMBER 30th * for 2001-2002

THIS IS THE ANNUAL FORM AND SHOULD ONLY BE USED BY THOSE WHO HAVE PREVIOUSLY FILED A "FIRST STATEMENT OF CESSATION OR REDUCTION" IN GROUNDWATER EXTRACTIONS. IF YOU NEED A FIRST STATEMENT FORM PLEASE CALL (916) 341-5366.

1. Name of the water purveyor, reservoir, stream, river, etc., from which the alternate non-tributary water was received or diverted
(City of Beverly Hills) - Metropolitan Water District of Southern California

2. Amount of water used from the alternate non-tributary source 13,670 acre-feet per annum.

3. Amount of water pumped from wells 0 acre-feet per annum.

4. Amount of reduction in extraction of groundwater 0 acre-feet per annum.

5. Please state any change that has occurred and other facts you think may clarify your statement.

City owned wells were abandoned and groundwater extractions ceased on October 4, 1976 as part of City Council's decision to import all MWD supply.

Signed: E. Osuka Date: 12.5.02

* The water year is November 1 through October 31 for the Counties of Imperial, Orange, Ventura, Santa Barbara, Los Angeles, San Diego, San Luis Obispo, Riverside, and San Bernardino in accordance with the Water Code section 1005.2.

THIS FORM IS DUE NO LATER THAN FEBRUARY 28, 2003

"The energy challenge facing California is real. Every Californian needs to take immediate action to reduce energy consumption. For a list of simple ways you can reduce demands and cut your energy costs, see our web-site at: http://waterrights.ca.gov."

KSN

State of California
State Water Resources Control Board
DIVISION OF WATER RIGHTS
P.O. Box 2000, Sacramento, CA 95812-2000
Info: (916) 657-2170, FAX: (916) 657-1485, E-mail: http://www.waterrights.swrcb.ca.gov

00 JAN -5 PM 2:34

19-0026C
City of Beverly Hills
Water Div, Public Works Dept.
9298 West Third Street
Beverly Hills, CA 90210-3713

ANNUAL STATEMENT

CESSATION OR REDUCTION IN THE EXTRACTION OF GROUNDWATER FOR OCTOBER 1st through SEPTEMBER 30th * for 1998-99

THIS IS THE ANNUAL FORM AND SHOULD ONLY BE USED BY THOSE WHO HAVE PREVIOUSLY FILED A "FIRST STATEMENT OF CESSATION OR REDUCTION" IN GROUNDWATER EXTRACTIONS. IF YOU NEED A FIRST STATEMENT FORM PLEASE CALL (916) 657-1872.

1. Name of the water purveyor, reservoir, stream, river, etc., from which the alternate non-tributary water was received or diverted
   City of Beverly Hills - Public Works Department

2. Amount of water used from the alternate non-tributary source Ø acre-feet per annum.

3. Amount of water pumped from wells Ø acre-feet per annum.

4. Amount of reduction in extraction of groundwater _____ acre-feet per annum.

5. Please state any change that has occurred and other facts you think may clarify your statement.

   City-owned wells were abandoned and groundwater extractions closed on October 4, 1976, as part of City Council decision to import all MWD supply.

Signed: B. Ogonka Date: 1.3.2000

* The water year is November 1 through October 31 for the Counties of Imperial, Orange, Ventura, Santa Barbara, Los Angeles, San Diego, San Luis Obispo, Riverside, and San Bernardino in accordance with the Water Code section 1005.2.

THIS FORM IS DUE NO LATER THAN FEBRUARY 29, 2000

State Water Resources Control Board

John P. Caffrey, Chairman

Peter M. Rooney
Secretary for Environmental Protection

Pete Wilson
Governor

Division of Water Rights
901 P Street • Sacramento, California 95814• (916) 657-0765 FAX (916) 657-1485
Mailing Address: P.O. Box 2000 • Sacramento, California • 95812-2000
Internet Address: http://www.swrcb.ca.gov

ANNUAL STATEMENT

19-0026C
City of Beverly Hills
Water Div, Public Works Dept.
9298 West Third Street
Beverly Hills, CA 90210-3713

99 JAN 13 PM 3:24

CESSATION OR REDUCTION IN THE EXTRACTION OF GROUND WATER FOR OCTOBER 1 through SEPTEMBER 30* for 1997-98

THIS IS THE ANNUAL FORM AND SHOULD ONLY BE USED BY THOSE WHO HAVE PREVIOUSLY FILED A "FIRST STATEMENT OF CESSATION OR REDUCTION" IN THE EXTRACTION OF GROUND WATER. IF YOU NEED A FIRST STATEMENT FORM (60 B), PLEASE CALL (916) 657-1872.

1. Name of the water purveyor, reservoir, stream, river, etc., from which the alternate non-tributary water was received or diverted
   City of Beverly Hills - Public Works Department
2. Amount of water used from the alternate non-tributary source Ø acre-feet per annum.
3. Amount of water pumped from wells Ø acre-feet per annum.
4. Amount of reduction in extraction of ground water 13,106 acre-feet per annum.
5. Please state any change that has occurred and other facts you think may clarify your statement.

   City-owned wells were abandoned and groundwater extractions ceased on October 4, 1976, as part of the City Council decision to import all MWD supply.

Signed: E. Ortega Date: 1-11-99

* The water year is November 1 through October 31 for the counties of Imperial, Orange, Ventura, Santa Barbara, Los Angeles, San Diego, San Luis Obispo, Riverside, and San Bernardino in accordance with the Water Code section 1005.2.

THIS FORM IS DUE NO LATER THAN FEBRUARY 26, 1999

WR 60-C (8-98)

STATE OF CALIFORNIA
STATE WATER RESOURCES CONTROL BOARD
DIVISION OF WATER RIGHTS
P. O. BOX 2000
SACRAMENTO, CA 95812-2000

19-0026C
City of Beverly Hills
Water Div, Public Works Dept.
9298 West Third Street
Beverly Hills, CA 90210-3713

ANNUAL STATEMENT OF CESSATION OR REDUCTION IN THE EXTRACTION OF GROUND WATER FOR OCTOBER 1 through SEPTEMBER 30* for 1996-97

THIS IS THE ANNUAL FORM AND SHOULD ONLY BE USED BY THOSE WHO HAVE PREVIOUSLY FILED A FIRST STATEMENT OF CESSATION OR REDUCTION IN THE EXTRACTION OF GROUND WATER. IF YOU NEED A FIRST STATEMENT FORM (60-B), PLEASE CALL (916) **657-1384**.

1. Name of the water purveyor, reservoir, stream, river, etc., from which the alternate non-tributary water was received or diverted
   City of Beverly Hills - Public Works Department

2. Amount of water used from the alternate non-tributary source Ø acre feet per annum.

3. Amount of water pumped from wells Ø acre feet per annum.

4. Amount of reduction in extraction of ground water 13,967 acre feet per annum.

5. Please state any change that has occurred and other facts you think may clarify your statement.

   City-owned wells were abandoned and groundwater extractions ceased on October 4, 1976, as part of the City Council's decision to import all MWD water supply.

Signed: [illegible] Date: 12-9-97

*The water year is November 1 through October 31 for the counties of Imperial, Orange, Ventura, Santa Barbara, Los Angeles, San Diego, San Luis Obispo, Riverside, and San Bernardino in accordance with the Water Code Section 1005.2.

THIS FORM IS DUE NO LATER THAN DECEMBER 31,1997

WR 60-C (Rev. 10/95)

KC

STATE WATER RESOURCES CONTROL BOARD
DEC 20 AM 11:50
DIV. OF WATER RIGHTS SACRAMENTO

STATE OF CALIFORNIA
STATE WATER RESOURCES CONTROL BOARD
DIVISION OF WATER RIGHTS
P. O. BOX 2000
SACRAMENTO, CA 95812-2000

19-0026C
City of Beverly Hills
Water Div, Public Works Dept.
9298 West Third Street
Beverly Hills, CA 90210-3713

ANNUAL STATEMENT OF CESSATION OR REDUCTION IN THE EXTRACTION OF GROUND WATER FOR OCTOBER 1 through SEPTEMBER 30* for 1995-96

THIS IS THE ANNUAL FORM AND SHOULD ONLY BE USED BY THOSE WHO HAVE PREVIOUSLY FILED A FIRST STATEMENT OF CESSATION OR REDUCTION IN THE EXTRACTION OF GROUND WATER. IF YOU NEED A FIRST STATEMENT FORM (60-B), PLEASE CALL (916) 657-1384.

1. Name of the water purveyor, reservoir, stream, river, etc., from which the alternate non-tributary water was received or diverted
   City of Beverly Hills - Public Works Department

2. Amount of water used from the alternate non-tributary source Ø acre feet per annum.

3. Amount of water pumped from wells Ø acre feet per annum.

4. Amount of reduction in extraction of ground water 13259 acre feet per annum.

5. Please state any change that has occurred and other facts you think may clarify your statement.
   City-owned wells were abandoned and groundwater extractions ceased on October 4, 1976, as part of the City Council decision to import all MWD water supply.

Signed: E. Opinka Date: 12·16·96

*The water year is November 1 through October 31 for the counties of Imperial, Orange, Ventura, Santa Barbara, Los Angeles, San Diego, San Luis Obispo, Riverside, and San Bernardino in accordance with the Water Code Section 1005.2.

THIS FORM IS DUE NO LATER THAN DECEMBER 31,1996

WR 60-C (Rev. 10/95)

STATE WATER RESOURCES
CONTROL BOARD

96 DEC 20 AM 11: 50

DIV. OF WATER RIGHTS
SACRAMENTO

STATE OF CALIFORNIA
STATE WATER RESOURCES CONTROL BOARD
DIVISION OF WATER RIGHTS
P. O. BOX 2000
SACRAMENTO, CA 95812-2000

STATE WATER RESOURCES
1995 NOV 13 AM 11: 14
DIV. OF WATER RIGHTS
SACRAMENTO

19-0026C

City of Beverly Hills
Water Division, Public Works Dept.
9298 West Third Street
Beverly Hills, CA 90210-3713

ANNUAL STATEMENT OF CESSATION OR REDUCTION IN THE EXTRACTION OF GROUND WATER FOR OCTOBER 1 through SEPTEMBER 30* for 1994-95

THIS IS THE ANNUAL FORM AND SHOULD ONLY BE USED BY THOSE WHO HAVE PREVIOUSLY FILED A FIRST STATEMENT OF CESSATION OR REDUCTION IN THE EXTRACTION OF GROUND WATER. IF YOU NEED A FIRST STATEMENT FORM (60-B), PLEASE CALL (916) 481-5173.

1. Name of the water purveyor, reservoir, stream, river, etc., from which the alternate non-tributary water was received or diverted
   City of Beverly Hills - Public Works Department

2. Amount of water used from the alternate non-tributary source Ø acre feet per annum.

3. Amount of water pumped from wells Ø acre feet per annum.

4. Amount of reduction in extraction of ground water 13,222,7 acre feet per annum.

5. Please state any change that has occurred and other facts you think may clarify your statement.

   City-owned wells were abandoned & groundwater extractions ceased on October 4, 1976 as part of the City Council decision to import all MWD supply.

Signed: E. Otsuka Date: 11.7.95

*The water year is November 1 through October 31 for the counties of Imperial, Orange, Ventura, Santa Barbara, Los Angeles, San Diego, San Luis Obispo, Riverside, and San Bernardino in accordance with the Water Code Section 1005.2.

THIS FORM IS DUE NO LATER THAN DECEMBER 31, 1995

WR 60-C (Rev. 10/95)

NFL

STATE OF CALIFORNIA
STATE WATER RESOURCES CONTROL BOARD
DIVISION OF WATER RIGHTS
P. O. BOX 2000
SACRAMENTO, CA 95812-2000

19-0026C City of Beverly Hills C/N 0172
Water Division, Public Works Dept.
9298 West Third Street
Beverly Hills, CA 90210-3713

ANNUAL STATEMENT OF CESSATION OR REDUCTION IN THE EXTRACTION OF GROUND WATER FOR OCTOBER 1 through SEPTEMBER 30* for 1993-94

THIS IS THE ANNUAL FORM AND SHOULD ONLY BE USED BY THOSE WHO HAVE PREVIOUSLY FILED A FIRST STATEMENT OF CESSATION OR REDUCTION IN THE EXTRACTION OF GROUND WATER. IF YOU NEED A FIRST STATEMENT FORM (60-B), PLEASE CALL (916) 481-5173.

1. Name of the water purveyor, reservoir, stream, river, etc., from which the alternate non-tributary water was received or diverted
City of Beverly Hills - Public Works Department

2. Amount of water used from the alternate non-tributary source -0- acre feet per annum.

3. Amount of water pumped from wells -0- acre feet per annum.

4. Amount of reduction in extraction of ground water 13,100 acre feet per annum.

5. Please state any change that has occurred and other facts you think may clarify your statement.

City-owned wells were abandoned and groundwater extractions ceased on October 4, 1976, as ~~part of the City Council decision to import all~~ MWD water supply.

Signed: E. Otsuka Date: 11.7.94

*The water year is November 1 through October 31 for the counties of Imperial, Orange, Ventura, Santa Barbara, Los Angeles, San Diego, San Luis Obispo, Riverside, and San Bernardino in accordance with the Water Code Section 1005.2.

THIS FORM IS DUE NO LATER THAN DECEMBER 31, 1994

WR 60-C (Rev. 10/94)

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STATE WATER RESOURCES

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STATE OF CALIFORNIA
STATE WATER RESOURCES CONTROL BOARD
DIVISION OF WATER RIGHTS
P. O. BOX 2000
SACRAMENTO, CA 95812-2000

STATE WATER RESOURCES CONTROL BOARD
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DIV. OF WATER RIGHTS
SACRAMENTO

190026C City of Beverly Hills
Water Division, Public Works Dept.
9298 West Third Street
Beverly Hills, CA 90210

C/N 0172

ANNUAL STATEMENT OF CESSATION OR REDUCTION IN THE EXTRACTION OF GROUND WATER FOR OCTOBER 1 through SEPTEMBER 30* for 1992-93

THIS IS THE ANNUAL FORM AND SHOULD ONLY BE USED BY THOSE WHO HAVE PREVIOUSLY FILED A FIRST STATEMENT OF CESSATION OR REDUCTION IN THE EXTRACTION OF GROUND WATER. IF YOU NEED A FIRST STATEMENT FORM (60-B), PLEASE CALL (916) 481-5273.

1. Name of the water purveyor, reservoir, stream, river, etc., from which the alternate non-tributary water was received or diverted
City of Beverly Hills - Public Works Department

2. Amount of water used from the alternate non-tributary source
-0- acre feet per annum.

3. Amount of water pumped from wells -0- acre feet per annum.

4. Amount of reduction in extraction of ground water 12,526 acre feet per annum.

5. Please state any change that has occurred and other facts you think may clarify your statement.

City-owned wells were abandoned and groundwater extractions ceased on October 4, 1976, as part of the City Council's decision to import all MWD water supply.

Signed: E. Otanka Date: 11.4.93

*The water year is November 1 through October 31 for the counties of San Luis Obispo, Santa Barbara, Ventura, Los Angeles, Orange, San Diego, Imperial, Riverside, and San Bernardino in accordance with the Water Code Section 1005.2.

THIS FORM IS DUE NO LATER THAN DECEMBER 31, 1993

WR 60-C (Rev. 10/93)

STATE WATER RESOURCES
CONTROL BOARD

STATE OF CALIFORNIA
STATE WATER RESOURCES CONTROL BOARD
DIVISION OF WATER RIGHTS
P. O. BOX 2000
SACRAMENTO, CA 95812-2000

1992 NOV 30 PM 1:32

DIV. OF WATER RIGHTS
SACRAMENTO

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190026C
City of Beverly Hills
Water Division, Public Works Dept.
9298 W. Third Street
Beverly Hills, CA 90210-3713

EXTRACTION
for 1991-92

THIS IS THE
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WATER. IF Y

O HAVE PREVIOUSLY
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ILL (916) 657-2170.

1. Name of the water pu... , etc., from which the alternate non-tributary water was received o. ..verted
City of Beverly Hills - Public Works Dept.

2. Amount of water used from the alternate non-tributary source -0- acre feet per annum.

3. Amount of water pumped from wells -0- acre feet per annum.

4. Amount of reduction in extraction of ground water 11,122.8 acre feet per annum.

5. Please state any change that has occurred and other facts you think may clarify your statement.

City-owned wells were abandoned and groundwater extractions ceased on October 4, 1976 as part of the City Council decision to import all MWD water supply

Signed: E. Otsuka Date: 11.23.92

*The water year is November 1 through October 31 for the counties of San Luis Obispo, Santa Barbara, Ventura, Los Angeles, Orange, San Diego, Imperial, Riverside, and San Bernardino in accordance with the Water Code Section 1005.2.

THIS FORM IS DUE NO LATER THAN DECEMBER 31, 1992

WR 60-C (Rev. 11/92)

NFL

STATE OF CALIFORNIA
STATE WATER RESOURCES CONTROL BOARD
DIVISION OF WATER QUALITY AND WATER RIGHTS
P. O. BOX 2000
SACRAMENTO, CA 95812-2000

190026C
City of Beverly Hills
Water Division, PUBLIC WORKS DEPT.
~~450 N. Crescent Drive, Room 600~~ 9298 W. Third St.
Beverly Hills, CA 90210

STATE WATER RESOURCES
91 NOV 25 PM 3:14
DIV OF WATER RIGHTS
SACRAMENTO

ANNUAL STATEMENT OF CESSATION OR REDUCTION IN THE EXTRACTION OF GROUND WATER FOR OCTOBER 1 through SEPTEMBER 30* for 1990-91

THIS IS THE ANNUAL FORM AND SHOULD ONLY BE USED BY THOSE WHO HAVE PREVIOUSLY FILED A FIRST STATEMENT OF CESSATION OR REDUCTION IN THE EXTRACTION OF GROUND WATER. IF YOU NEED A FIRST STATEMENT FORM (60-B), PLEASE CALL (916) 657-2170.

1. Name of the water purveyor, reservoir, stream, river, etc., from which the alternate non-tributary water was received or diverted City of Beverly Hills - Public Works Department

2. Amount of water used from the alternate non-tributary source _____ acre feet per annum.

3. Amount of water pumped from wells -0- acre feet per annum.

4. Amount of reduction in extraction of ground water 13,760 acre feet per annum.

5. Please state any change that has occurred and other facts you think may clarify your statement.

City-owned wells were abandoned and groundwater extraction ceased on October 4, 1976, as part of the City Council decision to have all MWD water supply in the system.

Signed: E. OTSUKA Date: 11-18-01

*The water year is November 1 through October 31 for the counties of San Luis Obispo, Santa Barbara, Ventura, Los Angeles, Orange, San Diego, Imperial, Riverside, and San Bernardino in accordance with the Water Code Section 1005.2.

THIS FORM IS DUE NO LATER THAN DECEMBER 31, 1991

WR 60-C (Rev. 11/91)

cc: Scott L. Slater
HATCH & PARENT

NFB

STATE OF CALIFORNIA
STATE WATER RESOURCES CONTROL BOARD
DIVISION OF WATER QUALITY AND WATER RIGHTS
P. O. BOX 2000
SACRAMENTO, CA 95812-2000

190026C City of Beverly Hills
Water Division 455 North Rodeo Drive
~~450 N. Crescent Drive, Room 600~~
Beverly Hills, CA 90210-4817

ANNUAL STATEMENT OF CESSATION OR REDUCTION IN THE EXTRACTION OF GROUND WATER FOR OCTOBER 1 through SEPTEMBER 30* for 1989-90

THIS IS THE ANNUAL FORM AND SHOULD ONLY BE USED BY THOSE WHO HAVE PREVIOUSLY FILED A FIRST STATEMENT OF CESSATION OR REDUCTION IN THE EXTRACTION OF GROUND WATER. IF YOU NEED A FIRST STATEMENT FORM (60-B), PLEASE CALL (916) 322-4503.

1. Name of the water purveyor, reservoir, stream, river, etc., from which the alternate non-tributary water was received or diverted City of Beverly Hills - Water Division

2. Amount of water used from the alternate non-tributary source 14,552.3 acre feet per annum.

3. Amount of water pumped from wells Ø acre feet per annum.

4. Amount of reduction in extraction of ground water _____ acre feet per annum. Ceased pumping ground water in 1976.

5. Please state any change that has occurred and other facts you think may clarify your statement.

As part of the City Council's decision to have all M.W.D. water supply in the system, City owned wells were abandoned and ground water extraction ceased on October 4, 1976.

Signed: E. Hannah, Supt. Date: 11/20/90

*The water year is November 1 through October 31 for the counties of San Luis Obispo, Santa Barbara, Ventura, Los Angeles, Orange, San Diego, Imperial, Riverside, and San Bernardino in accordance with the Water Code Section 1005.2.

THIS FORM IS DUE NO LATER THAN DECEMBER 31, 1990

WR 60-C (Rev. 10/90)

Mfl Inactive file

STATE WATER RESOURCES
CONTROL BOARD

1990 NOV 26 PM 1:45

DIV. OF WATER RIGHTS
SACRAMENTO

Appendix H | Sustainable Groundwater Management Act of 2014

APPENDIX H

SUSTAINABLE GROUNDWATER MANAGEMENT ACT OF 2014 AND ITS IMPACT ON THE CITY OF BEVERLY HILLS

Historically, California has never managed its groundwater supplies on a state-wide basis. That has now changed. As of January 1, 2015, the Sustainable Groundwater Management Act (SGMA), signed by Governor Edmund G. Brown in September 2014, now regulates the use of groundwater on a more universal scale.

The new law will have profound practical impacts, particularly on the state's agricultural community. Issues raised by the SGMA – some of which will doubtless play out in protracted court battles – will shape western water law and policy for years to come. At the same time, the SGMA's emphasis on local groundwater management should provide an unprecedented opportunity to shape California's future, for those whose livelihoods and involvement in the larger economy are fundamentally dependent on access to the state's groundwater resources.

CALIFORNIA'S APPROACH TO MANAGING GROUNDWATER

Until now, the right to use groundwater in California has been viewed as a property right attached to overlying surface lands. In *City of Pasadena v. City of Alhambra*, for example, the California Supreme Court stated that the "overlying right," or right of the owner of the land to take water from the ground underneath for use on his overlying land "…is based on ownership of the land and is appurtenant thereto." Under the doctrine of correlative rights, land owners had a common right to the beneficial use of percolating waters underlying their property. When an underlying aquifer became overdrawn, courts could allocate pumping rights among overlying land owners through an adjudicatory procedure.

The SGMA adopts a fundamentally different strategy for managing the state's groundwater resources. At the heart of the new law is a requirement to implement sustainability plans for the majority of groundwater basins throughout the state, including many on which California's agricultural community are highly dependent. These plans can vary from simple basin-wide plans developed and implemented by individual local agencies, to multiple plans by different local agencies operating in the same basin, to state-imposed plans where no sufficient local plan exists.

While sustainability plans must contain a number of specific requirements, by far the most significant is that they be designed to meet what the SGMA calls the "sustainability goal" within 20 years of implementation. The sustainability goal is, in short, a stated objective to "achieve sustainable groundwater management" by ensuring that a given basin is "operated within its sustainable yield." In other words, the basin must be operated in such a way as not to cause "undesirable results." Many of these standards leave a great deal of interpretive work to regulatory agencies and ultimately to the courts. Disputes over the on-the-ground, practical meaning of key terms such as "sustainable groundwater management," "sustainable yield," and "undesirable results," for example, almost certainly will wind up in litigation.

The SGMA also contains procedural requirements for plan development and implementation, and exempts many activities involved in that process from the environmental review requirements of the California Environmental Quality Act ("CEQA").

While the SGMA will regulate California's groundwater on a statewide basis for the first time, it does not cover every groundwater basin within the state's jurisdiction, nor will its impacts be felt immediately. The statute generally does not apply to specified basins that have already been adjudicated under existing law, for example, and it does not require sustainability plans from basins considered to be low priority. Moreover, sustainability plans need not be implemented for several years, and affected basins are not required to attain sustainability goals until approximately 2040.

That said, the California Department of Water Resources (DWR) has estimated the SGMA will cover 96 percent of groundwater used in California. California water users cannot afford to wait to get involved in efforts now underway to shape the manner in which the statute is applied.

The Central Basin has been designated as a high priority under SGMA. The Central Basin is largely adjudicated, however the La Brea Sub Basin, where the City of Beverly Hills is planning a well field, was excluded from the adjudication. The adjudicated portion of the Central Basin does not require a sustainability plan or other type of basin management. However, the un-adjudicated La Brea Sub Basin will require the formation of a Groundwater Sustainability Agency (GSA) and a sustainability plan. The Hollywood Basin is rated very low and at this time is exempted from the SGMA program.

THE IMPORTANCE OF LOCAL CONTROL

In enacting the SGMA, the California legislature sought to "manage groundwater basins through the actions of local governmental agencies to the greatest extent feasible." For the most part, any local agency with water supply, water management, or land use responsibilities in a given groundwater basin (or a combination of such agencies) can become the groundwater sustainability agency for that basin.

The SGMA gives sustainability agencies a number of powers and authorities in addition to those they already may possess. Agencies are authorized (among other things) to conduct investigations; require registration of facilities that extract groundwater; require said facilities to measure the amount of water they extract; acquire property including water rights; regulate, limit or allocate groundwater extraction; and authorize transfers of groundwater allocations. They also have the power to "impose fees, including…permit fees and fees on groundwater extraction" to support their activities, and to bring enforcement actions seeking civil penalties for violations relating to rules implemented pursuant to the SGMA.

The SGMA's use of local planning and management—as opposed to purely centralized state control—should be viewed as valuable opportunities for informed and proactive water users to have a say in groundwater sustainability planning from the start.

A GSA will need to be formed by June 30, 2017 to manage the La Brea Sub Basin. The formation will require involvement of potential stakeholders, including the City of Los Angeles. The sub basin lies within the City of Los Angeles jurisdiction and it has principal land use responsibility.

STATE OVERSIGHT AND INTERVENTION

While the SGMA generally emphasizes local management of groundwater resources, it does provide for state involvement on a number of levels. For example, DWR must develop and publish best management practices for sustainable groundwater management, and it is responsible for reviewing sustainability plans every five years to ensure compliance with the SGMA. In addition, the State Water Resources Control Board (SWRCB or State Board) can "designate a basin as a probationary basin" for failure to develop a groundwater sustainability plan where one is needed, or for implementation of an insufficient plan. If a local agency fails to remedy the problem that led to a designation, the State Board may adopt its own interim sustainability plan for the basin.

DWR is also tasked with establishing the initial priority for the state's groundwater basins, a job of considerable consequence given that many of the SGMA's requirements apply only to those basins designated as high or medium priority. DWR has announced that the basin designations it finalized under the California Statewide Groundwater Elevation Monitoring (CASGEM) program will serve as the initial prioritization required by the SGMA.

There is no doubt that implementation of the law will be controversial and will invariably generate considerable litigation, particularly in California's Central Valley. Looming restrictions on the use of groundwater by the state's agricultural community, at a time when other resources have become increasingly scarce, will have severe impacts on farms and ranches throughout the state. Ranchers, farming interests and water districts already are lining up to position themselves to avoid the most onerous potential consequences of the new regulatory regime.

Figure G-1 illustrates basin priorities for Southern California. Central Basin is Basin number 4-11.04 and ranked High Priority and Hollywood Basin is Basin number 4-11.02 and is ranked Very Low.

TIMELINE

Following are some of the more important deadlines for future actions to implement the SGMA:

- **September 16, 2014: Groundwater management legislation becomes law**

  Governor Brown signs Senate Bill 1168, Assembly Bill 1739, and Senate Bill 1319, which made up the groundwater management legislation package.

- **January 1, 2015: Legislation goes into effect**

  The SGMA becomes effective.

- **January 31, 2015: DWR must establish initial groundwater basin priority**

  DWR establishes the initial priority – high, medium, low or very low – or each groundwater basin in the state by the end of January 2015 (Water Code § 10722.4).

- **January 1, 2016: DWR must set emergency regulations for basin boundary revision**

  DWR adopts emergency regulations for groundwater basin boundary revisions by January 1, 2016. The regulations must include the methodology and criteria used to evaluate proposed boundary revisions, including the establishment of new sub basins (Water Code § 10722.2).

- **June 1, 2016: DWR must establish emergency regulations for evaluating plans**

  DWR adopts emergency regulations for evaluating GSPs and their implementation and coordination agreements among local agencies for ground water sustainability planning. The regulations must identify GSP components and information to assist plan and coordination agreement development and implementation (Water Code § 10733.2).

- **December 31, 2016: DWR estimate of water available for groundwater replenishment due**

  DWR publishes its estimate of the water available for groundwater replenishment on its website (Water Code § 10729(c)).

- **January 1, 2017: Basin deadline to submit alternative to a GSP**

  Medium- and high-priority basins choosing to meet sustainability objectives by ways other than groundwater sustainability planning (which includes not forming a GSA) must submit their alternatives to DWR (and then again every five years) (Water Code § 10733.6).

- **January 1, 2017: DWR will establish best management practices for sustainable management**

  DWR publishes best management practices for the sustainable management of groundwater on its website (Water Code § 10729(d)).

- **June 30, 2017: Deadline to form a GSA**

  A local agency or agencies in each high- or medium-priority groundwater basin must have officially formed one or more (GSAs) for the entire basin (Water Code §5 10724, 10735.2(a)(1))

- **June 30, 2017: State Water Board can begin to put basins on probation**

  The State Water Board can initiate probationary status to a medium- or high-priority basin if the basin lacks one or more GSA(s) that covers the entire basin or no alternative has been approved (Water Code § 10735.2(a)(1)).

- **July 1, 2017: Those pumping in a probationary basin must report extractions**

  Pumping groundwater in a basin that either has been designated as a probationary basin or lies outside a GSA's management area must be reported to the State Water Board. These reporting requirements do not apply to those extracting for domestic purposes 2 AFY or less, and some others (Water Code §§ 5202, 10724).

- **January 31, 2020: GSPs required for critically over drafted basins**

  Basins designated as high- or medium-priority and subject to critical conditions of overdraft must be managed under a GSP or GSPs. The State Water Board can initiate probationary status for all or part of a basin if there is no GSP, if the GSP is inadequate, or the GSP implementation will not likely achieve sustainability (Water Code § 10720.7(a)(1), 10735.2(a)(2), 10735.2(a)(3)).

- **January 31, 2022: GSPs required for all remaining high- and medium- priority groundwater basins**

  All remaining basins designated as high- or medium-priority must be managed under a GSP or GSPs. The State Water Board can initiate probationary status in 2022 for all or part of a basin if there is no GSP, if the GSP is inadequate, or the GSP implementation will not likely achieve sustainability except for basins where groundwater extractions result in significant depletion of interconnected surface waters (Water Code § 10720.7(a)(2), 10735.2(a)(4), and 10735.2(a)(5)(A)).

- **January31, 2025: State Water Board actions where extractions impact surface waters**

  The State Water Board can initiate probationary status for those medium- or high-priority basin where the GSP is inadequate or implementation is not likely to achieve sustainability and the basin is in a condition where groundwater extractions result in significant depletion of interconnected surface waters (Water Code § 10735(a)(5)(B).

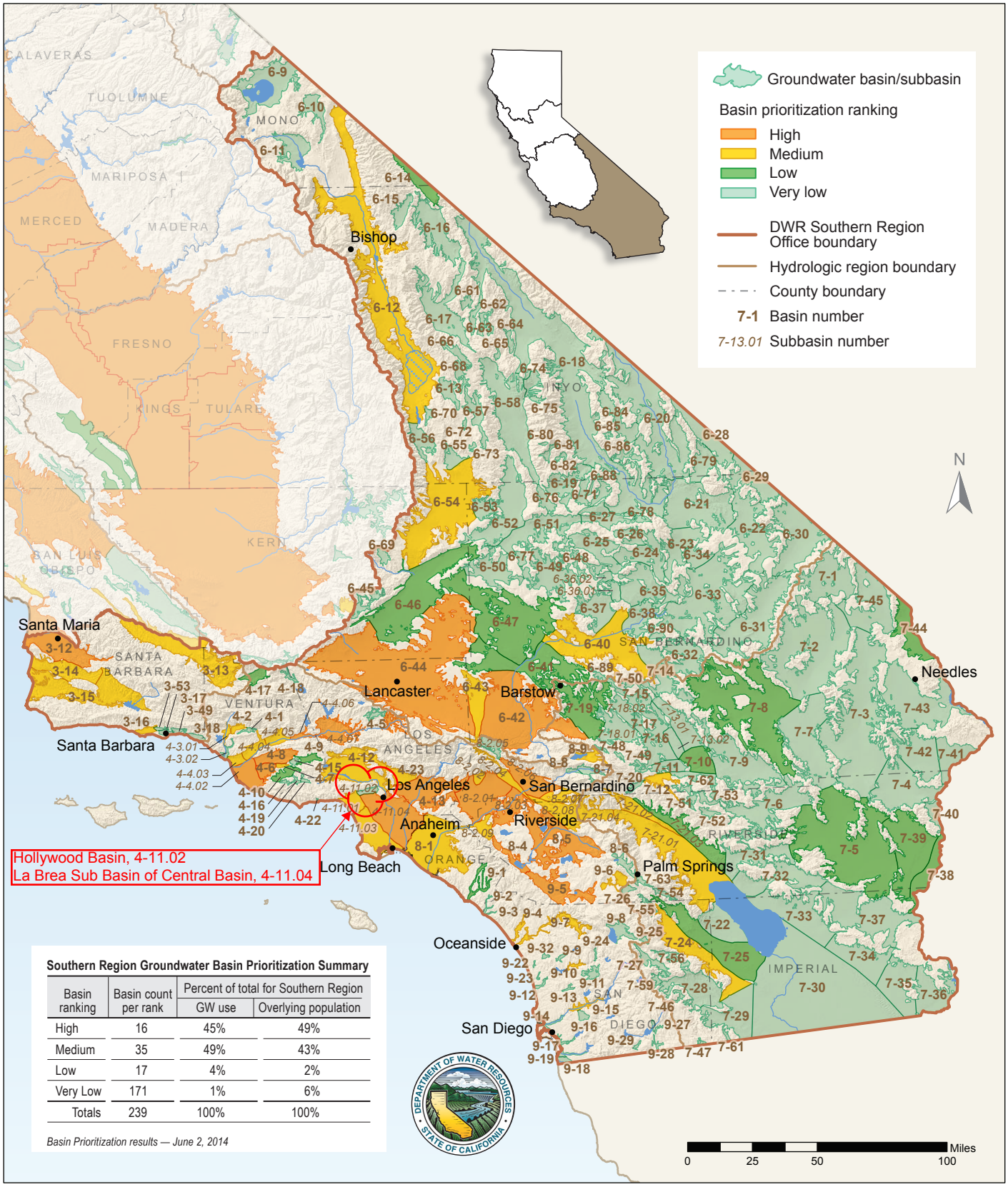
CONCLUSIONS

The two groundwater basins from which the City is presently pumping and from which the City plans to continue pumping groundwater are included in the SGMA. The basins are the Hollywood Basin and the La Brea Sub-basin of the Central Basin. The Hollywood Basin is ranked as very low priority and is not included in the SGMA program. The Central Basin as a whole is ranked as high priority. The majority of the Central Basin is adjudicated and is generally not subject to SGMA. However, the La Brea Sub-basin (which is the unadjudicated part of the Central Basin) is subject to SGMA.

To comply with the SGMA, the City will need to take establish a Groundwater Sustainability Agency (GSA). The deadline for establishing the GSA is June 30, 2017. Since the sub basin is largely overlain by the City of Los Angeles, it will be necessary to include them in the formation of the GSA. The GSA will then be the entity

that will ensure compliance with the SGMA requirements and develop and adopt a Groundwater Sustainability Plan (GSP) by January 31, 2020.

CASGEM Groundwater Basin Prioritization — Southern Region



Southern Region Groundwater Basin Prioritization Summary

Basin ranking	Basin count per rank	Percent of total for Southern Region	
		GW use	Overlying population
High	16	45%	49%
Medium	35	49%	43%
Low	17	4%	2%
Very Low	171	1%	6%
Totals	239	100%	100%

Basin Prioritization results — June 2, 2014

City of Beverly Hills
Enterprise Water Plan
Figure G-1

Appendix I

January 8, 2015 Workshop Presentation to the City of Beverly Hills Public Works Commission: 10-Year Water Enterprise Development

PSOMAS

Presentation to the

City of Beverly Hills
Public Works Commission

10-YEAR WATER ENTERPRISE PLAN DEVELOPMENT

Workshop No. 2
Finalize Alternatives for 10-Year Water Enterprise Plan

January 8, 2015

HOW WE GOT HERE

A Quick Recap

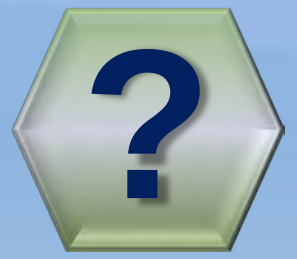
19 Alternatives

WORKSHOP 1

9 Alternatives

WORKSHOP 2

Recommended Portfolio



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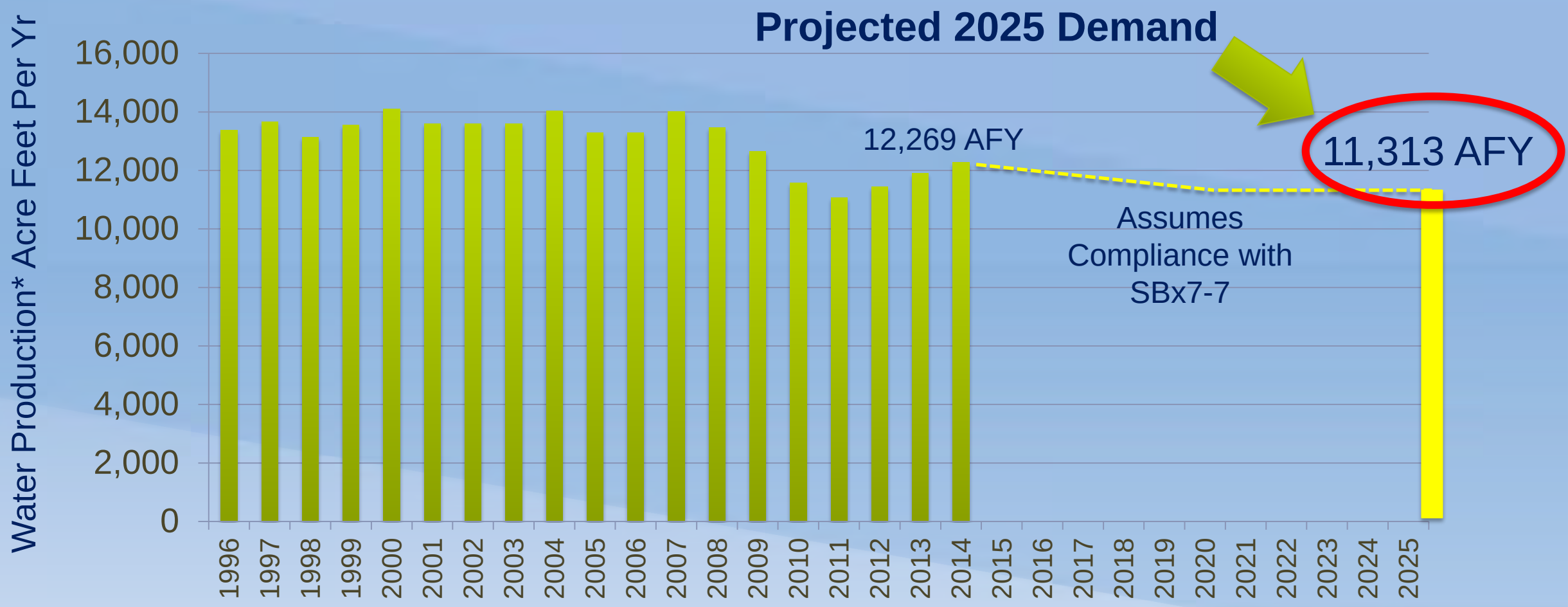
WHY A WATER ENTERPRISE PLAN?

To Address Water Reliability Issues

- **Context for the study**
  - Metropolitan Water District of Southern California's (MWD) supply reliability is decreasing because of complex environmental issues in both the Colorado River Basin and Bay Delta (i.e., climate change, long-term drought, endangered species)
  - MWD expects local agencies to do their share of improving reliability
  - Water shortages will have a significant economic impact on the City of Beverly Hills (CBH)
  - CBH has a unique quality of life, which its citizens expect to be maintained

We can engineer whatever level of reliability the Commission and Council deem appropriate, for environmental, policy or social reasons

WHAT LEVEL OF RELIABILITY SHOULD WE PLAN FOR?



*Met deliveries plus plant production (includes system losses but not losses through plant per UWMP workbook)

Ed Means

METROPOLITAN WATER DISTRICT AND OCEAN DESALINATION

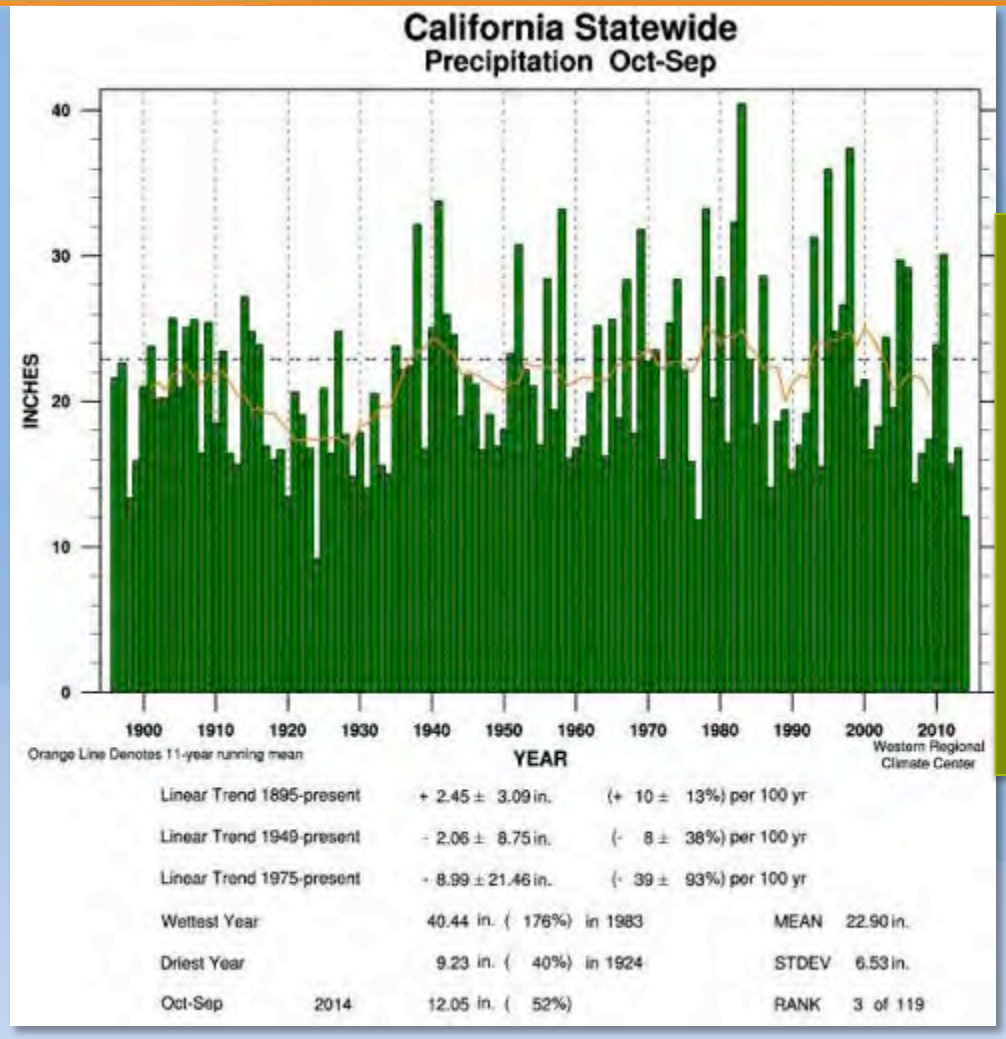
PSOMAS

WHAT LEVEL OF RELIABILITY SHOULD WE PLAN FOR?

- What is the balance between “independence from MWD” and seeking drought year reliability?
- What is the depth of a drought we are hedging against?
- What are the costs/tradeoffs of the new supplies?
- Want to use MWD when it is available
- Given the time to develop local resources (10 years), are near-term steps warranted?
- How much supply diversity does CBH want to manage?

WHAT LEVEL OF RELIABILITY SHOULD WE PLAN FOR?

