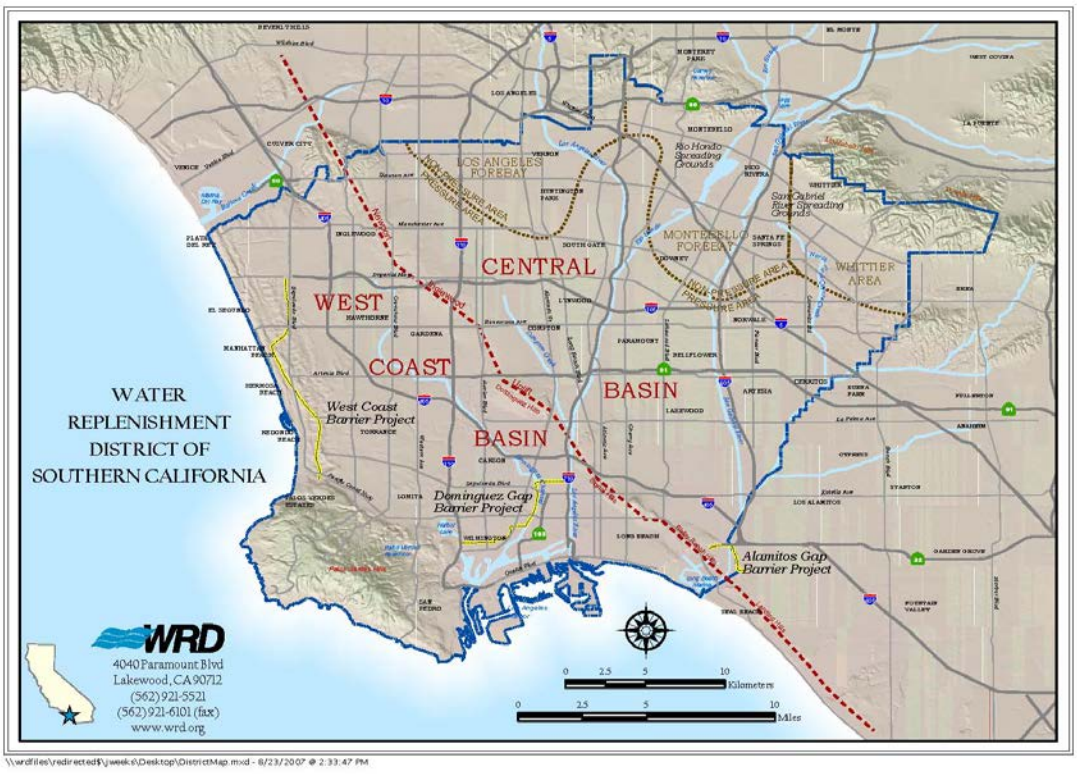
RECLAMATION

Managing Water in the West

Los Angeles Basin Groundwater Adjudication Summary

Los Angeles Basin Stormwater Conservation Study



U.S. Department of the Interior
Bureau of Reclamation
Engineering Services Office
Boulder City, Nevada

July 2014

PROJECT INFORMATION

PROJECT NUMBER:	**A10-1862-6019-135**
PROJECT NAME:	**Los Angeles Basin Groundwater Adjudication Summary**
PROJECT MANAGER:	**Douglas B. Blatchford, P.E.**
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Distribution List

Project Summary

Project Start Date	June 2010
Project Completion Date	July 2014

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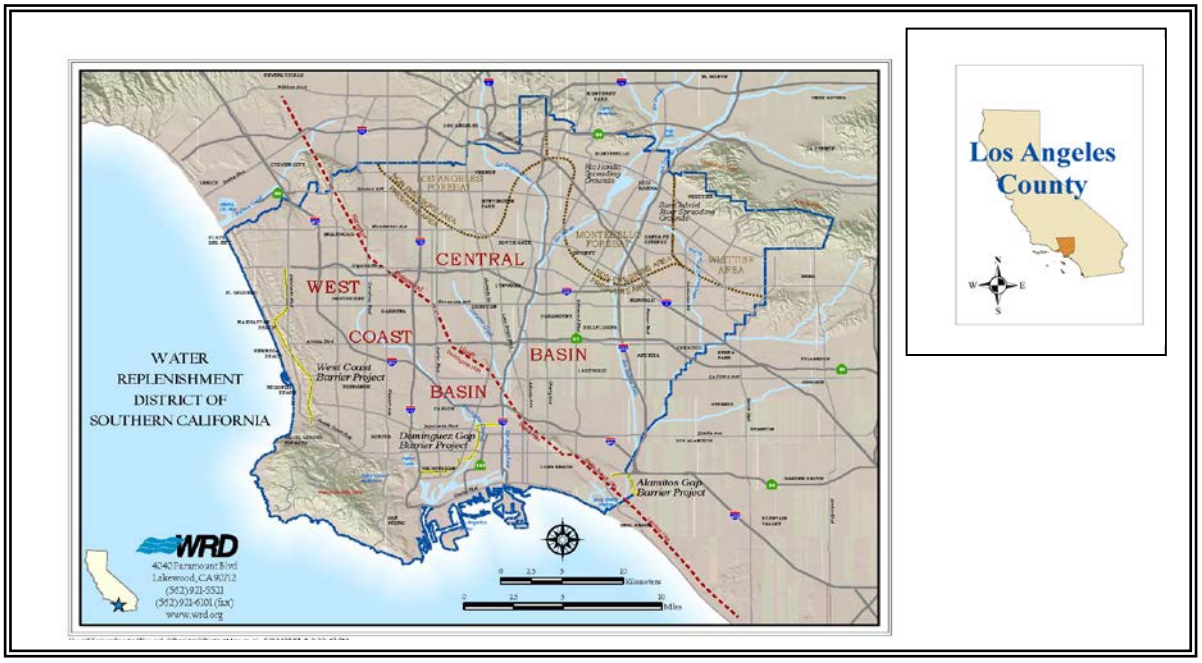
Acronyms and Abbreviations

