

EFFICIENT WATER USE IN CALIFORNIA: THE EVOLUTION OF GROUNDWATER MANAGEMENT IN SOUTHERN CALIFORNIA

**PREPARED IN PART FOR THE CALIFORNIA STATE ASSEMBLY RULES COMMITTEE
AND IN PART UNDER A GRANT FROM THE ROCKEFELLER FOUNDATION**

ALBERT J. LIPSON

**R-2387/2-CSA/RF
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PREFACE

This report is one of seven documenting the findings of Rand's study of water use efficiency in California. The study was commissioned by the California State Assembly in the autumn of 1976 and was supported in part by a grant from the Rockefeller Foundation. Its purpose was to examine current water use efficiency and to suggest ways to improve it. The focus of the study was deliberately set statewide, although particular areas of the state receive attention in some reports. It was not designed to solve problems that have drawn recent attention, such as the 1976-77 drought and its exacerbation of the groundwater overdraft problem in the San Joaquin Valley. Rather, the focus has been widened across a broad expanse of time and across all sources and uses of water. It is a study of long-range water use problems and solutions, rather than of immediately perceived short-term problems.

This report in the series examines the evolution of groundwater management in Southern California and discusses its implications for policymakers considering how to improve the efficiency of water use. What driving forces led local water users to institute groundwater management? What institutional arrangements did they develop to control groundwater use, and what factors influenced their choices? What are the implications of the Southern California experience for other areas of the state facing problems of long-term groundwater overdraft? This report is designed to help provide answers to these questions.

A companion report (R-2387/1-CSA/RF) presents an overview of groundwater management issues and policy options. The companion reports are:

Efficient Water Use in California: Executive Summary, by Charles E. Phelps, Morlie H. Graubard, David L. Jaquette, Albert J. Lipson, Nancy Y. Moore, Robert Shishko, and Bruce Wetzel, R-2385-CSA/RF, November 1978.

Efficient Water Use in California: Water Rights, Water Districts, and Water Transfers, by Charles E. Phelps, Nancy Y. Moore, and Morlie H. Graubard, R-2386-CSA/RF, November 1978.

Efficient Water Use in California: Groundwater Use and Management, by David L. Jaquette and Nancy Y. Moore, with Albert J. Lipson, R-2387/1-CSA/RF, November 1978.

Efficient Water Use in California: Economic Modeling of Groundwater Development with Applications to Groundwater Management, by Bruce Wetzel, R-2388-CSA/RF, November 1978.

Efficient Water Use in California: Conjunctive Management of Ground and Surface Reservoirs, by David L. Jaquette, R-2389-CSA/RF, November 1978.

Efficient Water Use in California: Water Supply Planning, by Nancy Y. Moore, Morlie H. Graubard, and Robert Shishko, R-2390-CSA/RF, November 1978.

These reports should be of interest to those concerned with California water policy and its implications for other states and the nation.

SUMMARY

To enlighten the legislative debate on policy options to improve groundwater management, this report examines the evolution of local programs now in place in Southern California. The intent was to analyze the development of these institutional arrangements and to review their statewide policy implications.

FINDINGS

A diverse system of local groundwater management has evolved in Southern California since the State Supreme Court's landmark *Pasadena v. Alhambra* decision in 1949 approved the doctrine of "mutual prescription." Local groundwater producers faced with severe water deficiencies gradually developed institutional arrangements and management plans to secure imported water, control groundwater pumping, and divide the costs and benefits of cheaper groundwater and more expensive imported supplies. Those downstream also sought to protect their sources of local surface supply from growing use upstream. Interbasin conflict and adjudications allocating surface stream flows were an integral part of the process of developing and implementing groundwater management plans within Southern California basins.

Most producers sought to gain recognition of their valuable water rights on the basis of past production. Groundwater management has been imposed primarily through court action in which water rights have been determined and producers have agreed on a negotiated "physical solution." Through the device of a stipulated agreement between parties to a groundwater adjudication, a complex and sophisticated system of court-supervised basin management has evolved on a piecemeal basis in each basin. Management has also been instituted by local creation of a groundwater management district authorized by the legislature.