Historical Reference Points



Multi-Year Droughts of Large-Scale Extent Since 1900*

YEAR	LEVEL OF MWD REDUCTION
1918 – 1920	
1923 – 1926	
1928 – 1935	
1947 – 1950	
1959 – 1962	
1976 – 1977	10% Voluntary
1987 – 1992	17% Mandatory
2000 – 2002	Water Supply Alert
2007 – 2009	10% Mandatory
2013 – 2015	Water Supply Alert / x%?

*Based on Statewide Runoff

WHAT LEVEL OF RELIABILITY SHOULD WE PLAN FOR?

Future Projections

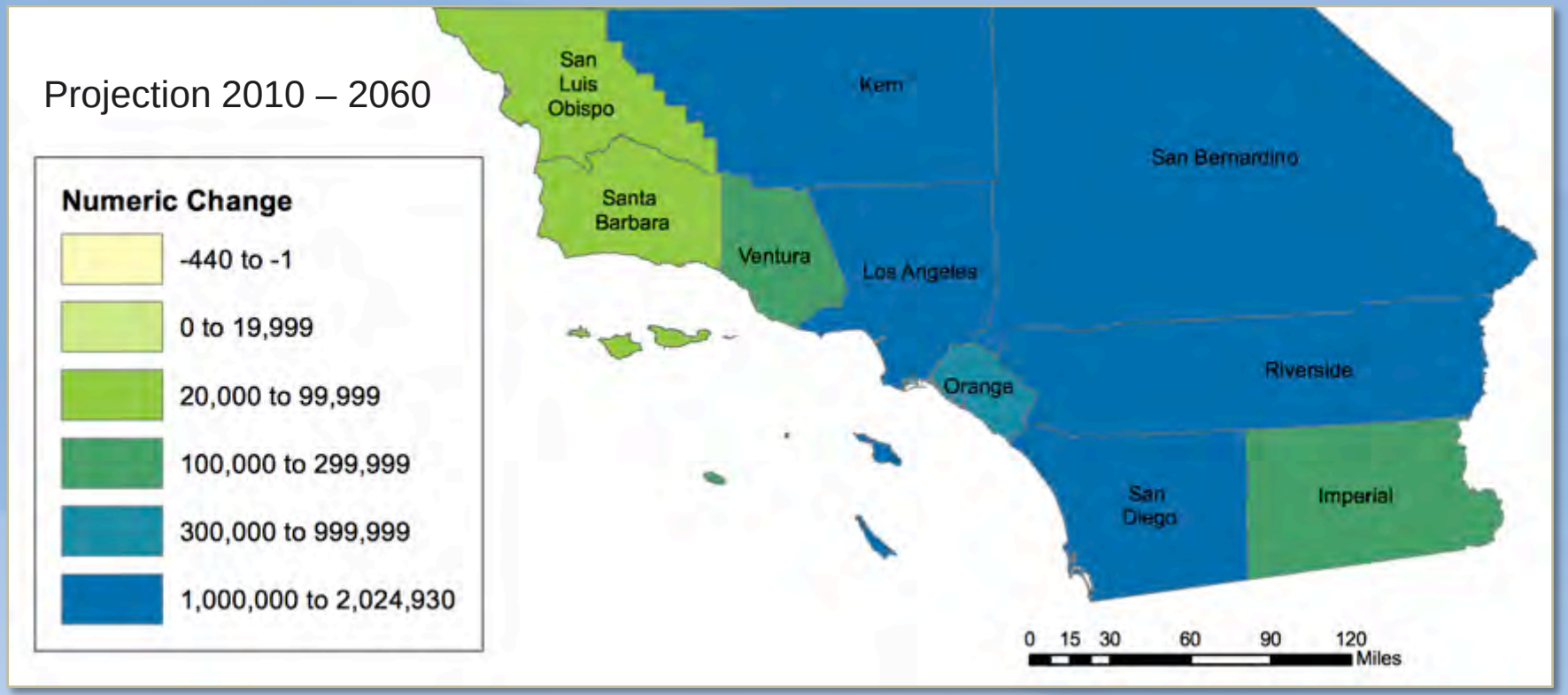
- **IPCC Modeling:** The region is likely to become drier and experience more severe droughts
- **Recent Studies:** Project stream flow changes in the Colorado River ranging from less than 10% to 45% by the 21st century
- **Analyzing Tree Rings Dating Back to 800 AD:** There is no three-year period when California's rainfall has been as low, and its temperatures as hot, as they have been from 2012 to 2014 – Woods Hole Researcher

2014 image by Daniel Griffin

Kevin Anchukaitis collects a tree-ring sample from a 300 year-old blue oak in California.

WHAT LEVEL OF RELIABILITY SHOULD WE PLAN FOR?

Population Impacts



Source: California Department of Finance, Population Projections for California and its Counties, 2010 Baseline Series.
Map prepared by: California Department of Finance Demographic Research Unit, January 2013.

- **CBH population is not expected to grow significantly**
- **However, growth in Southern California will continue to pressure regional water supplies**
- **Demand management will help lower the risk of shortage—but not likely eliminate it**

NOT ALL SUPPLIES ARE TREATED EQUALLY UNDER AN MWD ALLOCATION

EXAMPLE

Current Supplies: 20% Shortage Allocation Scenario

Projected 2025 Demand AF 11,313				
	CURRENT SOURCES	20% ALLOCATION	EFFECTIVE SHORTAGE	
MWD	10,193	8,154	0.82	**18% Short**
Local Supply	1,120	1,120		
Total Supply	11,313	9,274		

NOT ALL SUPPLIES ARE TREATED EQUALLY UNDER AN MWD ALLOCATION

EXAMPLE

Develop 1,000 AF of New Local Water

Projected 2025 Demand AF 11,313				
	CURRENT SOURCES	20% ALLOCATION	EFFECTIVE SHORTAGE	
MWD	9,193	7,354	0.84	16% Short
Local Supply	2,120	2,120		
Total Supply	11,313	9,747		

PORTFOLIO DIFFERENCES BETWEEN WELL WATER AND EXTRAORDINARY WATER

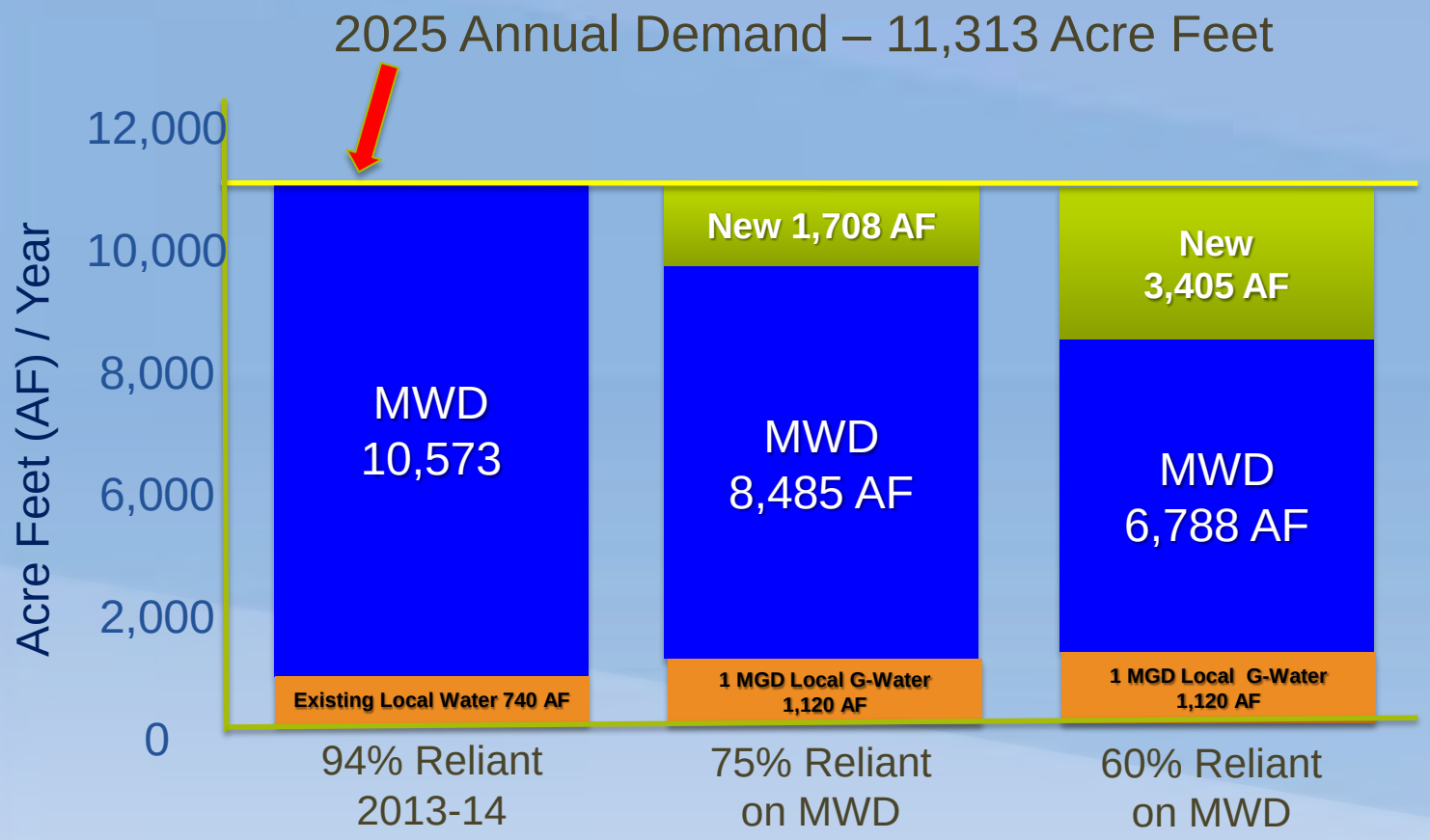
EXAMPLE

Develop 1,000 AF of Insurance or Extraordinary Supply

Projected 2025 Demand AF 11,313				
	CURRENT SOURCES	20% ALLOCATION	EFFECTIVE SHORTAGE	
MWD	10,193	8,154	0.91	9% Short
Local Supply	1,120	1,120		
Extraordinary Supply		1,000		
Total Supply	11,313	10,274		

WHAT LEVEL OF RELIABILITY SHOULD WE PLAN FOR?

Basic Approaches

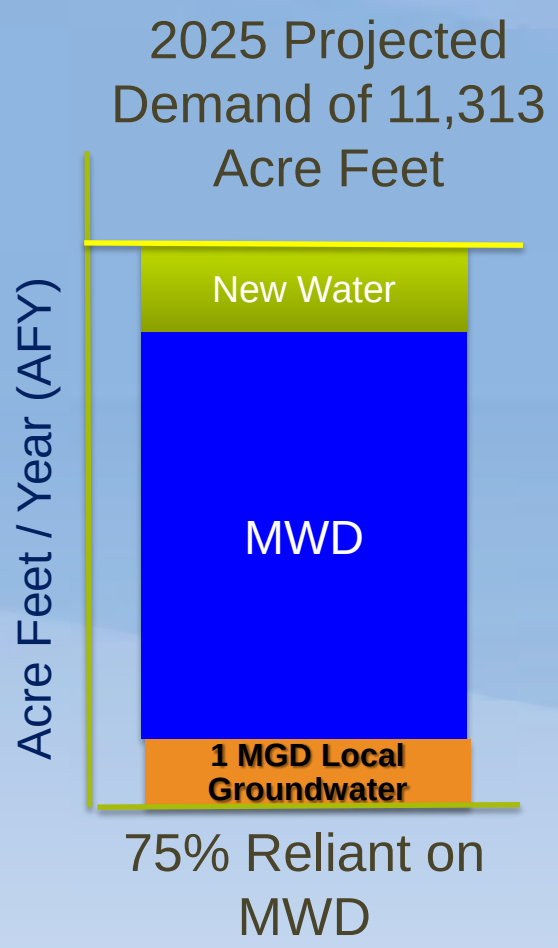


- **75% reliance on MWD requires 1,708 AF new annual production**
- **Plan for a two-year shortage**
- **At 75%, if through banking/insurance – need 3,416 AF**
- **The less "dependent" on MWD, the more MWD water is left on the table in normal/wet years**

Questions for Ed?

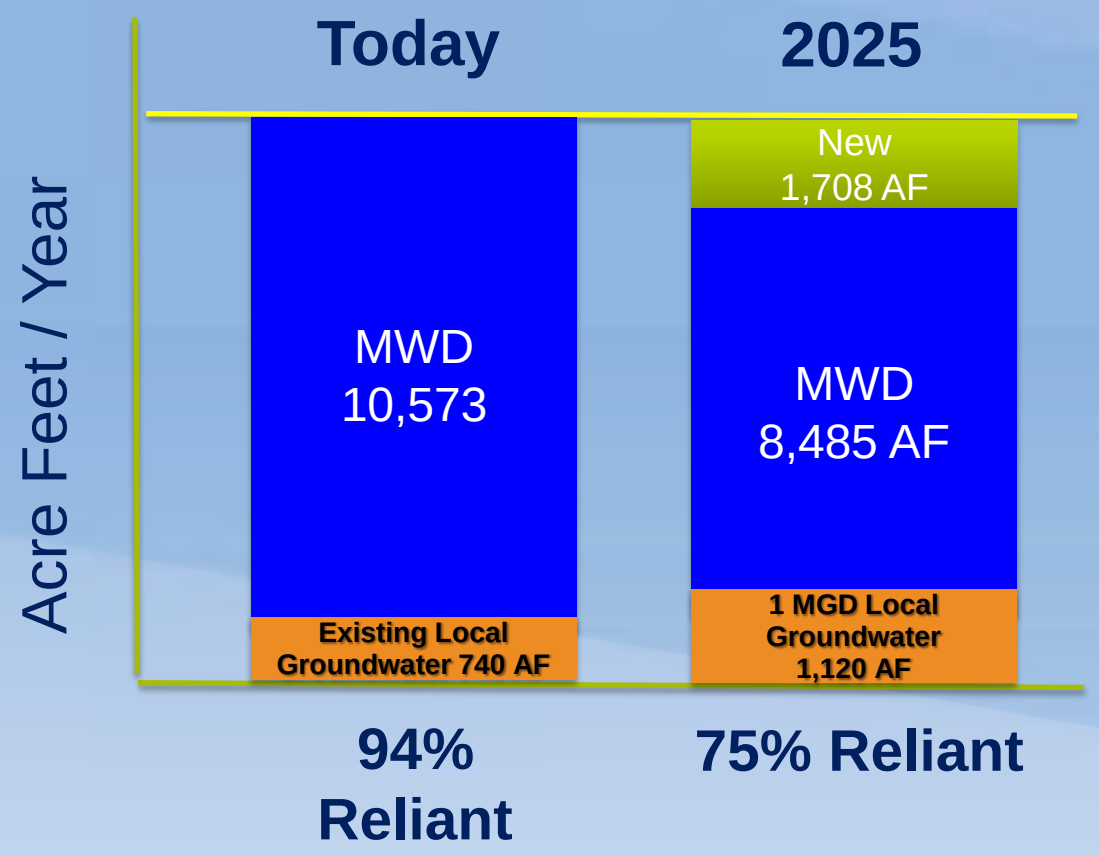
Regarding Reliability Recommendations

RECOMMENDED PORTFOLIO



- **Target 10-year water portfolio to 25%**
- **Comply with water conservation measures**
- **Develop groundwater**
- **Implement extraordinary "insurance" alternatives**

THE PROPOSED PRELIMINARY PLAN IS FLEXIBLE AND SIGNIFICANTLY IMPROVES RELIABILITY



- Track and evaluate
  - Improvements in desalination efficiency
  - Groundwater yield
  - Future water insurance needs
  - Regional recycled water
  - Conservation beyond 2020

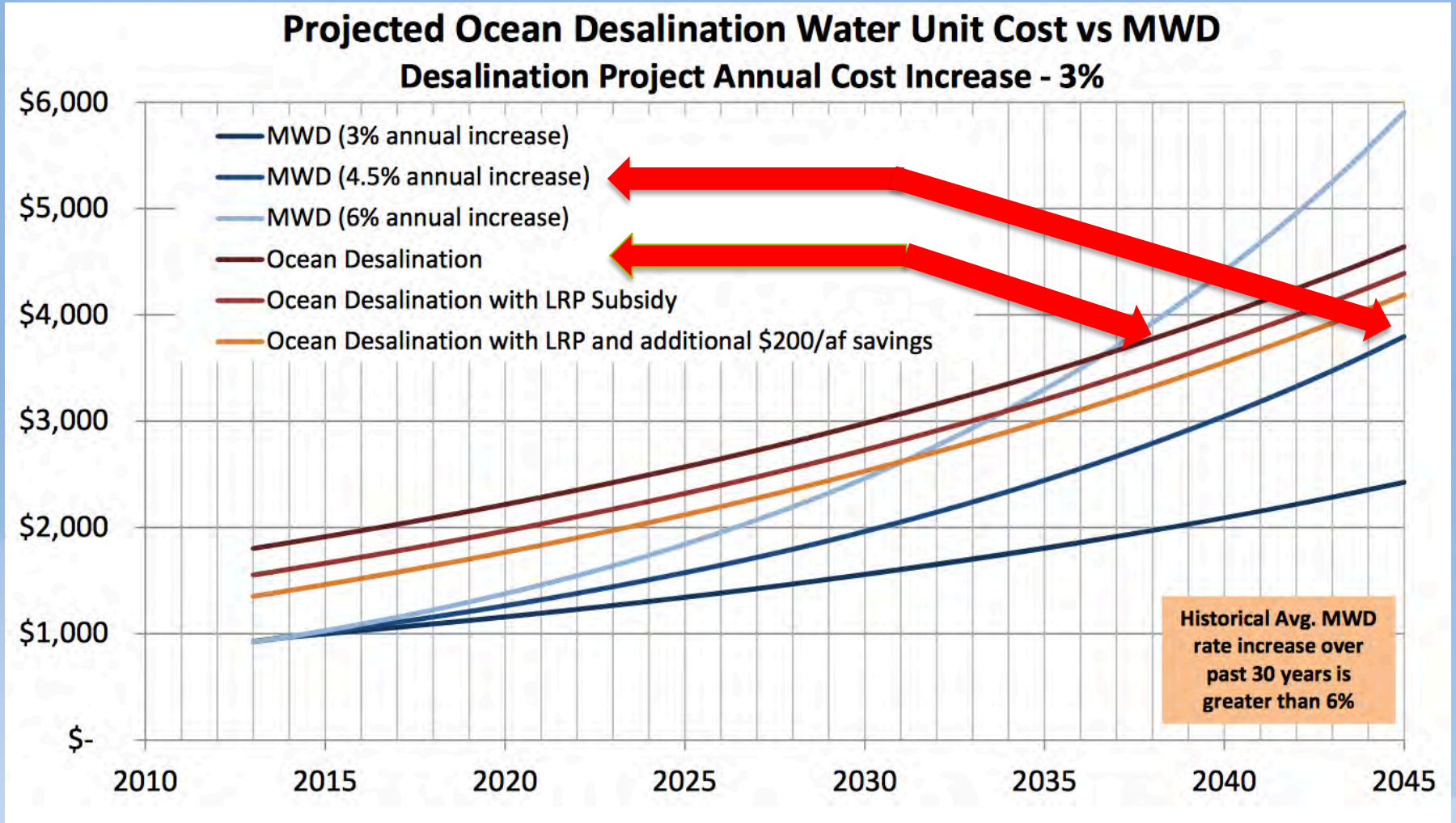
OCEAN DESALINATION

Proposed Plants Along California Coast

Source: Pacific Institute

- **17 plants in planning and two in Mexico**
- **Prefer plant in MWD service area to avoid (hopefully) wheeling charges**
- **Carlsbad –** Complete/subscribed; permitting took ~12 years
- **Huntington Beach –** Planning/unsubscribed
- **Rosarito Beach –** Advanced planning
- **West Basin –** Conceptual planning
- **Camp Pendleton –** Planning
- **Long Beach –** Plans on hold
- **Dana Point –** Studies continue

OCEAN DESALINATION COST



"Crossover" point is pretty far out in the future

Source: OCWD Presentation

OCEAN DESALINATION DELIVERY

- Purchase agreement signed
- Water would be delivered to CBH MWD connections by exchange
- Negotiate MWD exchange agreement – specify flow/volume/cost
- Goal – avoid wheeling costs
- Not recommended at this time given permitting risk and construction uncertainty

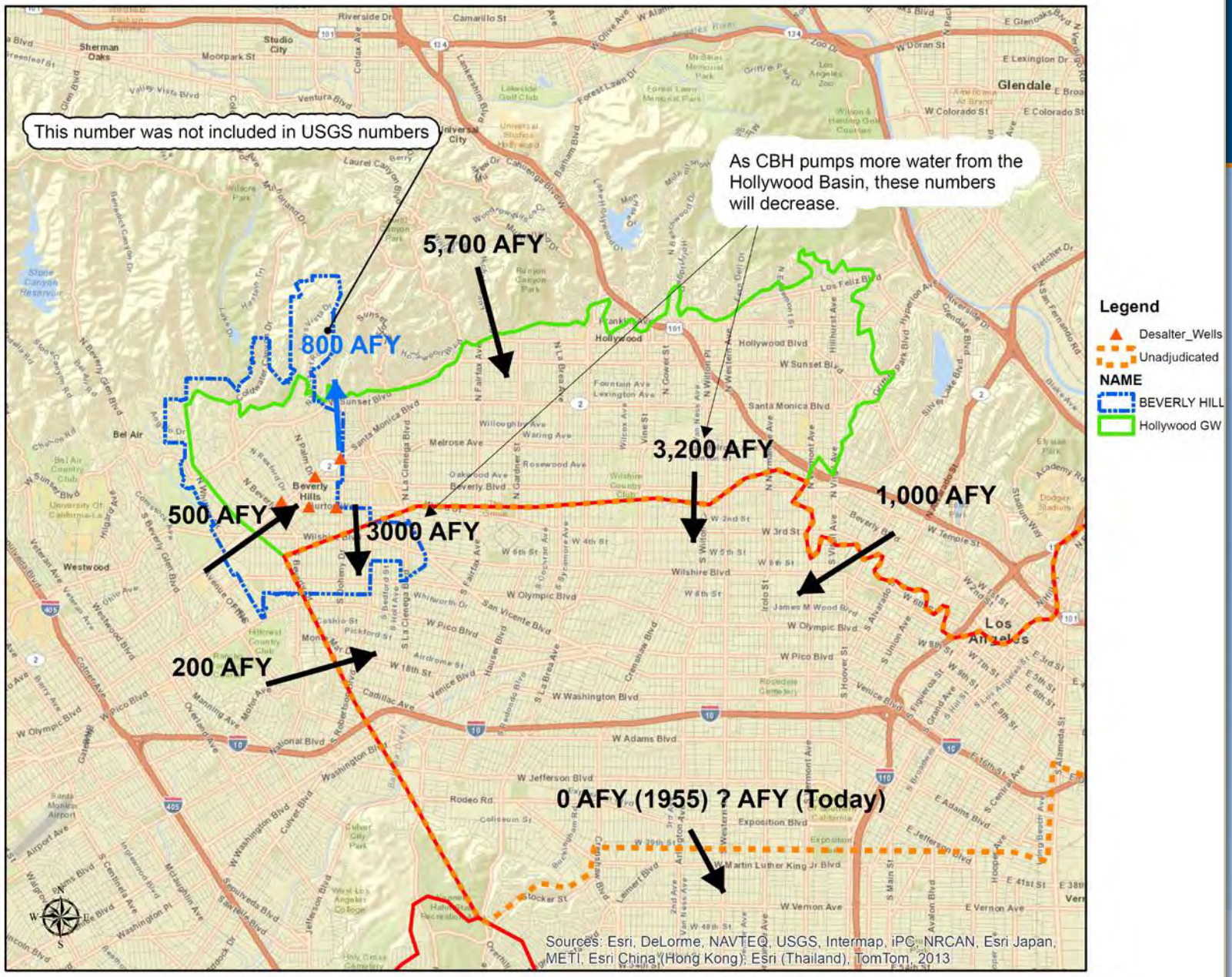
Questions for Ed?

Regarding Ocean Desalination

Michael Donovan, RG, CHg, QSD/QSP
GROUNDWATER DEVELOPMENT

HOLLYWOOD BASIN *vs.* CENTRAL BASIN

PRELIMINARY WATER BUDGET FOR HOLLYWOOD AND UNADJUDICATED CENTRAL BASINS



SCALE

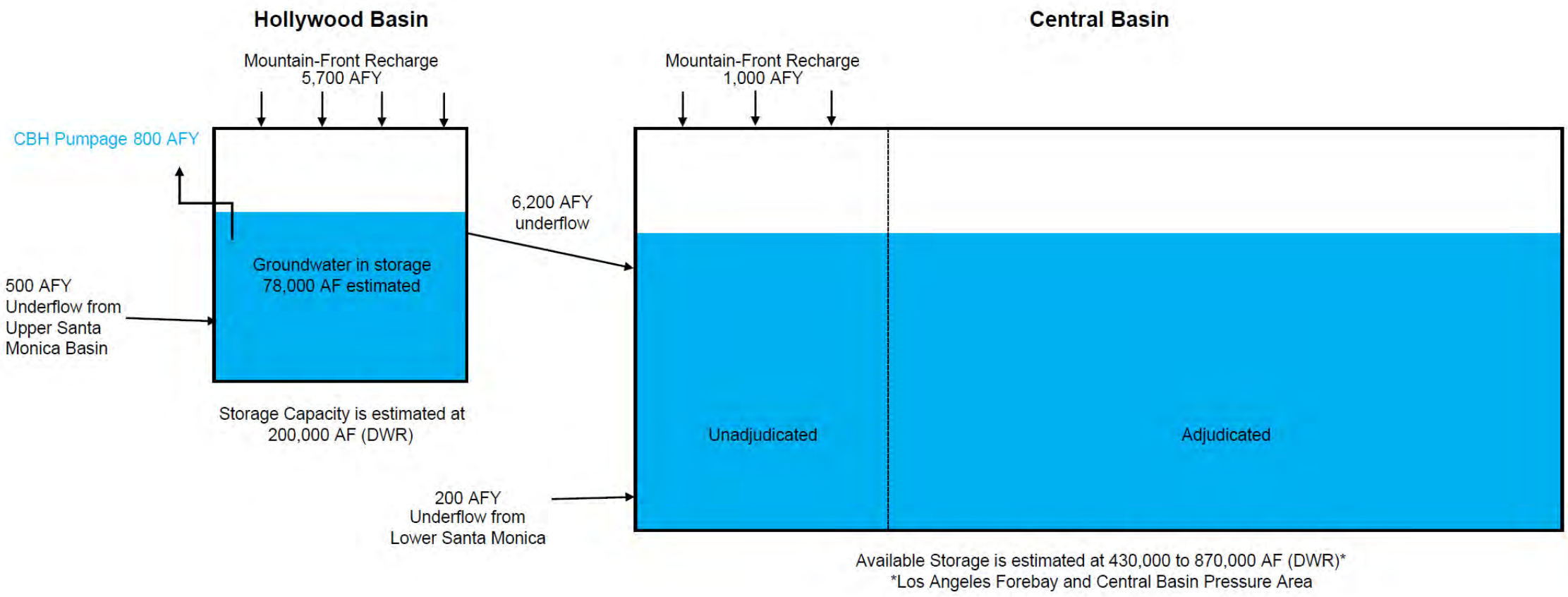
0 0.5 1 2 3 4 Miles

Based on preliminary interpretation of USGS calibrated groundwater model (WRI 03-4065) for period from Years 1971-2000.

(La Brea Sub-Basin)
Groundwater Development

HOLLYWOOD BASIN vs. CENTRAL BASIN

(La Brea Sub-Basin) Groundwater Development



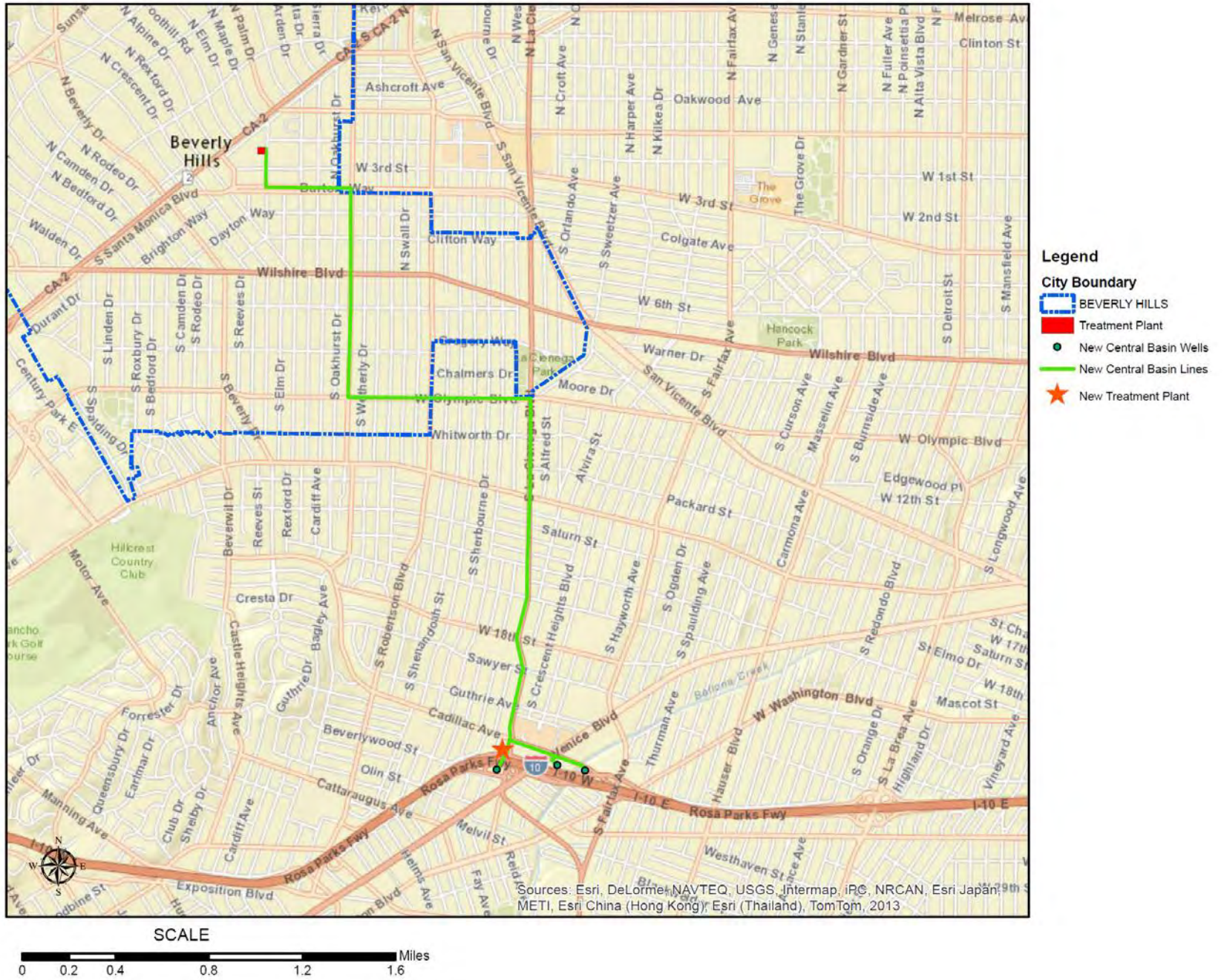
CENTRAL BASIN (LA BREA SUB-BASIN) GROUNDWATER DEVELOPMENT

History

- Unadjudicated portion of Central Basin has been successfully developed by CBH in the past
- Wells with production rates exceeding 800 GPM were operated
- Groundwater in storage may assist in times when other resources are threatened or not available

CENTRAL BASIN (LA BREA SUB-BASIN) GROUNDWATER DEVELOPMENT

ALTERNATIVE 9C - UNADJUDICATED CENTRAL BASIN GROUNDWATER WELLS



- Three wells at 800 GPM
- Upgrade of existing treatment plant and new forebay and pump station, or new treatment plant
- 3,000 to 23,000 feet of pipeline

CENTRAL BASIN (LA BREA SUB-BASIN) GROUNDWATER DEVELOPMENT

- **What will be required**
  - All three options require wells
  - Length of pipeline will be dependent on where pipeline corridors are available; old existing line may be present but would likely have to be relined following an initial condition assessment
  - For 2nd treatment plant, will need to know long-term water quality expected from wells (presented costs are based on RO desalter plant similar to current CBH). Historical water quality (GTC, 1975) indicates TDS in wells in La Brea area can range from 400 MG/L to over 800 MG/L.
  - For LADWP option, will need to see where water could be introduced into trunk line (if at all)

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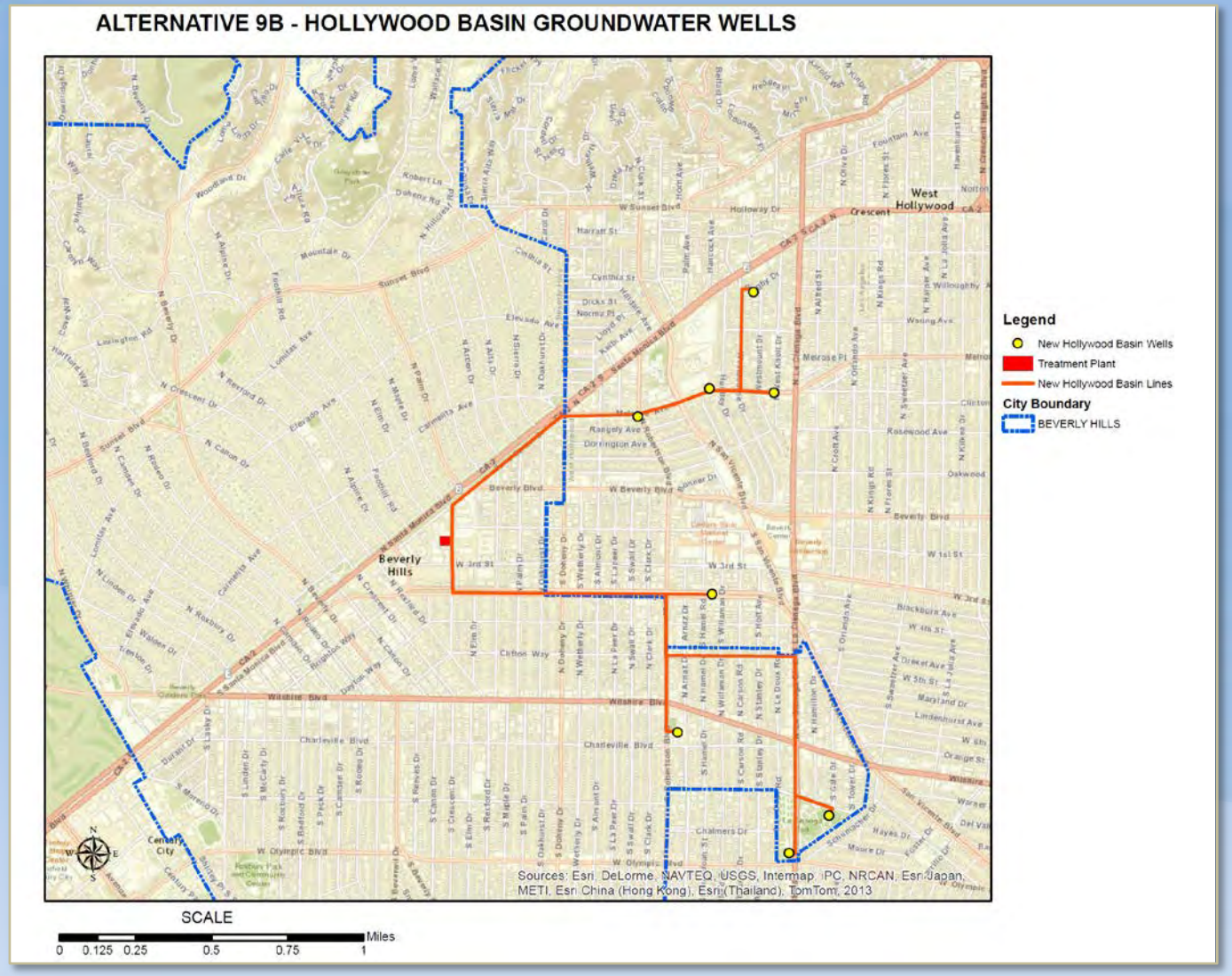
CENTRAL BASIN (LA BREA SUB-BASIN) GROUNDWATER DEVELOPMENT

COMPONENT	COST (PER AFY)		
	Recommended Option 3A – PUMP AND TREAT AT EXISTING TREATMENT PLANT	3B – PUMP AND TREAT AT NEW TREATMENT PLANT AND DISTRIBUTE TO CBH ZONE 3	3C – PUMP AND TREAT AT NEW TREATMENT PLANT AND DIST. TO LADWP TRUNK LINE IN LA CIENEGA
	Range	Range	Range
Well Capital Cost	$167 – $200	$167 – $200	$167 – $200
Well Forebay & Pump Station	$11 – $13	$0 – $0	$0 – $0
Pipelines	$82 – $99	$71 – $86	$11 – $13
Treatment Plant	$155 – $222	$305 – $390	$305 – $390
O&M Costs	$1,027 – $1,233	$1,021 – $1,225	$1,021 – $1,225
TOTAL	**$1,442 – $1,767**	**$1,564 – $ 1,901**	**$1,504 – $1,828**

Note: Costs amortized over 30-50 years

HOLLYWOOD BASIN GROUNDWATER DEVELOPMENT



- Hollywood Basin has 800 to 1,200 AFY being developed – maximum is ~2,500 AFY total
- Six to eight wells at 200 GPM
- 24,000 feet of pipeline
- Upgrade of existing treatment plant to increase throughput

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HOLLYWOOD BASIN GROUNDWATER DEVELOPMENT

- Hollywood Basin has been successfully developed by Beverly Hills in the past
- Wells with production rates varying from 200 to 300 GPM were developed
- Historical production data suggests production zone around treatment plant may be compartmentalized
- Should not rely on Hollywood Basin for more than 1,100 AFY
- Need to monitor water quality
- Cost per acre-foot is high due to the low well volume and the extensive extraction network required to develop the basin

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HOLLYWOOD BASIN GROUNDWATER DEVELOPMENT

- **Well Capital Costs (6 – 8 wells) = $19,800,000 – $23,700,000**
  (amortized $667 – $800/AFY)
- **Pipelines (24,000 feet) = $5,500,000 – $6,600,000**
  (amortized $171 – $206/AFY)
- **Treatment Plant = $8,000,000 – $11,000,000**
  (amortized $310 – $434/AFY)
- **O&M Costs = $1,572 – $1,887/AFY**
- **TOTAL COST = $2,720 – $3,327/AFY**
  (based on an annual production of 1,500 AFY for 40 years)

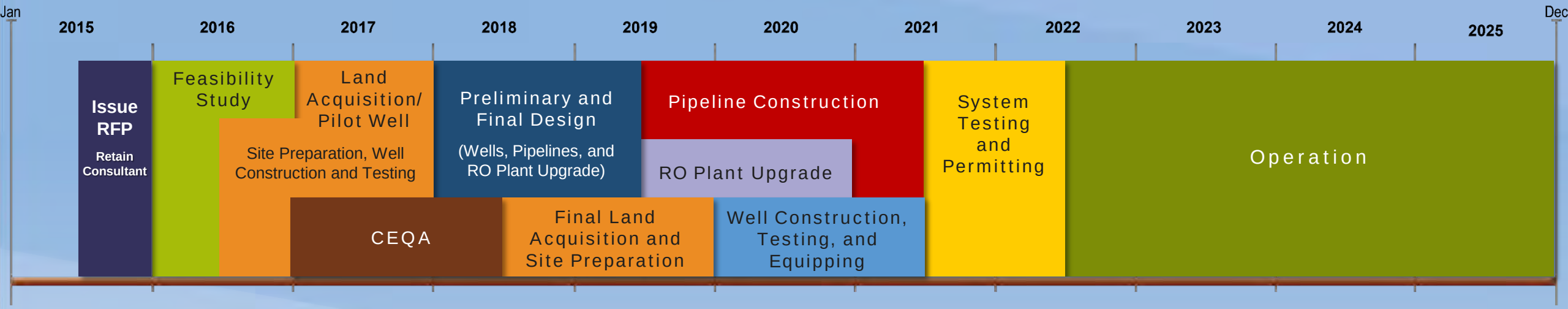
HOLLYWOOD BASIN vs. CENTRAL BASIN
(La Brea Sub-Basin) Groundwater Development

- **Mountain-front recharge that occurs in Hollywood Basin eventually discharges to unadjudicated Central Basin**
- **Hollywood Basin is at the very beginning of the recharge cycle and likely would be impacted first during drought periods**
- **Not recommending additional groundwater development in the Hollywood Basin**
- **Central Basin offers more production for money spent**

Central Basin Wells*	$1,442/AF – $1,901/AF
Hollywood Basin Wells	$2,720/AF – $3,327/AF

** Effective range, regardless of plant location or whether the water is conveyed to CBH or LADWP*

LA BREA SUB-BASIN WELL IMPLEMENTATION TIMELINE*



*Timeline is based on average implementation requirements. Additional methods/procedures can be employed to reduce specific implementation times for various elements.

RECOMMENDATIONS

Groundwater Development

- **Develop unadjudicated Central Basin groundwater from La Brea Sub-Basin**
  - Issue feasibility RFP and retain Consultant
  - Start feasibility/siting study
- **No more new groundwater from the Hollywood Basin than what is currently being developed**

Questions for Michael?