AF	Acre-feet
AFY	Acre-feet per year
APA	Annual Pumping Allocation
CBMWD	Central Basin Municipal Water District
DPH	California Department of Public Health
DWR	California Department of Water Resources
JPL	NASA Jet Propulsion Laboratory
LACDPW	Los Angeles County Department of Public Works
LACSD	Los Angeles County Sanitation District
MGD	Million gallons per day
Metropolitan	The Metropolitan Water District of Southern California
RBMB	Raymond Basin Management Board
SFB	San Fernando Basin
ULARA	Upper Los Angeles River Area
WRD	Water Replenishment District of Southern California

Introduction

This report is a brief summary of adjudicated groundwater basins within Los Angeles County, California. These basins include the Central Basin, West Coast Basin, Main San Gabriel Basin, Raymond Basin, and Upper Los Angeles River Area Basin. The purpose of this study is to organize and compile adjudication background information for ease of reference. Further detailed study is anticipated in the Los Angeles Basin; this report brings together not only the history of adjudication, but also the resulting rules and regulations related to respective court orders. This is important because operations and maintenance of each respective basin are ultimately tied to rules and guidelines set by the Court. The scope of this report is limited to a brief summary for the basins listed above.

Central Basin



Adjudication Summary

According to The Metropolitan Water District of Southern California (Metropolitan) [3]:

> "The judgment sets out the annual pumping rights of each of the parties; appoints DWR as watermaster; specifies the duties, powers and responsibilities of watermaster; provides for carryover of 20% of annual pumping rights for one year, or 35% carryover under the 'drought carryover' provisions; 20% over-pumping to be paid back the following year, or prorated over the following 5 years under specified conditions; provides for an exchange pool wherein a right not used by one party can be made available to another. Judgment makes no provision for storage and recapture of stored water beyond the specified extraction right and specifies that 'no party…has any right to extract ground water from Central Basin except as herein affirmatively determined.' "

The following is summarized from the Water Replenishment District of Southern California (WRD) website [17], the 2009 proposed judgment amendment [12], The Metropolitan Water District of Southern California [8][10], and the Central Basin Municipal Water District (CBMWD) website [1]:

Central Basin was adjudicated in 1965, and the judgment was amended in 1991. The judgment does not address storage and expressly provides that extraction rights in the basin are limited to those specified in the judgment. Under the existing judgment, there is no opportunity to use additional recycled water each year to increase groundwater pumping. Any opportunity to utilize

yield from this proposed project would be limited to meeting WRD's needs for basin replenishment to support adjudicated pumping rights.

Total storage in the Central Basin is estimated to be approximately 13.8 million acre-feet (AF). Unused storage space is estimated to be approximately 1.1 million AF. Of the unused storage space, the amount available for groundwater storage is approximately 330,000 AF, assuming that up to 75 feet below the ground surface is actually available. Basin parties have agreed with study findings that 330,000 acre-feet of unused storage space exists in the Central Basin. Following extended negotiations among basin rights holders, a proposed judgment amendment has been developed to allow beneficial use of the 330,000 acre-feet of storage space. The proposed judgment amendment was submitted to the Court for consideration in April 2009. Support for the amendment is not unanimous, and opponents (cities of Downey, Cerritos and Signal Hill, and CBMWD) have submitted motions to the Court. Initial hearings are scheduled for June and July 2009.

The proposed judgment amendment would allow for substantial increased storage with annual maximum basin-wide increase in pumping not exceeding 87,000 AF (increase of 40 percent of the annual pumping allocation [APA]) without additional review and approval assuming full participation by all the basin producers. The maximum amount of storage by any producer is two times the producer's APA, and annual extraction of this stored water is not to exceed 120 percent by any producer without specific approval. The proposed amendment provides for a 125,000 acre-foot Basin Operating Reserve for WRD's operations, but additional pumping by basin producers is maximized in the above calculation.

Total average Metropolitan firm demands in 2020 for CBMWD and the City of Compton are about 83,000 acre-feet per year (AFY). The City of Los Angeles' demand is not included in this analysis. In addition, the City of Long Beach is not included because the Los Angeles County Sanitation District (LACSD) has excess capacity in their Long Beach plant that Long Beach would use for a similar project in the future. Average projected replenishment demands for Central Basin are projected to be about 27,500 AFY in 2020. It is important to note that the replenishment water purchased by WRD for the entire basin (including Long Beach and Los Angeles) is delivered through CBMWD facilities. For this analysis, it is assumed that this practice continues in the future.

Under the terms of the currently proposed adjudication amendment, agencies within CBMWD and Compton service areas would have the ability to store and extract up to 40 percent of their APA (currently about 169,000 AFY), or an additional 68,000 AFY. However, because of basin constraints such as water quality, blending requirements or reduction in operational flexibility, firm project participation is estimated to be 50 percent, or 33,000 AFY.