The development and implementation of a management plan for each adjudicated area has been slow, arduous, and costly. Local producer associations (e.g., West Coast and Central Basin Water Users Associations) took leadership to define the problem, examine alternatives, and bring about a settlement tailored to fit the particular needs of each groundwater basin. First efforts were devoted to securing an imported supply. Through the development of major water import projects (which some have suggested were built too early and too large), it was possible for water users to decrease their dependence on groundwater. The availability of an imported supply enabled them to negotiate the division of costs and benefits of new more expensive supplies and existing less expensive groundwater. It was necessary to force groundwater users to use this more expensive supply, cut back pumping, and/or finance artificial replenishment. This involved not only complex studies of basin hydrology and the determination of past groundwater production, but also difficult negotiations between producers and among overlying water agencies to determine basin boundaries and an equitable settlement under which the beneficiaries of artificial replenishment would pay the costs.

In the Raymond Basin, Pasadena resorted to the courts in 1937 to protect its groundwater rights after first joining the Metropolitan Water District to obtain supplemental water. This was the first groundwater adjudication and the courts invented the doctrine of mutual prescription to cut back all pumpers proportionately on the basis of their past use rather than to eliminate entirely the rights of some pumpers as would have been the case had they followed previous legal rules.

In Orange County, producers resorted to the courts to settle interbasin issues to protect themselves from upstream users but not to determine water rights within their basin. Instead they chose to create a groundwater management district by special act of the legislature. In 1953 they were authorized to institute a pump tax to purchase replenishment water the first time such taxing power was utilized. This avoided litigation costs, but also denied pumpers the benefits of water rights transferability, which cannot be realized unless individual rights are determined.

In the interconnected West Coast and Central Basins, located downstream along the San Gabriel River, water users chose adjudication. To raise funds by pump tax to buy imported water for artificial replenishment of their groundwater basin they also successfully sought state legislation in 1955 enabling them to form a replenishment district overlying both basins.

Early adjudications in the Raymond and West Coast Basins involved adversarial court proceedings and took ten to twenty years to resolve. Gradually producers realized that they had little to gain from such expensive time-consuming litigation. Recent adjudications have developed complex management solutions by negotiated settlement in only three to five years involving more parties and diverse producers than participated in earlier ones.

Early court proceedings also established rigid rules limiting pumping to "safe yield" and confining the actions of the court-appointed Watermaster (a supervisory function, undertaken in early adjudications by a predecessor to the Department of Water Resources) to ministerial duties, such as monitoring production. The more recent physical solutions implemented in the Main San Gabriel and Chino Basins created new policymaking and management institutions with flexible powers to control groundwater use and finance replenishment under court supervision. In the Main San Gabriel Basin, the Watermaster is a nine-member committee composed primarily of elected water producers who annually set the "operating safe yield" and exercise powers somewhat analogous to those of the Central and West Basin Water Replenishment District. In the Chino Basin, the Watermaster is the overlying Chino Municipal Water District with checks and balances on its broad powers exercised by an elected producer advisory committee.

In the absence of overall state policy governing groundwater use, adjudication has been increasingly used as a means of developing a management plan by the process of negotiation between producers without the need to create new statutory political instrumentalities (i.e., districts or joint powers agencies). However, the 1975 *Los Angeles v. San Fernando* decision has complicated subsequent adjudications, since it eliminated mechanical application of a formula to determine water rights on the basis of past production.

Overall, groundwater management in major Southern California groundwater basins has been locally instituted over a long slow process primarily through court action that has stopped the clock on the acquisition of additional water rights. Those with adjudicated rights have something of value that is transferable. Area users where management has been instituted receive the benefits of safe emergen-

cy water supply requiring little or no treatment to meet their peak demands and transmitted to the point of use without pipelines or added surface reservoirs.

POLICY IMPLICATIONS

Local groundwater management evolved in overdrafted Southern California basins *only after more expensive imported water became available*. However, perhaps a more economically efficient approach would have been to institute groundwater management before undertaking large-scale imports.