John Thornton, PE

WATER BANKING, DROUGHT INSURANCE,
SPOT LOANS AND EXCHANGES

PSOMAS

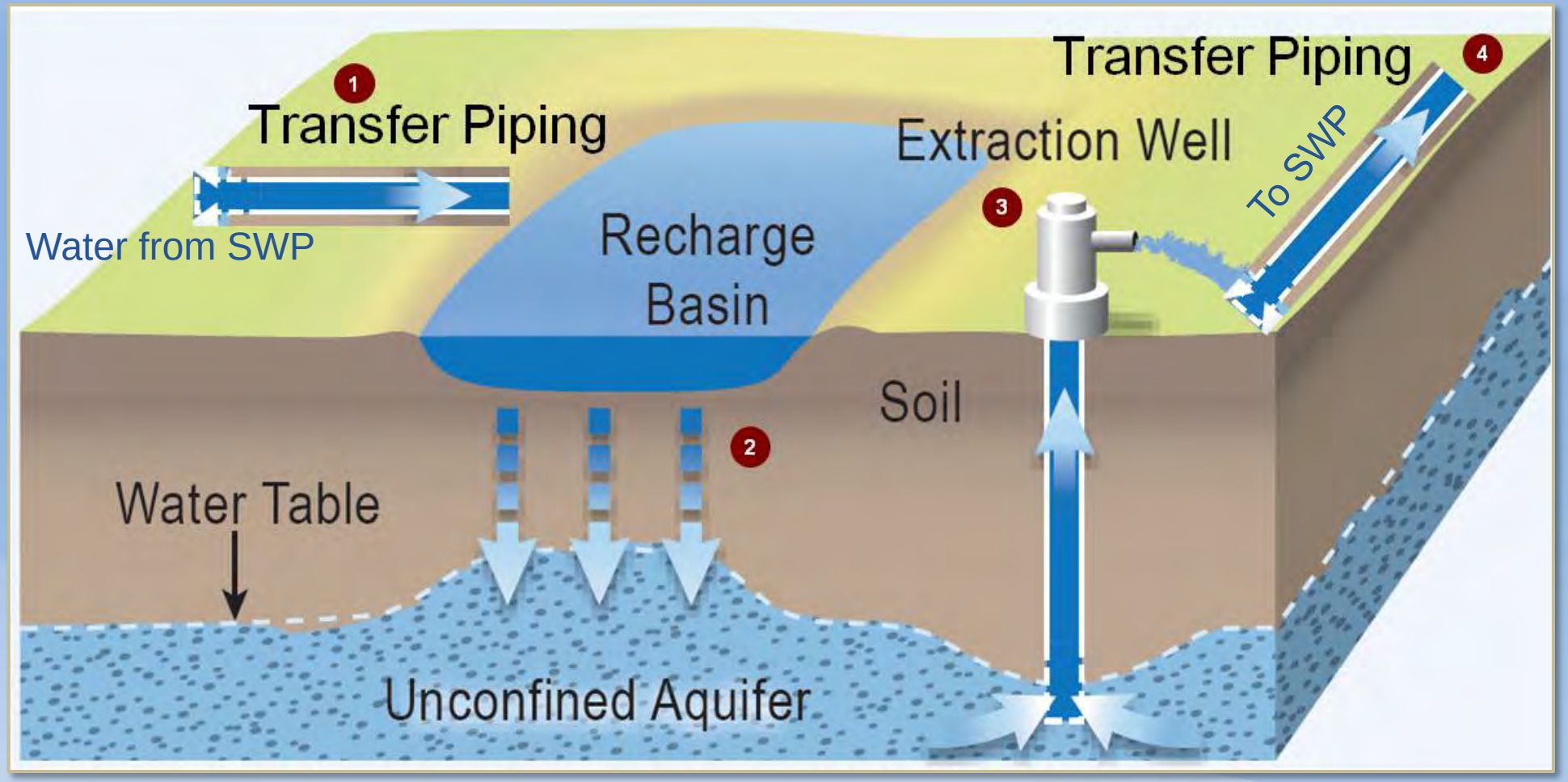
WATER BANKING / DROUGHT INSURANCE / SPOT WATER LOAN

- Goal is improve overall CBH reliability in time of drought and to fill in for shortfall created by MWD allocation or rationing
- Provides a supplemental water supply outside of MWD
- Generally, all start with a Water Bank and are part of a Water Banking program
- Examples are based using the Willow Springs Water Bank in the Antelope Valley

WATER BANK

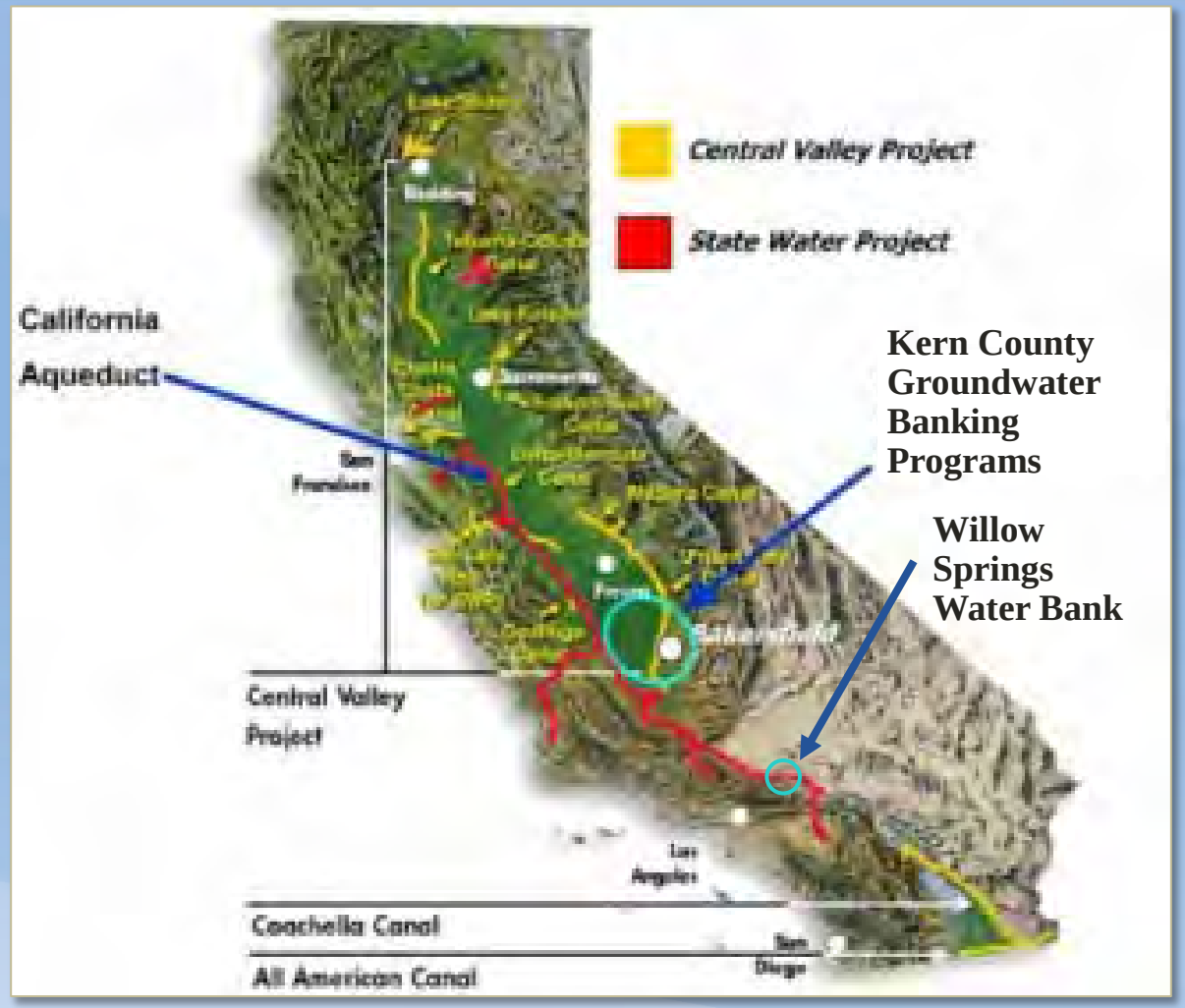
- **What is a Water Bank?**
  - Similar to a financial bank except for water
  - Water is stored or banked underground in times of surplus
  - Water is extracted and delivered to Beverly Hills in times of need — normally, a MWD allocation or possibly an outage of a well
  - You can only draw out what you put in
  - Extraordinary supplies are exempt from MWD allocation formula
  - Buy shares in the bank based on the amount of water you store
  - Can sell shares and/or stored water at market value
  - Can put water in, withdraw, and put water back in for future use

TYPICAL WATER BANK



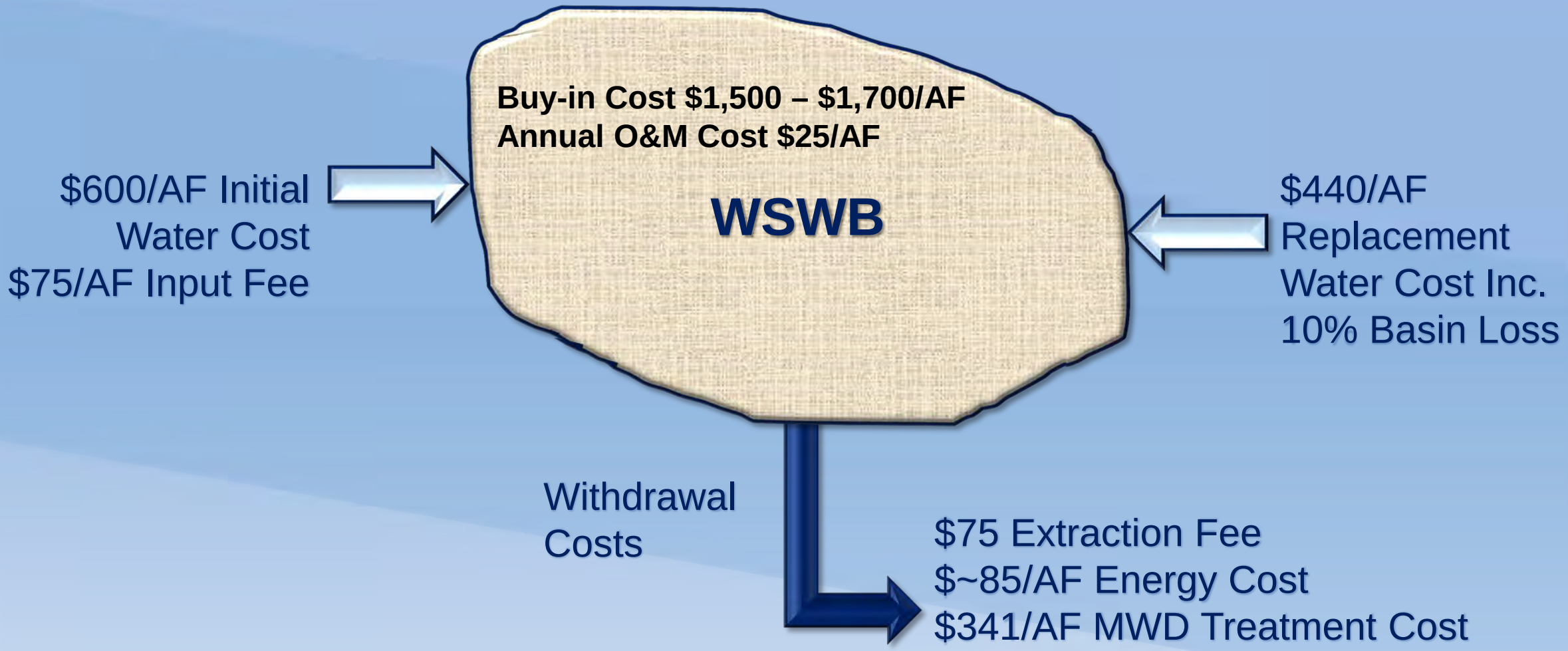
CURRENT WATER BANKS

- Kern Water Bank
- Semitropic Water Bank
- Rosedale-Rio Bravo Water Bank
- Willow Springs Water Bank

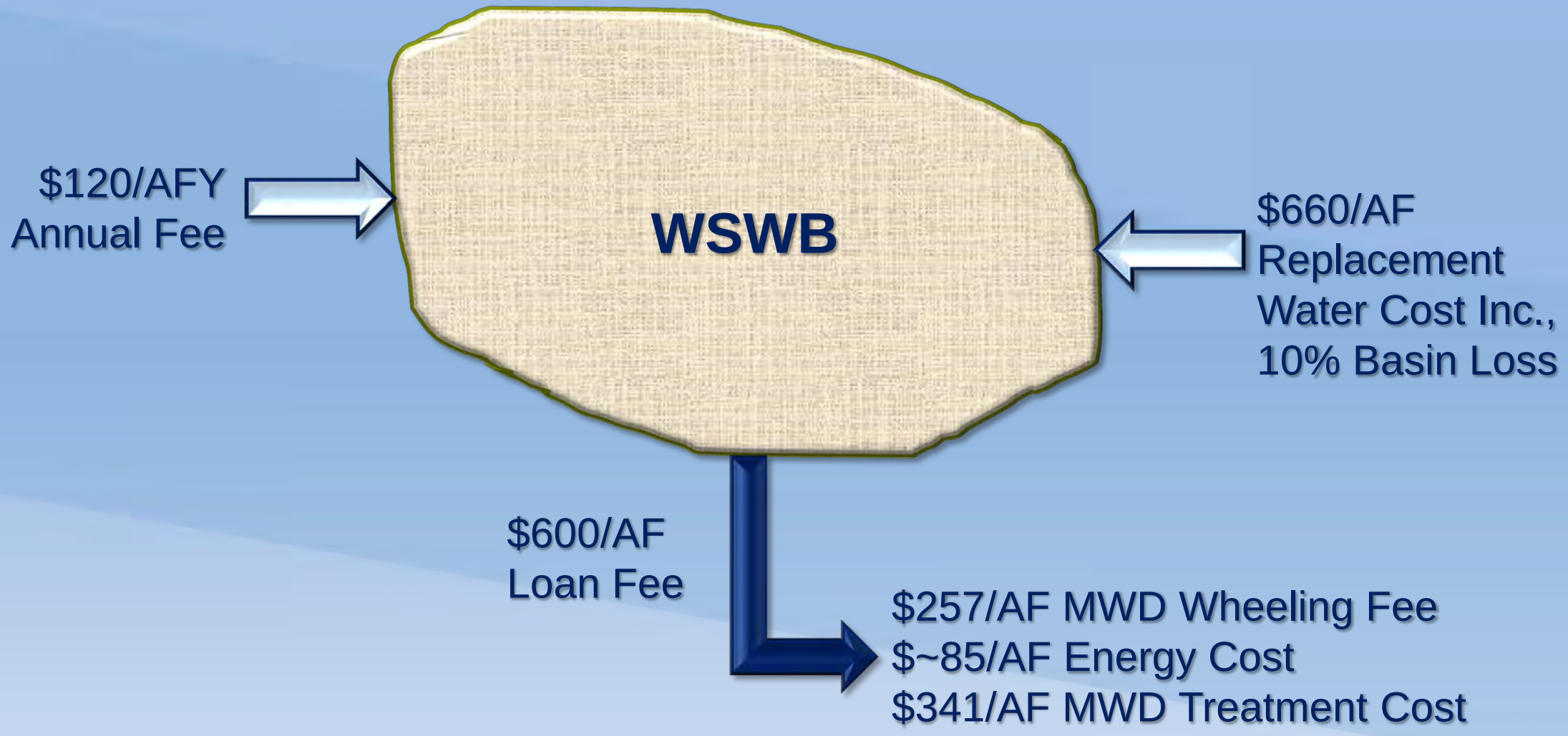


WILLOW SPRINGS WATER BANK

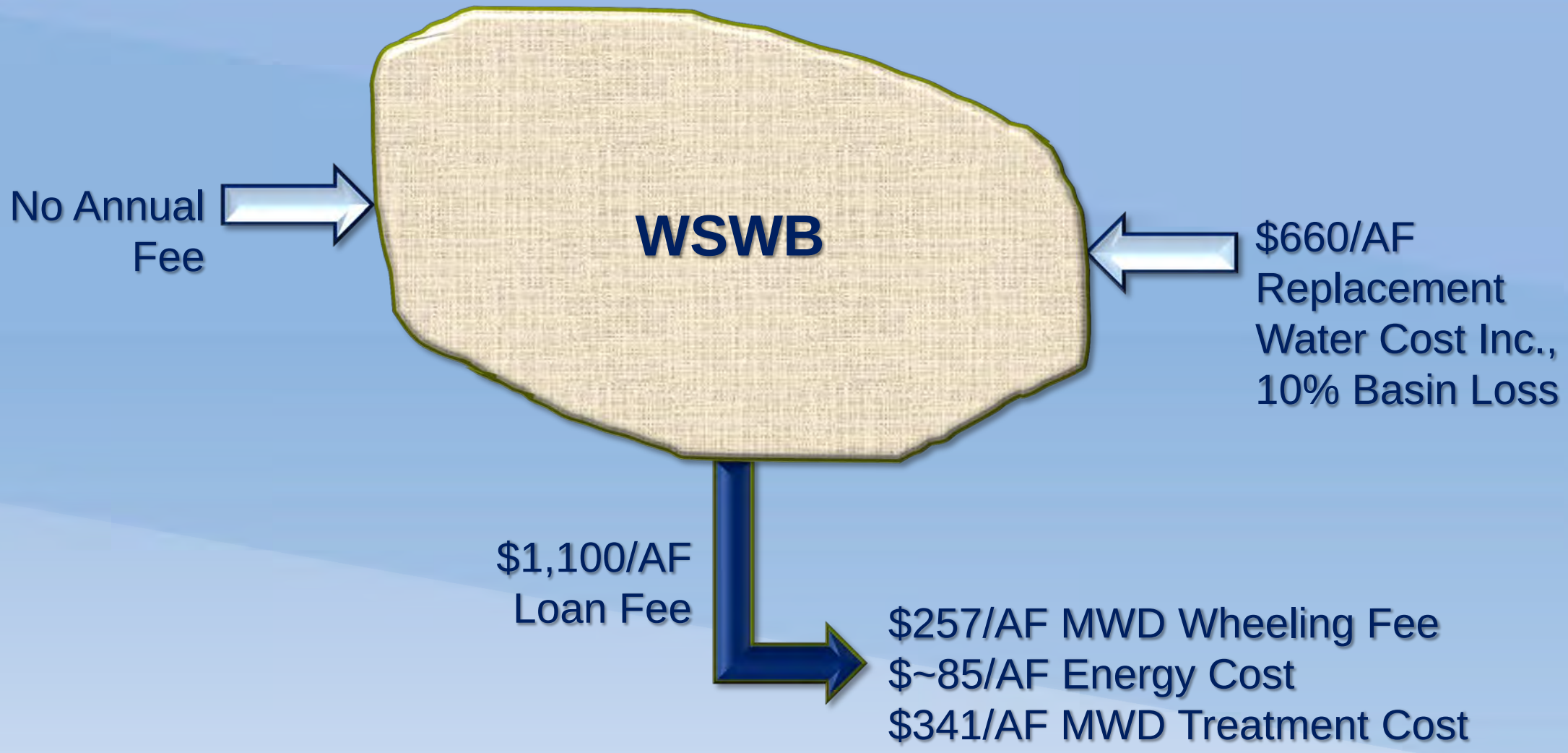
WATER BANKING SCHEMATIC



DROUGHT INSURANCE SCHEMATIC



SPOT WATER LOAN SCHEMATIC



HOW IT IS DELIVERED TO BEVERLY HILLS

WATER BANK / DROUGHT INSURANCE / SPOT WATER LOAN

Cost Summary

CONCEPT	Recommended Option WATER BANKING	DROUGHT INSURANCE	DROUGHT INSURANCE	SPOT WATER LOAN
	3,400 AF of Storage, 1,700 AF Put/Take, 2 Per 5 Years Over 30 Years, $/AF	1,700 AF, 4 Years, 2 Calls, $/AF	1,700 AF, 4 Years, 0 Calls, $/AF	1,700 AF Per Call 2 Calls, $/AF
Annual Fee	N/A	$480	$480	N/A
Loan Fee	N/A	$600	$0	$1,100
Buy-In	$231	N/A	N/A	N/A
Annual O&M	$125	N/A	N/A	N/A
Initial Water Purchase	$173	N/A	N/A	N/A
Input/Extract Fee	$172	N/A	N/A	N/A
Energy Cost (est.)	$85	$85	$0	$0
MWD Wheeling Cost	N/A	$257	$0	$257
MWD Treat Cost	$341	$341	$0	$341
Bank Pay-Back Cost	$440	$660	$0	$660
Total / AF	$1,567	$2,423	(1)	$2,358
MWD WSAP Penalty Rate	$2,403	$2,403	$2,403	$2,403
Total Overall Cost	**$5,015,000 (2)**	**$8,238,200 (3)**	**$1,632,000 (3)**	**$8,017,200 (3)**

(1) No Water Delivered

(2) 30-year long-term program initial capital costs only

(3) Four year short-term program total cost over four years

BANKING RECOMMENDATIONS AND IMPLEMENTATION TIMELINE

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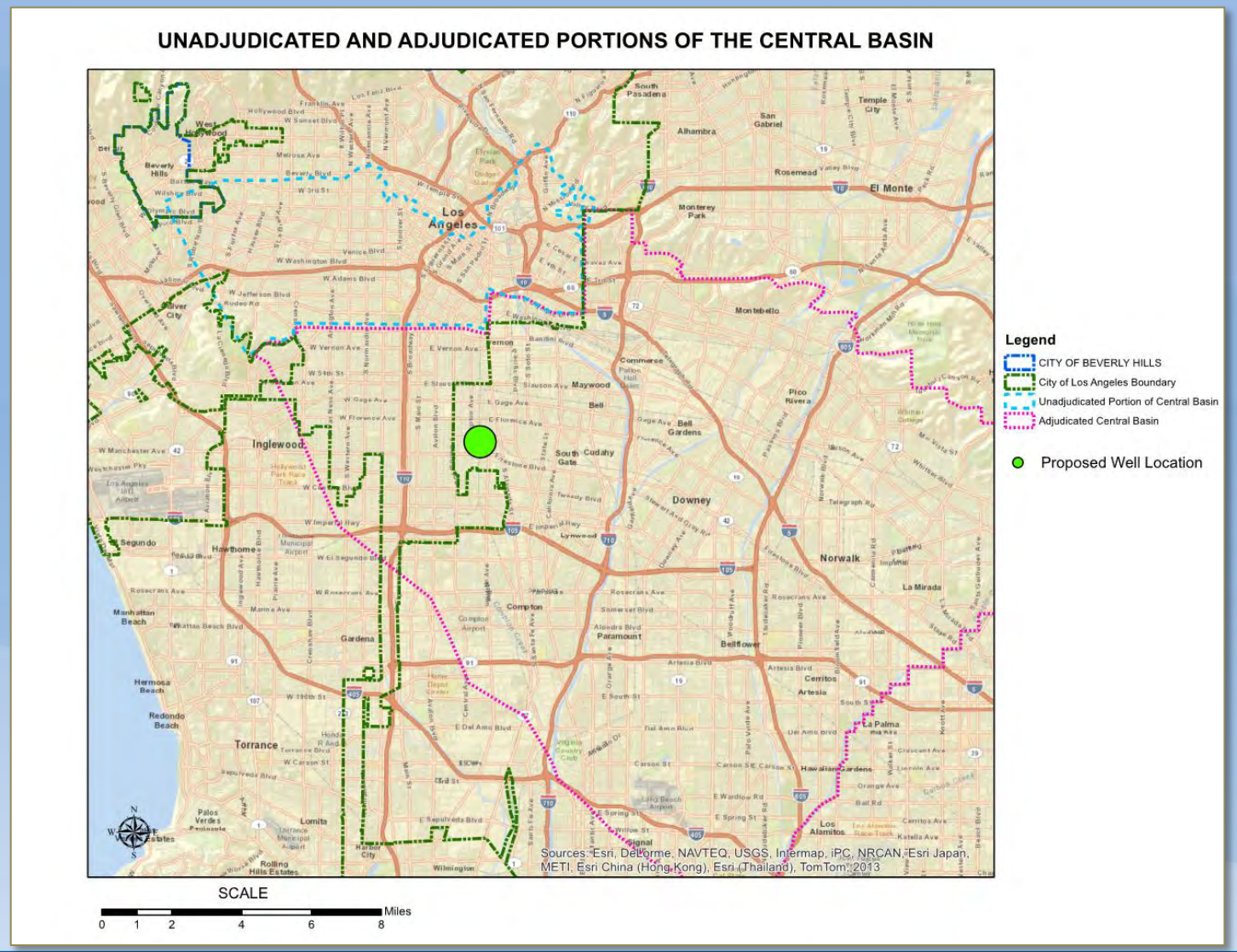
WATER EXCHANGE



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WATER EXCHANGE COST SUMMARY

	CAPITAL COST	COST PER AF
Production: 1,000 GPM and 1,200 AFY		
Capital Costs		
Purchase Central Basin Water Rights	$14,400,000	
Purchase Land and Develop Well, Pumping Facilities and Connector Pipeline	$3,605,000	
Subtotal	**$18,005,000**	**$761**
O&M Costs		
Capital Facilities		$750
Power		$123
WRD Replenshment Fee		$268
Subtotal		**$1,141**
Total Capital and O&M		**$1,902**
25% Contingency		$475
LADWP Wheeling Fee		$200
Grand Total		**$2,577**

Questions for John?

Mike Swan, PE, ENV SP
WATER CONSERVATION

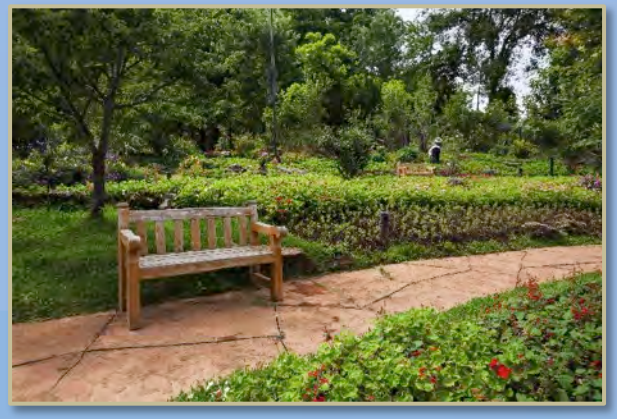
SBx7-7 WATER CONSERVATION

- **Goal**
  - Year 2020 target of 231 gpcd equates to usage of 11,200 AFY, a reduction of 1,175 AFY from current per capita use
  - Requires conservation of approximately an additional 200 AF each year for next six years (~1,200 AF)
- **Recommended Program**
  - Analytic/Public Engagement Water Conservation Programs, such as **Waterfluence** for Public/Quasi Public customers and **Triton** for single family residential customers
  - System Loss Reduction/Operational Enhancement Program, such as **TaKaDu**

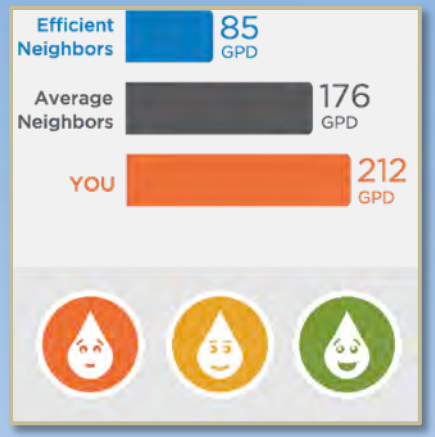
SBx7-7 WATER CONSERVATION

- **Enhanced supplemental rebates**
  - Rotary sprinkler nozzles
  - Smart irrigation controllers
  - Commercial High Efficiency Toilets (HET)/waterless urinals
  - Residential HETs
  - Turf removal/landscape conversions
  - Commercial plumbing, food service and cooling tower retrofits
  - Residential clothes washers

SBx7-7 WATER CONSERVATION



- **Public/Quasi Public Analytic/Engagement Program**
  - Targets large landscape irrigation users (i.e., parks, schools, HOAs, and hotels)
  - Provides site surveys, recommendations, sets water budgets, and tracks progress/savings
  - Achieves 25 – 32% savings—savings estimated at 165 AFY, which could be phased over three to five years



- **Residential Analytic/Engagement Program**
  - Targets single-family households
  - Uses analytics and customer engagement
  - Provides up to 5% savings estimated at 265 AFY, which could be achieved after two years with additional savings in future years (325 AF at 5 years)

SBx7-7 WATER CONSERVATION

- **System Loss Reduction/Operations Enhancement**
  - Targets unaccounted-for water (system leaks) with enhanced O&M benefits
  - CBH's current 7% water loss rate could be reduced to 5 - 6%, for a savings of approximately 240 AFY
- **Enhanced Supplemental Rebate Programs**
  - Rebates and other programs to achieve savings of nearly 100 AFY

SBx7-7 WATER CONSERVATION

Costs

- **Analytic/Engagement Programs**
  - **Waterfluence:** ~ $140/AF over five years

	SET-UP	ANNUAL	YEAR TOTAL
Year 1 (35 sites)	$5,000	$2,500	$7,500
Year 2 (additional 10 sites)	$1,500	$750 + $2,500	$4,750
Year 3 +	$0	$3,250	$3,250

  - **Triton** (7,000 Single Family Residences): ~ $750/AF over five years
    - Year 1: $30,000 set-up + $42,000 annually = $72,000
    - Year 2 +: $42,000 annually

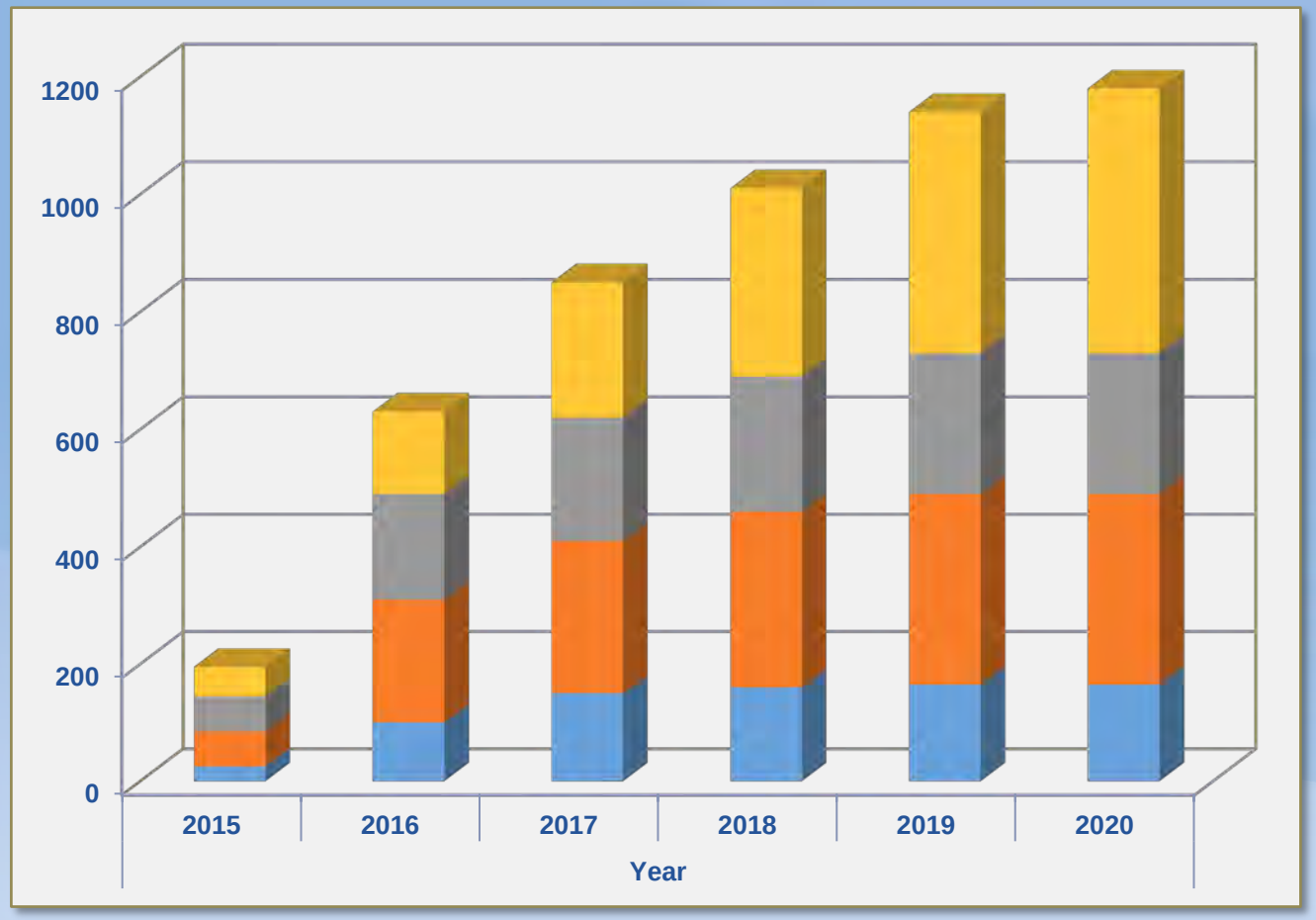
SBX7-7 WATER CONSERVATION

Costs

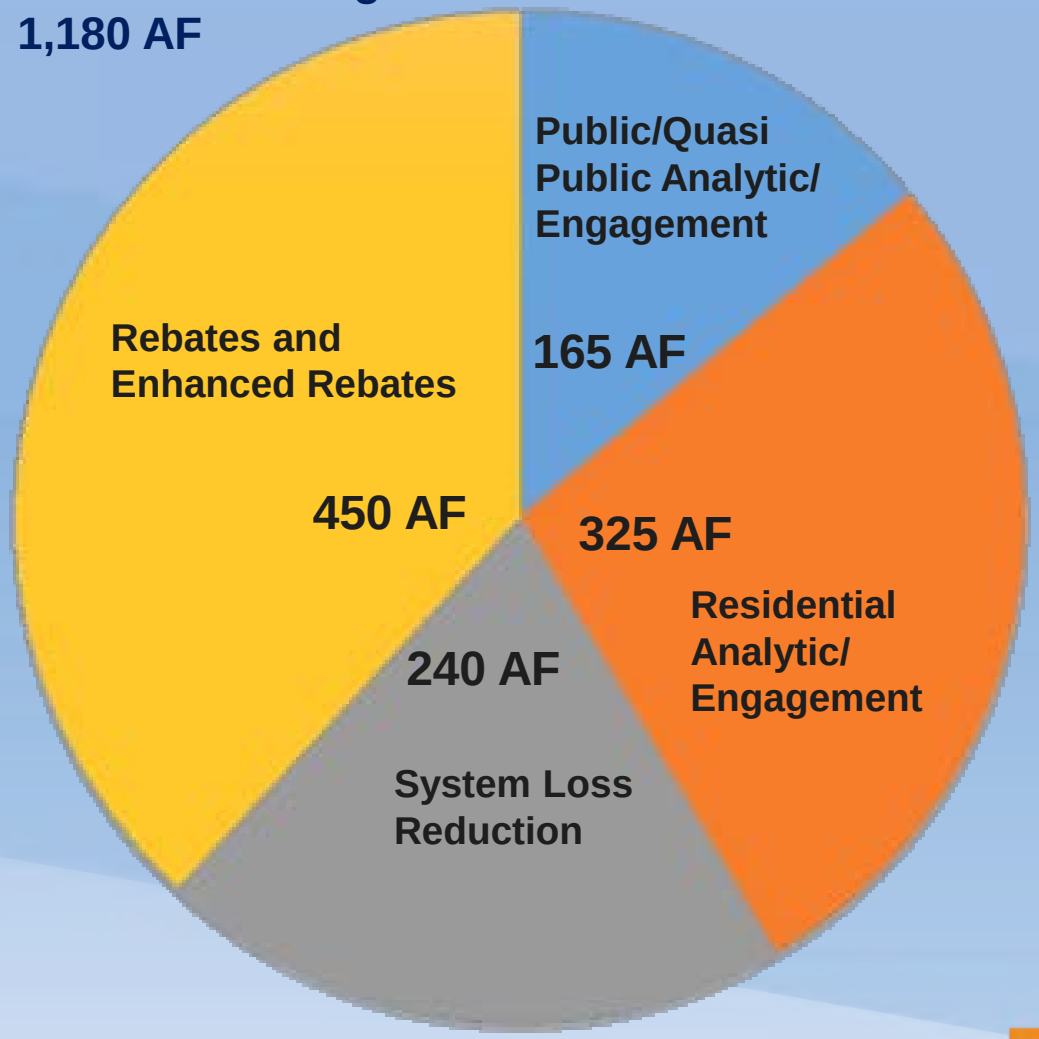
- **System Loss Reduction: ~ $1,250/AF over two years**
  - Year 1: Meters and Set-up + $120,000 annually = $180,000
  - Year 2+: $120,000 annually
- **Enhanced Supplemental Rebates Programs: ~ $1,000/AF**
  - Variable: $50 to $2,500/AF
  - At $1,000/AF = $100,000 annually
- **Budget for full-time Water Conservation Coordinator**

TOTAL CONSERVATION

2015 – 2020



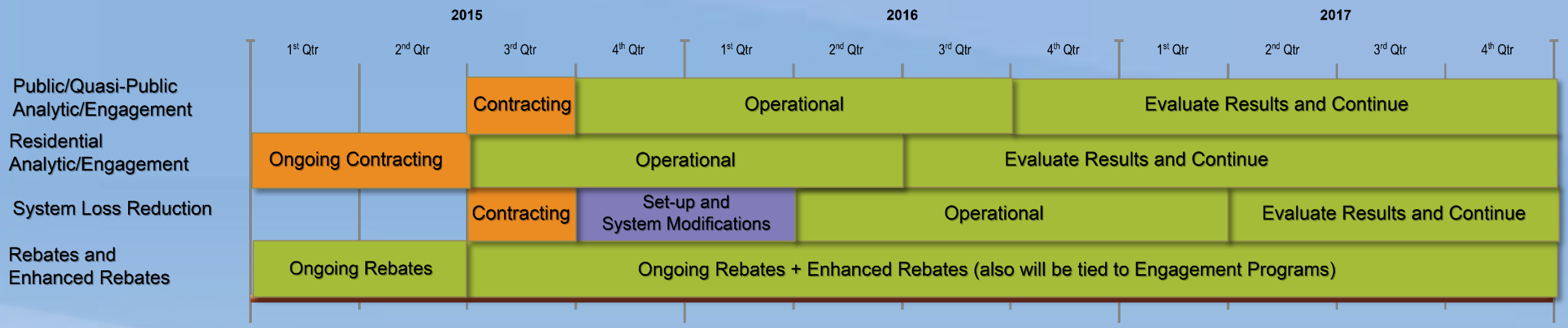
Total Conservation Savings
1,180 AF



CONSERVATION BEYOND 2020

- **Based on results of SBx7-7 programs**
  - Continue to implement beyond 2020
  - Conservation savings likely to decline
  - Cost per acre foot will increase
  - Evaluate annually
  - Do not count on additional conservation in water planning at this time
  - Demand for 10-year planning purposes would be 11,313 AFY

TEN-YEAR CONSERVATION TIMELINE

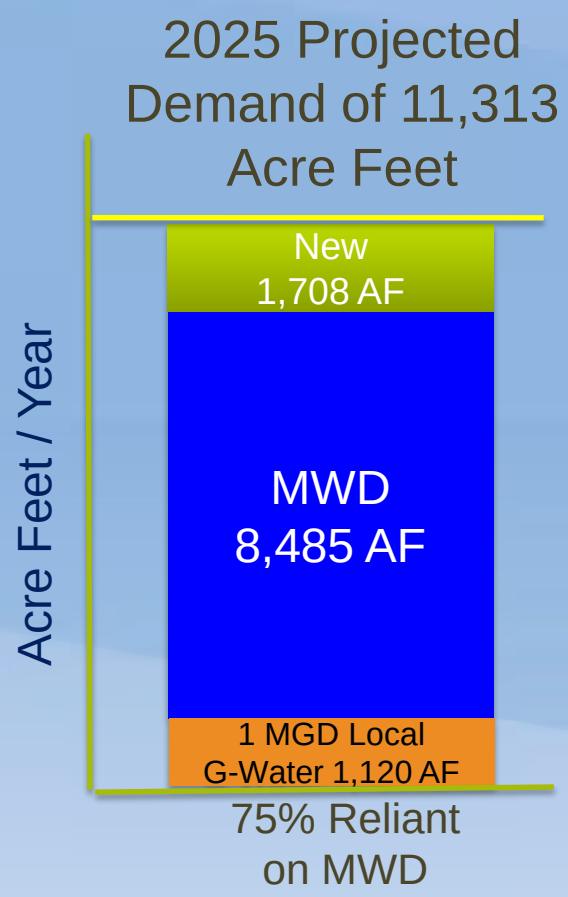


Questions for Mike?

Harvey Gobas, PE, ENV SP

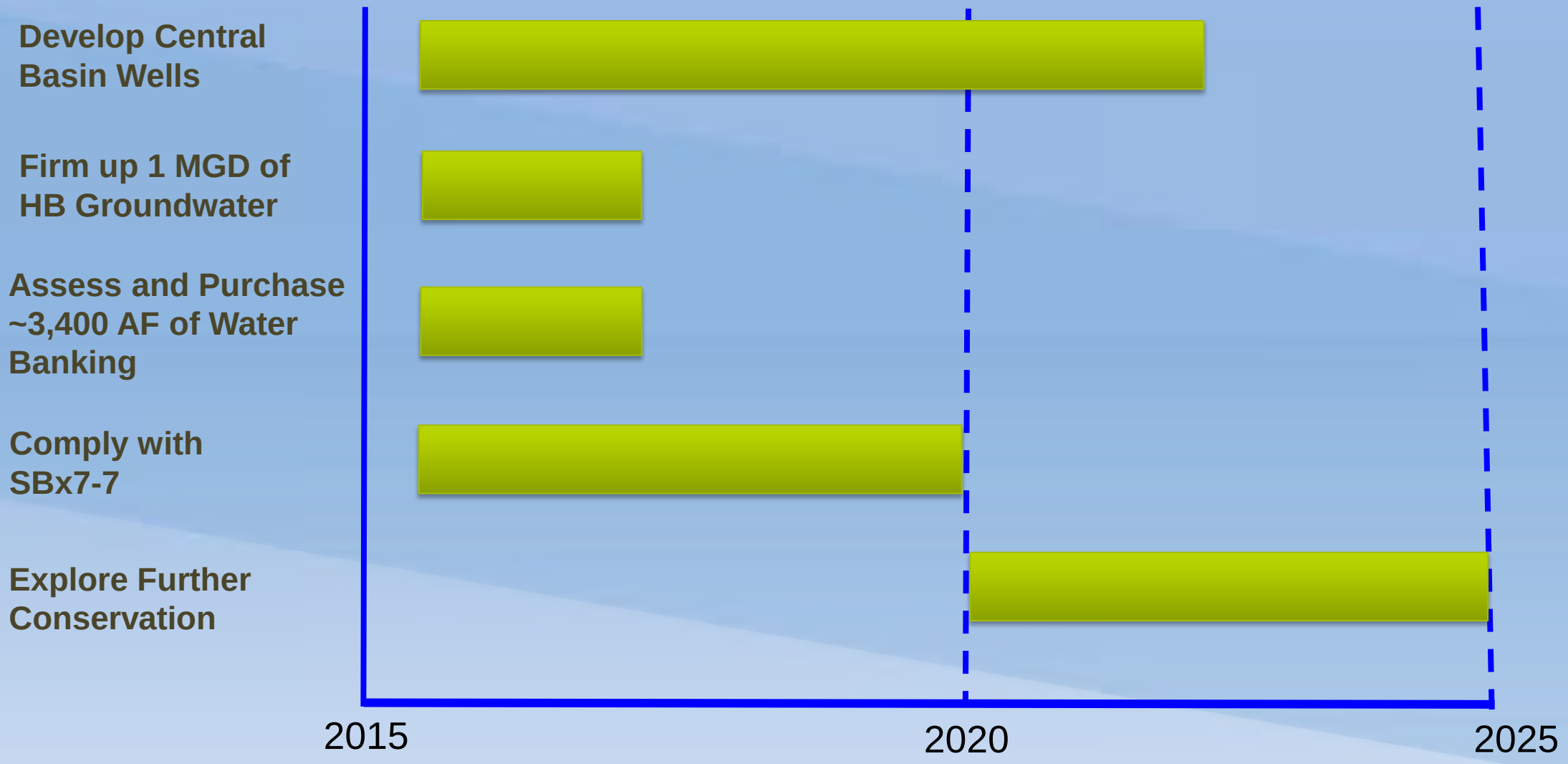
SUMMARY

WHAT TEN-YEAR LEVEL OF RELIABILITY SHOULD WE PLAN FOR?



- **Water supply – 25% local supply portfolio**
  - Achieve 1 MGD (1,120 AF) current RO plant production
  - MWD – 8,485 AF
  - Central Basin groundwater development – ~1,700 AF
- **Water Banking – 3,400 AF (two-year shortage)**
- **Water Conservation – Meet SBx7-7**
- **In Short Term – Conserve as best possible – If unsuccessful, prepare to pay MWD penalty rate**
- **Flexible Approach – Track progress – Revisit as required**

TEN-YEAR PORTFOLIO IMPLEMENTATION TIMELINE



PSOMAS

COST OF RECOMMENDED PORTFOLIO

RECOMMENDED ALTERNATIVE	OVERALL COST IN 2015 DOLLARS
Central Basin Well Development (includes well, pump station, pipeline, treatment plant)	$23,000,000 – $39,000,000
Water Banking	$4,500,000 – $5,500,000
SBx7-7	$1,000,000 – $1,500,000
Total Overall Cost (rounded)	**$28,500,000 – $46,000,000**

Note: Upper end of range includes a 20% contingency. Central Basin Well Development costs also incorporate the range of options previously discussed, i.e., delivering well water to the existing RO WTP, constructing a new WTP, or exchanging water with LADWP.

PSOMAS

COST OF RECOMMENDED STAFFING

RECOMMENDED STAFFING	FISCAL YEAR NEEDED	COST IN 2015 DOLLARS (including Benefits)
Water Conservation Coordinator (Full Time)	2014/15	$140,000
Project Managers (3 Full Time)	2014/15 to 15/16	$525,000
Water Resources Manager (Full Time)	2015/16	$200,000
Water Treatment Operators (3 Full Time)	2017/18	$400,000
Pump/Well Mechanic (Full Time)	2017/18	$100,000
Pump/Well Electrician (Full Time)	2017/18	$100,000
Water Distribution Operator (Full Time)	2017/18	$100,000
Total Recommended Staffing Cost		**$1,565,000**

SCHEDULE AND NEXT STEPS

- **January 2015**
  - Commission and City staff to affirm Psomas' WEP recommendations
  - Council presentation
- **February 2015**
  - Prepare final draft WEP Report and financial plan
- **March 2015**
  - Review final draft WEP Report and financial plan with Staff and Commission
  - Council review
  - Finalize WEP Report and financial plan
  - Present Final WEP Report and financial plan to Commission and Council
- **April 2015**
  - Council adopts WEP Report and financial plan

Feedback from Commissioners?