- With the 75 percent blending requirement from the California Department of Public Health (DPH), the ability to store and extract recycled water from LACSD for firm Metropolitan demand would be about 25,000 AFY by 2020.
- After 5-10 years of operation, it is assumed that 100 percent recycled water could be stored to replace the firm demand in the Central Basin, so the project yield would increase to about 33,000 AFY.

- An additional 20,000 AFY of recycled water could be spread at Montebello Forebay to replace projected replenishment demand for a total of 45,000 AFY by 2020 and 53,000 AFY by 2030.

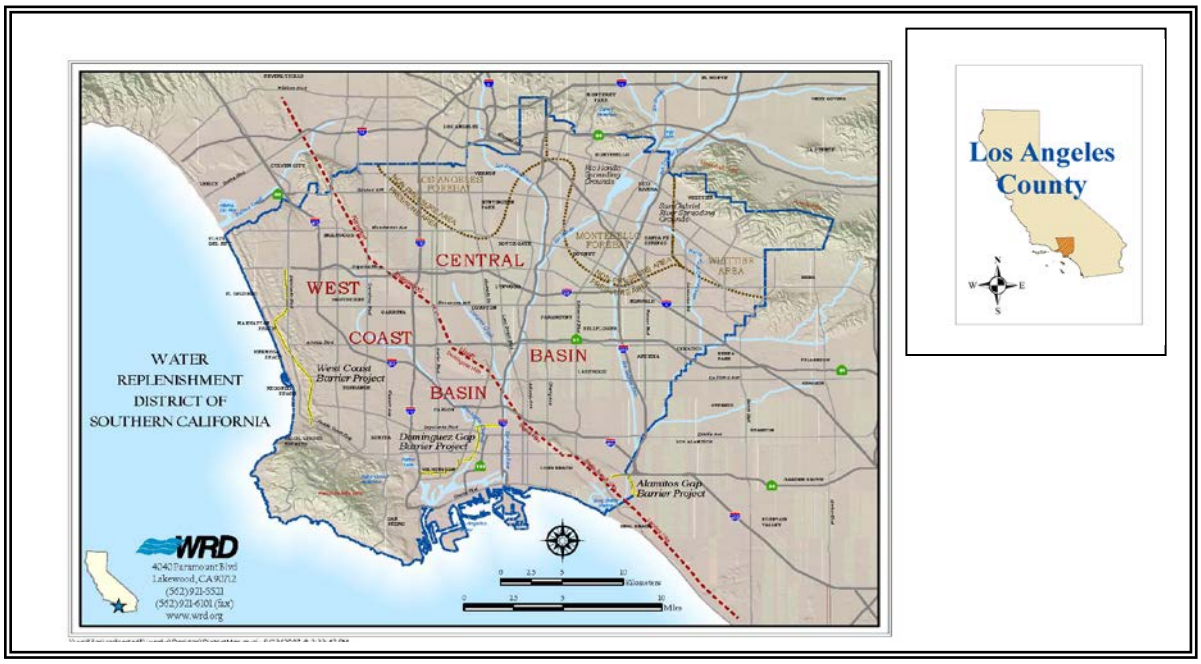
Spreading basins in the Montebello Forebay area and the San Gabriel River channel within the Central Basin cover more than 1,000 acres with a capacity of about 350 million gallons per day (MGD). However, the actual amount that can be spread is limited by mounding and other factors. Total average annual spreading for the past 20 years has been approximately 135,000 AFY. Spreading utilizes local runoff, untreated imported water, and recycled water. Assuming a 75:25 blend of recycled water to imported water, it would be possible to offset about 20,000 AFY of the projected imported water replenishment demand at the Montebello Forebay.

The Los Angeles Forebay was historically a recharge area for the Los Angeles River. This forebay's recharge capacity has been substantially reduced since the river channel was lined. Recharge is now limited to deep percolation of precipitation, in-lieu when available, and subsurface inflow from the Montebello Forebay to the east, the Hollywood Basin, and relatively small amounts from the San Fernando Valley through the Los Angeles Narrows. Therefore, the only feasible recharge method for this area is an injection wellfield. Additional extraction wells would be needed within the CBMWD service area to extract the water. Facilities would be owned and operated by the partner agencies. However, responsibility for payments for operational and maintenance costs ($200 to $250/AF in 2009 dollars) is yet to be determined.

At this stage of the analysis, it would be inappropriate to assume substantial additional annual pumping beyond that proposed in the judgment amendment would be approved by 2020. Such approval would require modeling and review to assure that the proposed pumping would not cause material physical harm to the basin or to another producer. Any analysis would need to address impacts to water local water levels due to pumping depressions and movement of any contamination. The decision-making process proposed in the judgment amendment would require majority vote by two independent bodies comprising the proposed new basin watermaster – the WRD Board and a storage panel of producers to be created.

Even under the most conservative assumptions, there is a moderate risk that during wet periods or various demand periods that the entire amount of recycled water could not be stored or extracted. This situation would result in the need to have the water delivered directly to the Los Angeles River or, after the outfalls from LACSD are repaired, directly to the outfall.

West Coast Basin



Adjudication Summary

According to The Metropolitan Water District of Southern California [3]:

> "The judgment sets out the annual pumping rights of each party, provides for carryover of 10% of annual pumping rights for one year, overpumping of 10% to be replaced the following year, an exchange pool wherein a right not used by one party can be made available to another, emergency overpumping up to a total of 10,000AF under specified conditions, and appoints the California Department of Water Resources (DWR) as watermaster."