Southern California experience has shown that it is unlikely that overdrafted areas in the San Joaquin Valley will, by themselves, institute basinwide controls over groundwater use unless pumpers have access to imported water. However, such access does not ensure that groundwater management will be adopted. At present, partial groundwater management is being practiced in some San Joaquin Valley areas overlain by water districts with access to imported supplies. In general, pumping is not monitored or controlled as it is in Southern California, and varying recharge programs and pumping rates cause some areas to pay for recharge that benefits others. There is no coordinated planning or management to serve basinwide needs.

It would be desirable to develop a long-range water policy for the San Joaquin Valley, one that includes the requirements that (1) *any future water projects be economically justified with those benefiting paying their share of the costs* and (2) *basinwide management be instituted before added surface supplies are made available*.

Because inexpensive local surface water is available to users in the Sacramento Valley, it is unlikely that they will institute groundwater management, even though basins there offer potential for conjunctive management with the State Water Project.

Since groundwater management in most areas of the state is likely to be desirable, state legislation should facilitate:

1. Determination by the state of local groundwater basin boundaries and the division of complex hydrological areas containing interdependent local groundwater and surface supplies into manageable units of governance.
2. The development and analysis of management options for basins and relevant watershed areas and local determination of a management plan.
3. Plan implementation by making available the necessary legal powers to a duly constituted local authority.
4. The determination of transferable water rights.

The Southern California experience strongly suggests the need to form local producer organizations similar to the water users associations developed in the West Coast, Central, and Main San Gabriel Basins of Los Angeles to exercise leadership and utilize existing technical capability in the search for and implementation of a local management plan.

General enabling legislation should permit local groundwater managers anywhere in California to do all of the things that can now be done in Southern California. This would allow local areas to designate a new or existing agency to

collect production data, monitor water use, control extractions, raise revenue by pump tax, initiate an adjudication, establish water levels using flexible operating criteria, and store and retrieve imported water.

To further stimulate local management, the state should have the power to undertake the development of a plan if local entities fail to act within a reasonable time. State action could be justified to promote the constitutional mandate that water be put to beneficial use. The pattern of state supervision of local actions is well established in the field of stationary source air quality regulation. This field was initially dominated by scattered local agencies until 1967 legislation established state policy.

Since some legal uncertainty has been created by the recent *Los Angeles v. San Fernando* decision, a body of statutory law should be enacted that would make legal rules governing water rights determination more certain. Such laws should be designed to encourage negotiated settlement of water rights issues in non-overdrafted as well as in overdrafted areas and to permit the transfer of water rights.

ACKNOWLEDGMENTS

This report has benefited from the contributions of many who helped design and institute Southern California groundwater management programs. Each appendix identifies persons interviewed who provided information about the particular groundwater basins studied. I would particularly like to acknowledge the assistance of Carl Fossette, one of the pioneers in the creation of groundwater management in Southern California, who not only provided valuable insights into developments in the Central, West Coast, and Main San Gabriel Basins but also took time to review and comment on an earlier draft of this report. Thomas Stetson also reviewed and provided detailed comments on an earlier draft and provided special help in developing our case study of the Main San Gabriel Basin, as did Ralph Helm. Max Bookman also reviewed portions of the report and contributed substantially to our understanding of groundwater management in Southern California, particularly in the Central and West Coast Basins, and also to our understanding of management developments in portions of the San Joaquin Valley.

Donald Stark helped provide an overview of basin-by-basin groundwater developments that helped structure our approach to this study. Fran Brommenschenkel of the Chino Basin Municipal Water District and Robert Jackson of the Tehachapi-Cummings County Water District contributed to and reviewed draft chapters pertaining to groundwater management in the Chino and Tehachapi Basins.

Within Rand, James DeHaven's constructive review comments helped me avoid drawing some potentially misleading implications from the research. Richard Hillestad also provided helpful suggestions, as did Project Leader Charles Phelps. Debts to others do not absolve the author of responsibility for remaining errors.