PSOMAS

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Santa Ana, CA 92717
www.Psomas.com

BEVERLY HILLS

Appendix J

Summary of Past and Projected Water Supply Production and Consumption

Beverly Hills Total Water Production

Total Water (AF)	2007	2008	2009	2010	2011	2012	2013	2014
January	124.4	97.8	114.8	78.4	80.0	48.1	144.7	86.1
February	108.0	94.6	122.9	104.8	-	106.3	93.8	58.1
March	128.0	117.8	87.0	71.0	-	44.9	110.7	69.4
April	106.8	97.5	-	27.0	7.0	14.5	6.4	58.5
May	114.5	87.0	132.7	96.0	82.0	50.5	-	27.2
June	109.5	112.2	119.4	85.0	92.0	140.8	56.6	74.1
July	114.2	83.7	130.5	87.0	139.3	130.4	-	
August	113.5	-	132.7	100.0	97.9	6.2	-	
September	107.3	-	46.9	97.0	81.4	-	95.4	
October	111.5	-	101.9	105.0	106.0	124.2	95.4	
November	107.1	73.4	107.8	102.0	106.0	59.9	73.6	
December	113.2	118.5	106.3	67.0	89.7	49.3	66.1	
Total Plant Production	1,358.0	882.5	1,202.9	1,020.2	881.3	775.1	742.7	373.5
Imports	12,775.5	12,291.5	10,860.3	10,184.1	10,247.3	11,030.1	12,102.1	
Total Production	14,133.5	13,174.0	12,063.2	11,204.3	11,128.6	11,805.2	12,844.8	
FY Plant Production		1,273.64	852.40	1,088.30	819.00	1,025.40	782.15	704.04
% MWD Water	90.4%	93.3%	90.0%	90.9%	92.1%	93.4%	94.2%	#DIV/0!

Consumption

	Fy 05/06	Fy 06/07	Fy 07/08	Fy 08/09	Fy 09/10	Fy 10/11	Fy 11/12	Fy 12/13	FY 13/14
COMMERCIAL	992,163	1,025,149	974,294	959,890	921,091	883,381	894,488	925,346	957,436
R-MULTI	1,227,062	1,231,505	1,183,925	1,162,120	1,112,064	945,352	932,366	946,732	1,080,356
R-SINGLE	2,841,440	3,121,778	2,956,585	2,861,403	2,535,765	2,312,164	2,412,358	2,508,500	2,713,487
TOTAL (ccf)	5,231,130	5,574,096	5,283,400	5,150,773	4,711,925	4,542,261	4,665,208	4,838,662	4,961,676
Acre Feet (AF)	12,009	12,796	12,129	11,825	10,817	10,428	10,710	11,108	11,390
% Change		7%	-5%	-3%	-9%	-4%	3%	4%	3%

Water Loss Calculation

Total Production (from MWD Data)	13,453.0	12,652.9	11,561.6	11,068.0	11,438.8	11,892.7	12,269.1
Sales/Consumption	12,129	11,825	10,817	10,428	10,710	11,108	11,390
Water Loss	1,323.98	828.35	744.51	640.40	728.96	784.66	878.66
Water Loss %	9.8%	6.5%	6.4%	5.8%	6.4%	6.6%	7.2%

Member Agency: Beverly Hills

Fiscal Year: 2007

	Full Service	Local Projects	Totals
July	1,354.70	63.5	1,418.20
August	1,334.10	90.6	1,424.70
September	1,195.80	93	1,288.80
October	1,057.30	96.6	1,153.90
November	981.2	100.8	1,082.00
December	937.8	95.3	1033.1
January	919.7	124.4	1044.1
February	770.5	108	878.5
March	974.2	128	1,102.20
April	975.90	106.8	1,082.70
May	1,151.00	114.5	1,265.50
June	1,123.30	109.5	1,232.80
	12,775.50	1,231.00	14,006.50

Member Agency: Beverly Hills

Fiscal Year: 2008

	Full Service	Local Projects	Totals
July	1,259.90	114.2	1,374.10
August	1,273.40	113.5	1,386.90
September	1,213.60	107.3	1,320.90
October	1,080.00	111.5	1,191.50
November	942.5	107.1	1,049.60
December	778.7	113.2	891.9
January	763.7	97.8	861.5
February	663.8	94.6	758.4
March	944.5	117.8	1,062.30
April	1,003.90	97.5	1,101.40
May	1,125.90	87	1,212.90
June	1,129.40	112.2	1,241.60
	12,179.30	1,273.70	13,453.00

Member Agency: Beverly Hills

Fiscal Year: 2009

	Full Service	Local Projects	Totals
July	1,219.80	83.7	1,303.50
August	1,310.10	0	1,310.10
September	1,218.50	0	1,218.50
October	1,244.70	0	1,244.70
November	966.4	73.4	1,039.80
December	700.8	118.5	819.3
January	830.1	114.8	944.9
February	569.2	122.9	692.1
March	865.5	87	952.50
April	950.10	0	950.10

May	1,044.70	132.7	1,177.40
June	880.60	119.4	1,000.00
	11,800.50	852.40	12,652.90

Member Agency: Beverly Hills Fiscal Year: 2010

	Full Service	Local Projects	Totals
July	1,016.80	130.5	1,147.30
August	1,009.60	132.7	1,142.30
September	1,107.90	46.9	1,154.80
October	928.6	101.9	1,030.50
November	857.2	107.8	965
December	710.6	106.3	816.9
January	707.7	78.4	786.1
February	609.9	104.8	714.7
March	763.1	71	834.1
April	891.8	27	918.8
May	921.2	96	1,017.20
June	948.9	85	1,033.90
	10,473.30	1,088.30	11,561.60

Member Agency: Beverly Hills Fiscal Year: 2011

	Full Service	Local Projects	Totals
July	1,035.30	87	1,122.30
August	1,038.10	100	1,138.10
September	984.10	97	1,081.10
October	788.00	105	893.00
November	803.1	102	905.10
December	692.9	67	759.9
January	694.5	80	774.5
February	704.1	0	704.1
March	747.9	0	747.90
April	899.70	7	906.70
May	936.80	82	1,018.80
June	924.50	92	1,016.50
	10,249.00	819.00	11,068.00

Member Agency: Beverly Hills Fiscal Year: 2012

	Full Service	Local Projects	Totals
July	986.3	139.3	1,125.60
August	1,048.00	97.9	1,145.90
September	998.1	0	998.1
October	873.4	105.7	979.1
November	683.8	105.9	789.7
December	750.2	89.7	839.9

January	810.5	48.1	858.6
February	717.7	106.3	824
March	852.5	44.9	897.4
April	842.7	14.5	857.2
May	962.8	50.5	1,013.30
June	969.2	140.8	1,110.00
	10,495.20	943.6	11,438.80

Member Agency: Beverly Hills Fiscal Year: 2013

	Full Service	Local Projects		Totals
July	1,031.30	130.4		1,161.70
August	1,207.50	6.2		1,213.70
September	1,138.60	0		1,138.60
October	984.3	124.2		1,108.50
November	892	60		952
December	621	49.2		670.2
January	717.6	140.6	45.82	858.2
February	669.2	94.6	30.83	763.8
March	821.7	107.2	34.94	928.9
April	962.9	9.5	3.10	972.4
May	1,047.30	0	0.00	1,047.30
June	1,020.80	56.6	18.45	1,077.40
	11,114.20	778.5		11,892.70

Member Agency: Beverly Hills Fiscal Year: 2014

	Full Service		Local Projects		Totals
July	1,185.50		0	0.00	1,185.50
August	1,184.40		0	0.00	1,184.40
September	1,060.60		95.3	31.06	1,155.90
October	1006.1		92.3	30.08	1,098.40
November	865.7		75.5	24.61	941.2
December	822.5	6,124.80	66.2	21.57	888.7
January	865.5		86.8	240.45	952.3
February	736.8		59.5		796.3
March	781.4		75.7		857.1
April	929		58.5		987.5
May	1,155.90		27.3		1,183.20
June	1,038.60	5,507.20	0		1,038.60
	11,632.00		637.1		12,269.10

Cost $10,089,114

Fiscal Year 2015

	Full Service	Local Projects	Totals
July	1,210.60	0	1,210.60
August	1,169.60	0	1,169.60
September	1,089.90	39.8	1,129.70
October	1037.5	47.7	1,085.20

Plant Production

853.3	average last 5 years	**Total Supply**	
952.95	average last 8 years	12,292.83	7.8%
		7.8%	

Service Area Population Estimates

	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2020	2025
Total West Hollywood	35,171	35,113	35,174	35,394	35,700	35,869	36,154	36,178	36,255	36,008	35,297	34,906	34,616	34,462	34,481	34,600	34,699	34,875	35,072	35,100	35,433
West Hollywood in Service Area from 2010 Census Block Compilation															8,043						
Percentage of West Hollywood in Service Area															23.33%						
West Hollywood in Service A	8,204	8,190	8,205	8,256	8,327	8,367	8,433	8,439	8,457	8,399	8,233	8,142	8,074	8,039	8,043	8,071	8,094	8,135	8,181	8,187	8,265
Beverly Hills	32,327	32,480	32,711	33,035	33,655	34,155	34,370	34,595	34,690	34,567	34,308	34,210	34,028	34,084	34,136	34,174	34,309	34,515	34,677	35,000	35,433
Total Service Area Pop	**40,531**	**40,670**	**40,916**	**41,291**	**41,982**	**42,522**	**42,803**	**43,034**	**43,147**	**42,966**	**42,541**	**42,352**	**42,102**	**42,123**	**42,179**	**42,245**	**42,403**	**42,650**	**42,858**	**43,187**	**43,698**

Sources: Population Estimates from State of California Department of Finance (DOF) E-4 Projections (as of Jan. 1 each year) 1991-2000, 2001-2010, 2011-2014, and 2010 Census Block data. 2020 & 2025 projection from SCAG 2012-2035 RTP/SCS Growth Forecast, adopted April 2012.

SBx7-7 20x2020 Update & Projections

Fiscal Year	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
Water Production (AF)	13,368	13,659	13,139	13,545	14,093	13,598	13,598	13,583	14,042	13,280	13,286
Service Area Population	40,531	40,670	40,916	41,291	41,982	42,522	42,803	43,034	43,147	42,966	42,541
Per Capita Use (gpcd)	294.4	299.8	286.7	292.8	299.7	285.5	283.6	281.8	290.5	275.9	278.8

Fiscal Year	2007	2008	2009	2010	2011	2012	2013	2014	2020	2025
Water Production (AF)	14,007	13,453	12,653	11,562	11,068	11,439	11,893	12,269	11,188	11,313
Service Area Population	42,352	42,102	42,123	42,179	42,245	42,403	42,650	42,858	43,187	43,698
Per Capita Use (gpcd)	295.2	285.2	268.1	244.7	233.9	240.8	248.9	255.6	231.3	231.3

10-yr. Baseline (1996-2005)	**289.1**	gpcd
5-yr. Baseline (2003-2007)	**281.7**	gpcd
2020 Target	**231.3**	gpcd
2015 Interim Target	**260.2**	gpcd

Projections

Using SCAG projected population for service area for 2020 of 43,187 and current per capita usage of 255.6 gpcd, water production required would be 12,363 AFY. Using SBx7-7 target requirement of 231.3 gpcd, the water required would be 11,188 AFY or 1,175 AF less, which would require water conservation programs saving almost 200 AF of water each year for the next six years.

Using SCAG projected population for service area for 2025 of 43,698 (10-year Plan), total water requirement using same 231.3 gpcd target requirement (no additional conservation), would be 11,313 AFY. If City continued conservation at 200 AFY to 2025, demand would be 10,313.

Source: Water Production Data from Metropolitan Water District website and City's 2010 Urban Water Management Plan. Population figures from State of California Department of Finance (DOF) E-4 Projections (as of Jan. 1 each year which is FY mid-point) 1991-2000, 2001-2010, 2011-2014, and 2010 Census Block data.

	at 255.6	at 231.1	% Reductn
2020 Projection (mg)	11.04	9.99	
2020 Projection (AF)	12,363	11,188	9.5%
2025 Projection (mg)	11.17	10.10	
2025 Projection (AF)	12,510	11,313	
If continue to conserve 200 AFY (2021-2025) (AF)		10,313	8.8%
		9,205,941	gallons
		210.7	gpcd

Appendix K

Appendix to Technical Memorandum No. 7

Appendix
to
Technical Memorandum No.7

- Summary of Historical Groundwater Production
- Summary of the Geology and Hydrogeology of the Central Basin

Technical Memorandum

City of Beverly Hills Summary of Historical Groundwater Production

May 6, 2015

Prepared for:
City of Beverly Hills
455 North Rexford Drive
Beverly Hills, CA 90210

Prepared by:
PSOMAS
3 Hutton Centre Drive
Suite 200
Santa Ana, California 92707

SECTION 1 Introduction

The City of Beverly Hills has had a history of groundwater production in both the Hollywood Basin and the adjacent unadjudicated area of the Central Basin referred to as the La Brea Subarea (LBSA). The following discussion presents an overview of the historical groundwater production within these two basins by the City of Beverly Hills.

1.1 Background

The City of Beverly Hills (City) has been and continues to be the only municipal-supply producer of groundwater in the Hollywood Groundwater Basin (Hollywood Basin).

Figure 1, *Local Groundwater Basin Boundaries by DWR*, provides an illustration of the location and boundaries of the Hollywood Basin relative to the official names and locations of the adjoining groundwater basins within the Los Angeles Coastal Plain, as defined by the California Department of Water Resources (DWR, 1965). As shown on Figure 1, the City lies generally within the western portion of the Hollywood Basin, although the southern portions of the City limits extend southward into the LBSA of the Central Groundwater Basin. Adjoining groundwater basins include the Santa Monica Basin to the west, the LBSA of the Central Basin to the south, and the Los Angeles Forebay portion of the Central Basin to the southeast.

Over time, land use within the Beverly Hills — Hollywood Basin area has transformed from undeveloped and agricultural to urban-suburban uses seen today. Approximately 90 percent of the land use in the City's water service area is currently residential; other land usage includes commercial and light industrial developments. Thus, this service area is nearly fully developed.

Concurrent with this significant land use change in the City has been an increase in demand for water throughout its service area. To meet the water needs of this approximately 5.7-square mile water service area, the City initially began purchasing small water companies or water wells owned by others. Eventually, the City began hiring local drilling contractors to drill and construct its own water supply wells. The earliest available records for annual groundwater extractions in and by the City date from approximately 1926, although it is known that groundwater supplies were used by the City as early as the late 19th Century.

Based on a 1975 Draft report by Geotechnical Consultants Inc. (GTC) for the City, at least 250 wells have historically been drilled and subsequently located by DWR within two miles of the City. Of this number, the City reportedly historically drilled and operated on the order of 80 wells for its municipal-supply water system within the Hollywood Basin and the LBSA of the Central Basin to the southwest. Of these approximately 80 known, historically constructed, City-owned wells (as of 1975), at least 37 wells were constructed in the Hollywood Basin with at least 43 additional wells constructed in the LBSA.

Between 1926 and 1941, groundwater represented the only water source for the City. However, in 1941, the City began augmenting its groundwater supply via the purchase of treated surface water imported to southern California from the Colorado River by the Metropolitan Water District of Southern California (MWD). Since 1941, the annual volumes of imported water purchased from MWD by the City have

Legend

- City of Beverly Hills City Limits
- Los Angeles Coastal GW Basins
- La Brea Subarea

N
W E
S

0 1.5 3 6 9 Miles

CA State Plane, Zone 5, NAD 83

Local Groundwater Basin Boundaries

Figure 1

2BEV020200

steadily increased. As of mid-1975 (GTC, 1975), the City's Water Department continued to actively operate seven wells, although none of these wells was actually located within the City limits.

In 1976, the Beverly Hills City Council voted to terminate all groundwater extractions by the City from its then-active water wells at that time, destroy all remaining active wells (at the time of the vote, the City had four active wells in the Hollywood Basin [Melrose A, Sherman 5B, Melrose M and Sherman 6H] and two in the LBSA [Venice and Sentous No. 3]), sell all existing properties where the still-active wells were located, and mothball or destroy its then-existing water treatment plants.

1.2 Current Operations

In the early 1990s, the Beverly Hills City Council decided to renew groundwater production from the areas were the City had previously developed groundwater. Between 1994 and 2001, the City constructed four new production wells in the Hollywood Basin along with a groundwater treatment plant to treat the water produced to acceptable drinking water standards. Section 2 describes the historical groundwater production by the City, and Section 3 describes the design capacity of the Groundwater Treatment Plant.

SECTION 2 Historical Groundwater Production

As previously indicated, the City has produced groundwater from both the Hollywood Basin and the unadjudicated portion of the Central Basin referred to as the LBSA. According to various reports, the (and/or water companies acquired by the City) have extracted groundwater since the early 1900s. Generally, production was low, gradually reaching a maximum of over 10,000 AFY in the 1951-52 time period.

Starting in 1941, the City commenced importing water from MWD. Importing water gradually increased over the years as groundwater production declined and water quality treatment issues increased. The relatively low cost of importing water made continuation of the production from the Hollywood Basin and LBSA less attractive and groundwater production was discontinued in 1976.

In 1994, interest was renewed in developing local groundwater in the Hollywood Basin. A water treatment plant rated at 2.3 million gallons per day (MGD) was built, and four production wells were constructed to support inflow to the treatment plant (see Section 3). Groundwater production commenced in 2000-2001 with an initial production of 405 acre-feet per year (AFY). Subsequent production varied from a high of 1,907 AFY (1.7 MGD) to a low of 637 AFY (0.57 MGD).

Table 1 presents a summary of groundwater production from 1926 to 2014. In general, the majority (~60 percent) of the water produced originated from wells in the LBSA and the remaining groundwater from wells in the Hollywood Basin. On a per well basis, the average production from wells within the LBSA was generally between 50 and 75 percent higher than those within the Hollywood Basin.

An evaluation was conducted from groundwater production data reported for wells during the 1967 period and is presented in Table 2. Average production rates for individual wells were used to compute the estimated production from each groundwater basin based on the estimated percentage that the wells were operational during that period (referred to in Table 2 as "Percent Active"). The "Percent Active" was adjusted until the estimated production matched the actual reported production. For the LBSA, the estimated "Percent Active" value was 85 percent, which is believed to be a reasonable value for an operational well field[1]. For the Hollywood Basin, the estimated "Percent Active" value was 60 percent, which appears to low suggesting that the reported average production rates are too high or that wells in the Hollywood Basin experienced above-average downtime due to maintenance and/or other issues such as water quality[2].

Figure 2 presents the location of production wells operated by the City in 1967. The average production rate for wells in the LBSA in 1967 were 603 gallons per minute (gpm). In general, the deeper wells (greater than 900 feet) exhibited average production rates above 800 gpm. The Hollywood Basin wells exhibited a lower average production rate of approximately 308 gpm.

[1] It would be expected that during the course of a normal year that wells would be rested and/or wells may be placed as out of service for normal maintenance and repairs.

[2] It would not be unexpected that some wells be taken off line due to water quality issues related to water treatment especially during extended dry periods when recharge to the aquifer is low or non-existent and increases in various constituents occurs due to the lack of recharge.

Table 1
Summary of Groundwater Production and Imported Water Purchases by the City of Beverly Hills (a, b)

Fiscal Year	Hollywood Basin				Central Basin (La Brea Subarea)				Total Groundwater Production			Water Purchased from MWD		Total Water Used (ac-ft)
	No. of Wells	Annual Production (ac-ft)	% of Total Ground-water Production	Average Production per Well (ac-ft)	No. of Wells	Annual Production (ac-ft)	% of Total Ground-water Production	Average Production per Well (ac-ft)	Total No. of Wells	MGY	ac-ft	MGY	ac-ft	
1926 (c)	---(d)	---	---	---	---	---	---	---	---	1,124	3,450	0	0	3,450
1927 (c)	---	---	---	---	---	---	---	---	---	1,313	4,030	0	0	4,030
1928 (c)	---	---	---	---	---	---	---	---	---	1,489	4,570	0	0	4,570
1929 (c)	---	---	---	---	---	---	---	---	---	1,603	4,920	0	0	4,920
1930 (c)	---	---	---	---	---	---	---	---	---	2,248	6,900	0	0	6,900
1931 (c)	---	---	---	---	---	---	---	---	---	2,268	6,960	0	0	6,960
1932 (c)	---	---	---	---	---	---	---	---	---	2,049	6,290	0	0	6,290
1933 (c)	---	---	---	---	---	---	---	---	---	2,111	6,480	0	0	6,480
1934 (c)	---	---	---	---	---	---	---	---	---	2,000	6,139	0	0	6,139
1935 (c)	---	---	---	---	---	---	---	---	---	1,842	5,654	0	0	5,654
1936 (c)	---	---	---	---	---	---	---	---	---	2,162	6,635	0	0	6,635
1937 (c)	---	---	---	---	---	---	---	---	---	2,208	6,778	0	0	6,778
1938 (c)	---	---	---	---	---	---	---	---	---	2,216	6,801	0	0	6,801
1939 (c)	---	---	---	---	---	---	---	---	---	2,593	7,958	0	0	7,958
1940 (c)	---	---	---	---	---	---	---	---	---	2,522	7,742	0	0	7,742
1941 (c)	---	---	---	---	---	---	---	---	---	1,198	3,677	0	0	3,677
1941-42	---	---	---	---	---	---	---	---	---	1,226	3,763	938	2,879	6,642
1942-43	---	---	---	---	---	---	---	---	---	1,469	4,509	703	2,158	6,667
1943-44	---	---	---	---	---	---	---	---	---	1,394	4,279	735	2,256	6,535
1944-45	---	---	---	---	---	---	---	---	---	1,282	3,935	843	2,587	6,522
1945-46	---	---	---	---	---	---	---	---	---	1,316	4,039	989	3,036	7,075
1946-47	---	---	---	---	---	---	---	---	---	1,172	3,597	1,385	4,251	7,848
1947-48	---	---	---	---	---	---	---	---	---	1,949	5,982	818	2,511	8,493
1948-49	---	---	---	---	---	---	---	---	---	2,016	6,188	622	1,909	8,097
1949-50	9	4,168	46.4%	463	8	4,808	53.6%	601	17	2,924	8,976	167	513	9,489
1950-51	9	3,597	38.4%	400	8	5,767	61.6%	721	17	3,051	9,364	181	556	9,920
1951-52	9	3,720	39.4%	413	9	5,712	60.6%	635	18	3,073	9,432	597	1,832	11,264
1952-53	11	3,651	34.7%	332	9	6,881	65.3%	765	20	3,431	10,532	424	1,301	11,833
1953-54	11	3,726	38.3%	339	9	5,990	61.7%	666	20	3,165	9,716	318	976	10,692
1954-55	9	3,312	37.0%	368	9	5,641	63.0%	627	18	2,917	8,953	495	1,519	10,472
1955-56	9	3,725	44.4%	414	9	4,659	55.6%	518	18	2,732	8,384	826	2,535	10,919
1956-57	9	3,643	40.9%	405	9	5,259	59.1%	584	18	2,900	8,902	1,174	3,603	12,505
1957-58	9	3,739	39.8%	415	9	5,664	60.2%	629	18	3,063	9,403	661	2,029	11,432
1958-59	9	3,427	42.4%	381	9	4,655	57.6%	517	18	2,633	8,082	888	2,726	10,808
1959-60	9	3,504	41.8%	389	8	4,877	58.2%	610	17	2,731	8,381	1,090	3,346	11,727
1960-61	10	3,300	45.1%	330	8	4,021	54.9%	503	18	2,385	7,321	1,157	3,551	10,872
1961-62	9	2,947	50.2%	327	8	2,924	49.8%	366	17	1,913	5,871	1,435	4,405	10,276
1962-63	9	3,178	35.9%	353	9	5,672	64.1%	630	18	2,883	8,850	1,708	5,242	14,092
1963-64	9	1,531	25.4%	170	8	4,488	74.6%	561	17	1,961	6,019	1,439	4,417	10,436
1964-65	9	2,577	40.0%	286	8	3,863	60.0%	483	17	2,098	6,440	2,080	6,384	12,824
1965-66	9	3,518	52.2%	391	8	3,218	47.8%	402	17	2,195	6,736	1,983	6,087	12,823
1966-67	8	3,010	42.0%	376	8	4,154	58.0%	519	16	2,334	7,164	1,674	5,138	12,302
1967-68	---	2,940	35.0%	---	---	5,450	65.0%	---	---	2,733	8,390	1,809	5,553	13,943
1969 (c)	---	2,860	38.1%	---	---	4,650	61.9%	---	---	2,447	7,510	2,052	6,298	13,808
1970 (c)	---	2,710	43.6%	---	---	3,540	56.9%	---	---	2,027	6,222	2,702	8,293	14,515
1971 (c)	---	2,400	44.1%	---	---	3,080	56.5%	---	---	1,775	5,448	3,012	9,246	14,694
1971-72	---	---	---	---	---	---	---	---	---	1,824	5,599	3,155	9,685	15,284
1972-73	---	---	---	---	---	---	---	---	---	1,469	4,510	3,862	11,853	16,363
1973-74	---	---	---	---	---	---	---	---	---	1,226	3,763	3,442	10,564	14,327
1974-75	---	---	---	---	---	---	---	---	---	625	1,918	3,862	11,853	13,771
1975-76	---	---	---	---	---	---	---	---	---	353	1,082	3,637	11,164	12,246
1976-77	0	0	---	0	0	0	---	0	0	0	0	4,397	13,496	13,496
1977-78	0	0	---	0	0	0	---	0	0	0	0	4,374	13,426	13,426
1978-79	0	0	---	0	0	0	---	0	0	0	0	4,169	12,796	12,796
1979-80	0	0	---	0	0	0	---	0	0	0	0	4,340	13,321	13,321
1980-81	0	0	---	0	0	0	---	0	0	0	0	4,572	14,034	14,034
1981-82	0	0	---	0	0	0	---	0	0	0	0	4,494	13,793	13,793
1982-83	0	0	---	0	0	0	---	0	0	0	0	4,306	13,218	13,218
1983-84	0	0	---	0	0	0	---	0	0	0	0	4,774	14,654	14,654
1984-85	0	0	---	0	0	0	---	0	0	0	0	4,844	14,869	14,869
1985-86	0	0	---	0	0	0	---	0	0	0	0	4,750	14,578	14,578
1986-87	0	0	---	0	0	0	---	0	0	0	0	4,819	14,791	14,791
1987-88	0	0	---	0	0	0	---	0	0	0	0	4,726	14,506	14,506
1988-89	0	0	---	0	0	0	---	0	0	0	0	4,755	14,594	14,594
1989-90	0	0	---	0	0	0	---	0	0	0	0	4,844	14,867	14,867
1990-91	0	0	---	0	0	0	---	0	0	0	0	4,483	13,760	13,760
1991-92	0	0	---	0	0	0	---	0	0	0	0	3,980	12,216	12,216
1992-93	0	0	---	0	0	0	---	0	0	0	0	4,092	12,559	12,559
1993-94	0	0	---	0	0	0	---	0	0	0	0	4,240	13,014	13,014
1994-95	0	0	---	0	0	0	---	0	0	0	0	4,054	12,442	12,442
1995-96	0	0	---	0	0	0	---	0	0	0	0	4,355	13,368	13,368
1996-97	0	0	---	0	0	0	---	0	0	0	0	4,450	13,659	13,659
1997-98	0	0	---	0	0	0	---	0	0	0	0	4,281	13,139	13,139
1998-99	0	0	---	0	0	0	---	0	0	0	1	4,413	13,545	13,546
1999-2000	0	0	---	0	0	0	---	0	0	0	0	4,591	14,093	14,093
2000-01	0	0	---	0	0	0	---	0	0	0	0	4,430	13,598	13,598
2001-02	4	405	100.0%	101	0	0	---	0	4	132	405	4,430	13,598	14,003
2002-03	4	1,907	100.0%	477	0	0	---	0	4	621	1,907	4,293	13,178	15,085
2003-04	4	1,854	100.0%	464	0	0	---	0	4	604	1,854	3,971	12,188	14,042
2004-05	4	1,362	100.0%	341	0	0	---	0	4	444	1,362	3,883	11,918	13,280
2005-06	4	1,142	100.0%	286	0	0	---	0	4	372	1,142	3,957	12,144	13,286
2006-07	4	1,231	100.0%	308	0	0	---	0	4	401	1,231	4,162	12,776	14,007
2007-08	4	1,273	100.0%	318	0	0	---	0	4	415	1,273	3,968	12,179	13,452
2008-09	4	852	100.0%	213	0	0	---	0	4	278	852	3,844	11,800	12,652
2009-10	4	1,088	100.0%	272	0	0	---	0	4	354	1,088	3,412	10,473	11,561
2010-11	4	819	100.0%	205	0	0	---	0	4	267	819	3,339	10,249	11,068
2011-12	4	944	100.0%	236	0	0	---	0	4	308	944	3,419	10,495	11,439
2012-13	4	779	100.0%	195	0	0	---	0	4	254	779	3,621	11,114	11,893
2013-14	4	637	100.0%	159	0	0	---	0	4	208	637	3,790	11,632	12,269

Notes:
ac-ft = acre-feet; MGY = million gallons per year;
(a) Source: Derived from City of Beverly Hills, 1968; Bookman-Edmonston, 1972; GTC, 1975; RCS, 2011
(b) Some groundwater production prior to 1941 may have been produced by water companies that were later acquired by City of Beverly Hills.
(c) Values reported are for Calendar Year.
(d) --- = Indicates values were not available or unreported.

TABLE 2
ESTIMATED PRODUCTION FROM CITY OF BEVERLY HILLS WELLS FOR 1967 YEAR

State ID No.	LA County Designation	Well Name	Basin	Well Depth (feet)	Screened Interval (feet bgs)	Average Production (gpm) (a)	Percent Active (estimated) (b)	Estimated Production (ac-ft) (c)	Actual Production (ac-ft) (d)
---	---	Chariton No.1	La Brea Subarea	---	---	510	85%	699	---
1/14-32M5	2626T	Cadillac No. 3	La Brea Subarea	735	---	235	85%	322	---
1/14-32L1	2626EE	Venice Well	La Brea Subarea	1010	150-700	970	85%	1,330	---
1/14-32K2	2636F	Sentous No.2	La Brea Subarea	725	318-702	445	85%	610	---
1/14-32K3	2636H	Sentous No.3	La Brea Subarea	910	300-700	855	85%	1,172	---
					Average	**603**	**Sub-Total**	**4,134**	**4,154**
1/14-29D1	2623	City Well 1B	Hollywood	602	144-636	400	60%	387	---
1/14-19J4	2613H	Tatum 1B	Hollywood	530	300-516	200	60%	194	---
1/14-19D5	2602F	Foothill No. 3	Hollywood	660	324-654	430	60%	416	---
1/14-18K4	2611C	Melrose A	Hollywood	---	---	315	60%	305	---
1/14-18H2	2621B	Sherman 6A	Hollywood	472	---	345	60%	334	---
1/14-17D1	2621A	West Knoll Well	Hollywood	---	---	430	60%	416	---
1/14-19D4	2602G	Foothill No. 4	Hollywood	700	320-644	?	60%	0	---
---	2580A	Franklin No. 9	Hollywood	---	---	105	60%	102	---
1/14-18J2	2621E	Melrose M	Hollywood	673	353-673	330	60%	319	---
1/14-17E3	2621G	Sherman 5B	Hollywood	651	300-578	120	60%	116	---
1/14-19R5	2613J	Willows 1B	Hollywood	592	300-580	400	60%	387	---
					Average	**308**	**Sub-Total**	**2,976**	**3,010**
							TOTAL	**7,111**	**7,164**

Notes:

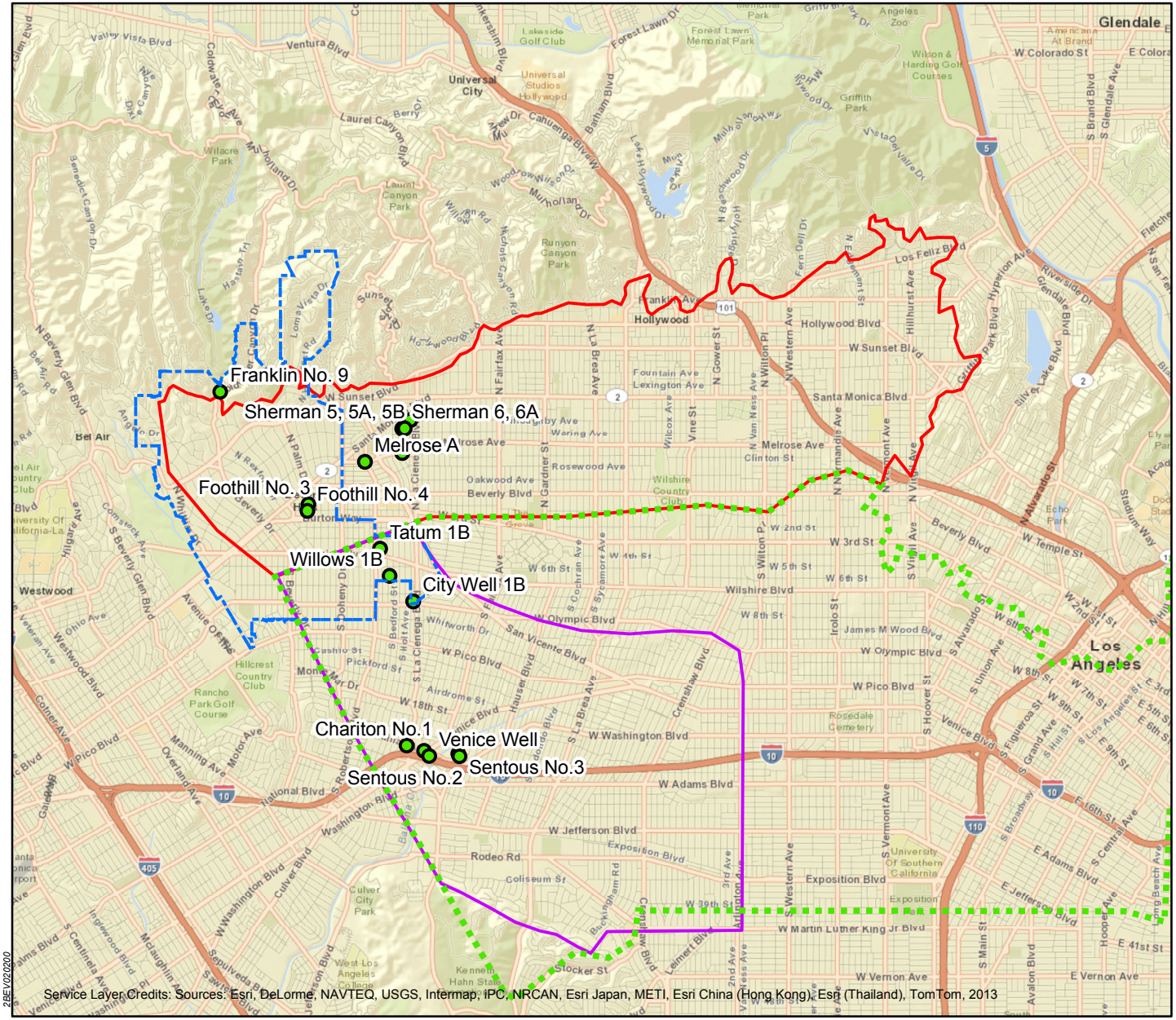
(a) As reported by City of Beverly Hills, 1968.

(b) The estimated percentage that a particular well is active during the year at the average production rate. Value was adjusted so that the estimated production for the year was equivalent to the actual reported production.

(c) The estimated production for the well operating at the stated Percent Active for a year.

(d) The actual production reported for the well by the City of Beverly Hills, 1968.

City of Beverly Hills
Historical Groundwater Production



Legend

- City of Beverly Hills City Limits
- 1968 COBH Wells
- La Brea Subarea
- Hollywood Groundwater Basin
- Unadjudicated Portion of Central Basin

N W E S

0 0.5 1 2 3 Miles

CA State Plane, Zone 5, NAD 83

2BEV020200

Well Location Map

Figure 2

Given that the “Percent Active” value was only 60 percent in comparing Estimated Production to Actual Production (Table 2), the average production rate reported for the Hollywood Basin may be too optimistic and probably should be considered to be less than the calculated value of 308 gpm.

SECTION 3 Groundwater Treatment Plant

The groundwater treatment plant sources water from four wells, all located along Santa Monica Boulevard and connected via a common water main. At the water treatment plant, approximately 60 percent of the feed water is directed to a two-stage reverse osmosis (RO) treatment train, with the remaining 40 percent bypassing that train. The bypass provides a blended final treated water that contains sufficient calcium hardness and alkalinity to maintain a stable final water quality (Hazen and Sawyer, 2014).

The RO system consists of two stages with 20 pressure vessels in the first stage and 10 in the second stage. Each vessel contains seven RO membrane elements. The RO System is physically arranged in three parallel banks of 10 vessels. The water is fed to the first 20 elements (arranged in two banks) where approximately half of the water is produced as a high quality permeate. The concentrate waste from the first stage is further directed to the second stage where additional permeate is produced. Permeate from both stages is blended together to produce a final RO permeate stream. Approximately 78 percent of the feed water becomes treated permeate, with the remaining 22 percent concentrate stream diverted as waste to sewer (Hazen and Sawyer, 2014).

The combined RO permeate and treated bypass water are then blended in a clearwell, where sodium hypochlorite is added to provide a free chlorine in the clearwell. Table 3 provides a summary of the flow components of various design elements of the treatment plant as well as the flow components of the current operations. As can be observed, the current flow into the treatment system is approximately 300 gpm below the level for which the system was designed. In addition, the decrease in permeate efficiency (70 percent versus the design rate of 78 percent) and the lack of continuous operation have decreased the overall plant output from 2,633 AFY to 1,416 AFY.

Assuming the plant achieved full production capability of 2.35 MGD (2,633 AFY) from wells operated in the Hollywood Basin, the plant would require expansion to increase production by another 1,700 AFY (1.52 MGD) to achieve a combined output of 3.87 MGD (4,333 AFY). Table 4 summarizes the design capacity of the plant if the throughput were doubled from original design operations. The theoretical output would be 4.4 MGD or 5,266 AFY.

TABLE 3
Summary of Design and Actual Operations Capacities for Various Components of the City of Beverly Hills Water Treatment Plant (a)

Water Treatment Component	Flow/%	Design (normal) (b)			Design with 15% Increase in TDS (b,c)			Current 2014 Operations		
		gpm	MGD	AFY	gpm	MGD	AFY	gpm	MGD	AFY(d)
Total Plant Feed	Flow	1,874	2.70	3,023	1,896	2.73	3,059	1,597	2.30	1,835
Reverse Osmosis (RO) Feed	Flow	1,098	1.58	1,771	1,200	1.73	1,936	1,218	1.75	1,400
	% of Total Feed	59%	---	---	63%	---	---	76%	---	---
RO Permeate	Flow	856	1.23	1,381	936	1.35	1,510	853	1.23	980
	% of RO Feed	78%	---	---	78%	---	---	70%	---	---
Blend Bypass	Flow	776	1.12	1,252	696	1.00	1,123	379	0.55	436
	% of Total Feed	41%	---	---	37%	---	---	24%	---	---
Reject (RO Brine)	Flow	242	0.35	390	264	0.38	426	365	0.53	419
	% of RO Feed	22%	---	---	22%	---	---	30%	---	---
Total Blended Product	Flow	1,632	2.35	2,633	1,632	2.35	2,633	1,232	1.77	1,416
	% of Total Feed	87.1%	---	---	86.1%	---	---	77.1%	---	---

Notes:
TDS=total dissolved solids; gpm=gallons per minute; MGD=millions of gallons per day; AFY=acre-feet per day
a - Derived from Hazen and Sawyer, 2014.
b - Based on original design operating 7 days per week, 52 weeks per year.
c - Based on original design with a 15 percent increase in concentration of total dissolved solids.
d - Based on plant operating 5 days per week, 52 weeks per year

TABLE 4

Summary of Design and Increased Operations Capacities for Various Components of the City of Beverly Hills Water Treatment Plant

Water Treatment Component	Flow/%	Design (normal) (a, b)			Capacity Doubled from Original Normal Operations (b)		
		gpm	MGD	AFY	gpm	MGD	AFY
Total Plant Feed	Flow	1,874	2.70	3,023	3,748	5.40	6,046
Reverse Osmosis (RO) Feed	Flow	1,098	1.58	1,771	2,196	3.16	3,543
	% of Total Feed	59%	---	---	59%	---	---
RO Permeate	Flow	856	1.23	1,381	1,712	2.47	2,762
	% of RO Feed	78%	---	---	78%	---	---
Blend Bypass	Flow	776	1.12	1,252	1,552	2.23	2,504
	% of Total Feed	41%	---	---	41%	---	---
Reject (RO Brine)	Flow	242	0.35	390	484	0.70	781
	% of RO Feed	22%	---	---	22%	---	---
Total Blended Product	Flow	1,632	2.35	2,633	3,264	4.70	5,266
	% of Total Feed	87.1%	---	---	87.1%	---	---

Notes:
gpm=gallons per minute; MGD=millions of gallons per day; AFY=acre-feet per day
a - Derived from Hazen and Sawyer, 2014.
b - Based on original design operating 7 days per week, 52 weeks per year.

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Technical Memorandum

City of Beverly Hills Summary of the Geology and Hydrogeology of the Central Basin

May 6, 2015

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SECTION
1 Introduction

The following discussion presents an overview of the geology and hydrogeology of the Central Basin.

1.1 Background

The La Brea Subarea (LBSA) of the unadjudicated portion of the Central Basin is a potential water supply alternative being considered by the City of Beverly Hills (City) for future water supply development. The following discussion presents an overview of the geology and hydrogeology that was used to develop a proposed conceptual development plan for the LBSA.

1.2 Purpose

The purpose of the following discussion is to summarize geologic and hydrogeologic information that was used to develop a conceptual development plan for groundwater as an alternative water supply for the City. The information provided is based upon information obtained from existing reports and studies conducted by others; no additional information was collected.

1.3 Description of the Area

The area, shown in Figure 1, lies within the coastal part of the greater Los Angeles metropolitan area. The study area is bounded by the Santa Monica Mountains to the north; the Elysian, Repetto, Montebello, and Puente Hills to the northeast; Orange County to the southeast; and the Pacific Ocean (Santa Monica Bay and San Pedro Bay) and the Palos Verdes Hills to the west and southwest. The coastal basin area incorporates the four coastal groundwater basins in Los Angeles County: the Central Basin, the West Coast Basin, the Hollywood Basin, and the Santa Monica Basin (California Department of Water Resources, 1961).

Legend

- City of Beverly Hills City Limits
- Los Angeles Coastal GW Basins
- La Brea Subarea

N
W E
S

0 1.5 3 6 9 Miles

CA State Plane, Zone 5, NAD 83

Local Groundwater Basin Boundaries

Figure 1

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SECTION 2 Geologic and Hydrogeologic Conditions

The following discussion was based largely on the work conducted by Reichard et al. (2003) and the California Department of Water Resources (DWR; 1959 & 1961) regarding the geology and hydrogeology of the coastal groundwater basins in Los Angeles County.

2.1 Geology

The visible surface features of the coastal plain area of Los Angeles County closely follow the underlying geologic features and conditions. The area-encompasses a broad, gently sloping plain with elevations ranging from sea level to about 250 feet above mean sea level (msl). The plain is adjoined on the north by the Santa Monica Mountains, on the northeast by the Elysian, Repetto, Montebello, Puente, and Coyote Hills; on the southeast it slopes evenly into Orange County. The Palos Verdes Hills rise in the southwest-corner of the plain.

The coastal plain area is divided by a line of low hills which cut across from the northwest to southeast and include the Beverly Hills, the Baldwin Hills, the Rosecrans Hills, Dominguez Hill, and Signal Hill, as shown on Figure 1. This line of hills is a surface manifestation of the so-called Newport-Inglewood Uplift (NIU). This feature has considerable significance with respect to groundwater movement. The coastal plain area lying generally northeast of the uplift is referred to as the Central Basin.

The coastal plain area rests upon a foundation of igneous and metamorphic rock or "basement complex" consisting of metamorphic rocks in the western portion and granitic and metamorphic rocks in the eastern portion. The metamorphic rock resulted from sediments and other rock types that were subjected to a process of heat and pressure and were formed into rock. The granite comprises rock formed by cooling of molten rock masses which rose from great depths as a result of primordial crustal movement.

Overlying this dense foundation rock, sedimentary formations were deposited during the Tertiary period, estimated to have ended about two million years ago. These sediments, having been in place for a very long period and subjected to pressure from overlying materials as well as from seismic movement, have been consolidated and/or cemented into conglomerates, sandstones and shales. These consolidated sediments form a layer over the basement complex, which has a widely varying thickness reaching more than 14,000 feet near Long Beach. As a result of deformation and folding previously referred to, these sandstones and shales are found at varying elevations throughout the area. They make up the-bulk of the Palos Verdes Hills in the Southwest and the Elysian, Repetto, Montebello and Puente Hills which adjoin the coastal plain on the north and east.