The following is summarized from the Water Replenishment District of Southern California (WRD) [17], The Metropolitan Water District of Southern California [7][10], and the West Basin Municipal Water District websites [15]:

Groundwater storage and extraction in the West Coast Basin is governed by the basin adjudication with excess production restricted to emergencies. An amended judgment establishing water rights of 64,478 AF and enjoining excess extractions was filed in 1977 and most recently amended in 1989.

Total storage in the West Coast Basin is estimated to be approximately 6.5 million AF. Unused storage space is estimated to be approximately 1.1 million AF. Of the unused storage space, the amount available for groundwater storage is only 120,000 AF because the upper 75 feet cannot be used for groundwater storage. The judgment makes no provision for establishment of storage

accounts with provision of increased pumping of stored water or for enhanced recharge and increased production. Thus, 120,000 acre-feet of identified unused storage space in the West Coast Basin is difficult to put to beneficial use.

As a result, a major proposed amendment to the judgment has been developed after several years of negotiations to address use of 120,000 acre-feet of unused storage space in the basin and submitted to the court for consideration in April 2009. This amendment is reportedly unopposed by water rights holders in West Coast Basin. The proposed amendment would allow each rights holder to store and extract up to 40 percent of their annual adjudicated pumping allocation (APA, or annual pumping rights under the judgment) subject to review and approval. Regional storage projects would be allowed to use up to 9,600 AF of space. Approximately 50,000 AF of dewatered storage space would be designated as Basin Operating Reserve and held for replenishment operations of the WRD.

Total average firm Metropolitan demands in 2020 for West Basin MWD and the City of Torrance are projected to be about 168,000 acre-feet per year (AFY) with limited change projected by 2030. It is assumed that the City of Los Angeles would not participate in this project because they are implementing a similar project for their own recycled water plants. Neither West Basin MWD nor the City of Torrance is expected to have a replenishment demand on Metropolitan in 2020 or 2030.

Under the currently proposed adjudication amendment, groundwater producers within the West Basin MWD and Torrance service areas would have the ability to store and extract up to 40 percent of their annual production rights of 63,000 AFY, or an additional 26,000 AFY. Because of basin constraints such as water quality, blending requirements or reduction in operational flexibility, project participation is estimated to be 50 percent, or 13,000 AFY.

- With the 75 percent blending requirement from the DPH, the ability to store and extract recycled water from LACSD would be about 10,000 AFY by 2020 (Phase 1).
- After 5-10 years of operation, it is assumed that 100 percent recycled water could be stored in the West Coast Basin, so about 13,000 AFY (10-15 MGD) could be stored by 2030 (Phase 2).

Because there are no spreading locations available in this area, the proposed project would need to include:

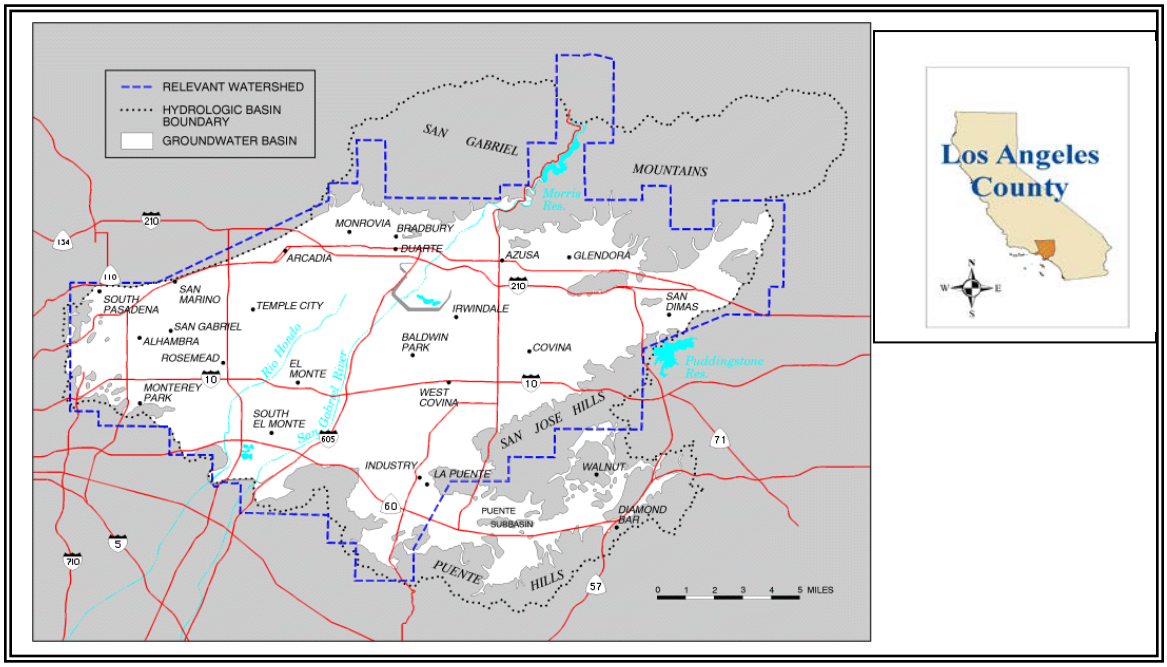
- Ten to 15 new injection wells and 5 to 10 new extraction wells.
- About 5 MGD could be treated by the existing Brewer and Goldsworthy desalters and associated wells.