During the Pleistocene period (commencing approximately two million years ago), the water-bearing formations of the coastal plain area as they are known today were formed. During the early part of the period (lower Pleistocene), the basement complex and overlying sediments just described were mostly covered by a shallow sea. Into this sea flowed streams which carried sediment from erosion of surrounding granitic mountain masses. Because of the constant building up of deltas and bars by these streams and because of fluctuations in the sea level, the shore line of the sea moved alternately landward and seaward. By this process, layer upon layer of sediments were laid down. These layers are called, as a group, the San Pedro Formation.

During most of the Tertiary period and continuing through the Pleistocene and to the present day, a relatively continuous crustal movement, causing folding and deformation of the area, has been occurring. Commencing near the middle of the Pleistocene period, there appears to have begun an extensive shifting and warping of rock and earth masses within and surrounding the coastal plain area. This activity has produced many of the physiographic features in evidence today. Initially, there was a warping and uplifting of the previously laid down sediments and underlying foundation rock, forming a belt of hills at the northeasterly edge of the coastal plain area separating it from the inland San Fernando and San Gabriel Valleys. These hills included what are now known as the Repetto, Montebello, and Puente Hills. Later in the middle Pleistocene time, there was additional deformation of the coastal plain.

Surface manifestation of this deformation is the line of hills referred to as the NIU (see Figure 2), which runs through the center of the coastal plain comprising the Beverly, Baldwin, Rosecrans, and Dominguez Hills. The sediments that had been laid down were arched up generally along this line, and in places the arching effect was sufficient to break the sediment layers. These breaks resulted in shearing of the sediment layers along approximately vertical planes and these planes or shear zones are called fault zones and often the continuity of these sediment layers was interrupted at these faults.

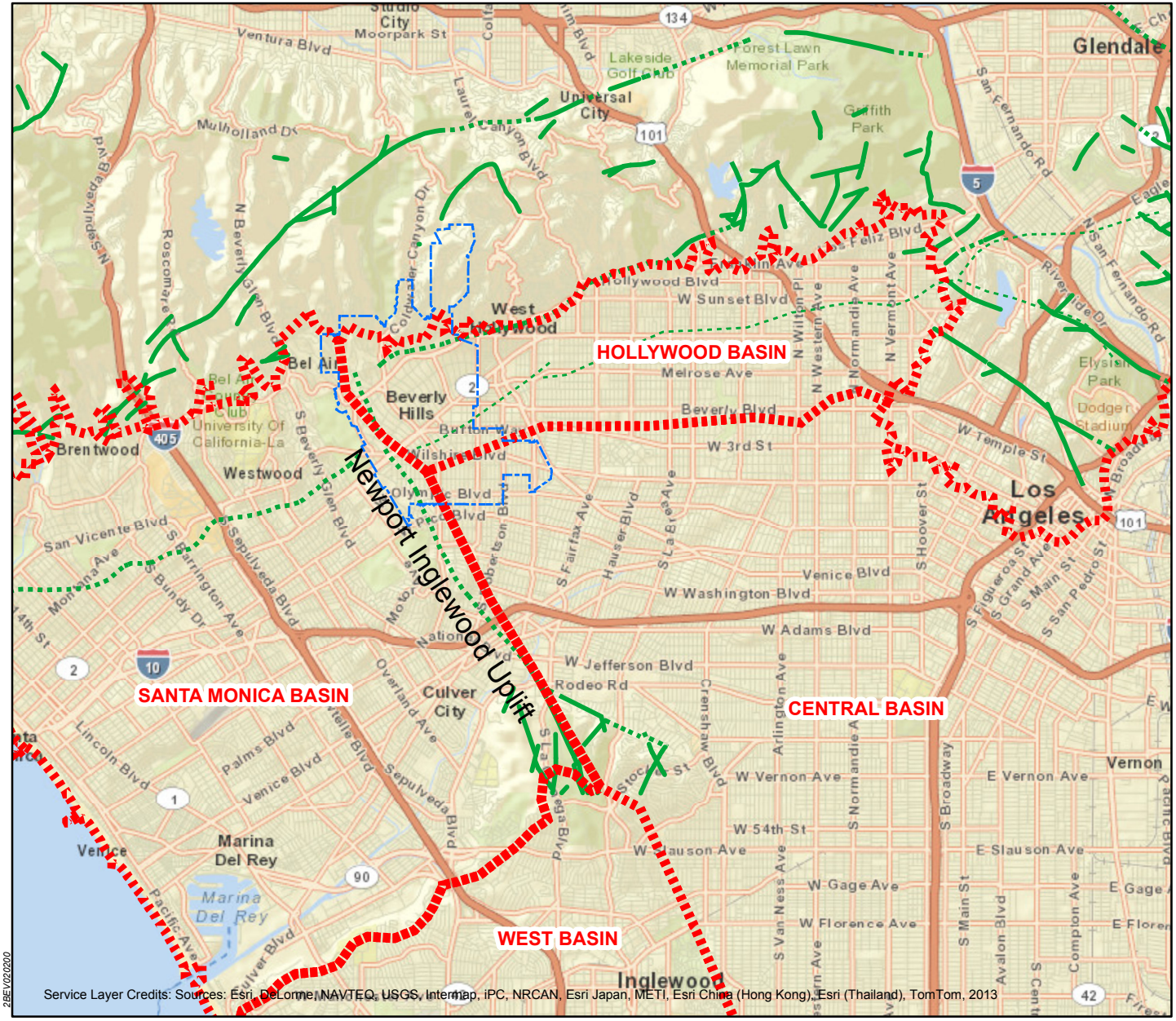
Concurrently with the uplifting, erosional forces began wearing down the upraised hills and the ancestral Los Angeles and San Gabriel Rivers cut through the intermediate belt of hills at the Los Angeles and Whittier Narrows, respectively. The ancestral Los Angeles River apparently occupied many channels crossing the plain cutting through the uplift at Ballona Gap and Dominguez Gap. During the same general time period, The San Gabriel River cut through at Los Alamitos Gap. During the remainder of the Pleistocene period, the coastal plain was a low, 'swampy area over which sediment-laden ancestral Los Angeles and San Gabriel Rivers meandered alternately, eroding and depositing additional layers of sediment. Deposits laid down during this time are described as the Lakewood formation.

Subsequent to the deposition of the sediment layers, a lowering of sea level occurred and the Los Angeles River in particular cut relatively deeply into the coastal plain in the Ballona Gap and Dominguez Gap areas. Later, during what is known as Recent time, sea level rose, flooding the areas where the rivers had cut into the sediments and causing deposition of debris therein. These deposits constitute the Gaspur water-bearing zone in Dominguez Gap area and the "50-foot gravel" in Ballona Gap area.

2.2 Hydrogeology

The deposits of sediment during the Pleistocene and Recent times created in the coastal plain area a loosely consolidated, layered (or stratified) body of sands, gravels, silts, and clays. It is the nature of such deposition in an area covered with water, that coarser materials (sands and gravels) are deposited near the point where the in-flowing stream enters the ponded water, while finer materials (clays and silts) are carried out into the standing water and slowly settle to the bottom.

The continual landward and seaward migration of the shore line alternately inundated and exposed the coastal plain area, resulting in deposition of alternating layers of coarser and finer materials. The coarser materials composed of sands and gravels being highly permeable and the finer materials, composed primarily of silts and clays being less permeable.



Legend

- City of Beverly Hills City Limits
- Los Angeles Coastal GW Basins

Faults

- fault, approx. located
- fault, certain
- fault, concealed
- fault, concealed, queried
- fault, inferred
- fault, inferred, queried
- intruded fault, certain
- North Salt Lake Fault
- Santa Monica Fault

N W E S

0 0.5 1 2 3 4 Miles

CA State Plane, Zone 5, NAD 83

Location of Newport Inglewood Uplift in Relation to Coastal Groundwater Basins

Figure 2

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The coarse-grained deposits underlying the coastal plain, called water-bearing zones or aquifers, contain and transmit the water which are typically extracted by wells. The relatively impermeable layers of the fine-grained deposits generally confine the movement of groundwater to the coarse-grained deposits, or aquifers, as well as inhibiting vertical movement of waters between aquifers or downward from the surface. These fine-grained layers have some far-reaching effects upon the occurrence and movement of groundwater.

The DWR (1961) built on the work of Poland and others (Poland et al., 1956, 1959) and further analyzed the groundwater flow system. Identified aquifers are shown in the stratigraphic column in Figure 3. Reichard et al (2003) identified aquifers that were grouped into four aquifer systems: the Recent, Lakewood, Upper San Pedro, and Lower San Pedro aquifer systems (see Figure 3). The Pico unit also is shown and is defined as a non-transmissive zone that underlies the lower San Pedro aquifer system (Reichard et al, 2003).

The hydrogeologic units that compose the Holocene (Recent) age deposits of the Recent aquifer system include the semi-perched aquifer, the Bellflower aquiclude, the Gaspur aquifer, and the Ballona aquifer (DWR, 1961). Although these hydrogeologic units are referred to in this report as consisting of Holocene-age deposits, some of these units consist of deposits of Pleistocene age. The semi-perched aquifer is a relatively thin layer of coarse sand and gravel near the land surface consisting of alluvial sediments. Because of low yields and poor water quality, little water is pumped from the semi-perched aquifer. Except in parts of the Montebello and Los Angeles Forebay areas, this semi-perched zone is separated from the underlying aquifers by a zone of lower permeability materials referred to as the Bellflower aquiclude. The Bellflower aquiclude is very heterogeneous and includes all of the fine grained sediments that extend from the ground surface or from the base of the semi-perched aquifer, down to the underlying aquifer (DWR, 1961).

The main aquifers of the Lakewood aquifer system are the Exposition, Artesia, Gardena, and Gage aquifers (Figure 3). Generally, the Lakewood aquifer system is a heterogeneous unit dominated by sandy silts and silty sands interbedded with sands that become coarser and thicker near the base of the aquifer system. The entire Lakewood aquifer system ranges in thickness from 150 to 400 feet (Reichard et al, 2003).

The Upper San Pedro aquifer system incorporates the Hollydale, Jefferson, Lynwood, and Silverado aquifers (Figure 3). An angular unconformity exists between the Lakewood Formation and the underlying San Pedro Formation. The Silverado aquifer is in the lower part of the Upper San Pedro aquifer system and produces the most water in the Los Angeles coastal basin area.

The Lower San Pedro aquifer system includes the Sunnyside aquifer (also referred to as the Lower San Pedro aquifer). The upper part of this system tends to be characterized by alternating fine-grained and coarse-grained zones. The fine-grained zones tend to pinch out or disappear near the forebay margins. The coarsest part of the aquifer system generally is at the base and is as much as 100 feet thick.

2.2.1 Sources and Movement of Groundwater

The groundwater system is recharged by direct precipitation, irrigation return, stream recharge, runoff from the surrounding uplands, artificial recharge of water through spreading grounds, injection of water in the seawater-barrier wells, and underflow from adjacent basins. Recharge from streams is limited because most of the streams that transect the area are concrete-lined.

AGE	FORMATION	AQUIFER	AQUIFER SYSTEMS	USGS MODEL LAYER
HOLOCENE	Active Dune Sand	Semiperched	Recent Aquifer System	1
UPPER PLEISTOCENE	Older Dune Sand	Gaspur Ballona	Lakewood Aquifer System	2
	Lakewood Formation (DWR, 1961)	Exposition Artesia		
	Unnamed Upper Pleistocene (Poland and others, 1956, 1959)	Gardena Gage (200-Foot Sand)		
LOWER PLEISTOCENE	*San Pedro Formation*	Hollydale Jefferson	Upper San Pedro Aquifer System	3
		Lynwood (400-Foot Gravel) Silverado		
		Sunnyside Lower San Pedro	Lower San Pedro Aquifer System	4
UPPER PLIOCENE	*Pico Formation*	None	None	---

Modified from DWR, 1961; Ponti, 1989.

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Geologic Formations, Aquifers, Aquifer Systems, and Model Layers in the Los Angeles Coastal Plain

Figure 3

2.2.2 Groundwater Recharge

Before significant groundwater development began, groundwater moved from the forebay areas (and from the Santa Monica Mountains on the northwest) south and west toward the Santa Monica and San Pedro Bays. Surface water generated from precipitation events (referred to as mountain front recharge) moved laterally outward and vertically downward to the underlying confined aquifers usually at the basin margins, forebay area, and along major water courses (Los Angeles and San Gabriel Rivers and Ballona Creek). The groundwater eventually discharged to either wetlands or offshore into the ocean.

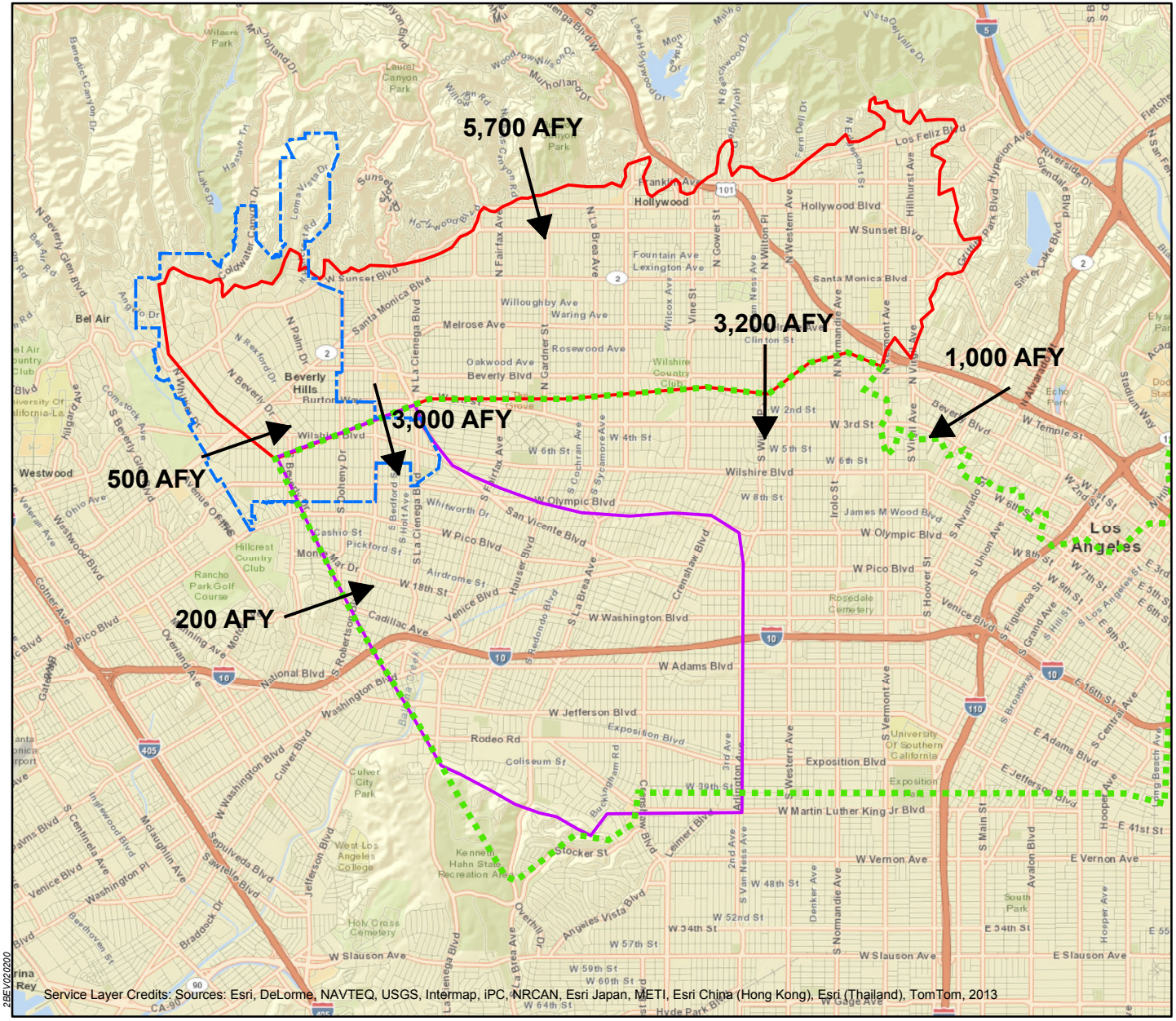
The NIU is a major structural feature that acts as a partial barrier to groundwater flow between the Central and West Coast Basins. Other faults (see Figure 2) in the study area also appear to have hydraulic effects. Poland and others (1959) stated that faults in the Los Angeles area affect groundwater flow because of displacement of units and cementation within fault zones. The degree to which the various faults affect flow in different aquifers has not been quantified. Because the NIU affects interflow between the Central and West Coast Basins, considerable effort has been directed at quantifying the groundwater flow rates across the NIU.

Reichard et al (2003) attempted to quantify the amount of groundwater recharge into the Hollywood, Central, and West Basins and averaged the amount over a 30-year period (1971-2000) as part of a groundwater modeling effort for the aforementioned basins. Table 1 presents a summary of the various components and the groundwater budget for the Hollywood and LBSA of the Central Basin. As can be seen, the majority of the inflow to the Hollywood and eventually to the LBSA originates as mountain front recharge (see Figure 4). The Hollywood Basin was estimated to have an average mountain front recharge of 5,800 acre-feet per year. This inflows infiltrates into the three identified layers (see Figure 3) and eventually discharges into the LBSA at the southern boundary of the City of Beverly Hill and at the eastern end of the Hollywood Basin into the Los Angeles Forebay of the unadjudicated Central Basin.

TABLE 1
AVERAGE 30-YEAR WATER BUDGET FOR HOLLYWOOD AND LA BREA SUBAREA (CENTRAL BASIN) 1971-2000

Basin	Time Period	Total Mountain Front Recharge (AFY)	Layer	TOTAL FLOW IN/OUT OF BASIN (AFY)											
				In						Out					
				Mountain Front Recharge	Adj. Basin	From Layer 2	From Layer 3	From Storage	Total	Adj. Basin	To Layer 3	To Layer 4	Pump	To Storage	Total
Hollywood Basin	1971-2000	5,700	2	5,700	300	---	0	0	**6,000**	2,800	3,200	---	0	0	**6,000**
			3	0	100	3,200	---	0	**3,300**	2,200	---	1,100	0	0	**3,300**
			4	0	100	---	1,100	0	**1,200**	1,200	0	---	0	0	**1,200**
West Hollywood Basin	1971-2000	2,300	2	2,300	300	---	0	0	**2,600**	1,000	1,600	---	0	0	**2,600**
			3	0	100	1,950	---	0	**2,050**	1,500	---	550	0	0	**2,050**
			4	0	100	---	400	0	**500**	500	0	---	0	0	**500**
East Hollywood Basin	1971-2000	3,400	2	3,400	0	---	0	0	**3,400**	1,800	1,600	---	0	0	**3,400**
			3	0	0	1,250	---	0	**1,250**	700	---	550	0	0	**1,250**
			4	0	0	---	700	0	**700**	700	0	---	0	0	**700**
Central Basin - La Brea Subarea	1971-2000	1,000	2	1,000	2,800	---	NA	0	**3,800**	NA	NA	---	NA	NA	NA
			3	0	2,400	NA	---	0	**2,400**	NA	---	NA	NA	NA	NA
			4	0	1,200	---	NA	0	**1,200**	NA	NA	---	NA	NA	NA
								TOTAL	**7,400**						

Derived from Reichard at al., 2003.
Notes:
NA=Not Available; --- = Not applicable.



Legend

- City of Beverly Hills City Limits
- La Brea Subarea
- Hollywood Groundwater Basin
- Unadjudicated Portion of Central Basin

N W E S

0 0.5 1 2 3 Miles

CA State Plane, Zone 5, NAD 83

Average 30-Year Water Budget for the Hollywood Basin and La Brea Subarea

Figure 4

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SECTION 3 References

California Department of Water Resources, 1961, *Planned Utilization of the Ground Water Basins of the Coastal Plain of Los Angeles Country, Appendix A, Ground Water Geology*. California Department of Water Resources Bulletin 104, 191 p.

California Department of Water Resources, 1959. Report on Proposed Central and West Basin Water Replenishment District. July 1959. 148 p.

Poland, J.F., Garrett, A.A., and Sinnot, A., 1959, *Geology, Hydrology, and Chemical Character of Ground Waters in the Torrance-Santa Monica Area, California*. U.S. Geological Survey Water Supply Paper 1461, 425 p.

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Reichard, E.G., Land, M., Crawford, S.M., Johnson, T., Everett, R.R., Kulshan, T.V., Ponti, D.J., Halford, K.J., Johnson, T.A., Paybins, K.S., Nishikawa, T., 2003. *Geohydrology, Geochemistry, and Ground-Water Simulation-Optimization of the Central and West Coast Basins, Los Angeles County, California*. Water Resources Investigations Report 03-4065.

Appendix L

Appendix to Technical Memorandum No. 8

Appendix

to

Technical Memorandum No.8

- Summary of the Geology and Hydrogeology of the Hollywood Basin

Technical Memorandum

City of Beverly Hills Summary of the Geology and Hydrogeology of the Hollywood Basin

May 6, 2015

Prepared for:
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Prepared by:
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SECTION
1 Introduction

The following discussion presents an overview of the geology and hydrogeology of the Hollywood Basin.

1.1 Background

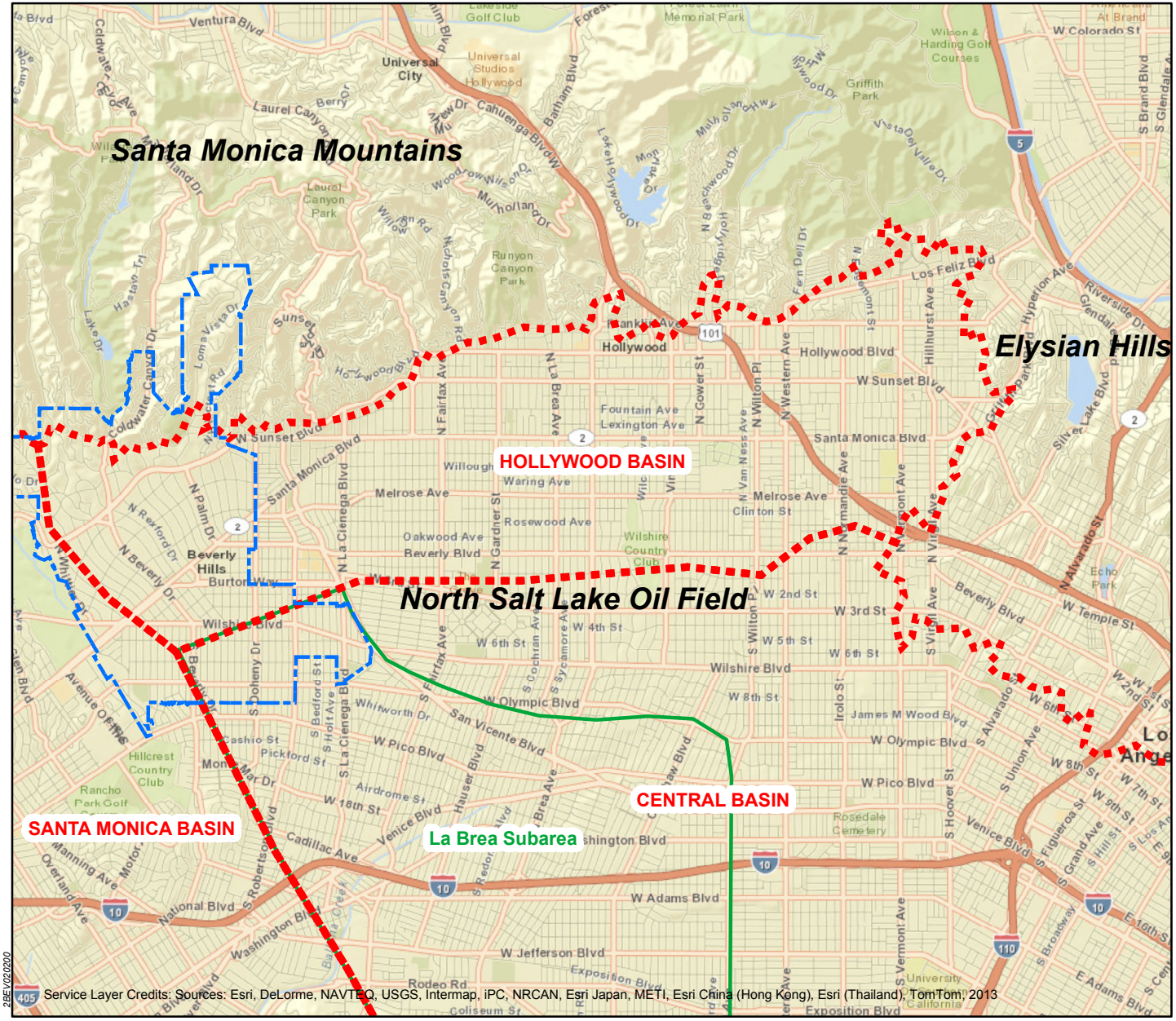
The Hollywood Basin is currently being used to supply a portion of the current water supply for the City of Beverly Hills (City). The City is currently investigating potential development of shallow groundwater for future water supply development. The following discussion presents an overview of the geology and hydrogeology of the Hollywood Basin and the proposed plans to provide supplemental water to the existing treatment plant so that is able to operate at the current plants maximum output. For a further discussion on the current treatment plants current production and design capability the reader is directed to Technical Memorandum No.7 (TM7) – Central Basin Well Development, Appendix A.

1.2 Purpose

The purpose of the following discussion is to summarize geologic and hydrogeologic information that was used to develop a conceptual development plan for groundwater as an alternative water supply for the City. The information provided is based upon information obtained from existing reports and studies conducted by others; no additional information was collected.

1.3 Description of the Area

The area, shown in Figure 1, lies within the coastal part of the greater Los Angeles metropolitan area. The study area is bounded by the Santa Monica Mountains to the north; the Elysian Hills to the east; the North Salt Lake Oil Field on the south; and the Beverly Hills/Newport-Inglewood Uplift on the west.



Legend

- City of Beverly Hills City Limits
- Los Angeles Coastal GW Basins
- La Brea Subarea

0 0.5 1 2 3 Miles

CA State Plane, Zone 5, NAD 83

Location of the Hollywood Basin

Figure 1

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SECTION 2 Geologic and Hydrogeologic Conditions

The following discussion was based largely on the work conducted by Reichard et al. (2003) and the California Department of Water Resources (DWR; 1959 & 1961) regarding the geology and hydrogeology of the Hollywood Basin.

2.1 Geology

The visible surface features of the coastal plain area of Los Angeles County closely follow the underlying geologic features and conditions. The area-encompasses a broad, gently sloping plain with elevations ranging from sea level to about 250 feet above mean sea level (msl). The plain is adjoined on the north by the Santa Monica Mountains, on the northeast by the Elysian, Repetto, Montebello, Puente, and Coyote Hills; on the southeast it slopes evenly into Orange County. The Palos Verdes Hills rise in the southwest-corner of the plain.

The Hollywood Basin is bounded on the north by the Santa Monica Mountains and the associated Hollywood Fault, by the Elysian Hills to the east, by the low lying Beverly Hills on the west which cut across from the northwest to southeast and the North Salt Lake Oil Field which brings pre-Pleistocene (Tertiary) deposits to the surface as shown on Figure 2. The Beverly Hills is a surface manifestation of the so-called Newport-Inglewood Uplift (NIU). This feature has considerable significance with respect to groundwater movement from and to adjacent groundwater basin that borders the Hollywood Basin on the west.

The Hollywood Basin area rests upon a foundation of igneous and metamorphic rock or "basement complex" consisting of granitic and metamorphic rocks. The metamorphic rock resulted from sediments and other rock types that were subjected to a process of heat and pressure and were formed into rock. The granite comprises rock formed by cooling of molten rock masses which rose from great depths as a result of primordial crustal movement.

Overlying this dense foundation rock, sedimentary formations were deposited during the Tertiary period, estimated to have ended about two million years ago. These sediments, having been in place for a very long period and subjected to pressure from overlying materials as well as from seismic movement, have been consolidated and/or cemented into conglomerates, sandstones and shales. These consolidated sediments form a layer over the basement complex, which has a widely varying thickness reaching more than 14,000 feet near Long Beach. As a result of deformation and folding previously referred to, these sandstones and shales are found at varying elevations throughout the area. They make up the-bulk of the North Lake Oil Field in the South and the Elysian Hills which adjoin the Hollywood Basin on the east.

During the Pleistocene period (commencing approximately two million years ago), the water-bearing formations of the coastal plain (including the Hollywood Basin) area were formed. During the early part of the period (lower Pleistocene), the basement complex and overlying sediments just described were mostly covered by a shallow sea. Into this sea flowed streams which carried sediment from erosion of surrounding granitic Santa Monica Mountains. Because of the constant building up of deltas and bars by these streams and because of fluctuations in the sea level, the shore line of the sea moved alternately landward and seaward. By this process, layer upon layer of sediments were laid down. These layers are called, as a group, the San Pedro Formation.

During most of the Tertiary period and continuing through the Pleistocene and to the present day, a relatively continuous crustal movement, causing folding and deformation of the area, has been occurring. Commencing near the middle of the Pleistocene period, there appears to have begun an extensive shifting and warping of rock and earth masses within and surrounding the coastal plain area. This activity has produced many of the physiographic features in evidence today. Initially, there was a warping and uplifting of the previously laid down sediments and underlying foundation rock, forming a belt of hills at the northeasterly edge of the coastal plain area separating it from the inland San Fernando and San Gabriel Valleys. These hills included what are now known as the Repetto, Montebello, and Puente Hills. Later in the middle Pleistocene time, there was additional deformation of the coastal plain.

Surface manifestation of this deformation is the line of hills referred to as the NIU (see Figure 2), which runs along the western edge of the Hollywood Basin comprising the Beverly Hills. The sediments that had been laid down were arched up generally along this line, and in places the arching effect was sufficient to break the sediment layers. These breaks resulted in shearing of the sediment layers along approximately vertical planes and these planes or shear zones are called fault zones and often the continuity of these sediment layers was interrupted at these faults.

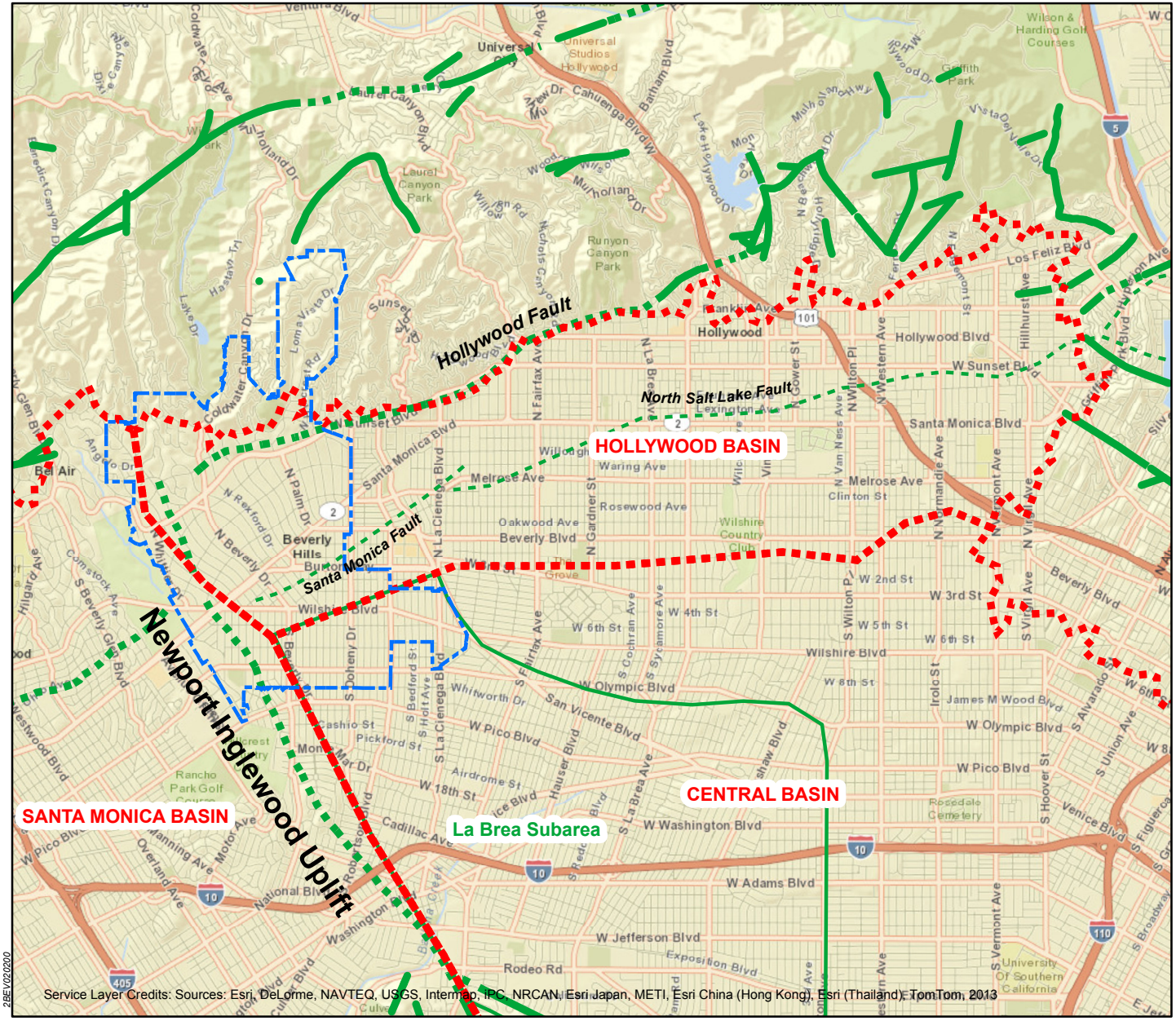
Much of the deposits that occur in the Hollywood Basin probably resulted as alluvial fan deposits emanating from the adjacent Santa Monica Mountains including Benedict, Franklin, Coldwater, Laurel, and Brush Canyons.

Continued changes in sea level caused the alluvial fans to extend out from the Santa Monica Mountains during sea level recessions and fine grained deposits of silt and clay occurred when sea level rose inundating the fans in a shallow coastal bay. The upward movement of the Santa Monica Mountains north of the Santa Monica Fault and the upward push of the North Salt Lake Oil field created an elongated trough with coarse alluvial sediments separated by fine-grained sediments.

2.2 Hydrogeology

The deposits of sediment during the Pleistocene and Recent times in the Hollywood Basin created a loosely consolidated, layered (or stratified) body of sands, gravels, silts, and clays. It is the nature of such deposition in an area covered with water, .that coarser materials (sands and gravels) are deposited near the point where the in-flowing stream enters the ponded water, while finer materials (clays and silts) are carried out into the standing water and slowly settle to the bottom.

Similar to what occurred for the entire Los Angeles coastal plain, the continual landward and seaward migration of the shore line alternately inundated and exposed the coastal plain area, resulting in deposition of alternating layers of coarser and finer materials. The coarser materials composed of sands and gravels being highly permeable and the finer materials, composed primarily of silts and clays being less permeable.



Legend

- City of Beverly Hills City Limits
- Los Angeles Coastal GW Basins
- La Brea Subarea

Faults

- fault, approx. located
- fault, certain
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- fault, inferred
- fault, inferred, queried
- intruded fault, certain
- North Salt Lake Fault
- Santa Monica Fault

N W E S

0 0.5 1 2 3 Miles

CA State Plane, Zone 5, NAD 83

Location of Newport Inglewood Uplift and other Faults in the Hollywood Basin

Figure 2

2BEV020200

Similar to the Central Basin, the coarse-grained deposits were the primary water-bearing zones or aquifers and contain and transmit the water which may be extracted by wells. The relatively impermeable layers of the fine-grained deposits generally confine the movement of groundwater to the coarse-grained deposits, or aquifers, as well as inhibiting vertical movement of waters between aquifers or downward from the surface.

The DWR (1961) built on the work of Poland and others (Poland et al., 1956, 1959) and further analyzed the groundwater flow system. Identified aquifers are shown in the stratigraphic column in Figure 3. Reichard et al (2003) identified aquifers that were grouped into four aquifer systems: the Recent, Lakewood, Upper San Pedro, and Lower San Pedro aquifer systems (see Figure 3). The Pico unit also is shown and is defined as a non-transmissive zone that underlies the lower San Pedro aquifer system (Reichard et al, 2003).

The main water-bearing zones are contained within the Lakewood Formation, and the upper and lower San Pedro Formation. While the Central Basin has named aquifers, there has been no correlation between the water-bearing units in the Hollywood Basin and the named aquifers in the Central Basin. It is likely that the deposits were laid down contemporaneously however, the proximity of the Hollywood Basin to the source rock (the Santa Monica Mountains) and the lack of major reworking of the sediments by the Los Angeles River and Ballona Creek probably caused the character and thickness of the water-bearing units to varying from those deposited in the Central Basin.

2.2.1 Sources and Movement of Groundwater

The groundwater system is recharged by direct precipitation, irrigation return, stream recharge, runoff from the surrounding uplands and underflow from adjacent basins. Recharge from streams is limited because most of the streams that transect the area are concrete-lined.

2.2.2 Groundwater Recharge

Before significant groundwater development began, groundwater moved from the upland areas (the Santa Monica Mountains) south into the Hollywood Basin and eventually to the Central Basin. Surface water generated from precipitation events (referred to as mountain front recharge) moved laterally outward and vertically downward to the underlying semi-confined aquifers usually at the basin margins and along major water courses emanating from the Santa Monica Mountains.

The NIU is a major structural feature that acts as a partial barrier to groundwater flow between the Hollywood Basin and the Santa Monica Basin. Other faults (See Figure 2) in the Hollywood Basin also appear to have hydraulic effects. Poland and others (1959) stated that faults in the Los Angeles area affect groundwater flow because of displacement of units and cementation within fault zones. The degree to which the various faults affect flow in different water-bearing units has not been quantified.

Reichard et al (2003) attempted to quantify the amount of groundwater recharge into the Hollywood Basin and averaged the amount over a 30-year period (1971-2000) as part of a groundwater modeling effort for the aforementioned basins. A summary is provided in TM7 – Central Basin Well Development, Appendix B. The Hollywood Basin was estimated to have an average mountain front recharge of 5,800 acre-feet per year. This inflows infiltrates into the three identified layers (see TM7 - Central Basin Well Development, Appendix B) and eventually discharges into the La Brea Subarea at the southern boundary of the City of Beverly Hill and at the eastern end of the Hollywood Basin into the Los Angeles Forebay of the unadjudicated Central Basin

AGE	FORMATION	MAXIMUM THICKNESS (feet)	AQUIFER SYSTEMS	USGS MODEL LAYER
HOLOCENE	Alluvial fan system covered in places with surficial soils	100-150	---	---
UPPER PLEISTOCENE	*Lakewood Formation (DWR, 1961)* *Unnamed Upper Pleistocene (Poland and others, 1956, 1959)*	250	Lakewood Aquifer System	2
LOWER PLEISTOCENE	*San Pedro Formation*	500-600	Upper San Pedro Aquifer System	3
			Lower San Pedro Aquifer System	4
UPPER PLIOCENE	*Pico Formation*	None	None	---

Modified from DWR, 1961; Ponti, 1989, and RCS, 2011.

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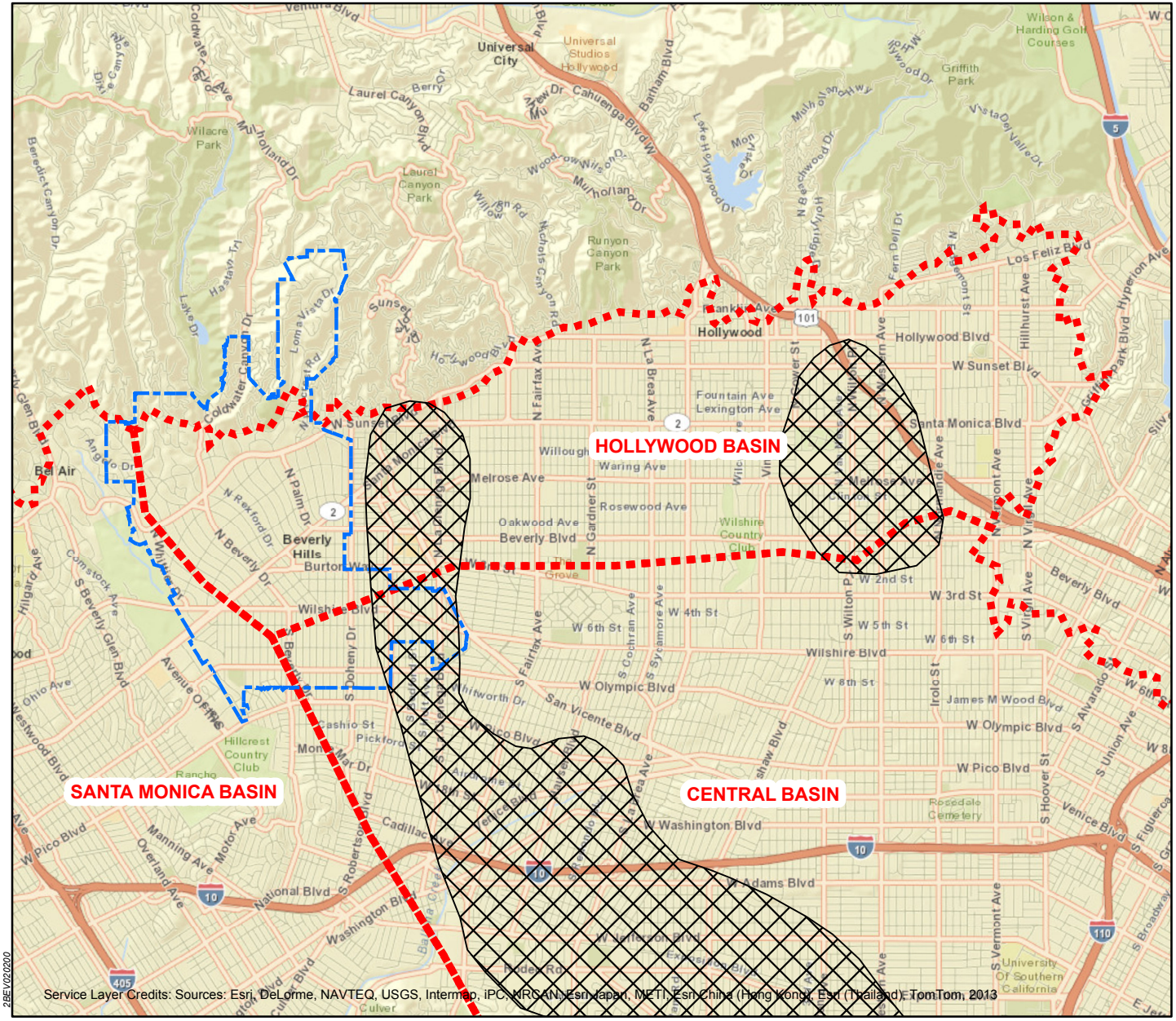
City of Beverly Hills

Geologic Formations, Aquifer Systems, and Model Layers in the Hollywood Basin

Figure 3

2.2.3 Shallow Groundwater Conditions

The shallow aquifer system is considered to represent geologically young alluvial sediments that were deposited along alluvial channels emanating from the various canyons along the south flank of the Santa Monica Mountains. Over time, vegetation, soil development and overbank deposits began to confine the alluvial channels as you progressed southward away from the mountains. Eventually, the alluvial channels were covered in fine-grained deposits where the confined channels were created. These conditions coupled with the existence and alignment of a branch of the North Salt Lake Fault zone led to shallow groundwater conditions. Basically, groundwater moving south/southeast from the mountain front of the Santa Monica Mountains in the alluvial channels would tend to encounter this fault; because faults either tend to be infilled with clay-rich fault debris (known as gouge) or displaced the permeable channels, the continued southerly movement of groundwater would be impeded by this gouge or offset and the groundwater would tend to rise up and in some instances reaching the surface and created "cienegas", areas of rising water or springs. Prior to major development in the Beverly Hills/West Hollywood area, Mendenhall (1905) documented areas with artesian conditions. Figure 4 presents the areas where historically, localized artesian conditions were noted.