The project could be implemented directly with the West Basin MWD and the City of Torrance, with storage accomplished through partnerships with the Los Angeles Department of Public Works (LACDPW) and/or WRD, and extraction accomplished by producers, as applicable.

Any change beyond the adjudication currently proposed in this basin would likely be unsuccessful at this time. Considerable efforts have resulted in the current proposal, and it has yet to be approved and tested. In addition, there are parties such as the City of Los Angeles and

West Basin MWD who are already planning to use recycled water for recharge, potentially limiting the participation in this project. Because of seawater intrusion issues, water quality may also be a concern. The proposed amendment to the adjudication would need to be approved to accommodate the additional production from the desalters without the water quality restrictions currently applied. Facilities would be owned and operated by the partner agencies. Responsibility for payments of operational and maintenance costs ($200 to $250/AF in 2009 dollars) is yet to be determined. Under this option, there is moderate risk to Metropolitan that the project would not be successful.

Main San Gabriel Basin



Adjudication Summary

According to The Metropolitan Water District of Southern California [3]:

> "Judgment defines natural safe yield under 1967 cultural conditions, specifies annual pumping rights, allows one year for carry-over of unused water rights, enjoins unauthorized recharge, restricts export of groundwater. Judgment establishes a watermaster to administer the judgment including assumption of Make-Up obligation on behalf of the basin, storage of supplemental water, and concern with water quality matters. Judgment provides for determination of annual operating safe yield, specifies basin operating criteria that replacement water shall not be spread when the water level at the Key Well exceeds elevation 250 and that replacement water shall be spread as practicable to maintain the water level at the Key Well above elevation 200. Judgment Exhibit H estimates that a usable volume of 400,000 AF of storage space within the operating range of elevations 200 to 250. Judgment allows overproduction of rights, but this production incurs replacement water assessment."

The following is summarized from The Metropolitan Water District of Southern California [6][10] and the Main San Gabriel Basin Watermaster website [2]:

The Main San Gabriel Basin was originally adjudicated in 1973, with the judgment most recently amended in 1989. The judgment specifies annual pumping rights (prescriptive pumping rights total to 197,634 AFY) while establishing a watermaster that determines the percentage of rights that can be pumped each year without incurring an obligation to pay for replacement water.

There is no firm cap on pumping. Since 1995, annual groundwater production has ranged from approximately 250,000 AFY to 275,000 AFY. The judgment specifies a basin operating range tied to the Key Well elevation (200' to 250') that provides for 400,000 AF of groundwater production, and specifies that imported replacement water shall not be spread when the water level at the Key Well exceeds the upper elevation of the operating range.

The production of this basin is supported by storm water captured behind a series of four dams on the San Gabriel River and by over 1,000 acres of spreading basins. Imported water is used to supplement this recharge, and recycled water could be used in place of the imported water. Active spreading of runoff and imported water recharges 100,000 to 140,000 AFY in average years with substantial swings in dry and wet years (60,000 AFY to over 400,000 AFY). However, in wet years, the demand for supplemental replenishment water is substantially reduced. In order for Main San Gabriel Basin to make a firm commitment for a substantial annual amount of recharge water, the judgment would need to be amended to allow replacement water to be spread above the Key Well upper elevation.

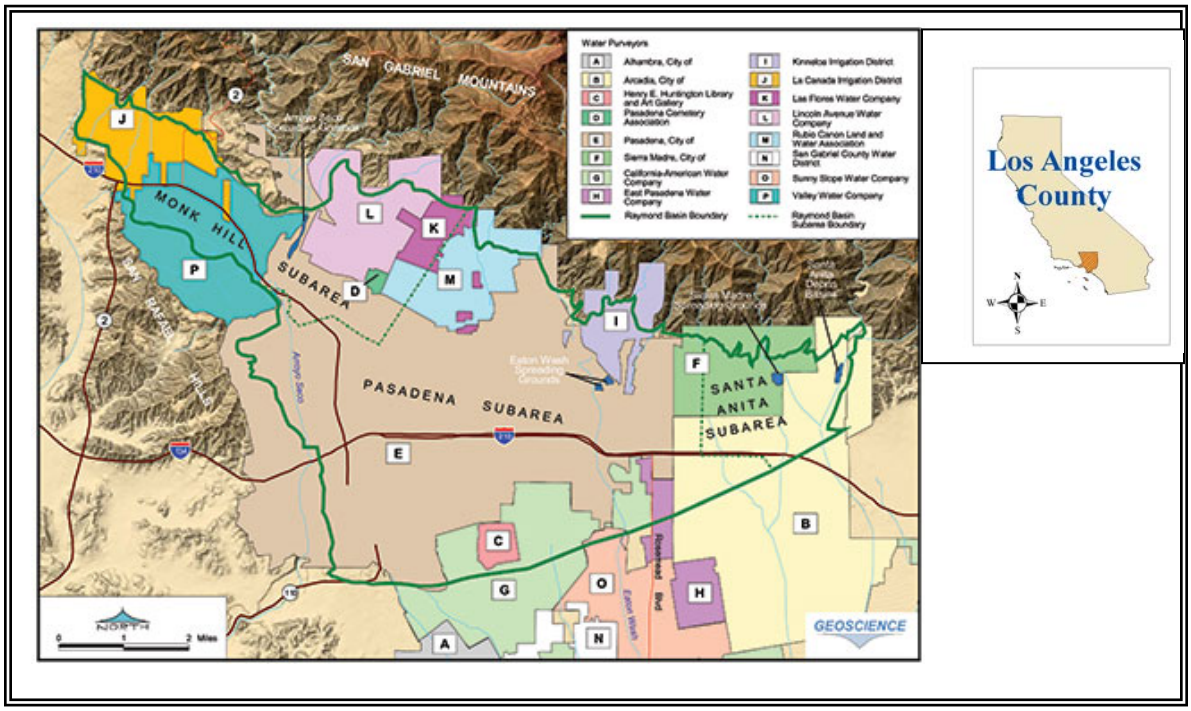
According to the Main San Gabriel Watermaster, the total amount of water in storage for the Main San Gabriel Basin is approximately 8.6 million AF. Usable storage within the operating range is approximately 800,000 AF while the unused storage space is about 500,000 AF. Total average Metropolitan firm demands in 2020 for the Upper District are about 18,000 AFY, up to 28,000 AFY by 2030, with an average projected replenishment demand of about 27,000 AFY. It is assumed that 75 percent of the projected Metropolitan demand (14,000 AFY) could be replaced with recycled water.