Legend

- City of Beverly Hills City Limits
- Los Angeles Coastal GW Basins
- Historical Artesian Conditions

N
W E
S

0 0.5 1 2 3 Miles

CA State Plane, Zone 5, NAD 83

Historical Artesian Conditions in the Hollywood Basin

Figure 4

2BEV020200

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Appendix M

Water Resource Planning and Policy Documents Inventory and Summaries

Water Enterprise Plan

Water Resource Planning and Policy Document Inventory

City of Beverly Hills

Prepared by Psomas

May 2015

TABLE OF CONTENTS

REFERENCE # (BY YEAR)	DOCUMENT NAME	AUTHOR
1968-1	Preliminary Studies, Considerations and Recommendations Relating to Source of Water Supply for City of Beverly Hills	City of Beverly Hills
1970-1	Phase I West Hollywood Seepage Study – Final Report	Leighton, F. Beach
1972-1	Ground Water Supply Available to City of Beverly Hills	Bookman-Edmonston Engineering, Inc
1974-1	Final Environmental Impact Report for Beverly Hills Franklin Reservoir	James Montgomery Consulting Engineers
1975-1	Hydrogeologic Investigation – Beverly Hills Ground Water Basins-Draft	Geotechnical Consultants, Inc
1985-1	City of Beverly Hills Water System Master Plan	James Montgomery Consulting Engineers
1985-2	City of Beverly Hills Ground Water Flow in the West Hollywood Area	James Montgomery Consulting Engineers
1990-1	Analysis of Ground Water System at Cedars-Sinai Medical Center	Joe Egan and Associates
1991-1	Article: “Growing Interest in Digging Private Water Wells Reported”	Murchie, Don
1991-2	RFP- Municipal Water Supply and Groundwater Study	City of Beverly Hills
1992-1	Article: “City to Study Development of Groundwater to Cut Costs”	City of Beverly Hills
1992-2	Proposal for Engineering Services for Municipal Water Supply and Groundwater Study	Kennedy Jenks Consultants / Richard C. Slade
1992-3	Interview Agenda for Municipal Water Supply and Groundwater Study	Kennedy Jenks Consultants / Richard C. Slade
1992-4	Transmittal from Richard Slade to Kennedy Jenks Consultants	Richard C. Slade & Assoc.
1992-5	Municipal Water Supply and Groundwater Study – Element 2 Subpotable Water Supply-Draft	Boyle Engineering Corp.
1992-6	Municipal Water Supply and Groundwater Study – Element 1 Potable Supply from Groundwater Development-Draft	Boyle Engineering Corp.
1992-7	Article: “Water Well System for City Recommended”	Dunn, Mia
1994-1	City of Beverly Hills Test/Production Well Completion Report	Boyle Engineering Corp.
1995-1	Groundwater Development/Treatment Program – Pilot Testing Plan	Boyle Engineering Corp.
1995-2	Draft Municipal Water Supply and Groundwater Development –Pilot Testing Report	Boyle Engineering Corp.
1996-1	Groundwater Project Evaluation	City of Beverly Hills
1996-2	Municipal Water Supply and Groundwater Development – Pilot Testing Report	Boyle Engineering Corp.

1997-1	Water System Appraisal	Stetson Engineers, Inc.
1999-1	Ordinance of the City of Beverly Hills Adopting a Groundwater Management Plan for the Hollywood Groundwater Basin	City of Beverly Hills
2000-1	City of Beverly Hills Well Construction	City of Beverly Hills
2000-2	Draft City of Beverly Hills Drinking Water Source Assessments for City Wells No. 2, 4, 5, and 6	Boyle Engineering Corp.
2001-1	City of Beverly Hills Drinking Water Source Assessments for City Wells No. 2, 4, 5, and 6	Boyle Engineering Corp.
2001-2	Well Completion Report, City of Beverly Hills Wells No. 2, 4, 5, and Site No. 1	Boyle Engineering Corp.
2002-1	Water System Master Plan	Black & Veatch
2002-2	O & M Manual for RO Plant & Public Works Facility Monorail, Trolley & Hoist	American Monorail of California
2002-3	City of Beverly Hills Reverse Osmosis Water Treatment Plant	EarthTech
2003-1	City of Beverly Hills Standard Drawings and Specifications for Construction of Water Pipeline Installations	City of Beverly Hills
2003-2	Proposal to Provide a Safe Yield Evaluation of the Hollywood Ground Water Basin	Geoscience Support Services, Inc
2004-1	California Groundwater Bulletin 118: Coastal Plain of Los Angeles Groundwater Basin, Hollywood Subbasin	State of California
2004-2	Determination of Maximum Perennial Yield for the Hollywood Basin	Geoscience Support Services, Inc
2004-3	Comments on Draft Determination of Maximum Perennial Yield for the Hollywood Basin	C. Wesley Strickland
2004-4	City of Beverly Hills Water Distribution System Emergency Response Plan	Otsuka, Ed
2005-1	City of Beverly Hills 2005 Urban Water Management Plan	SA Associates
2006-1	Summary of Analytical Result: Water Samples from Sump a 331 North Maple Drive	Richard C. Slade & Assoc.
2006-2	Preliminary Notes, Results of Interim Lab Testing of Groundwater Samples, 2 Sumps, Maple Drive	Richard C. Slade & Assoc.
2006-3	Ordinance of the City of Beverly Hills Relating to the Removal of Groundwater and Amending the Beverly Hills Municipal Code	City of Beverly Hills
2006-4	City of Beverly Hills and CA Department of Health Services Meeting: Shall Groundwater Well Discussion	Unknown
2007-1	Lead and Copper Rule – Internal Corrosion Desktop Evaluation	Boyle Engineering Corp.
2007-2	Fluoride Monitoring and Contingency Plan	City of Beverly Hills
2007-3	Summary Review of Dewatering Sites for Shallow Groundwater Recovery Project-Beverly Hills	Richard C. Slade & Assoc.
2007-4	Chapter IV – Groundwater Basin Reports: LA County coastal Plains Basins-Hollywood Basin	Unknown
2007-5	Evaluation and Detailed Life Cycle cost Analysis of 5 Welded Steel Water Storage Tanks	Albert A. Webb Assoc.

2008-1	Letter from California Department of Health to City Regarding Shallow Groundwater Recovery Project	California Department of Public Health
2009-1	Hydrogeologic Feasibility Study and Preliminary Design Report for Development of Shallow Groundwater near Water Treatment Plant	Richard C. Slade & Assoc.
2009-2	Beverly Hills Sustainable City Plan	City of Beverly Hills
2009-3	Ground Water Quality Data in the Central Los Angeles Basin Study Unit, 2006: Results from the California GAMA Program	US Geological Survey & State Water Resources Control Board
2010-1	Summary of Drilling and Testing Operations-Robertson Yard Exploratory Borehole	Richard C. Slade & Assoc.
2010-1	Approval of Agreement Between city and Richard Slade & Associates for Hydrogeologic Services AND Approval of PO for the Services	City of Beverly Hills
2010-2	Ordinance of City of Beverly Hills to Increase Water and Solid Waste Utility Rates Beginning FY 2010-11	City of Beverly Hills
2010-3	Ordinance of City of Beverly Hills to Increase Water and Solid Waste Utility Rates Beginning FY 2010-11 and Providing for Annual Inflation Adjustment	City of Beverly Hills
2010-4	Authorization for Consultant Agreement Between City of Beverly Hills and Raftelis Financial Consultants for Preparation of a Water Rate Study	City of Beverly Hills
2010-5	Design & Replacement of 5 Water Reservoirs, Replacement of On-Site Piping, and Seismic Retrofitting of Associated 5 Pump Stations – O&M Manual	TRIMAX
2010-6	Operations, Maintenance, & Monitoring Manual –City of Beverly Hills Water Treatment Plant	City of Beverly Hills
2010-7	City of Beverly Hills General Plan	City of Beverly Hills
2011-1	Permit Amendment 1910156PA-003	California Department of Public Health
2011-2	Groundwater Management Plan – Hollywood Groundwater Basin (Draft)	Richard C. Slade & Assoc.
2011-3	Economic Sustainability Plan 2011-2015	City of Beverly Hills
2011-4	City of Beverly Hills Water Utility Laboratory Standard Operation Procedures	City of Beverly Hills
2011-5	City of Beverly Hills 2010 Urban Water Management Plan	SA Associates
2012-1	City of Los Angeles, Non-Potable Reuse Master Planning Report, Volume 1	RMC and CDM Smith
2012-2	Ordinance to Increase Water Rates in FY 2012-13 and 2013-14	City of Beverly Hills
2012-3	Ordinance to Increase Water Rates in FY 2012-13 and 2013-14	City of Beverly Hills
2012-4	Two-Year Extension of Purchase Order Commitment for Imported Water Provided by the Metropolitan Water District of Southern California	City of Beverly Hills
2013-1	Comprehensive Annual Financial Report, Fiscal Year Ending June 30, 2012	City of Beverly Hills

2013-2	California Accidental Release Prevention (CalARP) Program 2 Document, Volume 1	SCS Tracer Environmental
2013-3	California Accidental Release Prevention (CalARP) Program 2 Document, Volume 2	SCS Tracer Environmental
2013-4	Article: "Water Treatment Facility"	Anderson, Robert
2013-5	Risk Management Plan for City of Beverly Hills Public Works Services	SCS Tracer Environmental
CROSS-INDEX BY AUTHOR		

WATER RESOURCE PLANNING AND POLICY DOCUMENT INVENTORY

Document Name:	***Document Type:***
Preliminary Studies, Considerations and Recommendations Relating to Source of Water Supply for City of Beverly Hills	Planning Report
Author:	***Date:***
City of Beverly Hills	August 1968

Issues Addressed:

Water sources, historic & projected water use, water rights

Summary

This document has limited value due to its age, completeness, and organization. There are many missing pages which are critical to completely understanding the issues at hand. The document was written at a time when the City's water was supplied by about 60% local well water, and 40% MWD water. At the time MWD was formed, the City was one of the original 13 member agencies. MWD water was essentially all Colorado River water, as the initial phase of the State Water Project (SWP) was still under construction. The document does provide some insight into the City's concern for securing its water supply into the future. The document provides an extensive discussion of the City's two basic water supply choices: 1) continuation and further development of the combination of local well water supplemented with purchased MWD water, or 2) purchase of only MWD water. For option 1, the City recognizes that substantial expenditures will be necessary for new and replacement water infrastructure.

Topics covered by the document include:

- Recommendations and points to consider (missing pages)
- History and background of City water department
- Historic and projected water demands
- MWD history, current and future sources of water, and potential supplies beyond SWP (desalination, second phase SWP, supplementing Colorado River flows by importing surplus water from some other drainage basin, reclamation and reuse of surface drainage flows, and more effective water conservation and water management).
- Water quality
- Water rights
- Water system maintenance and operation concerns
- Capital expenditures, revenues, water rates, economic comparisons.

By: **Nancy E. Heim, PE**

WATER RESOURCE PLANNING AND POLICY DOCUMENT INVENTORY

Document Name:	**Document Type:**
Phase I West Hollywood Seepage Study – Final Report	Groundwater Report
Author:	**Date:**
F. Beach Leighton	January 16, 1970

Issues Addressed:

Groundwater seepage

Summary

This investigation was performed for the County of Los Angeles, to determine the origin, causes, nature and extent of the surfacing ground water in a portion of West Hollywood. The study area is bounded by Melrose Ave, La Cienega Blvd, Beverly Blvd, and Doheny Drive. The study comes as a result of 47 properties reporting seepage problems, some so severe, that pumps are required with pumping rates ranging from 1/2 to 20 gpm. The study involved house-to-house surveys, extensive collection and analysis of data including publications, sampling of seepage water to determine the quality, geology logging, soil borings, and other related work.

The report describes the geologic and hydrologic setting for the area and indicates the presence of relatively impermeable clay-rich materials surrounding permeable sand creating "confined water" that becomes pressurized and where it can find a way toward the surface, it becomes artesian. Also, the report states that "toe seepages and swampy conditions are common in alluvial environments", such as in the case for the West Hollywood area.

Some of the relevant conclusions of the study include:

- Rain that falls in the watershed above the seepage area is the chief source of seepage water.
- Alluvial deposits in the area have a great capacity to absorb and transmit sand and storm runoff. Water migrates in at least three sand aquifers to the reach the seepage area as ground water.
- Possible causes for water seepage from sands to ground surface include old cesspools, improperly abandoned water wells, old subdrain systems, old sewer systems, and the natural rise of artesian waters.
- The current wet period is not the first to occur in the study area. Wet periods have been recorded as early as 1883, yet seepage has never been so severe in the history of development. It is concluded that the present wet cycle contributes to the seepage problem, but is not responsible by itself.
- Most of the seepage water exists as confined water (water under pressure in multiple layers) which is discharged to the surface by leakage.

Some of the tentative recommendations for remedial treatment of the seepage problem involve:

- A subdrain system for the uppermost sand layer (Sand A) to employ almost continuous trench drains. Shallow well drains in this zone would produce ¼ to 2 gpm for each, and would have to be placed in a close grid pattern.
- Draining Sand B (2nd sand layer) to reduce the piesometric head.
- Converting 2 borings from the study to observation wells that can be pumped.
- Locating possible leaking pipelines and abandoned wells that were not properly sealed.

By: Nancy E. Heim, PE

WATER RESOURCE PLANNING AND POLICY DOCUMENT INVENTORY

Document Name:	**Document Type:**
Ground Water Supply Available to City of Beverly Hills	Groundwater Report
Author:	**Date:**
Bookman-Edmonston Engineering, Inc	August 1972

Issues Addressed:

Safe-yield of groundwater extraction, geology, historic groundwater extractions

Summary

Background

The City historically has relied on groundwater extractions as a water supply source to meet demands. At the time of this study, the City was using approximately 62% imported MWD water, with the rest supplied by local wells. As the City has experienced increased water demands, there were concerns about the long-term yield available from its own local ground water basins.

Summary

The objective of this investigation was to determine and report the long-term (25-30 years) safe yield of the ground water supply available to the City. This report presents information developed during the study, together with conclusions regarding the long-term safe yield. The report describes ground water geology, relevant groundwater basins, historic groundwater extraction rates, and evaluation of long-term yield based on percolation, subsurface flows, groundwater extractions and water level fluctuations.

The report concludes that the average annual safe yield from the Hollywood Basin and the la Brea subbasin over a 30-yr period is about 3,000 AFY from each basin.

Some additional noteworthy findings of the investigation include:

- Studies by the Department of Water Resources indicated a decline throughout a 30-year period if 4,000 AFY were extracted from the Hollywood Basin and 3,200 AFY were extracted from the La Brea subbasin.
- Over the past five years (1967-1971), the City extracted an average of 2,800 AFY from the Hollywood Basin where groundwater levels remained generally stable, and about 3,800 AFY from the La Brea subbasin where groundwater levels showed a net decline.
- Although water quality issues were not a part of the study, it was noted that improvement in the mineral quality of the ground water could not be expected with extractions at the safe yield level described.

NOTE BY REVIEWER: *Tucked inside the front pages of the report, is a letter from Richard Slade of Geotechnical consultants dated July 7, 1975. This letter provides updated information regarding the groundwater basins, proposed sites for exploratory test holes, and the number of wells to be abandoned/redeveloped by the City.*

By: **Nancy E. Heim, PE**

WATER RESOURCE PLANNING AND POLICY DOCUMENT INVENTORY

Document Name:	**Document Type:**
Final Environmental Impact Report for Beverly Hills Franklin Reservoir	EIR
Author:	**Date:**
James M. Montgomery Consulting Engineers	July 1974

Issues Addressed:

Environmental

Summary

Background

The City is proposing a 6.3 MG reservoir to provide water for fire-fighting and emergency storage for portions of their service area. This Environmental Impact Report (EIR) was prepared to satisfy the requirements of the CEQA passed in 1970.

Summary

The site of the proposed Beverly Hills Franklin Reservoir is located a short distance north of the Beverly Hills city limits on a ridge separating Beverly Drive from the City of Los Angeles' Lower Franklin Canyon Reservoir. The fee title to the 2.12 acre parcel is retained by the City of Los Angeles, Department of Water and Power.

The document contains information that is typical for an EIR: Environmental setting, assessment of environmental impacts, mitigation measures to minimize impacts, alternatives to the proposed project, and other related information. Being the final version of the EIR, the document also contains a chapter dedicated to comments on the project and responses to those comments.

NOTE BY REVIEWER: *While the cover letter to this Final EIR indicates it was approved by the Environmental Review Board on July 12, 1974, there is a handwritten note on the front cover stating the document was "not adopted by City Council". In reviewing later City documents, it appears the proposed Beverly Hills Franklin Reservoir was never constructed.*

By: **Nancy E. Heim, PE**

WATER RESOURCE PLANNING AND POLICY DOCUMENT INVENTORY

Document Name:	**Document Type:**
Hydrogeologic Investigation - Beverly Hills Ground Water Basins -Draft	Hydrogeology Report
Author:	**Date:**
Geotechnical Consultants, Inc	August 1975

Issues Addressed:

Geology, hydrogeology

Summary

Prepared for the City of Beverly Hills, this draft report represents Phase I of a planned 4-phase study of the groundwater basins underlying the City. The purpose of the Phase I hydrogeologic investigation was to provide the City with detailed information concerning the viability and current status of their groundwater basins; plans for abandonment or redevelopment of existing active wells; plans for new water well location, design and construction; and recommendations for improving the utilization and management of their ground water resources.

The report contains detailed information including:

- Discussion of relevant geology and hydrogeology of the area
- Analysis of available boring logs from water and oil wells
- Discussion of water quality issues and water level data from existing wells
- Hydrogeologic analysis of data to achieve the project purpose described in the above paragraph.

It is noteworthy, that at the time of this investigation, the City had drilled and operated no fewer than 80 wells during its history, however, only a total of 7 wells were still actively operating. The report provides a historical summary of the water delivered to the City from 1926-1974, showing groundwater and MWD quantities. Projected water demands to the year 2000 also are provided.

The report concludes that it is hydrogeologically feasible for the City to develop additional groundwater supplies from its adjacent ground water basins. It discusses well efficiencies and yields, outlines existing problems in the City's active wells, and provides a series of recommendations for further exploration, a program of preventative maintenance for future wells, proper destruction of several existing wells and eventual phasing out and replacement of the remaining wells.

NOTE BY REVIEWER: *Although this draft document provides considerable information that may be useful to hydrogeologists and others, it has no table of contents and will be difficult to extract specific information without reading much of the report in detail. Also, the referenced Plates (Figures) are not included in the copy.*

By: **Nancy E. Heim, PE**

WATER RESOURCE PLANNING AND POLICY DOCUMENT INVENTORY

Document Name:	**Document Type:**
COBH Water System Master Plan	Water Master Plan
Author:	**Date:**
James Montgomery, Consulting Engineers, Inc	June 1985

Issues Addressed:

Existing water facilities, water sources, water quality, non-potable water system feasibility

Summary

This water master plan provides an update to the last master plan completed in 1963. As a water master plan, the report provides information on land use, population, water requirements, the existing water system, sources of supply, evaluation of existing facilities, recommended improvements, feasibility of non-potable water use, and capital improvement program.

Sources of Supply:

The City relies solely on the purchase of imported water from MWD, via two connections each with a capacity of 40 cfs. The water quality from MWD is considered to be generally good, with trihalomethanes occasionally exceeding standards. By comparison, a ground water exploration and testing program by the City indicated a number of potential water quality problems if the City elected to use local ground water sources as an alternative. Although some problems could be reduced by blending local well water with MWD supplies, some treatment would be required, costing between $324 and $766/af. Developing ground water facilities, therefore, was not recommended since the MWD rate was $229/af. Projections of future costs further indicated it was more economical to rely on MWD for all City water.

Evaluation of Existing Facilities and Recommendations:

A number of recommendations for improvements were identified for sources of water supply, storage facilities, booster pump stations, emergency connections, distribution system, telemetry and control facilities. Specific recommendations and or conclusions included, but were not limited to:

- Constructing an additional connection to MWD for redundancy supply
- Constructing two additional emergency connections to the surrounding LADWP system in addition to the existing two connections. It was also noted that LADWP water was not entirely reliable as a backup, since availability is dependent on LADWP customers and demonstration of mutual benefit.
- The potential use of shallow ground water for non-potable purposes indicates that water quality was only marginally suitable for landscape irrigation, and not cost effective. In addition, potential usage is scattered throughout the City.
- Development of a non-potable water system is not a cost effective investment and should not be further analyzed until plans for redevelopment in the industrial area of the City are finalized.
- Performing various actions to reduce the percentage of unaccounted-for water in the distribution system.
- City should continue to rely on MWD imported water as a sole source of supply and not pursue the development of new ground water supplied facilities.

By: Nancy E. Heim, PE

WATER RESOURCE PLANNING AND POLICY DOCUMENT INVENTORY

Document Name:	**Document Type:**
COBH Ground Water Flow in the West Hollywood Area	Groundwater Report
Author:	**Date:**
James M. Montgomery Consulting	September 1985

Issues Addressed:

Shallow groundwater, water quality, hydrogeology, abandoned wells, hazards

Summary

Background

The occurrence of high ground water levels in the West Hollywood area has existed since the early days of local development. The problems created by the current high levels have become increasingly important to the City of Beverly Hills due to the potential for future litigation which might involve the City. This report describes the occurrence of shallow groundwater in the West Hollywood area and identifies possible hazards to structures which could result from the high groundwater levels. The report covers local and regional geology, hydrogeology, general ground water quality, the issue of abandoned wells, summary of potential hazards, and alternatives to control and dispose of/use the nuisance water.

Summary

The significance of the high groundwater levels in the area is, partially, due to the fact that there are some 50 known abandoned wells in the 0.7 square mile study area. The City already is involved in litigation concerning a property where three abandoned City wells were located.

The origin and occurrence of ground water is attributed to 1) groundwater recharge due to deep percolation of the precipitation occurring in the Santa Monica Mountains, 2) groundwater movement and subsurface flows, and 3) surface discharge of groundwater. It was estimated that approximately 2000 AFY percolates to the groundwater basin, with approximately 1120 AF moving solely through the shallow aquifers. A total of 20 collection systems to capture springs and seeps were identified in the study, although it is probable more exist. The flow from these springs was estimated on the order of 170 gpm, during June 1985 (a dry period). Assuming continuous, uninterrupted flow, the total would be about 275 AFY.

The possible connection between the abandonment of the old water wells and current spring flow is unclear, based on past records and field reconnaissance of the well sites. Details supporting this conclusion are further discussed in the report.

Potential hazards to structures that may result from high ground water levels include: settlement and/or heave, hydraulic uplift, removal of foundation material ("piping"), liquefaction, and mobilization of natural gas and hydrocarbon fuels.

Alternatives for dealing with the high groundwater levels were evaluated, including 1) no action, 2) discharge drains to gutters, 3) dewatering systems, 4) relief wells. There was mention of collecting and treating the groundwater to meet drinking water standards, with connection to the existing municipal water supply system. Other options discussed included using the water as an irrigation supply, or simply discharging to storm drains or sanitary sewers.

By: Nancy E. Heim, PE

WATER RESOURCE PLANNING AND POLICY DOCUMENT INVENTORY

Document Name:	**Document Type:**
Analysis of Ground Water System at Cedars-Sinai Medical Center	Groundwater Report
Author:	**Date:**
Joe Egan and Associates	February 1990

Issues Addressed:

Use of non-potable sump water, water quality

Summary

Background

When the Cedars-Sinai Medical Center (CSMC) was constructed, a groundwater collection and pumping system was installed in order to prevent flooding in the lower levels of the building. The groundwater is collected and pumped to the storm drain system. The hospital contracted with Egan and Associates to study the groundwater system and determine flow quantities and quality of the water, investigate the ownership of the ground water, and identify possible uses.

Summary

The report describes the existing ground water system, the strategy used for the investigations, results of the investigations and recommendations. Findings include:

- Water quantity: Summer flows total 128,000 gpd, winter season flows average 102,000 gpd
- Water quality: Water is very hard, and costs will be involved with treating the water, depending on the intended use.
- Ownership of groundwater: Water from the Hollywood Basin is unadjudicated, therefore, the water belongs to CSMC
- Best use of the groundwater: Potential uses of the groundwater studied included irrigation, boiler make-up water, and make-up water for cooling towers. The investigation concluded the best use was for make-up water for central heating, ventilation, and air conditioning system cooling towers at the hospital.

The report provides details for the make-up flow requirements for the cooling towers, conceptual preliminary design, and preliminary cost estimate. Based on total cost and annual savings, the report estimates payback would be about five years.

By: Nancy E. Heim, PE

WATER RESOURCE PLANNING AND POLICY DOCUMENT INVENTORY

Document Name:	**Document Type:**
Title of Article: "Growing Interest in Digging Private Water Wells Reported"	Newspaper Article
Author:	**Date:**
Don Murchie *(The Currier)*	May 1991

Issues Addressed:

Private wells in Beverly Hills, use of excavation water

Summary

This is a brief article that appeared in the May 31, 1991 edition of *The Currier*, the City's local newspaper.

Ongoing drought has sparked an interest by some homeowners to dig their own water wells. The only known private wells in the City are 1) on Merv Griffin property at Doheny and Schuyler Rd, and 2) on El Rodeo School property. Although the Griffin well is not in current use, the owner expressed interest in putting it back into service for landscape irrigation purposes. The school property well is maintained as a backup source for emergencies only.

The article discusses the City's concern with water privatization and its possible impact on the water table underlying the City, even though the City closed its well system in the mid 1970s and receives all of its water from MWD. The Public Works Commission was also expected to investigate the legal right of citizens to dig private wells.

The article mentions an "upcoming major engineering analysis of the city's long-range water supply". The study was expected to address the possible use of an estimated 1.2 million gallons per day of excavation water that drains into the City's storm drain system.

By: **Nancy E. Heim, PE**

WATER RESOURCE PLANNING AND POLICY DOCUMENT INVENTORY

Document Name:	**Document Type:**
RFP- Municipal Water Supply and Groundwater Study	RFP
Author:	**Date:**
COBH, Public Works Dept	December 1991

Issues Addressed:

Potable water supplies, non-potable water supplies

Summary

The City is requesting a comprehensive study of water supply sources available to supplement its current supplies. The study is to provide information that assesses the feasibility of alternative water supply sources, costs associated with development of specified supply, and groundwater mitigation options. The study did NOT consider desalination or alternate water wholesalers as options. The RFP outlined very specific requirements for three separate phases of investigation:

- Element #1: Potable Water Supply from Groundwater Development (Water well evaluation including recommended siting of wells, design parameters, well monitoring/maintenance, pumping equipment, costs. Water treatment facilities evaluation including review of available water treatment technologies, land requirements, required treatment parameters, permitting requirements, costs, and MWD funding participation.)
- Element #2: Feasibility of Subpotable Water Development for Irrigation Water Supply and Fire Suppression (Analysis to include construction of separate water distribution system, consideration of groundwater from both shallow and deeper aquifers, treatment requirements, reclaimed water available from the City of Los Angeles, costs for construction and O&M of separate water system, regulations, MWD participation).
- Element #3: (Optional phase) Analysis of Groundwater Table in Selected Areas of the City (Comprehensive investigation of water table increases and decreases, long- and short-term impacts, mitigation options, costs for mitigation options).

By: Nancy E. Heim, PE

WATER RESOURCE PLANNING AND POLICY DOCUMENT INVENTORY

Document Name:	**Document Type:**
Title of Article: "City to Study Development of Groundwater to Cut Costs"	Newspaper Article
Author:	**Date:**
City of Beverly Hills	January 1992

Issues Addressed:

Groundwater development, water conservation efforts

Summary

The City of Beverly Hills provides an information update on the City's programs and projects in a publication entitled, *Beverly Hills Review*. The January 1992 edition highlighted the City's efforts to study groundwater development in order to cut costs of obtaining water from Metropolitan Water District (MWD).

The article briefly describes the history of the City's water supply beginning in 1923 and discusses the current, severe five-year drought and MWD's mandated water reduction of 20%. During the previous two years, MWD water costs had escalated dramatically and rates were expected to possibly double again over the next three years. In response, the City retained a legal firm to study potential water supply options, especially local groundwater development and its economic feasibility. In the meantime, the City planned to intensify its water conservation efforts. These efforts also are discussed in the article.

It is noteworthy that several other articles relating to water appeared in this issue of the *Beverly Hills Review:*

- "It Pays to Fix Those Leaky Pipes" – Highlights the cost of slow leaks
- "Xeriscaping Project Set for City Park" – Landscaping with drought-tolerant plants
- "New Present/Future Water Management Policy Set" – Outlines elements of the proposed policy
- "Where Water Goes" – A single sentence informative statement educating readers about how much water is used each day for landscaping, toilet flushing, showers etc.
- "Incentives to Save Water; Appeals Board Named" – Water conservation program with fee structure to provide incentive to conserve water in order to meet MWD target reductions.

By: Nancy E. Heim, PE

WATER RESOURCE PLANNING AND POLICY DOCUMENT INVENTORY

Document Name:	***Document Type:***
Proposal for Engineering Services for Municipal Water Supply and Groundwater Study	Proposal
Author:	***Date:***
Kennedy Jenks Consultants/ Richard C. Slade	January 1992
Issues Addressed:	
Project approach, experience	

Summary

The City had sent out a Request for Proposal (RFP) for the "Municipal Water Supply and Groundwater Study" during December 1991. Richard Slade (groundwater geologist) was teaming with Kennedy Jenks Consultant for the project.

In response to the City of Beverly Hills' RFP dated December 1991, Kennedy Jenks in association with Richard Slade & Associates, submitted this proposal to perform the work. The document provides a brief discussion of the project background and objectives, outlines the project approach, and describes in detail, the proposed tasks necessary to complete the project objectives. Task descriptions are provided for each of the 3 Elements identified in the RFP:

- Element #1 – Potable Water Supply from Groundwater Development
- Element #2 – Feasibility of Subpotable Water Development for Irrigation Water supply
- Element #3 – Analysis of Groundwater Table in Selected Areas of the City (Optional Phase)

By: **Nancy E. Heim, PE**

WATER RESOURCE PLANNING AND POLICY DOCUMENT INVENTORY

Document Name:	**Document Type:**
Interview Agenda for Municipal Water Supply and Groundwater Study	Agenda Notes
Author:	**Date:**
Kennedy Jenks Consultants/ Richard C. Slade	February 1992
Issues Addressed:	
Project approach, experience	

Summary

The City had sent out a Request for Proposal (RFP) for the "Municipal Water Supply and Groundwater Study" during December 1991. Richard Slade (groundwater geologist) was teaming with Kennedy Jenks Consultant for the project and submitted a proposal. The team was now preparing for an interview with the City.

The agenda prepared by Kennedy Jenks included an introduction on why the team should be selected for the project, a summary of experience and qualifications, project organization, project approach and summary.

By: Nancy E. Heim, PE

WATER RESOURCE PLANNING AND POLICY DOCUMENT INVENTORY

Document Name:	**Document Type:**
Transmittal from Richard Slade to Kennedy Jenks Consultants RE: Municipal Water Supply and Groundwater Study	Notes
Author:	**Date:**
Richard C. Slade	February 1992

Issues Addressed:

Experience

Summary

The City had sent out a Request for Proposal (RFP) for the "Municipal Water Supply and Groundwater Study" during December 1991. Richard Slade (groundwater geologist) was teaming with Kennedy Jenks Consultant for the project and had submitted a proposal to perform the work.

This 8-page document from Richard Slade was sent to Kennedy Jenks Consultants for their use in preparing for an interview with the City of Beverly Hills for the Municipal Water Supply and Groundwater Study. The document provides information on Slade's local experience, expert witness experience and other specialized qualifications.

By: Nancy E. Heim, PE

WATER RESOURCE PLANNING AND POLICY DOCUMENT INVENTORY

Document Name:	**Document Type:**
Municipal Water Supply and Groundwater Study – Element 2 Subpotable Water Supply (Draft)	Planning Report
Author:	**Date:**
Boyle Engineering Corp	August 1992

Issues Addressed:

Subpotable water supply, feasibility and costs

Summary

As Element 2 of the Municipal Water Supply and Groundwater Study, this draft report addresses the feasibility of developing a subpotable water supply for the City of Beverly Hills. Tasks performed included:

- Water Development Feasibility – discussion of three alternatives: 1) shallow zone groundwater, 2) reclaimed water from City of Los Angeles, 3) blending subpotable groundwater with untreated potable supply considered in Element 1.
- Water Supply Analysis – water quality requirements and long term reliability of water source.
- Reclaimed Water Availability – present or future availability of reclaimed water in Los Angeles either from 1) Los Angeles Glendale Water Reclamation Plant, or 2) Phase II West Basin Municipal Water District
- Facility Costs – estimates of costs for dual water systems to convey subpotable water, including treatment, pumping, distribution, storage, and O&M.
- Implementation Issues – strategies for O&M, permitting and regulatory requirements, monitoring, financing for the program, and possible implementation schedule.

Conclusions

Considering the three alternatives, the lowest cost alternative was development of a subpotable water system using shallow groundwater as a source. However, such a system did not represent a cost-effective project for the City at a cost of $2,420/AF, which was eight times the cost of imported MWD water at that time.

Use of the City's shallow groundwater was marginally acceptable for use as irrigation water; although only treatment using chlorination would be required to comply with CDHS requirements.

Participation in a regional reclaimed water supply system represented the option with the lowest capital cost, with unit costs ranging from $530/AF to $3,200/AF.

Unit costs for two alternative typical distribution systems (including supply/transmission and distribution) using subpotable water were $2,420/AF and $2,800/AF.

By: Nancy E. Heim, PE

WATER RESOURCE PLANNING AND POLICY DOCUMENT INVENTORY

Document Name:	**Document Type:**
Municipal Water Supply and Groundwater Study – Element 1 Potable Supply from Groundwater Development (Draft)	Planning Report
Author:	**Date:**
Boyle Engineering Corp.	September 1992

Issues Addressed:

Groundwater for potable use: feasibility, treatment and costs

Summary

Background

The marginal quality of groundwater in the Hollywood basin was a major factor in the City's decision to discontinue the use of groundwater as a supplementary water supply in 1976. However, rising costs of purchased MWD water, combined with significant improvements to treatment technology prompted the City to re-evaluate the possible use of groundwater as a supplemental source. The purpose of this portion of the study (Element 1) was to quantify the amount of available groundwater and to provide a conceptual design of the well field and treatment facilities necessary to obtain and develop these supplies.

Summary

The draft report describes geologic conditions, hydrogeology, and groundwater quality for both deep well water and shallow groundwater. At the time, it appeared that groundwater lying between 300 and 700 feet deep was suitable for development, with some treatment. Due to high TDS concentrations and hardness levels, shallow groundwater sites were not considered suitable for potable uses without extensive treatment. The report went on to provide conceptual well field, well design and wellhead facilities for extracting the groundwater, as well as water treatment processes and facilities required for treating the water for potable use. Based on the evaluation of a number of treatment options, reverse osmosis (RO) was selected as the optimum process for treating the brackish groundwater.

Various alternatives for brine disposal (waste from the RO process) were evaluated, since this could be a substantial cost of desalting. Based on viability and costs, direct discharge to the local sewer was determined to be the best choice at the time. The report also dedicated a chapter to implementation issues related to the groundwater development program including, planning, staffing requirements, project financing and permit requirements. Potential Phase II work also was described including a production/test well and pilot testing of treatment processes.

A chapter on groundwater treatment costs concluded that a projected production rate of 2.4 mgd from the treatment plant, would have a unit cost of about $720/AF. This cost included components of the well field, raw water transmission system, treatment facilities, product water transmission, and brine disposal.

By: Nancy E. Heim, PE

WATER RESOURCE PLANNING AND POLICY DOCUMENT INVENTORY

Document Name:	**Document Type:**
Title of Article: "Water Well System for City Recommended"	Newspaper article
Author:	**Date:**
Mia Dunn *(The Currier)*	October 1992

Issues Addressed:

Test well, 8-well system & treatment plant

Summary

This short article appeared in the October 23, 1992 edition of *The Currier*, the City's local newspaper, and indicated the Public Works Commission had recommended the City Council vote to move forward with building a well system and water treatment plant to supplement current supplies from MWD. The move followed recommendations from a recently completed Boyle Engineering study. If approved, a test well and treatment facility will be built to determine the quality of treated water before moving forward with a project to construct a total of eight wells, pipelines, and a treatment facility at an estimated cost of $7.5 million. If the council approves the test project, work could begin by March.

The article also noted that when the City abandoned its well system in 1976, there were 67 wells at various times on 27 well sites between mid-1920 until 1976.

By: Nancy E. Heim, PE

WATER RESOURCE PLANNING AND POLICY DOCUMENT INVENTORY

Document Name:	**Document Type:**
City of Beverly Hills Test/Production Well Completion Report	Well Report
Author:	**Date:**
Boyle Engineering	Sept 1994

Issues Addressed:

Well construction, water quality, Hollywood Basin water

Summary

As part of an investigation to develop a production wellfield and treatment plant to supplement its water supply from MWD, the City of Beverly Hills contracted for design and construction of a test/production well in the summer of 1994. The well was constructed to determine water quality, well yield, and hydrogeologic conditions in the local area. The well is located in the Burton Way median strip approximately 1200 feet east of City Hall.

The report describes the hydrogeology of the Hollywood Basin, details of the well construction, aquifer isolation testing, pump testing of the test/production well, water quality testing, and a copy of the geologist's well log.

Water quality sampling was completed in two phases: first using zone isolation tests, then at well completion, with a focus on constituents that may present difficulties in treatment processes (ie. TDS, Hydrogen Sulfide, Iron and Manganese). The report notes that some significant differences occurred in the analyses for hydrogen sulfide and total iron when comparing each of the two testing phases.

The report emphasized several well operation and maintenance recommendations including the importance of proper well pump cycling and record keeping. Good records, particularly of water levels and pumping rates are important to determine trends in well capacity and aquifer conditions that could indicate problems in the future. Capacity tests were recommended on a monthly or quarterly basis, as a minimum.

By: Nancy E. Heim, PE

WATER RESOURCE PLANNING AND POLICY DOCUMENT INVENTORY

Document Name:	**Document Type:**
Groundwater Development/Treatment Program – Pilot Testing Plan	Pilot Program
Author:	**Date:**
Boyle Engineering Corporation	May 1995

Issues Addressed:

Treatment technologies, costs

Summary

Background

This document describes a pilot testing program for the City of Beverly Hills to treat local groundwater to meet federal and state drinking water standards. Water quality analyses from monitoring well A-3 (1992) and Test Well No. 6 (1994) show elevated levels of total dissolved solids, hardness and hydrogen sulfide. Possible unacceptable levels of iron and manganese also are of concern, making the groundwater unsuitable for potable use without some form of treatment.

Pilot Testing Program

The goals of the pilot treatment project include the following:

- Demonstrate that current technologies can be used to treat the City's groundwater for potable use
- Verify the cost of treating the City's groundwater
- Reduce the concentration of various constituents to acceptable levels for potable use.

The following pilot plant treatment processes were tested:

- Pre-treatment: using chemical addition to reduce scale-forming dissolved minerals
- Treatment: using reverse osmosis and nanofiltration to treat TDS, hardness, iron and manganese
- Post-treatment: using ozone, air stripping and hydrogen peroxide to reduce hydrogen sulfide to non-detectible levels.

The report outlines chemical usage, design flowrates, equipment sizing, and projected water quality compared to MWD water supplied to the City. The report also describes the water quality testing program, including scheduling. The entire project, beginning with equipment delivery and assembly, and ending with report preparation, extended from early May 1995 to mid-August.

By: Nancy E. Heim, PE

WATER RESOURCE PLANNING AND POLICY DOCUMENT INVENTORY

Document Name:	**Document Type:**
DRAFT Municipal Water Supply and Groundwater Development Program – Pilot Testing Report	Pilot Testing Report
Author:	**Date:**
Boyle Engineering Corporation	December 1995

Issues Addressed:

Water quality data, treatment alternatives, costs

Summary

This document was not reviewed, as the final document was available. Please see summary prepared for final document dated May 1996.

This document, however, does contain a significant amount of raw data in the appendices not provided in the final document pdf:

- RO test data
- Nanofiltration test data
- Concentrate discharge water quality
- RWQCB monitoring report
- Pilot plant field data sheets
- Laboratory reports.

NOTE BY REVIEWER: *Well numbers were changed between the Draft report and the Final report. For example, the Draft report refers to Well No. 6 as the test well, while the Final report refers to the same well as Well No. 1.*

By: **Nancy E. Heim, PE**

WATER RESOURCE PLANNING AND POLICY DOCUMENT INVENTORY

Document Name:	**Document Type:**
Groundwater Project Evaluation	Planning Report
Author:	**Date:**
COBH, Public Works Department	January 1996

Issues Addressed:

Local groundwater development

Summary

Background

Since the mid-1970's, the City has relied 100% on imported water from MWD. Included in the MWD Integrated Resource Planning (IRP) strategy is the development of local groundwater resources by local member agencies. With cyclical droughts, rapidly rising cost of MWD water, and the potential for seismic interruption of the imported supply, the City of Beverly Hills undertook a Water Supply Study (by Boyle Engineering) in 1992 to assess short and long-term water management strategies.

Summary

This evaluation is essentially a follow-up of the 1992 study by Boyle Engineering. It provides a brief summary of the study and its findings. The study concluded that groundwater development program was a feasible alternative to supply water to the City, while the pursuit of non-potable water sources would be of little value to the City for several decades into the future. The evaluation document outlines the pilot well project completed in 1995, including treatment alternatives and costs for disposal of brine from the recommended reverse osmosis (RO) treatment.

The evaluation document contains a number of relevant exhibits including, but not limited to: a model groundwater management plan, a draft ordinance to regulate accessibility to municipal water (prohibits others from drilling wells and simultaneously receiving City water), a draft ordinance to control and protect groundwater, and a sample agreement with MWD to receive financial incentives of up to $250/AF for developing local groundwater resources under MWD's Groundwater Recovery Program (GRP).

After reviewing project reports and alternatives, the Public Works Commission recommended moving the groundwater project forward to the environmental impact report (EIR) stage. Some of the other conclusions/recommendations supporting the groundwater program included:

- Groundwater development will provide additional emergency water management flexibility, and reduce reliance on imported water.
- Developing local groundwater will "cushion" water reductions and financial impacts imposed by MWD during drought conditions.
- Groundwater development allows deferral of the City Water Master Plan recommendation to construct the 6 mg reservoir in Franklin Canyon within a City of Los Angeles easement.
- Project will allow City to maintain its water rights to pump from the unadjudicated Hollywood Basin aquifer.
- With escalating costs of MWD water, the project (with MWD incentive payments) will be cost neutral in 1997.

By: Nancy E. Heim, PE

WATER RESOURCE PLANNING AND POLICY DOCUMENT INVENTORY

Document Name:	**Document Type:**
Municipal Water Supply and Groundwater Development Program – Pilot Testing Report	Pilot Testing Report
Author:	**Date:**
Boyle Engineering Corporation	May 1996

Issues Addressed:

Water quality data, treatment alternatives, costs

Summary

Test well No. 1 located in the Burton Way median strip west of Foothill Blvd was constructed in 1994-1995 (date discrepancy within report). A pilot treatment plant was constructed and operated from May to September 1995 utilizing water from Well No. 1 to more effectively define the treatment process parameters and costs to produce groundwater meeting drinking water regulations and customer requirements. This report documents the water quality objectives, pilot plant design and operation, and results of this pilot testing program. It also presents recommendations and considerations for the full-scale well and treatment project that the City is considering to supplement its current MWD supply. Water quality data from two existing monitoring wells in the area also is included and discussed.

The pilot plant consisted of the following: 1) pretreatment (chemical addition and cartridge filtration), 2) membrane treatment (reverse osmosis and nanofiltration), and 3) post-treatment for H2S removal (air stripping, ozonation, and hydrogen peroxide oxidation). Some of the conclusions of the program include:

- Well water can be effectively treated to meet quality standards and goals.
- RO is the preferred membrane treatment process.
- Air stripping is the preferred post-treatment for H2S removal.
- The preferred method of concentrate disposal is to the storm drain system.
- Continued implementation of the City's groundwater development program is justified.

This report also includes a chapter dedicated to updating some of the elements described in the City's original Phase 1 report – Municipal Water Supply and Groundwater Study, submitted on September 17, 1992. The new information is based on the data obtained from the test/production Well No. 1 and the pilot plant:

- Original well field proposed eight wells with one as standby for a total pumping rate of 3,000 AFY. New data show higher pumping rates are possible, and therefore, only four operating wells may be required.
- Well No. 1 is fully equipped for production, and the location for the three additional wells is provided.
- Depending on hydraulics, a fifth well may need to be constructed and the pumping rate at each well could be reduced.
- The proposed treatment plant location was moved across the street to a site used by the City as the refuse transfer station.
- The size of the raw water collection pipelines has changed due to fewer wells and higher flow rates.
- Updated costs for capital and O&M for the full-scale project is provided, along with some discussion of alternatives and cost effectiveness of the program.

NOTE BY REVIEWER: *Well numbers were changed between the Draft report and the Final report. For example, the Draft report refers to Well No. 6 as the test well, while the Final report refers to the same well as Well No. 1.*

By: **Nancy E. Heim, PE**

WATER RESOURCE PLANNING AND POLICY DOCUMENT INVENTORY

Document Name:	**Document Type:**
Water System Appraisal	Appraisal Report
Author:	**Date:**
Stetson Engineers, Inc	May 1997

Issues Addressed:

Water system valuation, water rights, land and land right holdings

Summary

This report represents the culmination of a four phase project to provide a valuation of the City's water distribution system. The report details the Replacement Cost New Less Accrued Depreciation (RCNLD) valuation, a comparable sales valuation, water right review and valuation, and a tabulation of land and land rights. As a result of the work, the value as of January 1, 1996 was at least $82.6 million, including water rights, but excluding land and land rights.

Though this report focuses on methods of valuation and other financial aspects of the City's water system, it also provides a brief description of the water system and its history, and explains California water rights (including overlying, appropriative, and prescriptive rights). The report contains a table showing a summary of the historic ground water extractions and MWD purchases from 1958 to 1976. During this period, the rate of groundwater extraction decreased as more water was imported from MWD. Annual groundwater extractions from 1953-1957 also are shown in an attached letter to the State Water Resources Control Board (SWRCB), dated 1977. It is noteworthy that in October 1976, the City ceased groundwater production due to high concentrations of manganese and iron in the water supply, resulting in complete reliance on imported water from MWD. For water year ending September 30, 1977, and each year thereafter, the City has filed a "Statement of Cessation or Reduction in the Extraction of Groundwater" with the SWRCB, thereby protecting its right to extract a total of 9,403 acre-feet/year from the Hollywood Basin and a portion of the Central Basin. Although the groundwater rights of the City have not been adjudicated, they have been preserved through the annual filings under Water Code section 1005.1

By: Nancy E. Heim, PE

WATER RESOURCE PLANNING AND POLICY DOCUMENT INVENTORY

Document Name:	**Document Type:**
Ordinance of the COBH Adopting a GW Management Plan for the Hollywood GW Basin	City Ordinance
Author:	**Date:**
City of Beverly Hills	May 4, 1999

Issues Addressed:

City Ordinance, groundwater management plan

Summary

This document is the City's Ordinance 99-0-2327, adopting a groundwater management plan for the Hollywood Groundwater Basin, adopting regulations to implement the plan, and amending the City's municipal code. Adopted on May 4, 1999, the Ordinance is intended to regulate, manage, conserve, protect and preserve the City's water supply, including its groundwater resources, in order to remain a viable resource to be used by the City and its inhabitants.

Highlights of the Ordinance include:

- Restrictions on landowners/leasers using multiple water supplies (cannot pump well water from premises if receiving City water).
- Registration of wells, and permits required for installation, modification or destruction of wells.
- Prohibiting the transfer of water from one parcel to a non-adjoining parcel without a permit.
- Prohibiting the export of water from the basin or plan area without a permit.
- Prohibiting the storage or recapture of imported or developed groundwater within the basin without a permit.
- Restrictions on activities that could degrade or contaminate the water supply.
- Issues regarding revocation or suspension of permits, right of entry to inspect, and appeals.

Development and implementation of the Groundwater Management Plan (GWMP) is authorized in accordance with Water Code Section 10750. The Plan describes administrative issues, goals and objectives, provides authorization for studies, investigations and monitoring, addresses the issue of protecting water quality and quantity, implementation of rules and regulations, and coordination.

By: Nancy E. Heim, PE

WATER RESOURCE PLANNING AND POLICY DOCUMENT INVENTORY

Document Name:	**Document Type:**
COBH Well Construction	Photos
Author:	**Date:**
Groundwater Technical Advisory Committee	July 2000

Issues Addressed:

Well construction and completion photos

Summary

Dated July 2000, this packet contains a map showing well site locations for four water wells and the City's Water Treatment Plant. It also contains a series of photographs showing various stages of well construction during 1999, and photos of completed wells at three sites. Photos show several types of drill rigs and drill bits, sound wall installation and various other facets of well construction.

By: Nancy E. Heim, PE

WATER RESOURCE PLANNING AND POLICY DOCUMENT INVENTORY

Document Name:	***Document Type:***
DRAFT COBH Drinking Water Source Assessments for City Wells No. 2, 4, 5, and 6	Well Assessment Report
Author:	***Date:***
Boyle Engineering Corporation	Sept 2000

Issues Addressed:

Groundwater production, protection zones, vulnerability analysis for possible contamination

Summary

This document was not reviewed, as the final document was available. Please see summary prepared for final document dated May 2001.

WATER RESOURCE PLANNING AND POLICY DOCUMENT INVENTORY

Document Name:	**Document Type:**
COBH Drinking Water Source Assessments for City Wells No. 2, 4, 5, and 6.	Well Assessment Report
Author:	**Date:**
Boyle Engineering Corp.	May 2001

Issues Addressed:

Groundwater production, protection zones, vulnerability analysis for possible contamination

Summary

Background:

The California Drinking Water Source Assessment Protection (DWSAP) Program implemented in 1999 requires all water systems to conduct an assessment of their water sources to identify potential hazards in the vicinity of each source. Prior to 1976, the City relied on groundwater to supplement its water supply. Pumping was discontinued in 1976 due to quality problems, forcing the City to rely solely on imported MWD water. In later years, the City reinitiated a groundwater development program, and was therefore required to conduct the source assessment.

Assessment:

The report presents source assessments for the City's one completed well (Well No. 6) and three additional new wells (Well Nos. 2, 4, and 5) designed, but yet to be equipped as of May 2001. The following information is provided for each well:

- Drinking water source location
- Delineation of groundwater protection zones
- Physical barrier effectiveness (based on siting, type of aquifer, well operation, well construction)
- Well data (location, sanitary conditions, construction, aquifer, production and pump information)
- Possible contaminating activity (PCA)
- Vulnerability analysis for PCA

Summary of Findings:

Well No. 2: Recharge area approximately 0.6 sq. miles. Physical barrier effectiveness rated at 90%. Most vulnerable to the following activities for which no associated contaminants have been detected in supply: dry cleaning operations, park areas, residential housing, and historic railroad rights-of-way.

Well No. 4: Recharge area approximately 1.1 sq. miles. Physical barrier effectiveness rated at 90%. Most vulnerable to the following activities for which no associated contaminants have been detected in supply: vehicle repair shops, parking lots, park areas, residential housing, and historic railroad rights-of-way.

Well No. 5: Recharge area approximately 0.8 sq. miles. Physical barrier effectiveness rated at 90%. Most vulnerable to the following activities for which no associated contaminants have been detected in supply: gas station, confirmed leaking underground storage tanks, parking lots, park areas, residential housing, and historic railroad rights-of-way.

Well No. 6: Recharge area approximately 0.8 sq. miles. Physical barrier effectiveness rated at 90%. Most vulnerable to the following activities for which no associated contaminants have been detected in supply: gas station, a known contaminant plume, confirmed leaking underground storage tanks, a utility station, parking lots, government equipment storage areas, and historic railroad rights-of-way.

By: Nancy E. Heim, PE

WATER RESOURCE PLANNING AND POLICY DOCUMENT INVENTORY

Document Name:	**Document Type:**
Well Completion Report COBH, Well Nos. 2, 4, and 5, Site No. 1	Well Report
Author:	**Date:**
Boyle Engineering	August 2001

Issues Addressed:

Well design & construction, water quality

Summary

Background

The City of Beverly Hills contracted for design and construction of three new water supply wells (Nos. 2, 4, and 5) to pump groundwater from the Hollywood Basin to a City-owned water treatment plant and then distribute it within the City for municipal use.

Summary

The report describes details of each well including well location, drilling and construction, aquifer isolation testing, pump testing, water quality results. Details include information on the conductor casing, pilot hole drilling and reaming, gravel pack, well screen design, well development and post construction activities including alignment and plumbness testing. The document contains 3 appendices: lithologic logs, geophysical logs and pumping test results.

It is noteworthy, that after Wells 2 and 4 were completed, pilot hole drilling and zone tests were performed on Site No. 1 (located on the greenbelt median of Burton Way) in January 2000. A review of the drilling, geophysical logging, and aquifer isolation testing, led the consultant and City to conclude that the overall hydrogeologic conditions were unfavorable. As a result, the pilot hole (Site No. 1) was abandoned and well No. 5 was added to the project as a replacement.

By: Nancy E. Heim, PE

WATER RESOURCE PLANNING AND POLICY DOCUMENT INVENTORY

Document Name:	**Document Type:**
Water System Master Plan	Water Master Plan
Author:	**Date:**
Black & Veatch	August 2002

Issues Addressed:

Existing water facilities, projected water use, modeling, CIP

Summary

This report presents the results of the water master plan developed for the City of Beverly Hills to help the City ensure a continued reliable water supply for its customers to year 2025. The master plan covers approximately 3,642 acres within Beverly Hills city limits, and 368 acres of a portion of West Hollywood. The report includes:

- The results of physical facility inspections and assessments of the water system
- Water system inventory and GIS mapping
- Water distribution system modeling
- Operations review
- Pipe replacement/rehabilitation planning
- Evaluation of water department communications network
- Phased capital improvements planning, and financial planning.

The planning area is approximately 90% residential and expected to be fully developed by 2025. Any additional growth is expected to result from redevelopment and densification. Water use over the past 22 years has been stable with an average of 12.2 mgd. Design Year 2025 annual water requirements were established at 12.6 mgd, based on metered sales, a 10% unaccounted for water allowance, and no significant population increases.

The primary source of water for the City is imported water from MWD through two connections. The City also has two emergency service connections to Los Angeles Department of Water and Power (LADWP). The City's 13 pressure zone system has 10 pump stations and nine reservoirs to supply a network of distribution pipelines.

The two MWD connections have a capacity of 40 cfs (25mgd) each. In reviewing this master plan document, it was noted that the City of Beverly Hills is required to take a minimum combined daily flow of 8 cfs from the two MWD connections.

The master plan provides several tables summarizing water system facility improvements, but none of the improvements deal with water conservation issues or alternate water supplies.

By: **Nancy E. Heim, PE**

WATER RESOURCE PLANNING AND POLICY DOCUMENT INVENTORY

Document Name:	**Document Type:**
O & M Manual for RO Plant & Public Works Facility Monorail, Trolley & Hoist	O & M Manual
Author:	**Date:**
American Monorail of California	August 6, 2002

Issues Addressed:

Water Treatment Plant equipment O & M

Summary

The City of Beverly Hills owns and operates a water treatment plant (originally operated by the General Contractor, Earth Tech, Inc) that uses reverse osmosis (RO) and a series of pumps as part of its system. The plant is equipped with a 3-ton, non-electrified monorail system to service on-site pumps. The monorail system includes trolley and manual chain hoist.

This document is a typical O & M manual provided by the equipment supplier for use by plant operators. It contains the following information:

- Safe monorail operation practices
- Hoist safety practices
- Details of the monorail and track
- Features, installation, and operation of manual chain hoist with geared trolley
- Shop drawings with specification for the monorail system
- Manufacturer's standard guarantee.

By: **Nancy E. Heim, PE**

WATER RESOURCE PLANNING AND POLICY DOCUMENT INVENTORY

Document Name:	**Document Type:**
COBH Reverse Osmosis Water Treatment Plant	Plant Operation
Author:	**Date:**
EarthTech	(Undated) 2002?

Issues Addressed:

Reverse Osmosis, water treatment

Summary

Background

The City of Beverly Hills receives water from Metropolitan Water District (MWD) and supplements it with local groundwater well supplies. Through a design/build/operate agreement with the City, Earth Tech, Inc designed, constructed and operated (at the time of this report) water treatment facility to treat the water from the groundwater supply.

The City operates and maintains four water supply wells. Water from the wells is collected in a common water main, providing a blended groundwater supply to the City's water treatment plant. The treatment system consists of a single reverse osmosis (RO) train and its associated pre-treatment and post-treatment facilities. The RO system is designed to produce up to 1,028 gpm of product water from a feed of up to 1,318 gpm. Once treated, the water is discharged into a dedicated 16-inch transmission main that feeds into Sunset Reservoir where MWD water enters the Beverly Hills system. The treatment plant operates at a constant rate, with the MWD supply varying to match the system demand.

Summary

This document simply provides a basic overview of the RO system and associated components. The document provides definitions of terms used in RO treatment, principals of system operation, and briefly describes the function of each component in the system in relatively simple terms.

By: Nancy E. Heim, PE

WATER RESOURCE PLANNING AND POLICY DOCUMENT INVENTORY

Document Name:	***Document Type:***
COBH Standard Drawings and Specifications for Construction of Water Pipeline Installations	Specifications & Standard Drawings
Author:	***Date:***
City of Beverly Hills	April 2003
Issues Addressed:	
Standard drawings, standard specifications	

Summary

This document contains the City's standard drawings and standard specifications for use in the construction of water pipelines, with revisions dated April 2003. There are 19 standard drawings showing typical details for items such as thrust blocks, trenching, fire hydrant installation, and more. The standard specifications include sections covering the following topics:

- Earthwork
- Concrete Construction
- Water Pipeline Materials
- Water Pipeline Installation

By: **Nancy E. Heim, PE**

WATER RESOURCE PLANNING AND POLICY DOCUMENT INVENTORY

Document Name:	**Document Type:**
Proposal to Provide a Safe Yield Evaluation of the Hollywood Ground Water Basin	Proposal
Author:	**Date:**
Geoscience	August 2003

Issues Addressed:

Hollywood Basin, safe yield, hydrologic and geologic mapping

Summary

Background

Between 1907 and 1976, the City used both local groundwater from the Hollywood Basin (1907 - 1976) and water imported from MWD (1941 - Present) to supply the City's needs. Groundwater production at the time ranged from 2,500 – 3,000 AFY, but required treatment. In 1976, the City discontinued groundwater production and exclusively used water supplied from MWD.

Hollywood Basin

The Hollywood Basin covers approximately 15 square miles with three primary aquifers providing a total of 100,000-200,000 gpd/ft, with aquifer storage estimated at 80,000 AF. Based on data from the western 1/3 of the basin, LADWP estimated the Safe Yield to be 3,000 AFY in 1991. However, very little data is available on the eastern 2/3 of the basin, leaving some question regarding the true Safe Yield. Groundwater quality in the basin typically has high levels of hardness, iron and manganese and unactable levels of volatile organic chemicals (VOC).

Scope of Proposal

The primary goal of the proposed study is to validate groundwater resources available to the City by evaluating the Safe Yield of the Hollywood Basin. The proposed work includes the following:

- Background data collection, including hydrologic and geologic field investigation
- Data evaluation and delineation of aquifer systems
- Preparation of a detailed geohydrologic base map
- Calculation of the Safe Yield of the entire Hollywood Basin and hydrologic subunits within the City of Beverly Hills service area.
- Preparation of a geohydrologic report fully documenting the work performed, including conclusions and recommendations.

By: Nancy E. Heim, PE

WATER RESOURCE PLANNING AND POLICY DOCUMENT INVENTORY

Document Name:	**Document Type:**
California Groundwater Bulletin 118: Coastal Plain of Los Angeles Groundwater Basin, Hollywood Subbasin	State Groundwater Bulletin
Author:	**Date:**
State of California	February 2004
Issues Addressed:	
Basin boundaries, Hydrogeology	

Summary

This bulletin briefly describes the basin boundaries, hydrology, and provides hydrogeologic data for the Hollywood Subbasin which underlies the northeastern part of the Coastal Plain of the Los Angeles Groundwater Basin. Much of the information is based on historic data from the California Department of Water Resources, with some limited, updated information from other sources, including the City of Beverly Hills. Some of the more significant points regarding the Hollywood Subbasin identified in the document include:

- Basin surface area: 10,500 acres
- Average annual precipitation ranges from 12-14 inches.
- Unconfined groundwater conditions exist in the shallow aquifers in the northern and eastern portions of the basin, while the remainder of the subbasin and deeper aquifers are confined.
- Groundwater in the subbasin primarily is replenished by percolation of precipitation and stream flow from higher areas to the north. To a lesser extent, subsurface inflow also may take place through fractured rock in the Santa Monica Mountains.
- Groundwater flow is generally westward.
- Total storage capacity of subbasin: 200,000 acre-feet
- Between 1934 and 1956, subsurface flow in the subbasin fluctuated between positive and negative flows. (1934-1949: average loss = 2,194 af/yr.; 1950-1956: average recharge = 2,500 af/yr).
- Groundwater quality data is limited, although water from one water supply well showed TDS= 526 mg/L in 1998.
- The City of Beverly Hills is the only major user in the subbasin. The City does not enforce any management plan over the subbasin, but operates it on a maximum safe yield of 4,400 af/yr (based on DWR information from 1962).

By: Nancy E. Heim, PE

WATER RESOURCE PLANNING AND POLICY DOCUMENT INVENTORY

Document Name:	***Document Type:***
Determination of Maximum Perennial Yield for the Hollywood Basin	Hydrogeology Report
Author:	***Date:***
Geoscience Support Services, Inc	March 2004

Issues Addressed:

Safe-yield of groundwater extraction, geology, aquifer recharge

Summary

The City of Beverly Hills is looking to re-establish the use of local groundwater to supplement its current water supply imported from MWD. This report provides data, findings and recommendations from a hydrogeologic study to determine the maximum perennial (safe-yield) of the Hollywood Basin. Data reviewed included previous investigations from multiple sources. The report includes an overview of the study area, geology, hydrogeology, water balance of the Hollywood Basin, estimates of maximum perennial yield based on three methodologies, findings, and recommendations.

Because the surface area covering the Basin is completely urbanized, most of the groundwater recharge is from Santa Monica Mountain runoff and subsurface inflow from adjacent basins. The report estimates the total available storage in the Hollywood Basin to be 354,000 AF.

For this study, three methods were used to determine the maximum perennial yield in order to cross-check estimates and improve reliability of the results. Because safe yield of the Hollywood Basin is highly dependent on production in the Basin as well as the adjacent La Brea subarea, the maximum allowable pumping (safe yield) is a range depending upon both hydrologic and operational conditions. This range is estimated to be between 2,000 and 3,000 AFY.

Recommendations of the study include:

- Use an annual ground water audit process to manage the basin – evaluate ground water level trends, production rates, etc from the previous year and use it to make recommendations for pumping in the following year.
- Artificial recharge using aquifer storage and recovery (ASR) wells – due to land availability constraints, use injection wells to increase the safe yield of the Basin. The water must be injected into confined aquifers.
- Artificial recharge using spreading basins – surface spreading placed in the forebay of the Santa Monica Mountains should be assessed, since this method will ensure optimal recharge to both shallow and deep aquifers.
- More characterization of the Basin is necessary, since the eastern portion is not completely understood.
- Institute a groundwater monitoring program at least once a month since reliable data are lacking and therefore management decisions cannot be made with compete certainty.
- Develop electronic database and predictive tools to manage the Basin.
- Conserve spring flows – spring discharges currently channeled into storm drains should be collected and used in some way. At the very least, this water should be allowed to percolate back into the ground.

By: **Nancy E. Heim, PE**

WATER RESOURCE PLANNING AND POLICY DOCUMENT INVENTORY

Document Name:	**Document Type:**
Comments on Draft Determination of Maximum Perennial Yield for the Hollywood Basin	Memorandum
Author:	**Date:**
C. Wesley Strickland (Hatch & Parent Law Corp)	April 2004

Issues Addressed:

Comments on draft report by Geoscience Support Services

Summary

This 3-page memorandum represents the comments compiled by Hatch & Parent (law firm) on behalf of the City of Beverly Hills for clarification of the "Draft Determination of Maximum Perennial Yield for the Hollywood Basin" prepared by Geoscience Support Services, Inc, dated March 2004.

In addition to minor edits, the memorandum raises some significant questions regarding the information presented in the report, including some of the conclusions. Some of the concerns/questions include, but are not limited to:

- What level of pumping is expected in the La Brea Subarea in the future? (i.e., Pumping in subbasin expected to be minimal, while pumping from Hollywood Basin will be maximized.)
- No mention of groundwater from the Basin leaking into the Red Line subway tunnel of the LA Metropolitan Transportation Authority (from 1995 to present) or other outflow representing a loss of water to the Basin.
- Recent reductions in groundwater extractions from the Santa Monica Basin due to MBTE contamination.
- Should the safe yield be a range of 2,400 to 3,300 AFY rather than the stated 2,000 to 3,000 AFY? (i.e., Questions regarding how the safe yield range was determined and justification for the conclusion regarding the methods used.)

NOTE BY REVIEWER: *No final document was provided to Psomas by the COBH showing how these comments were addressed. Therefore, the safe yield numbers concluded in the study may be of limited use to the City.*

By: **Nancy E. Heim, PE**

WATER RESOURCE PLANNING AND POLICY DOCUMENT INVENTORY

Document Name:	**Document Type:**
COBH Water Distribution System Emergency Response Plan	Emergency Plan
Author:	**Date:**
Ed Otsuka (City of Beverly Hills)	November 2004
Issues Addressed:	
Water emergency plan, regulations	

Summary

Background

Emergency Response Planning (ERP) is essential to ensure a reliable and adequate supply of potable water is available during an emergency resulting from terrorist activities or natural disasters. This document is designed to meet all state and federal requirements, including those set forth in 2002 under the Public health Security and Bioterrorism Preparedness and Response Act. The document provides the City with emergency information, a standardized response and protocol to prevent, minimize, and mitigate problems resulting from emergencies.

Summary

The ERP document provides:

- Extensive lists of contacts, both internal and external to the city in the case of an emergency (i.e. city departments, utilities, state, county, and federal)
- Specific action plans for a variety of disaster events and scenarios
- Basic water system information, including a brief discussion of imported and groundwater supplies and identification of emergency/alternative water resources (two emergency connections to LADWP).
- Asset protection considerations
- Integration with Standardized Emergency Management System (SEMS), for managing responses to multi-agency and multi-jurisdiction emergencies within California
- Decision making process to determine if and when the ERP should be implemented
- Actions to be taken when an ERP is activated
- Communication protocol during an emergency response
- Notification procedures, including procedures for notifying the media and the public
- Procedures and resources for water quality sampling during an emergency
- Procedures for actions following an emergency
- Assessment of the ERP effectiveness, description of training and drill exercises of the ERP.

By: **Nancy E. Heim, PE**

WATER RESOURCE PLANNING AND POLICY DOCUMENT INVENTORY

Document Name:	**Document Type:**
COBH 2005 Urban Water Management Plan	Water Planning
Author:	**Date:**
SA Associates	December 2005
Issues Addressed:	
Water resources, demands, emergency planning	

Summary

This plan was been prepared in compliance with the Urban Water Management Planning Act, which requires water suppliers to file plans with the Department of Water Resources every five years. The Plan describes and evaluates reasonable and practical efficient water uses, reclamation, and conservation activities.

The 2005 Plan presents the following information:

- Description of city water system history, service area, population and water distribution system
- Water supply resources available to the City, including imported water from MWD, local groundwater extractions, and potential future water supplies, including transfers and exchanges, recycled water and desalinated water
- Water demands – past, current and projected
- Reliability of the City's water supplies
- Discussion of City's plans to implement water conservation measures and the impacts these measures will have on overall water demands
- Water shortage contingency plan describing the City's current conservation activities as well as coordinated efforts with MWD and its other member agencies.

Significant findings of the 2005 Plan include, but are not limited to:

- Water supply resources: The use of recycled water currently is not a feasible source of water for the City, since wastewater is treated at a plant more than 20 miles from the City, with the closest pipeline 15 miles away. The City is not located near the ocean and therefore has no plans for a local or regional desalination facility; though it could participate in a regional facility should one be available through MWD in the future.
- Reliability planning: If projected imported and local supplies (groundwater) are developed as planned, no water shortages are anticipated in the City's service area during the planning period (25 years).
- Water demand management: In July 2004, the City became a member to the California Urban Water Conservation Council and voluntarily complies with many of the Councils 14 BMPs to conserve water. The City has adopted the Efficient Landscaping Ordinance 93-0-2162. Although the Ordinance has not yet been implemented, the City plans to implement it in the next five years.
- Water shortage contingency plan: The City passed an Emergency Water Conservation Plan Ordinance 92-0-2139 in 1992. Because the City receives 90% of its water from MWD, the MWD 2005 Water Surplus and Drought Management Plan (WSDM Plan) is used by the City as a supplement guide to achieving its own reliability goals. Through effective management of its water supply, MWD and the City fully expect to be 100% reliable in meeting demands throughout the next 25-year planning period.

By: **Nancy E. Heim, PE**

WATER RESOURCE PLANNING AND POLICY DOCUMENT INVENTORY

Document Name:	***Document Type:***
Summary of Analytical Results. Water Samples from Sump at 331 North Maple Drive	Water Quality Data
Author:	***Date:***
Richard C. Slade & Associates	Summer 2006
Issues Addressed:	
Water quality data	

Summary

This document appears to be simply a collection of water quality data obtained in the summer of 2006 by Richard C. Slade & Associates as part of a contract with the City to investigate shallow groundwater extraction feasibility. It contains data from the two dewatering sumps located on Maple Street and Wells 2, 4, 5 and 6. It is unclear if any of the data refers to other sites.

With no attached report, this information is of limited use.

By: **Nancy E. Heim, PE**

WATER RESOURCE PLANNING AND POLICY DOCUMENT INVENTORY

Document Name:	**Document Type:**
Preliminary Notes, Results of Interim Lab Testing of GW Samples, 2 Sumps, Maple Drive	E-Mail
Author:	**Date:**
RC Slade & Associates	June 23, 2006

Issues Addressed:

Maple Drive sump water for potable use

Summary

This email contains communications between Richard Slade and Associates, ISG, and the City from June 6 through June 23, 2006 regarding water quality sampling data obtained at two dewatering sump sites within the City. The email refers to an attached table showing water quality data, however, no table was included with the pdf copy provided to Psomas.

The email discusses the City's interest in using water from the existing sumps on Maple Drive and blending it with other well water as a source to the City's Reverse Osmosis treatment plant. While it appears the quality of the sump water could be treated for potable use, the DHS may not approve blending this water within the potable system. The email mentions that if the DHS does not approve the treated sump water for potable use, the City may need to consider using the water for other non-potable beneficial reuses such as irrigation, lakes, etc.

By: Nancy E. Heim, PE

WATER RESOURCE PLANNING AND POLICY DOCUMENT INVENTORY

Document Name:	***Document Type:***
Ordinance of the COBH Relating to the Removal of Groundwater and Amending the Beverly Hills Municipal Code	Ordinance
Author:	***Date:***
City of Beverly Hills	October 2006
Issues Addressed:	
City Ordinance, definitions	

Summary

This one-page Ordinance, No. 06-0-2506, amends the City's municipal code by adding several new definitions to the existing code in an effort to further protect groundwater resources in the area. The new definitions include:

- "Basin Drainage Area"
- "Dewatering"
- "Premises"
- "Recharge"

The Ordinance also provides for some renumbering of several sections of the code.

By: **Nancy E. Heim, PE**

WATER RESOURCE PLANNING AND POLICY DOCUMENT INVENTORY

Document Name:	**Document Type:**
COBH and CA Department of Health Services Meeting: Shallow Groundwater Well Discussion	Meeting Notes
Author:	**Date:**
Unknown	October 2006

Issues Addressed:

EPA regulations, DHS concerns

Summary

This document contains an outline of items discussed at a meeting between the City and the California Department of Health Services held on October 17, 2006. The subject of the meeting was to discuss shallow groundwater well development and was to include: a site discussion, a water quality discussion involving two sites on Maple Drive and one on Coldwater Canyon, and future plans for the Maple sites.

The document contains a number of random handwritten notes by an unknown meeting attendee that are not entirely clear. A copy of a DHS business card is attached to the document.

NOTE BY REVIEWER: *On reviewing this document, I believe the issues and notes described, are reflected in a later document provided to Psomas entitled: "Hydrogeologic Feasibility Study and Preliminary Design Report for Development of Shallow Groundwater Near Water Treatment Plant", by Richard Slade and Associates, dated January 2009.*

By: **Nancy E. Heim, PE**

WATER RESOURCE PLANNING AND POLICY DOCUMENT INVENTORY

Document Name:	**Document Type:**
Lead and Copper Rule – Internal Corrosion Desktop Evaluation	Compliance Document
Author:	**Date:**
Boyle Engineering Corporation	January 2007
Issues Addressed:	
Lead and copper compliance	

Summary

Background

The Lead and Copper Rule (LCR) required under the Safe Drinking Water Act has been in effect since 1993. In April 1994, the City of Beverly Hills exceeded the acceptable lead level during routine monitoring, even though the City was using only imported MWD water to supply its needs. An LCR Compliance Study was conducted that identified flaws in the sampling that may have led to the violation. Then, in May and June of 2005, the City again exceeded the lead action level under the LCR and was required to conduct a study of the water system conditions, including water characteristics, sampling locations and procedures, distribution system materials, and stray current issues to evaluate the cause of the violation. This report summarizes and documents the evaluation effort.

Summary

There are seven elements of a Desktop Evaluation required by the LCR when a either lead or copper levels are exceeded; these are included in the report: 1) describe existing system conditions, 2) determine the need for source water treatment, 3) describe regulatory and functional constraints, 4) identify corrosion control priorities, 5) describe and screen alternative approaches to control corrosion, 6) evaluate corrosion control strategies, 7) recommend treatment strategies for the demonstration test.

The evaluation determined that the most likely causes of elevated lead in the City's service area were:

- The presence of lead-packed joints in older cast iron distribution piping and lead fittings in customer service lines
- Improper sampling techniques by customers relating to inappropriate faucets and standing time of water prior to sampling
- The presence of stray electrical current in customer plumbing
- Slightly corrosive water demonstrated by pH values during water quality monitoring.

Although the report provides eight specific recommendations for City implementation, the following are key:

- Enhance sampling techniques by providing customers with better sampling instructions.
- Escalate distribution system improvements (replace cast iron pipes using leaded joints, remove lead-based coatings inside storage reservoirs, replace galvanized service lines that have lead corporation stops, etc.).
- Improve corrosion indices of finished water by increasing the pH goal of the reverse osmosis water from 8.2 up to 8.4 to 8.5. (City using and treating local well water for 10% of its supply since April 2003).
- Address stray currents by using plastic water services, rubber-gasketed joints and curb stops, along with polyethylene sleeves on cast iron pipe.

By: Nancy E. Heim, PE

WATER RESOURCE PLANNING AND POLICY DOCUMENT INVENTORY

Document Name:	**Document Type:**
Fluoride Monitoring and Contingency Plan	City Procedures
Author:	**Date:**
City of Beverly Hills, Water Division	February 2007

Issues Addressed:

Fluoride monitoring, procedures and notifications, fluoride regulations

Summary

The City's Fluoride System Operations, Monitoring and Contingency Plan is provided in accordance and compliance with the California Code of Regulations Title 22. The City's goal is to maintain a fluoride concentration between 0.70 and 1.30 mg/L in the water supply system. A blending formula is provided to achieve optimal fluoride concentration at Sunset Reservoir, where fluoridated MWD water is blended with non-fluoridated water from the City's Reverse Osmosis Water Treatment Plant.

The plan provides information on:

- Fluoride monitoring
- Procedures for investigating the cause of an under/overfeed of fluoride
- Procedures for shutting down the fluoride station
- Emergency contact numbers
- Public notification requirements and forms in the case of fluoride concentration violations.

By: **Nancy E. Heim, PE**

WATER RESOURCE PLANNING AND POLICY DOCUMENT INVENTORY

Document Name:	**Document Type:**
Draft Summary Review of Dewatering Sites for Shallow Groundwater Recovery Project- Beverly Hills	Draft Technical Memo
Author:	**Date:**
Richard C. Slade & Associates	July 2007

Issues Addressed:

Shallow groundwater use, dewatering facilities, flow rates, water quality

Summary

This Draft Technical Memorandum summarizes findings and recommendations for existing active dewatering sites within the City of Beverly Hills, as part of the City's "Shallow Groundwater Recovery Project" (SGWRP). The purpose of the project was to assess the feasibility of recovering shallow groundwater for municipal water supply purposes after receiving treatment at the City water treatment plant. For this project, 17 potential dewatering sites were investigated, where the groundwater is currently collected and discharged to the storm drain system. Each site is regulated through the RWQCB under an NPDES permit. The tech memo provides a summary of each site, including street address, site contact information, measured flow rates, and general water quality information.

To be considered as a potential source, the site must 1) be capable of reliable and substantial flows of groundwater, 2) be located close to the existing water treatment plant, and 3) produce groundwater of a quality that can be treated by the current City water treatment plant. In addition to these three criteria, the report mentions a number of other issues that would need to be considered. Of the 17 original sites, only three (3) appear to qualify for further consideration based on Criterion No. 1 above. These sites include:

- The City's Site "A" parking structure (225 N. Crescent Dr.)
- 331 N. Maple Drive
- 407 N. Maple Drive

The tech memo indicates that further discussions of these three sites will be provided under separate cover.

By: Nancy E. Heim, PE

WATER RESOURCE PLANNING AND POLICY DOCUMENT INVENTORY

Document Name:	**Document Type:**
Chapter IV-Groundwater Basin Reports: LA County Coastal Plains Basins-Hollywood Basin	Groundwater Report
Author:	**Date:**
Unknown	September 2007

Issues Addressed:

Groundwater production and management

Summary

This untitled document is part of a larger document that is not identified. It is a chapter describing historic as well as current information on the Hollywood Basin. It provides hydrogeologic parameters of the Basin, a brief description of the groundwater management activities governing the Basin, water supply facilities, groundwater quality issues, and basin management considerations.

In its characterization of the Basin, this chapter describes the aquifers, depth to basin groundwater as up to 660 feet, the thickness of each water-bearing unit, natural safe yield equal to 3,000 AFY, and total storage equal to 400,000 AF. Unused storage space is unknown. The report mentions that in general, aquifers in the Hollywood Basin are not highly transmissive and do not yield significant groundwater except in the western portion. Groundwater is mostly replenished by percolation of precipitation and stream flow from the mountains to the north. Natural recharge is limited due to urbanization in the area.

The Basin is unadjudicated and managed by the City of Beverly Hills through municipal ordinances. The City has historically produced significant quantities of groundwater from the Basin, sometimes in excess of 7,000 AFY. It is noteworthy that the USGS estimates the flow from the Hollywood Basin into the adjacent Central Basin as approximately 5,900 AFY (based on data from 1971 to 2000), with no formal agreements regarding this flow.

The chapter describes the City of Beverly Hills' four currently operating production wells as having a combined capacity of 2,025 gpm, with all water treated at the city's reverse osmosis treatment plant which can process up to 3 mgd. The current wells have pumped an average of 1,200 AFY of groundwater between 2003 and 2005, with a maximum of 1,850 AF in a single year. The report indicates there is no other documented production in the Basin, and no injection wells, spreading basins, seawater intrusion barriers, or groundwater storage programs.

The chapter provides the following three basin management considerations:

- Shallow groundwater (less than 20 feet from the surface in some areas) may limit the ability to store water.
- Groundwater must be treated to meet drinking water standards (TDS levels exceed the secondary standard of 500 mg/L).
- The Basin receives limited natural recharge because of urbanization. The safe yield is only about 3.000 AFY.

By: Nancy E. Heim, PE

WATER RESOURCE PLANNING AND POLICY DOCUMENT INVENTORY

Document Name:	**Document Type:**
Evaluation and Detailed Life Cycle Cost Analysis of 5 Welded Steel Water Storage Tanks	Planning Report
Author:	**Date:**
Albert A. Webb Associates	December 2007

Issues Addressed:

Reservoir life cycle costs, hydraulic analysis, seismic calculations

Summary

Background

In the summer of 2006, the City of Beverly Hills received bid proposals for the refurbishment of 5 existing welded steel water storage tanks (3A, 4B, 5, 6, and 7) ranging in age from 43 to 51 years. Because the bids were much higher than anticipated in comparison to cost estimates prepared by the City's consultant, the City decided to reject the bids and evaluate the option of constructing new storage tanks in lieu of tank refurbishment.

Summary

The primary purpose of this study was to provide detailed engineering analysis, evaluations and recommendations to allow staff to determine if the existing tanks should be refurbished or replaced with new tanks. An additional objective was to evaluate one reservoir (Site 3A) from a hydraulic standpoint to determine the feasibility of constructing a new, reduced capacity tank with smaller footprint, better suited to the small size of the existing parcel. The 3A site warranted separate evaluation because it 1) is small and serves the same zone as the 19 MG Greystone Reservoir; 2) has no entitled access around the easterly edge of the tank; and 3) borders a steep 0.5:1 slope on the easterly side, and will likely fail if it becomes saturated.

Conclusions and Recommendations

- The benefit-cost ratios for Tanks 4B, 5, 6, and 7 ranged between 0.71 and 0.78, strongly favoring replacement of the existing tanks with new tanks of equal capacity.
- The calculated benefit-cost ratio for Tank 3A was 1.08, slightly favoring the refurbishment alternative. However, considering the site conditions at 3A, the City may wish to consider replacement of the tank rather than upgrading it.
- Although water quality and operations procedures were outside the scope of this study, potential nitrification in the tanks has been identified by City staff as an on-going concern. A separate study is recommended to address this issue.

The report discusses a number of scenarios that were considered regarding Tank 3A, including 1) removal of the tank from the City water system; 2) reduction of tank diameter to eliminate the property line encroachment issue, but increasing the height to maintain the same storage volume; 3) reduction of the tank diameter while maintaining the existing height, resulting in reduced capacity. If the City can obtain an easement from the adjacent property owner, the report recommends doing so and either refurbishing the tank or constructing a new tank with equivalent dimensions. Should the City prefer to go with a new reduced-capacity tank, lost volume could be made up by constructing a second 1 MG tank at Site 4B or providing additional storage capacity within the new replacement tanks at sites 5, 6, and/or 7.

By: Nancy E. Heim, PE

WATER RESOURCE PLANNING AND POLICY DOCUMENT INVENTORY

Document Name:	**Document Type:**
Letter from CDPH to City regarding Shallow Groundwater Recovery Project	Letter
Author:	**Date:**
Shu-Fang Orr (District Engineer, CDPH)	June 20, 2008

Issues Addressed:

Shallow groundwater usage, water quality, regulations

Summary

Background

The City has been studying the feasibility of using shallow groundwater to augment the City's domestic water supply, or to re-use it for other non-potable uses. This nuisance groundwater is collected at dewatering sites throughout the City and currently is discharged to the local storm drain. The study is part of the City's Shallow Groundwater Recovery Project (SGRP), in which several draft technical memorandums were prepared by Richard C. Slade and Associates (RCS). This letter is the California Department of Public Health (CDPH) response to the City's proposal to use groundwater from dewatering sumps at two sites identified in the tech memos.

Summary

The two sites under consideration are 331 N. Maple Drive, and 407 N. Maple Drive, where estimated flow rates of the dewatering systems are 150 gpm and 407 gpm respectively. RCS developed 6 alternatives for utilizing the water from these sites, three for potable use and three for non-potable use:

- Potable: water collected from sumps to be pumped to city's existing RO treatment plant
- Potable: drill shallow wells with 50' sanitary seal adjacent to the two sites and treat at existing RO treatment plant
- Potable: water collected from sumps to be pumped to a new RO treatment plant
- Non-potable: irrigation and other non-potable uses
- Non-potable: deep well injection
- Non-potable: discharge to sanitary sewer.

The CDPH letter concludes that water from the sumps contain excessive pathogens/pathogen indicators, and therefore does not recommend using the sumps as sources of drinking water supply, based on California Water Well Standards and other concerns. Drilling shallow wells with 50' sanitary seals may be a viable option, but the CDPH indicates the City must conform to a number of requirements (proper depth and setbacks, source water assessment, water quality monitoring, possible 4-log virus reduction treatment, etc.). For any non-potable uses, the CDPH stresses that the water must receive sufficient treatment to ensure it is free of pathogens in order to protect the general public and/or workers.

By: Nancy E. Heim, PE

WATER RESOURCE PLANNING AND POLICY DOCUMENT INVENTORY

Document Name:	***Document Type:***
Hydrogeologic Feasibility Study and Preliminary Design Report for Development of Shallow Groundwater near Water Treatment Plant	Hydrologic & PDR
Author:	***Date:***
Richard C. Slade and Associates	January 2009

Issues Addressed:

Hydrogeology, use of shallow groundwater, groundwater quality, preliminary well design and costs

Summary

This document provides results of a hydrogeologic feasibility study to develop local shallow groundwater wells near the City's existing Water Treatment Plant (WTP) to augment the current groundwater supplies from the City's existing 4 deep-water supply wells constructed in the 1990s. The water would be conveyed via a new 630 ft long pipeline for treatment by reverse osmosis (RO) at the City's WTP.

The study includes the following elements:

- Collection and review of basic groundwater and subsurface data (including rainfall data, review of driller's logs for nearby wells, data from foundation studies of nearby structures)
- Review of water level data and flow rates from sumps at 2 nearby dewatering facilities along Maple Drive
- Groundwater quality assessment based on data from current existing City wells, destroyed deep water wells, and the 2 dewatering facilities
- Review of local environmental conditions pertaining to potentially contaminating activities (PCAs) within a one-mile radius of the WTP
- Preliminary design parameters for initial shallow water wells, including proposed locations.

Conclusions

It is hydrogeologically feasible, though somewhat risky, for the City to construct new, shallow water wells for potable use in the study area. The report outlines a number of potential benefits as well as possible problems for the City if the wells are constructed. Some of the benefits include: 1) system could become a new and independent source of groundwater for the City not being used by anyone in the area, 2) shallow system may produce a few hundred gallons per minute of groundwater, 3) property is owned by the City, 4) wells are relatively close to the WTP, 5) cost of shallow well construction (+/- 175 ft or less) should be significantly less than for a typical 700 ft deep municipal-supply water wells. Some of the potential problems identified include: possible low pumping rates and volumes that vary by season as well as from year to year, possible water quality impact from existing commercial and/or industrial facilities in the area, and regulatory concerns from CDPH regarding suitability of the wells as sources of drinking water.

The preliminary design criteria recommends the specific location for the initial 2 shallow aquifer wells on City-owned property. Recommendations include 30-inch diameter borehole to a depth of 50 feet, 26-inch casing, pilot borehole drilled to a maximum depth of 200 feet with a diameter between 6 and 9 inches. Well casing, gravel pack design, well development, pumping and water quality testing are further discussed.

NOTE: this report contains a random table at the end summarizing alternatives for water use from one of the 2 dewatering sumps discussed in the report. The report was prepared by Tetra Tech in January 2008.

By: **Nancy E. Heim, PE**

WATER RESOURCE PLANNING AND POLICY DOCUMENT INVENTORY

Document Name:	**Document Type:**
Beverly Hills Sustainable City Plan	Planning
Author:	**Date:**
City of Beverly Hills	February 2009
Issues Addressed:	
Sustainability	

Summary

The Sustainable City Plan is not a State requirement, but represents the desire of the community to become more sustainable. The plan establishes guiding principles and goals to develop a framework and implement programs that focus on sustainability in nine areas, one of which is water. Each of the nine elements is addressed individually with goal, objective, and policies presented for each element. The water element includes potable water, wastewater, and storm water, with the following goals, objectives and policies:

- Goal: Reduce water use while maintaining a garden-like quality in the City
- Objective: Use water efficiently and effectively while managing storm and waste water in a beneficial manner
- Policies: 1) minimize water consumption , particularly for landscaping, 2) maximize the availability and use of alternative water sources, 3) replenish groundwater to ensure future availability, 4) maintain and improve storm water runoff quality, 5) reduce the amount of storm water runoff, and 6) minimize the adverse effects to water quality from the sanitary sewer system.

It is noteworthy, that the plan is written in general terms and suggests simple things that residents can do to help conserve water. The plan makes a point to inform the public that 65% of all water consumed in the City is used to irrigate landscape. The appendix material includes potential actions for the City to consider in developing an implementation strategy. Both short-term and long-term policies and actions are suggested, including adoption of a Water Efficiency Landscape Ordinance. The appendix goes a step further, and even lists other possible items that the City may wish to add to the implementation strategy. Nine specific items are listed for the water element, including but not limited to: reduce potable water used for irrigation, prepare and implement an integrated water resources plan that protects groundwater and uses alternative sources of water (gray water, recycled, storm water), explore methods of managing storm water runoff and its quality, strengthen the City's efficiency standards for new developments and properties that are sold, continue water-related partnerships with the school district and City of West Hollywood, encourage the use of drought-tolerant plants in landscaping, and ensure that new and replacement water infrastructure is sized adequately without being oversized.