- With the 75 percent blending requirement from DPH, the ability to store and extract recycled water from LACSD would be about 10,000 AFY by 2020.
- After 5-10 years of operation, it is assumed that 100 percent firm recycled water could be stored in the Main San Gabriel Basin, or about 14,000 AFY by 2030.
- An additional 25,000 AFY could be spread to replace existing imported replenishment demands, for a total of 35,000 AFY in 2020 and 39,000 AFY by 2030.

The spreading grounds are operated by LACDPW, while the member agencies arrange for delivery of water supplies for those operations. A similar partnership among Metropolitan, member agencies, LACDPW, and the Main San Gabriel Basin watermaster would be the most likely mechanism for implementation.

The Main San Gabriel Basin is upstream of the Central Basin. There is a moderate risk that during wet years when large quantities of water are spread in the Main San Gabriel Basin that mounding can occur in Central Basin, thereby reducing the amount that can be stored in Central Basin. In addition, various groundwater treatment facilities associated with Superfund sites in the Main San Gabriel Basin may be affected by changes in water level. Like Central Basin, there is moderate risk to Metropolitan that the water would not be used even under the most conservative assumptions. Under the aggressive assumption, the risks are substantially higher to both Metropolitan and LACSD.

Raymond Basin



Adjudication Summary

According to The Metropolitan Water District of Southern California [3]:

> "Judgment specifies safe yield in the Eastern and Western units of the basin, addresses rights to capture surface water for spreading and percolation and rights to recapture spread water, specifies groundwater pumping rights of the parties, and allows for 10% overpumping to be made up in the following year and 10% carryover for one year. Judgment establishes the Raymond Basin Management Board as watermaster with specified powers and responsibilities including: protecting the long-term quantity and quality of the groundwater supply, utilizing the groundwater storage capacity of the basin for the maximum advantage of the parties, integrating surface and groundwater supplies, and mutual cooperation."

The following is summarized from The Metropolitan Water District of Southern California [5][10]:

The Raymond Basin was first adjudicated in 1943, with the judgment modified and restated in 1984. The judgment specifies pumping rights, provides for 10 percent over-pumping to be made up the following year, and for 10 percent carryover of unpumped rights for one year.

Total storage in the Raymond Basin is 1.37 million AF with an unused storage space of about 570,000 AF. Only 250,000 AF of that unused storage space, the Raymond Basin Management

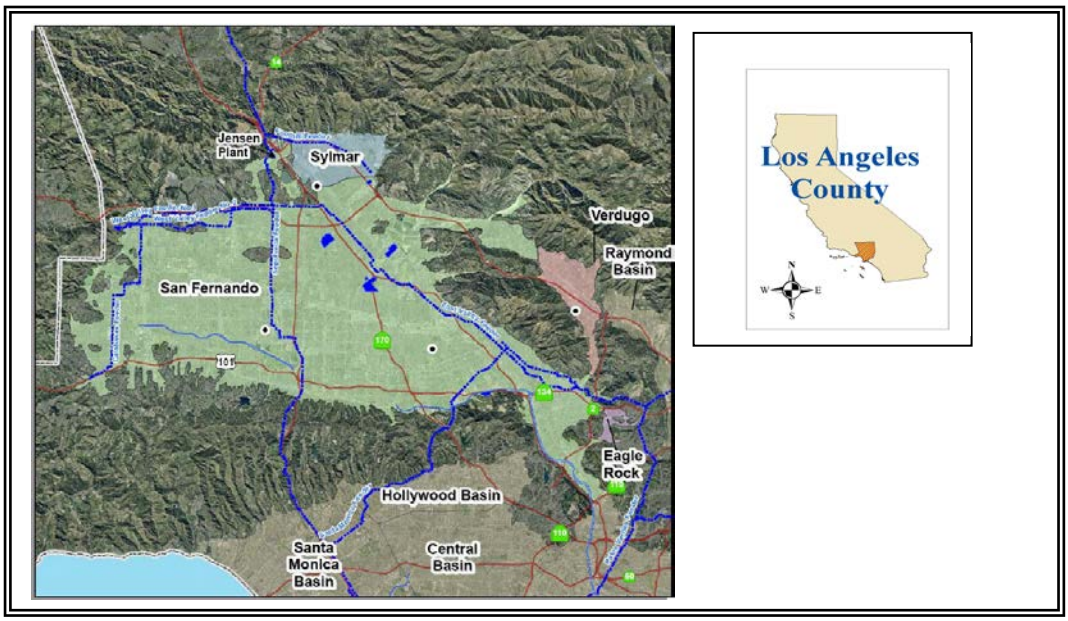
Board (RBMB) estimates, would be available for storage programs or Long Term Storage Accounts. Individual parties may also enter into a Long Term Storage Account to add or extract groundwater during the year subject to the RBMB adopted Groundwater Storage Policies. There is currently an injection capacity of about 8,000 AFY and a spreading capacity of about 23,000 AFY in the Pasadena subarea, the largest of the three subareas of Raymond Basin. Total average Metropolitan firm demands in 2020 for member agencies within the Raymond Basin are about 31,000 AFY, up to 33,000 AFY by 2030. No imported water has been used for groundwater replenishment in recent years, though small quantities have been injected for blending purposes.