By: **Nancy E. Heim, PE**

WATER RESOURCE PLANNING AND POLICY DOCUMENT INVENTORY

Document Name:	**Document Type:**
Ground-Water Quality Data in the Central Los Angeles Basin Study Unit, 2006: Results from the California GAMA Program	Groundwater Quality Data
Author:	**Date:**
US Geological Survey (USGS) and California State Water Resources Control Board (SWRCB)	March 2009
Issues Addressed:	
Groundwater quality	

Summary

Groundwater quality in the 860 square mile Coastal Los Angeles Basin (CLAB) study unit was investigated from June to November of 2006 as part of the Ground-Water Ambient Monitoring and Assessment (GAMA) Program. CLAB represents one of 10 hydrogeologic province study units within the state and consists of five groundwater basins, as defined by California Department of Water Resources: Orange County Coastal Plain, Central, West Coast, Santa Monica, and Hollywood. The project (by USGS, SWRCB, and others) is a comprehensive assessment of statewide groundwater quality designed to identify and characterize risks to ground water resources, which accounts for nearly half of the water used for public supply in California. The project is unique because the data collected during the study includes analyses of an extensive number of chemical constituents at very low concentrations, analyses not normally available. The data are useful for providing an early indication of changes in water quality, and for identifying the natural and human factors affecting water quality. It is important for the long-term management and protection of ground water resources. The data provided in the report are intended to characterize the quality of untreated groundwater resources, NOT the treated drinking water delivered to consumers by water agencies, although concentrations were compared with regulatory and non-regulatory health-based thresholds to provide some context for the results.

In the CLAB study area, where a total of 69 wells were sampled, only six constituents were detected at concentrations higher than health-based thresholds, and an additional seven constituents were detected above thresholds set for aesthetic concerns.

NOTE BY REVIEWER: *While the study contains important water quality information for the general area, only two wells were sampled within the Beverly Hills area. The information is of limited use to the COBH, due to the way the data are presented.*

By: **Nancy E. Heim, PE**

WATER RESOURCE PLANNING AND POLICY DOCUMENT INVENTORY

Document Name:	**Document Type:**
Summary of Drilling and Testing Operations-Robertson Yard Exploratory Borehole	Exploratory Borehole Report
Author:	**Date:**
Richard Slade & Associates	February 2010

Issues Addressed:

Hydrogeology, aquifer zone testing, preliminary well design and costs

Summary

This report summarizes the drilling, testing and subsequent permanent destruction of an exploratory borehole located at the City-owned Robertson Corporate Yard at 621 N Robertson Blvd, in the City of West Hollywood. The test hole was drilled to a depth of 851 ft below ground surface (bgs), tested and destroyed between September 9 and December 29, 2009. The report includes details of the drilling efforts, downhole geophysical surveys, monitoring of methane and hydrogen sulfide gas, and isolated aquifer zone testing for five separate zones, along with basic preliminary design and cost information for a future on-site water well.

Conclusions

The report concludes that it is hydrogeologically feasible for the City to construct a new municipal water supply well having an acceptable pumping capacity with acceptable water quality at the Robertson Corporate Yard. Some of the conclusions of the study include:

- Groundwater is expected to occur under semi-confined to confined conditions.
- Static water level is expected to be 50-100 ft bgs
- Pumping rates between 300 and 500 gpm may be achievable
- Specific capacity for a new well is estimated at 2 to 5 gpm/ft drawdown
- Because of poor water quality in the deeper zones, drilling and/or casing for a new well should not occur below approximately 560 ft.
- Water quality is expected to have a calcium-sodium-bicarbonate character, detectible hydrogen sulfide odors - but likely no methane, TDS between 500-700 mg/L, and hardness between 100-350 mg/L.

For the preliminary well design described in the report, the estimated cost is $465,000 (in 2010 dollars). The estimate includes the normal components necessary for basic well construction such as drill rig use, noise control, drilling to 580 ft., conducting electric logs and two isolated aquifer zone tests, 12-inch diameter casing, well development and testing, etc. The cost does not include equipping of the well with items such as permanent pump and wellhead, discharge piping, connection to the City's pipelines, water treatment, etc.

By: **Nancy E. Heim, PE**

WATER RESOURCE PLANNING AND POLICY DOCUMENT INVENTORY

Document Name:	**Document Type:**
Approval of Agreement between City and Richard Slade & Associates for Hydrogeologic Services AND Approval of PO for the Services	Agenda Report
Author:	**Date:**
City of Beverly Hills	March 2, 2010

Issues Addressed:

Consultant Agreement, Groundwater Management Plan Update

Summary

Background

In an effort to responsibly manage the groundwater basin, the City adopted its original Groundwater Management Plan (GWMP) on March 30, 1999. The Ordinance (No. 99-0-2327) and GWMP require periodic studies, investigations, data collection and other items as necessary for the preparation of a report to evaluate and update the plan. It is noteworthy, that while the City was seeking qualified applicants for this work, the State of California was adopting SBx7-6 requiring similar reporting of all water purveyors. Therefore, the proposed work was also intended to meet the requirements of the state's new ruling. The City's ordinance and GWMP form the basis for the scope of work being authorized. In addition, the City also was requesting review of operational procedures to enhance the use of the local groundwater.

City Staff recommends Council approve Consultant Agreement between COBH and Richard C. Slade & Associates for Groundwater Management Plan Report.

Scope of Work

- Data Collection & Review: Review of geological and groundwater conditions, well construction details, water level measurements, historic groundwater production, previous well rehabilitation efforts, water quality reports, and City ordinances applicable to the Hollywood Basin.
- Field Reconnaissance: Involving site visits to existing City water wells, groundwater monitoring wells, and the water treatment plant to observe conditions and evaluate current practices.
- Hydrogeologic Analyses with Regard to Future Water-supply Issues at City Wells: Data analysis to include, but not limited to rainfall, recharge, water levels, SCADA records, water quality, groundwater extractions, well construction parameters and locations, replenishment of groundwater, and GWMP update.
- Preparation of Annual Report: Report to include findings, analysis, conclusions and recommendations regarding existing City wells and groundwater management. Very specific figures, plots, tables and estimates are to be included.

The Agenda Report contains copies of the following documents:

- Agreement between COBH and RC Slade & Associates
- Groundwater Management Ordinance No. 99-0-2327 and Plan approved in 1999.

By: Nancy E. Heim, PE

WATER RESOURCE PLANNING AND POLICY DOCUMENT INVENTORY

Document Name:	***Document Type:***
Ordinance of COBH to increase Water and Solid Waste Utility Rates Beginning FY 2010-11	Agenda Report
Author:	***Date:***
City of Beverly Hills	June 3, 2010

Issues Addressed:

Water rates fiscal year 2010-11 and 2011-12, history of rate increases and studies

Summary

The Water Utility (and several other city utilities) are designated as enterprise funds and are self-sufficient from the General Fund and their revenue stream is determined through rates for service. The City Council is considering rate increases for both solid waste and water utilities.

City staff, with assistance from Raftelis Financial Consultants, Inc.(RFC) is recommending that water rates be increased by 15% for each of FY 2010/11 and 2011/12 in order to operate, maintain and continue capital improvements. Even with the increases, the Water Utility will be drawing from reserves to meet requirements to cover all costs.

Summary

Agenda Report describes alternative rate increases, fiscal impacts, and the financial implications relating to MWD as a supplier. It was noted that many of the costs for water for the City and its wholesaler (MWD) are fixed. Some of MWD's rate increases are attributable to drought conditions; the less water sold, the greater the cost per unit of water, due to fixed costs or purchasing from other sources.

The Agenda Report contains copies of the following documents:

- Proposed ordinance
- Public Notice mail out
- Solid Waste Utility Rate Report
- Water Utility Rate Report by Raftelis Financial Consulting (Feb 2010).

The RFC report outlines water usage, groundwater production, MWD purchases, projected expenses, recommended rates and their impacts on customers as well as the City.

By: **Nancy E. Heim, PE**

WATER RESOURCE PLANNING AND POLICY DOCUMENT INVENTORY

Document Name:	***Document Type:***
Ordinance of COBH to increase Water and Solid Waste Utility Rates Beginning FY 2010-11 and Providing for Annual Inflation Adjustment	Agenda Report
City Author:	***Date:***
City of Beverly Hills	June 22, 2010

Issues Addressed:

Water rates fiscal year 2010-11 and 2011-12

Summary

City staff recommends adopting the proposed ordinance, as amended, authorizing a rate increase for solid waste utility and water utility services, and beginning in Fiscal Year 2010-11 and for Fiscal Year 2011-12. The proposed ordinance also provides for an annual inflation adjustment in future years.

The item was first introduced and discussed at the City Council meeting of June 3, 1010, where an increase of 15% for water utility services was discussed for both Fiscal Years. The increase in rates is expected to generate an additional $3.5 million for FY 10/11 and $4.0 million for FY 11-12, and still use $6.8 million and $4.1 million of reserves, respectively for the two years.

The Agenda Report contains a copy of the Ordinance, along with an exhibit listing the new rates for FY 2010-11 and for FY 2011-12. The water rates are listed in Exhibit A as Reference No. 08-O-2552.

By: **Nancy E. Heim, PE**

WATER RESOURCE PLANNING AND POLICY DOCUMENT INVENTORY

Document Name:	**Document Type:**
Authorization for Consultant Agreement Between City of Beverly Hills and Raftelis Financial Consultants for Preparation of a Water Rate Study	Agenda Report
Author:	**Date:**
City of Beverly Hills	October 5, 2010
Issues Addressed:	
Water Rates, Consultant Agreement	

Summary

City staff recommends the Council approve a Consultant Agreement with Raftelis Financial Consultants to prepare a water rate study.

Background

The existing rate structure, established in 2005 added a fourth consumption tier for residential customers and charged commercial customers a uniform rate based on consumption. Based on survey results, the simplest rate system with the least number of variables was adopted. In the Spring of 2010, one customer requested lot size and occupancy be considered when setting consumption tier rates. As a result, the City Council staff drafted a scope of work to study a water budget rate structure reflecting a number of factors, and how such a structure would compare with the existing tiered rate structure.

Scope of Work Proposed for Raftelis Financial

- Presentation describing a comparison of different conservation rate structures
- Presentation explaining water budget rate structures, including highlighting benefits and challenges that come with implementing water budget rate structures
- Using data received from the City, build a model calculating the water budget for each customer, and compare to each customer's previous water usage to determine the impact
- Document the study results in a report.

At this point, the City Council will have the option of further pursuing the development of a rate structure framework, including a system that allows customers to petition for an increase in their water budget (to address unique circumstances). Tasks include data processing, model development, calculations of associated customer impacts, water rate design, and preparation of a study report documenting the process for the development of the financial plan and water budgets, including the recommended rates. Possible customer service training along with a presentation to the City Council also was included in the scope.

By: Nancy E. Heim, PE

WATER RESOURCE PLANNING AND POLICY DOCUMENT INVENTORY

Document Name:	**Document Type:**
Design & Replacement of 5 Water Reservoirs, Replacement of On-Site piping, and Seismic Retrofitting of Associated 5 Pump Stations – O& M Manual	O & M Manual
Author:	**Date:**
TRIMAX	December 2010

Issues Addressed:

Equipment O & M at reservoir/pump station sites

Summary

The City of Beverly Hills operates and maintains 10 reservoirs and associated pump stations to provide a reliable water source for its service area. This O&M Manual provides detailed equipment information relating to a project involving design and replacement of five water reservoirs, replacement of on-site piping at sites 3A, 4b, 5, 6, and 7 and seismic retrofitting of the associated five pump stations. The manual is aimed at providing critical information for use by water system operating staff. The contents include O & M information on the following pieces of equipment used at the various sites:

- Tank hatch intrusion switch
- Tank motion detector switch
- Level transmitter
- Magnetic flowmeter
- Pressure gauges
- Low-range turbidity analyzer
- pH / monochloramine analyzer
- Rotameter.

The document does not contain any other additional information.

By: Nancy E. Heim, PE

WATER RESOURCE PLANNING AND POLICY DOCUMENT INVENTORY

Document Name:	***Document Type:***
Operations, Maintenance, & Monitoring Manual – City of Beverly Hills Water Treatment Plant	O & M Manual
Author:	***Date:***
City of Beverly Hills	(Undated) 2010?

Issues Addressed:

Water treatment plant O & M, arsenic monitoring results

Summary

The City operates and maintains four water supply wells to supplement the water it purchases from MWD. Water from the wells is combined prior to entering the City's Water Treatment Plant (WTP), where it is treated using Reverse Osmosis (RO) along with associated pre-treatment and post-treatment. The treated water is sent directly to Sunset Reservoir where it blends with MWD water before entering the distribution system.

This undated document (sometime after mid-2009) provides detailed information on the City's WTP for use by plant operators. The contents are typical for an O&M manual and include the following:

- Introduction - System Description: Overview and detailed description of all components including pretreatment systems, Reverse Osmosis (RO) treatment train, post treatment systems
- Process Flow Description: General, chemical injection system, filters, RO unit, H_2S stripping & scrubbing, RO cleaning cycle, finished water clearwell
- System Safety: General safety guidelines, handling hazardous chemicals, emergency contact information
- Process Controls: PLC, SCADA and more
- System Operating Procedures: General operation, service, membrane cleaning of RO system, shutdown.
- Operating Permits: CDPH, NPDES, SCAQMD, Industrial Waste Discharge Permit, SWPPP information
- Monitoring & Sampling:
- Chemical Storage & Handling: Antiscalant, sodium hypochlorite, sulfuric acid, caustic soda, and ammonium hydroxide
- Troubleshooting Procedures: General tips, membrane system troubleshooting and performance, RO membrane cleaning and flushing.

The document also includes a separate section at the end, "Arsenic Blending and Treatment Plan" (Draft 4), which describes how the City meets its arsenic compliance levels for the WTP effluent, as a result of elevated arsenic levels existing in Well 4. The plan provides historic monitoring results for each well, combined plant influent and effluent, blending and treatment operations and formulas, and action plan when compliance or operational limits are exceeded.

By: **Nancy E. Heim, PE**

WATER RESOURCE PLANNING AND POLICY DOCUMENT INVENTORY

Document Name:	**Document Type:**
City of Beverly Hills General Plan	Planning
Author:	**Date:**
City of Beverly Hills	(Undated) 2010?

Issues Addressed:

Water conservation and planning

Summary

This undated document contains the most recently amended elements of the City's General Plan up to January 12, 2010. The General Plan fulfills State requirements and provides a framework for the City's physical, economic, and social development, while sustaining natural environmental resources. The plan is long-range and considers how the City will be in the year 2025, using goals, policies and implementation programs to guide decisions. While the General Plan includes 10 separate elements, only 4 relate directly to water. Goals and related policies pertaining to water in these four elements are briefly summarized below, with specific implementation programs presented elsewhere in the General Plan document.

Open Space Element

1. Recharge Groundwater Resources – Limit permeable surfaces, use shallow groundwater, recycle stormwater
2. Water Quality Protection – Control stormwater quality, use filters and screens for catch basins, use Stormwater System Master Plan, remove debris from streets and parking lots, capture stormwater and recharge, control/regulate extensive landscaping, continue watershed education, continue to control construction and post-construction impacts, participate in regional planning with other agencies.

Conservation Element

Although there are 12 goals that each include numerous policies, only those relating to water supply are mentioned herein:

1. Water Supply System – Groundwater rights, Urban Water Master Plan, water distribution system, water storage, regulatory standards, development requirements for water service & protection of groundwater.
2. Water Conservation through System Improvements – Water conservation goals, public outreach on need to conserve water, water conservation measures for public facilities and private projects, water efficient landscaping, new conservation technology.
3. Water Conservation through Reduced Consumption – Water conservation ordinance, green building program, rebate programs, public education, restrict water runoff, water auditing, water conservation measures for public facilities and private projects, water efficient landscaping, optimum timing for irrigation, new conservation technology, monitoring system and infrastructure upgrades.
4. Alternative Water Resources – Cooperative ventures for alternative water sources, recycled water master plan.
5. Groundwater Recharge – Increase permeability in alleys, capture construction stormwater and facilitate recharge, minimize shallow groundwater being discharged to stormwater system.
6. Wastewater Treatment Systems that Conserve Water, and Sanitary Sewer Systems and Storm Drainage Systems that Preserve Water Quality – Multiple policies already described in previous goals.

Safety Element

This element includes a number of goals relating to water including but not limited to: water supply reliability, impacts of new development on water infrastructure capacity, protection from flood hazards by encouraging permeable surface areas, and providing reservoir assessments to maintain structural integrity.

As part of their disaster preparedness, the City has developed two plans to facilitate emergency management, one of which is the Hazard Mitigation Action Plan (HMAP), approved by FEMA on March 4, 2011. This plan is part of the Safety Element, and includes strategies addressing earthquakes, wildfires, terrorism, seismic, flooding and wind storms. Various sections relate to water supply, but are not described herein due to space constraints.

Public Services Element

Listed within the goal of fire services, is the policy to provide adequate infrastructure to assure appropriate water pressure throughout the City's hydrant system.

By: **Nancy E. Heim, PE**

WATER RESOURCE PLANNING AND POLICY DOCUMENT INVENTORY

Document Name:	**Document Type:**
Permit Amendment 1910156PA-003	Water Supply Permit
Author:	**Date:**
California Department of Public Health	January 2011
Issues Addressed:	
Permits, fluoridation, 4-log virus treatment	

Summary

Background

The City was issued its original Domestic Water Supply Permit from the California Department of Public Health (CDPH) on April 4, 2003. This document represents the third amendment to the permit. The following is a brief description of the three amendments:

- Amendment 001 (Issued March 15, 2010): Replaced old 7.7 mg Coldwater Canyon Reservoir with new 8.3 mg reservoir.
- Amendment 002 (Issued November 24, 2010): Replaced old Tanks 3A, 4B, 5, 6, and 7 with new tanks, added circulation and chlorination systems at those sites as well as at 2 reservoirs, added boost chlorination systems at several sites.
- Amendment 003 (Issued January 4, 2011): Add and operate a fluoridation treatment facility at the reverse osmosis (RO) water treatment plant, and provide 4-log virus inactivation treatment for the effluent from the plant.

Summary

This permit and amendment applies to the City's four groundwater sources (Wells 2, 4, 5, 6), two MWD interconnections, and two LADWP emergency connections. The amendment is subject to a number of conditions, including, but not limited to the following:

- City required to employ a T4 level operator for the RO treatment plant.
- City to update the RO treatment plant Operation, Maintenance, and Monitoring Plan to reflect new owner and management. (Ownership of RO plant transferred from Earth Tech to the City on June 27, 2008).
- Conduct a comprehensive cross-connection inspection at the RO plant to investigate the source of contamination (consistent detection of total coliform bacteria in the RO effluent).

The amendment also includes a very informative Engineering Report by the CDPH to document the engineering review, evaluate the design and operation of the proposed fluoridation and 4-log treatment facilities, and provide recommendations regarding the issuance of the amended permit. The report provides a brief description of the City's water system, discussion of groundwater sources, treatment methods, operation, maintenance, monitoring requirements, and appraisal of sanitary hazards and safeguards.

By: **Nancy E. Heim, PE**

WATER RESOURCE PLANNING AND POLICY DOCUMENT INVENTORY

Document Name:	***Document Type:***
Groundwater Management Plan-Hollywood Groundwater Basin (Draft)	Groundwater Plan
Author:	***Date:***
Richard C. Slade & Associates	January 2011

Issues Addressed:

Hollywood Basin Groundwater: geology, hydrogeology, historic exploration and use, monitoring

Summary

This document evaluates existing conditions in the City's potable water well field supply and assesses groundwater management issues in the Hollywood Basin. It also provides an update to the City's original (and only) Groundwater Management Plan (GWMP), dated March 30, 1999.

At this time (2011), approximately 10% of the City's annual water supply was from wells in the Hollywood Basin, with the remaining 90% purchased from MWD. The document provides a detailed description of historical groundwater development beginning in 1926 and extending through 2010. It is noteworthy that the City's goal after 1994 was to supply approximately 20% of the City's water demand through groundwater extraction using its recently constructed four wells. However, this goal has never been achieved, primarily due to declining static and pumping water levels and reduced well efficiencies.

This GWMP provides very detailed, up-to-date information on recent groundwater exploration and feasibility studies up to 2009, including recent discussions of shallow groundwater wells. Other significant issues include construction parameters of the City's current and former wells, pumping test data, groundwater quality data, monitoring information, and estimates of perennial yield.

GWMP Goals

This plan provides a framework for current and future actions by the City to properly operate, protect and manage the Hollywood Basin. Essential elements include, but are not limited to:

- Monitoring pertinent operational data (water level, production volumes, etc.)
- Well testing, rehabilitation, abandonment and destruction
- Mitigation of declining water levels in the basin
- Monitoring contaminated groundwater
- Well construction for redundancy in the City's groundwater water supply
- Land use planning
- Regular evaluation of the GWMP
- Water conservation programs and water education of the public
- Participation in the California Statewide Groundwater Elevation Monitoring (CASGEM) program enacted in 2009 by the California Department of Water Resources.

By: **Nancy E. Heim, PE**

WATER RESOURCE PLANNING AND POLICY DOCUMENT INVENTORY

Document Name:	**Document Type:**
Economic Sustainability Plan 2011-2015	Planning Report
Author:	**Date:**
City of Beverly Hills	(Undated) 2011?

Issues Addressed:

Financial sustainability, city priorities and programs

Summary

Background

This undated document is part of the City's response to the severe economic recession of 2007-2010 that caused disastrous reductions in state and local government revenues. The City responded by reducing its General Fund budget by more than $27 million over 3 years, focusing on new revenue opportunities, and developing and prioritizing City programs that would increase economic activity and related City revenues. This plan represents the third element in the City's response, and outlines both a set of priorities and a set of measures to help the City track its progress going forward.

The plan addresses:

- The City's fiscal structure and efforts to address competition. It stresses that the City's attractiveness to retail patrons is due to the "walkable" village atmosphere, luxury environment, and uniqueness of shops.
- The City's strategic direction, including economic sustainability model (which includes infrastructure as one of the pillars intended to improve the economy and business revenues).
- The City's recognition that infrastructure (including water systems and sewers) is critical to maintaining the "premiere" brand of the City, and central to its economic sustainability.
- How the city will track the success of this program by establishing a "Dashboard" to track changes as they are made to programs and initiatives. It will help the City learn from its experiences.
- Implementation (by integrating economic sustainability assessment into the City's Strategic Plan, and other methods).

NOTE BY REVIEWER: *This document does not have any direct mention of water infrastructure, water initiatives, or information relative to the water supply for the City.*

By: **Nancy E. Heim, PE**

WATER RESOURCE PLANNING AND POLICY DOCUMENT INVENTORY

Document Name:	***Document Type:***
COBH Water Utility Laboratory Standard Operating Procedures	Laboratory procedures
Author:	***Date:***
City of Beverly Hills	(Undated) 2011?
Issues Addressed:	
Laboratory procedures	

Summary

This undated 29-page document provides revisions to the City's standard laboratory operating procedures for analyzing various constituents in water samples. The following summarizes the revisions and corresponding dates:

- pH: Revision C, dated 10/9/2007
- Total and Free Chlorine: Revision B, dated 2/16/2011
- Total Ammonia: Revision C, dated 2/16/2011
- Nitrite: Revision D, dated 2/16/2011

By: **Nancy E. Heim, PE**

WATER RESOURCE PLANNING AND POLICY DOCUMENT INVENTORY

Document Name:	**Document Type:**
COBH 2010 Urban Water Management Plan	Water Planning
Author:	**Date:**
SA Associates	August 2011

Issues Addressed:

Water resources, demands, emergency planning

Summary

This plan is the 5-year update to the 2005 Urban Water Management Plan (UWMP) and describes reasonable and practical efficient water uses, reclamation, and conservation activities by the City, as required by the Urban Water Management Planning Act. Similar to the 2005 UWMP, the 2010 covers many of the same issues, but provides more up-to-date information on any issues which have changed since the last UWMP, including the following topics: water supply resources, water quality, water demands, reliability planning, conservation measures, and urban water shortage contingency plans.

Significant issues discussed in the 2010 Plan include, but are not limited to:

- New legislation of the Water Conservation Act of 2009 (SBx7-7) calls for 20% reduction in water use by the year 2020. While the City's 2010 Plan contains a lengthy discussion of the requirements and methodologies, the City's compliance target for per capita water consumption is 228 GPCD, by year 2020.
- The City has 2 emergency connections with LADWP, and currently is pursuing a third connection on Zone 9 for 7.5 cfs.
- Expanded discussions of imported MWD water and local groundwater supplies, including a shift to reduce dependency on MWD by looking into additional groundwater production from shallow wells in its Robertson Yard facility, and from wells in the La Brea Subarea of the Central Basin.
- Although the City would benefit from recycled water furnished by WBMWD, there is no infrastructure nearby, and none is planned unless UCLA were to accept recycled water.
- With the passage of SB 1258 and adoption of graywater standards on August 4, 2009, the City anticipates expanded graywater use.
- A number of potential water quality issues are discussed in detail for both MWD water and local groundwater, although none is particularly significant at this time. These include salinity, perchlorate, uranium, nutrients, quagga mussels, and others.
- The City's annual water use fluctuates and has ranged from 11,563 AF to 14,007 AF between 2005 and 2010, with an estimated 1,700 AFY decrease in demand which represents a 13% drop in total consumption.
- In various water supply/demand scenarios, MWD as well as the COBH fully expect supply to exceed demand through 2035 for all climatologic conditions, although certain water use efficiency mandates of the City's Emergency Conservation Plan Ordinance would need to be followed.
- The City continues to use the 14 BMPs defined in the UWMP Act intended to reduce long-term urban water demands. In addition, the City developed an Efficient Landscaping Ordinance (09-0-2574) in 2009 pursuant to the Water Conservation Act. This Ordinance became effective in 2010 and provides for the efficient use of water in landscapes, which represent a significant water use within the City's service area.
- Contingency planning efforts by the City are addressed by implementing the Emergency Water Conservation Plan Ordinance adopted in 1992. The City also works in conjunction with actions of MWD during water shortages as set forth in MWD's Water Surplus and Drought Management (WSDM) Plan.

By: **Nancy E. Heim, PE**

WATER RESOURCE PLANNING AND POLICY DOCUMENT INVENTORY

Document Name:	**Document Type:**
City of Los Angeles, Non-Potable Reuse Master Planning Report, Vol 1	Planning Report
Author:	**Date:**
RMC and CDM Smith	March 2012

Issues Addressed:

Non-potable water potential in City of Los Angeles

Summary

Background

This report (Volume 1 of 3) was prepared for the Los Angeles Department of Public Works (LADPW) and the Los Angeles Department of Water and Power (LADWP) as part of their Recycled Water Master Planning (RWMP) documents. The RWMP documents provide an evaluation of alternative strategies that examine groundwater replenishment (GWR) and recycling water for non-potable reuse (NPR) in an effort to identify projects that will significantly increase the City's recycled water use locally. The goal of the RWMP is to develop 59,000 ac-ft per year of recycled water by 2035 as a sustainable source of local water to offset imported water demands. This NPR Report focuses only on non-potable reuse; GWR is addressed in a separate report.

Summary of Findings

Approximately 8,000 AFY is currently used for NPR within the City of Los Angeles. An additional 11,350 AFY of projects are in development. Therefore, the focus is to develop the remaining 39,650 AFY from a combination of GWR (30,000 AFY) and NPR (9,650 AFY) projects to meet the 59,000 AFY goal. An integrated alternatives analysis was completed to determine the balance between GWR and NPR to meet the City's goal, with built-in flexibility to adjust the amount of each eventually implemented. The NPR Report includes a thorough investigation of the City's non-potable reuse potential including both market and supply assessments. The assessment provided 11 potential non-potable systems consisting of 38 potential water recycling projects.

Relevance to City of Beverly Hills

The City of Beverly Hills is located adjacent to the Westside-Westwood system, one of the 11 potential non-potable systems identified in the report. This system is far from any existing recycled water infrastructure, and uses recycled water produced by West Basin Municipal Water district (WBMWD) and connects to the district's system in Inglewood. Implementation of this project will require coordination with WBMWD as the regional wholesaler and their retailers serving customers in the area. WBMWD has identified potential non-potable customers in their area that could be added to the project, but nothing was specifically identified in this report. In reviewing this report, there appeared to be no mention of any specific project potentials associated directly with the City of Beverly Hills.

By: Nancy E. Heim, PE

WATER RESOURCE PLANNING AND POLICY DOCUMENT INVENTORY

Document Name:	**Document Type:**
Ordinance to Increase Water Rates in FY 2012-13 and 2013-14	Agenda Report
Author:	**Date:**
City of Beverly Hills	May 15, 2012

Issues Addressed:

Water rates for FY 2012-13 and 2013-14, history of rate increases

Summary

City staff is introducing an ordinance to increase Water Utility rates by 7% for each Fiscal Year, 2012-13 and 2013-14. The increase will not mitigate a reserve draw-down in the first fiscal year, but will provide a modest operating revenue reserve within the second fiscal year period.

Summary

The Agenda Report indicated that the utility has invested millions of dollars in constructing and maintaining the water system, and that by the end of FY 2012-13, a large portion of its aging distribution system will have been replaced along with retrofitting nine of the City's ten reservoirs. The report provides a brief explanation of previous rate increases (2008-2012). For FY 2008-09 and FY 2009-10, the increases helped pay for the reverse osmosis treatment plant and replacement of the Coldwater Canyon Reservoir. Also the City had not anticipated a 21% increase by MWD taking place as early as September 2009. For FY 2010-11 and FY 2011-12, there were significant increases in ongoing expenditures due to sustained increase in the cost of purchasing water, repayment of debt service, and sharp declines in retail water sales. From 2008-11, retail water sales dropped 15% for a loss near $3.5 million, resulting in rate increases the following 2 fiscal years.

The report discusses significant factors driving water utility rate increases, including: need to replace aging water infrastructure, continuing threat of water shortages within the state, increased regulatory stringency, and decreased per capita consumption of water. The declining consumption is primarily attributed to newer home appliances being more water efficient, and the population responding to conservation messages that are often reinforced by the pricing structure.

The Agenda Report contains copies of the following documents:

- Proposed Ordinance
- Residential and Commercial letters of Notification
- Newspaper Notice
- Water Rate Study –Executive Summary, by Raftelis Financial Consultants (January 2012).

By: Nancy E. Heim, PE

WATER RESOURCE PLANNING AND POLICY DOCUMENT INVENTORY

Document Name:	**Document Type:**
Ordinance of COBH to Increase Water Rates in FYs 2012-13 and FY 2013-14	Agenda Report
Author:	**Date:**
City of Beverly Hills	June 7, 2012

Issues Addressed:

Water rates fiscal year 2012-13 and 2013-14

Summary

This Agenda Report recommends approval of the proposed ordinance to increase water utility rates by 7% for each of two fiscal years, FY 2012-13 and FY 2013-14.

At their May 15, 2012 meeting, the City council discussed the recommended increase for both fiscal years. The 7% increase in water rates is expected to generate an additional $1.9M and $2.1M for FY 12/13 and FY13/14 respectively. A projected $148,000 in the second fiscal year is expected to be available to help replenish reserves used in recent previous years.

This agenda item contains the city ordinance for the proposed rate increases. The water rates are listed in Exhibit A.

By: Nancy E. Heim, PE

WATER RESOURCE PLANNING AND POLICY DOCUMENT INVENTORY

Document Name:	***Document Type:***
Two-Year Extension of Purchase Order Commitment for Imported Water Provided by the Metropolitan Water District of Southern California	Agenda Report
Author:	***Date:***
City of Beverly Hills	December 4, 2012

Issues Addressed:

MWD water costs, PO for water through year 2015

Summary

City staff is recommending extension of the purchase order commitment for imported water supplied by Metropolitan Water District (MWD) of Southern California.

Summary

Effective July 2003, the City of Beverly Hills relied on a Purchase Order agreement for imported water from MWD. This voluntary PO established a financial commitment to MWD, in exchange for being allowed to purchase more of their retail demand at the lower Tier 1 supply rate than they would otherwise have been entitled to. The original PO, set for a 10-year period, was expiring on December 31, 2012. The Tier 1 rate from MWD for January 2013 is $847/AF, while the Tier 2 rate is $997/AF or 18% greater. Over the past 10-year term, the City has fulfilled its purchase order commitment.

Approval of the PO commitment extension will guarantee the City continues to purchase its water supply needs at the Tier 1 supply rates of $847/AF and $890/AF for 2013 and 2014 respectively. These rates were factored into the water rate study approved by the City earlier in the year. It is noteworthy that if the City did NOT approve the PO agreement, it would only be guaranteed the Tier 1 rate for 8,920 AFY. The report also states the water purchase budget for FY 2012/13 is $9.5 million.

The report provides a brief description of how the PO commitment program works and how base water demands are calculated. The agenda report also includes a copy of the Amended and Restated PO for System Water to be Provided by MWD.

By: **Nancy E. Heim, PE**

WATER RESOURCE PLANNING AND POLICY DOCUMENT INVENTORY

Document Name:	**Document Type:**
Comprehensive Annual Financial Report, Fiscal Year Ending June 30, 2012	Financial Report
Author:	**Date:**
City of Beverly Hills	February 2013

Issues Addressed:

City budgets, revenues and expenditures

Summary

This very detailed financial statement was prepared in accordance with state law required for all general-purpose local governments at the close of each fiscal year. It also includes the required independent audit by a licensed certified public accountant to provide reasonable assurance that the report is free of material misstatement.

The report provides a brief overview of the City of Beverly Hills' profile, form of government, factors affecting financial condition, budgeting, revenue and expenditure review and other related topics.

This document does not relate directly to issues associated with the City's water supply. However, it does provide an overall portrayal of the economic health of the City and its ability to continue to provide adequate services (including water) to its residents. Some of the highlights include:

- The conservative budget adopted for FY 2012/13 based on current economic conditions, projects a broader and flatter recovery of revenues considering the impact of the world-wide economic downturn on the City's retail, business and tourism trade.
- As required by law, the FY 2012/13 budget is balanced, with all expenditures supported by available resources.
- Enterprise fund revenues (which fund water, storm-water, wastewater, solid waste and parking operations) continue to depend on the rates the City charges to cover its expenditures. Certain rates must be increased due to the rise in fixed costs and the cost of resources to maintain current customer service levels.
- The Water Enterprise Fund anticipates selling less water than previously forecast, resulting in lower revenues even though a rate increase was effective July 1, 2012. It is anticipated that rate increases for water will continue to be required in future years.

It is noteworthy that as a part of this financial statement, the City's management offers readers an 11-page narrative overview and analysis of the financial activities of the City for the concluding fiscal year.

By: Nancy E. Heim, PE

WATER RESOURCE PLANNING AND POLICY DOCUMENT INVENTORY

Document Name:	**Document Type:**
California Accidental Release Prevention (CalARP) Program 2 Document, Vol 1	Safety Policy
Author:	**Date:**
SCS Tracer Environmental	August 2013

Issues Addressed:

Safety policies for ammonium-hydroxide used for disinfection

Summary

The City of Beverly Hills, Public Works Services' facility uses ammonium-hydroxide in the disinfection process to treat water for potable use. In order to operate the ammonium-hydroxide system, the facility complies with the Cal EMA California Accidental Release Prevention (CalARP) Program. This document was prepared as part of the CalARP Program.

Many of the safety features of the system are inherent in the policies and procedures that govern the operation of the system. During the Hazard Review conducted in July 2013, it was noted that no significant releases of ammonium-hydroxide occurred that exceed Federal reportable quantities, and no injuries had been reported resulting from any releases. The Hazard Review generated a number of recommendations to improved safety at the facility including additional training, key maintenance-related test/inspections, and enhanced emergency response policies and procedures.

The facility has an Emergency Action Plan that provides organization and notification procedures, evacuation routes, chemical health hazards, and mitigation procedures in the case of an emergency.

Volume 1 contains information on the following:

- Regulatory compliance matrix
- Overview (briefly describing documentation, and technical studies performed including the Hazard Review and Seismic Assessment)
- Facility description
- Safety information
- Operating procedures
- Training
- Facility maintenance
- Compliance audits
- Incident investigations
- Emergency response program
- Recordkeeping
- Management programs
- Certification document

By: **Nancy E. Heim, PE**

WATER RESOURCE PLANNING AND POLICY DOCUMENT INVENTORY

Document Name:	***Document Type:***
California Accidental Release Prevention (CalARP) Program 2 Document, Vol 2	Safety Policy
Author:	***Date:***
SCS Tracer Environmental	August 2013

Issues Addressed:

Safety policies for ammonium-hydroxide used for disinfection

Summary

The City of Beverly Hills Public Works Services facility uses ammonium-hydroxide in the disinfection process to treat water for potable use. In order to operate the ammonium-hydroxide system, the facility complies with the Cal EMA California Accidental Release Prevention (CalARP) Program. This document was prepared as part of the CalARP Program.

Volume 2 contains information on the following:

- Hazard Review recommendation implementation schedule
- Hazard Review document: describing results from a study performed for the City covering two elements; 1) chemical hazard and operability and 2) human factors analysis
- Hazard Assessment document: analysis to quantify the off-site impact of ammonia release from the facility. Study of maximum downwind distances and estimated residential populations at risk of being exposed during a chemical release
- Seismic Assessment document: provides a seismic evaluation of equipment and associated piping containing ammonium-hydroxide at the City Public Works Services facility.

By: **Nancy E. Heim, PE**

WATER RESOURCE PLANNING AND POLICY DOCUMENT INVENTORY

Document Name:	**Document Type:**
Title of Article: "Water Treatment Facility"	Newspaper Article
Author:	**Date:**
Robert Anderson *(The Currier)*	August 2013

Issues Addressed:

City's historic water treatment facility from 1928

Summary

This is a brief article that appeared in the August 23, 2013 edition of *The Currier*, the City's local newspaper. The article was written as part of a series for the City's upcoming Centennial celebration of its 1914 incorporation.

The article describes the City's filtration and softening plant built in 1928 located at the intersection of La Cienega and Olympic Boulevard. The plant was used to treat groundwater from the area's 20 wells serving the City of Beverly Hills and West Hollywood. The 30,000 square foot building was designed in the style of a Spanish church at a cost of $239,394 and funded through a $1 million bond. The remainder of the funds were spent upgrading and cleaning pipes in the distribution system, and to construct a large park across the street that included many facilities. The facility was known as "aeration plant" and used the lime hydroxide process. The article briefly describes the filtration system and tower used to exhaust hydrogen sulfide fumes created by the treatment process. Other facilities within the tower included machinery rooms, lab, chemical storage and large tanks to supply water for daily backwash of the filters. The plant treated 3 to 5 mgd of water with the capacity to treat up to 7.5 mgd. The state Health Board referred to the facility as "the most exemplary water treatment center in California, if not the entire United States".

By: **Nancy E. Heim, PE**

WATER RESOURCE PLANNING AND POLICY DOCUMENT INVENTORY

Document Name:	**Document Type:**
Risk Management Plan for COBH Public Works Services	Plan Report
Author:	**Date:**
SCS Tracer Environmental	August 2013

Issues Addressed:

Water treatment chemical risk assessment, ammonium-hydroxide for disinfection

Summary

The City operates a water treatment facility under their Public Works Services that utilizes ammonium-hydroxide for part of their disinfection process. This Risk Management Plan (RMPlan) addresses the facility's administrative and operational programs to prevent accidents and reduce potential risks associated with handling ammonium-hydroxide, which is a regulated substance. The RMPlan was prepared to satisfy the following regulation:

- California Emergency Management Agency, California code of Regulations, Title 19, Division 2, Chapter 4.5, California Accidental Release Prevention (CalARP) Program 2.

The plan addresses the following topics:

- Accidental release prevention and emergency response policies
- Stationary source and regulated substance
- Hazard assessment summary
- Accidental release prevention program and chemical-specific prevention steps
- 5-year accident history
- Emergency response program
- Planned changes to improve safety

By: Nancy E. Heim, PE

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AUTHOR	DOCUMENT NAME	REFERENCE # (BY YEAR)
Albert A. Webb Assoc.	Evaluation and Detailed Life Cycle cost Analysis of 5 Welded Steel Water Storage Tanks	2007-5
American Monorail of California	O & M Manual for RO Plant & Public Works Facility Monorail, Trolley & Hoist	2002-2
Anderson, Robert	Article: "Water Treatment Facility"	2013-4
Black & Veatch	Water System Master Plan	2002-1
Bookman-Edmonston Engineering, Inc	Ground Water Supply Available to City of Beverly Hills	1972-1
Boyle Engineering Corp.	Municipal Water Supply and Groundwater Study – Element 2 Subpotable Water Supply-Draft	1992-5
	Municipal Water Supply and Groundwater Study – Element 1 Potable Supply from Groundwater Development-Draft	1992-6
	City of Beverly Hills Test/Production Well Completion Report	1994-1
	Groundwater Development/Treatment Program – Pilot Testing Plan	1995-1
	Draft Municipal Water Supply and Groundwater Development –Pilot Testing Report	1995-2
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	Draft City of Beverly Hills Drinking Water Source Assessments for City Wells No. 2, 4, 5, and 6	2000-2
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	Well Completion Report, City of Beverly Hills Wells No. 2, 4, 5, and Site No. 1	2001-2
	Lead and Copper Rule – Internal Corrosion Desktop Evaluation	2007-1
C. Wesley Strickland	Comments on Draft Determination of Maximum Perennial Yield for the Hollywood Basin	2004-3
California Department of Public Health	Letter from California Department of Health to City Regarding Shallow Groundwater Recovery Project	2008-1
	Permit Amendment 1910156PA-003	2011-1
City of Beverly Hills	Preliminary Studies, Considerations and Recommendations Relating to Source of Water Supply for City of Beverly Hills	1968-1

City of Beverly Hills	RFP- Municipal Water Supply and Groundwater Study	1991-2
	Article: "City to Study Development of Groundwater to Cut Costs"	1992-1
	Groundwater Project Evaluation	1996-1
	Ordinance of the City of Beverly Hills Adopting a Groundwater Management Plan for the Hollywood Groundwater Basin	1999-1
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	Beverly Hills Sustainable City Plan	2009-2
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	Authorization for Consultant Agreement Between City of Beverly Hills and Raftelis Financial Consultants for Preparation of a Water Rate Study	2010-5
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Dunn, Mia	Article: "Water Well System for City Recommended"	1992-7
EarthTech	City of Beverly Hills Reverse Osmosis Water Treatment Plant	2002-3

Geoscience Support Services, Inc	Proposal to Provide a Safe Yield Evaluation of the Hollywood Ground Water Basin	2003-2
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Geotechnical Consultants, Inc	Hydrogeologic Investigation – Beverly Hills Ground Water Basins-Draft	1975-1
James Montgomery Consulting Engineers	Final Environmental Impact Report for Beverly Hills Franklin Reservoir	1974-1
	City of Beverly Hills Water System Master Plan	1985-1
	City of Beverly Hills Ground Water Flow in the West Hollywood Area	1985-2
Joe Egan and Associates	Analysis of Ground Water System at Cedars-Sinai Medical Center	1990-1
Kennedy Jenks Consultants / Richard C. Slade	Interview Agenda for Municipal Water Supply and Groundwater Study	1992-3
	Proposal for Engineering Services for Municipal Water Supply and Groundwater Study	1992-2
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Murchie, Don	Article: “Growing Interest in Digging Private Water Wells Reported”	1991-1
Otsuka, Ed	City of Beverly Hills Water Distribution System Emergency Response Plan	2004-4
Richard C. Slade & Assoc.	Transmittal from Richard Slade to Kennedy Jenks Consultants	1992-4
	Summary of Analytical Result: Water Samples from Sump a 331 North Maple Drive	2006-1
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	Summary Review of Dewatering Sites for Shallow Groundwater Recovery Project-Beverly Hills	2007-3
	Hydrogeologic Feasibility Study and Preliminary Design Report for Development of Shallow Groundwater near Water Treatment Plant	2009-1
	Summary of Drilling and Testing Operations-Robertson Yard Exploratory Borehole	2010-1
	Groundwater Management Plan – Hollywood Groundwater Basin (Draft)	2011-2

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	City of Beverly Hills 2010 Urban Water Management Plan	2011-5
SCS Tracer Environmental	California Accidental Release Prevention (CalARP) Program 2 Document, Volume 1	2013-2
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TRIMAX	Design & Replacement of 5 Water Reservoirs, Replacement of On-Site Piping, and Seismic Retrofitting of Associated 5 Pump Stations – O&M Manual	2010-6
Unknown	City of Beverly Hills and CA Department of Health Services Meeting: Shall Groundwater Well Discussion	2006-4
	Chapter IV – Groundwater Basin Reports: LA County coastal Plains Basins-Hollywood Basin	2007-4
US Geological Survey & State Water Resources Control Board	Ground Water Quality Data in the Central Los Angeles Basin Study Unit, 2006: Results from the California GAMA Program	2009-3

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