In Phase 1, of the 31,000 AFY of Metropolitan demand, it is assumed that the City of Pasadena needs about 10,000 AFY for blending purposes, which limits the amount of recycled water that Pasadena and San Marino could offset to about 21,000 AFY. Because water levels are declining in the Raymond Basin, it is likely that Pasadena would be more interested in supplemental recharge. Therefore, about 85 percent of the offset amount of 21,000 AFY, or 18,000 AFY, could be stored and extracted.

With the 75 percent blending requirement from DPH for injection and spreading, the ability to store and extract recycled water from LACSD would be about 15,000 AFY by 2020 (Phase 1). After 5-10 years of operation, it is assumed that 100 percent recycled water could be stored in the Raymond Basin, so about 18,000 AFY could be stored by 2030 (Phase 2).

Some caution is warranted in developing a major storage and extraction program in Raymond Basin. A Superfund clean-up of perchlorate is underway at the NASA Jet Propulsion Laboratory (JPL) in the northwestern portion of the basin (Monk hill sub-area in Foothill MWD’s service area). Substantial perchlorate contamination has also impacted production to the south of JPL in Pasadena’s service area and shut down nine wells. JPL has maintained that this perchlorate has other sources and is not an extension of the contamination from their site. Pasadena is seeking Prop. 50 funds for remediation infrastructure.

Upper Los Angeles River Basin



Adjudication Summary

According to The Metropolitan Water District of Southern California [3]:

> "The judgment distinguishes the San Fernando, Sylmar, Verdugo and Eagle Rock basins, finds them to be separate basins and sets out separate and distinct rights within each basin. The judgment sets out the separate conditions of the basins with respect to overdraft and safe yield and sets out the rights of the parties to surface and groundwater. Judgment expressly recognizes stored water – imported or reclaimed water that is intentionally spread or safe yield water that is stored in-lieu and provides for separate accounting and recapture subject to specific requirements. Judgment provides for appointment of a watermaster and specifies powers and duties of the watermaster. Judgment establishes an administrative committee."

The following is taken from the Upper Los Angeles River Area (ULARA) website [13] and The Metropolitan Water District of Southern California [9][10]:

Water rights in ULARA were first established by the 'Judgment After Trial By Court' in Superior Court Case No. 650079, entitled *The City of Los Angeles, Plaintiff vs. City of San Fernando, et al, Defendant.* signed March 14, 1968, by the Honorable Edmund M. Moor, Judge of the Superior Court of Los Angeles County.

Numerous pretrial conferences were held subsequent to the filing of the action by the City of Los Angeles in 1955 and before the trial commenced on March 1, 1966. On March 19, 1958, an Interim Order of Reference was entered by the Court directing the State Water Rights Board (now known as the State Water Resources Control Board) to study the availability of all public and private records, documents, reports, and data relating to a proposed order of reference in the case. The Court subsequently entered an Order of Reference to State Water Rights Board to Investigate and Report upon the Physical Facts (Section 2001, Water Code) on June 11, 1958.

A final Report of Referee was approved on July 27, 1962 and filed with the Court. The Report of Referee made a complete study of the hydrogeology of ULARA, insofar as it affects the occurrence and movement of groundwater and surface water of the area. In addition, investigations were made of the history of channels of the Los Angeles River and its tributaries; the areas, limits, and directions of flow of all groundwater within the area; the historic extractions of groundwater in the basin and their quality; and all sources of water entering and leaving ULARA. The Report of Referee served as the principal basis for geologic and hydrologic facts for the original Trial Court Judgment in 1968, the Decision of the California Supreme Court in 1975 (14 Cal 3d 199, 123 Cal Rept 1), and the Trial Court Final Judgment on remand on January 26, 1979.

The Trial Court issued its opinion on March 15, 1968. The City of Los Angeles filed an appeal with the California Court of Appeal, which held a hearing on November 9, 1972, and issued its opinion on November 22, 1972. The opinion, prepared by Judge Compton and concurred in by Judges Roth and Fleming, reversed, with direction, the original judgment handed down by Judge Moor. In essence, the City of Los Angeles was given rights to all water in ULARA, including the use of the underground basins with some limited entitlements to others. The defendants, however, were given the right to capture “return water”, which is water served to their customers that percolates back into the groundwater basin (see below).

A petition for rehearing was filed by the defendants on December 7, 1972, but was denied by the California Court of Appeal. On January 2, 1973, the defendants filed a petition for hearing with the California Supreme Court. On March 2, 1973 the California Supreme Court advised the parties it would hear the case. The hearing began on January 14, 1975.

On May 12, 1975, the California Supreme Court filed its opinion on the 20-year San Fernando Valley water litigation. This opinion, which became final on August 1, 1975, upheld the Pueblo Water Right of the City of Los Angeles to all groundwater in the San Fernando Basin (SFB) derived from precipitation within ULARA. The City of Los Angeles’ Pueblo Water Right was not allowed to extend to the groundwaters of the Sylmar and Verdugo Basins. However, all surface and groundwater underflows from these basins are part of Los Angeles’ Pueblo Water Right.

In addition, the City of Los Angeles was given a right to all SFB groundwater derived from “return water” imported by it from outside ULARA and either spread or delivered within the SFB. The Cities of Glendale and Burbank were also given rights to all SFB groundwater derived from “return water” that each imports from outside ULARA and delivered within ULARA. San Fernando was not a member of Metropolitan until the end of 1971, and had never prior thereto

imported any water from outside ULARA. Therefore, San Fernando has no right to capture "return water" in the SFB.

In effect, the California Supreme Court reversed the principal decision of the Trial Court, and remanded the case back to the Superior Court for further proceedings consistent with the Supreme Court's opinion. On remand, the case was assigned to the Honorable Harry L. Hupp, Judge of the Superior Court of Los Angeles County.

The Final Judgment (Judgment), signed by Judge Hupp, was entered on January 26, 1979. The water rights set forth in the Judgment are consistent with the opinion of the California Supreme Court described above. The Judgment includes provisions and stipulations regarding water rights; the calculation of imported return water credit; storage of water; stored water credit; and arrangements for physical solution water for certain parties as recommended by the California Supreme Court.

The Judgment also provides for a court-appointed Watermaster to enforce the Judgment. In addition, the Judgment formed an Administrative Committee consisting of one voting member from each of the following five municipal water agencies: Los Angeles, Glendale, Burbank, San Fernando, and the Crescenta Valley Water District. The purpose of the Administrative Committee is to "…advise with, request or consent to, and review actions of the Watermaster."

Copies of the Judgment are available from the ULARA Watermaster Office.

A separate stipulation was filed in Superior Court on January 26, 1979, appointing Melvin L. Blevins as Watermaster. On September 1, 2003, Mark G. Mackowski was appointed Watermaster following the resignation of Mr. Blevins.

The following table lists the judges who have succeeded Judge Hupp as Judge of Record for the San Fernando Judgment.

JUDGES OF RECORD

Judge	Date Appointed
Susan Bryant-Deason	January 1, 1999
Ricardo A. Torres	January 1, 1993
Gary Klausner	December 9, 1991
Jerold A. Krieger	April 16, 1991
Sally Disco	May 25, 1990
Miriam Vogel	January 16, 1990
Vernon G. Foster	April 30, 1985

References

[1] CBMWD. "Central Basin Municipal Water District." Accessed October 30, 2014 from: http://www.centralbasin.org/en/.

[2] "Main San Gabriel Basin Watermaster." 2013. Accessed October 30, 2014 from: http://www.watermaster.org/.

[3] Metropolitan Water District of Southern California. 2007a. "Summary of Groundwater Basin Management." *Groundwater Assessment Study*. Accessed October 30, 2014 from: http://www.mwdh2o.com/mwdh2o/pages/yourwater/supply/groundwater/PDFs/FINALAppendixB.pdf

[4] ———. 2007b. "Chapter IV – Groundwater Basin Reports San Gabriel Valley Basins – Six Basins ." *Groundwater Assessment Study*. Accessed October 30, 2014 from: http://www.mwdh2o.com/mwdh2o/pages/yourwater/supply/groundwater/PDFs/SanGabrielValleyBasins/SixBasins.pdf.

[5] ———. 2007c. "Chapter IV – Groundwater Basin Reports San Gabriel Valley Basins - Raymond Basin." *Groundwater Assessment Study*. Accessed October 30, 2014 from: http://www.mwdh2o.com/mwdh2o/pages/yourwater/supply/groundwater/PDFs/SanGabrielValleyBasins/RaymondBasin.pdf.

[6] ———. 2007d. "Chapter IV – Groundwater Basin Reports San Gabriel Valley Basins - Main San Gabriel and Puente Basins." *Groundwater Assessment Study*. Accessed October 30, 2014 from: http://www.mwdh2o.com/mwdh2o/pages/yourwater/supply/groundwater/PDFs/SanGabrielValleyBasins/SanGabrielandPuenteBasins.pdf.

[7] ———. 2007e. "Chapter IV – Groundwater Basin Reports Los Angeles County Coastal Plain Basins – West Coast Basin." *Groundwater Assessment Study*. Accessed October 30, 2014 from: http://www.mwdh2o.com/mwdh2o/pages/yourwater/supply/groundwater/PDFs/LACountyCoastalPlainBasins/WestCoastBasin.pdf.

[8] ———. 2007f. "Chapter IV – Groundwater Basin Reports Los Angeles County Coastal Plain Basins – Central Basin." *Groundwater Assessment Study*. Accessed October 30, 2014 from: http://www.mwdh2o.com/mwdh2o/pages/yourwater/supply/groundwater/PDFs/LACountyCoastalPlainBasins/CentralBasin.pdf.

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