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I. INTRODUCTION

RELEVANCE AND PURPOSE OF THE STUDY

A major issue now confronting the California Legislature is whether to impose state regulation on groundwater use and, if so, how. Legislation was introduced in early 1978 to accomplish this objective (S.B. 1505, Nejedly) and more recently the Governor's Commission to Review Water Rights Law has recommended that groundwater management be required in designated areas of need where localities have not developed management programs of their own.¹ To enlighten the legislative debate on policy options to improve groundwater management, we examined the evolution of local programs now in place in Southern California, in particular those imposed through court action. We believed that an analysis of why and how local management was instituted in one region of the state would help define problems and issues that should be considered in the development of any statewide program.

Unlike most other areas of the state, Southern California has a relatively well-developed and diverse system of local groundwater management that has evolved on a piecemeal basis over many years. The purpose of the research described in this report is to identify the key factors that led to the development of these local institutional arrangements, to describe the management tools designed to cope with their problems, and then to examine the statewide policy implications of the Southern California groundwater management experience.

METHOD

To gather data on local programs we reviewed existing literature, including reports of agencies and their consultants, and academic and trade journals. We also interviewed key participants in the development of specific Southern California programs. Those interviewed included attorneys who participated in groundwater rights litigation, managers of overlying water districts, consultants who helped develop management plans, producers involved in management negotiations, and state officials who have either observed the evolution of local programs or who directly administer court judgments. Considerable attention has been given to the more recent adjudications about which little has been written.

This study has several limitations. We neither evaluate nor present a complete history of each area studied. Rather, we present a short case study of the institutional development in each. While water quality problems have recently become more important in their management programs, our study does not examine major water quality issues.

¹ See Governor's Commission to Review Water Rights Law *Final Report*, Sacramento, California, December 1978. S.B. 1505, as enacted in 1978, gave the State Department of Water Resources responsibility to define groundwater basins, leaving many major controversial issues unresolved.

REPORT ORGANIZATION

Section II of this report presents major findings from case studies of individual Southern California groundwater management programs. In Sec. III, we summarize the major findings and discuss their policy implications. Appendixes A through G contain specific case studies of the following Southern California groundwater basins: Raymond, Central and West Coast, Main San Gabriel, Upper Los Angeles River Area, Tehachapi, Orange County Coastal Plain, and Chino.

II. SOUTHERN CALIFORNIA GROUNDWATER MANAGEMENT

INTRODUCTION

The essence of groundwater management is the skillful control of pumping from the underground "common pool" reservoir to promote efficient and equitable long-term use of the water derived from it.¹ This requires optimal use of groundwater basin storage and transmissive and treatment capacity in conjunction with available surface supplies. It calls for the manipulation of water levels during wet and dry periods to both conserve water and make it available when needed, particularly during emergencies. It necessitates the imposition of basinwide regulation so that management objectives can be achieved and their costs and benefits appropriately distributed.² Maximum use of groundwater basins as distribution, storage, and filtration systems saves the cost of surface transportation facilities (i.e., pipelines), storage reservoirs, and treatment plants. Effective management also reduces pumping costs by encouraging higher average water levels.³

The most prominent problems in Southern California that prompted a search for management solutions were increased pump lifts and salt water intrusion in coastal areas. Some locations also suffered from land subsidence and poor water quality. These problems were caused by depletion of local surface and groundwater supplies faster than they could be replenished naturally.

Groundwater management programs grew up in hydrologically interconnected basins along river systems. Those downstream and farthest from the sources of supply and hit first by shortages were the first to clamor for solutions. Gradually water problems moved upstream. Downstream users sought to protect their sources of supply from overuse by those upstream and took legal action to protect their water rights. The settlement of disputes between interconnected basins, mutually dependent on the same local surface supply sources, was a necessary part of the development of management plans within groundwater basins. Each area fought to protect its share of the local water supply, to ration it among competing uses and, where necessary, to seek additional water.

The solution to groundwater problems was made extremely complex because each of the many overlying pumpers possessed an unquantified property right to

¹ The problem occurs because individuals pumping from the common pool seek to capture water for their own use and tend not to consider the effects of their use on others dependent on the same resource. Thus, individual use may result in declining water levels for all. For more discussion of this problem, see the companion report by Bruce Wetzel, *Efficient Water Use in California: Economic Modeling of Groundwater Development with Applications to Groundwater Management*, The Rand Corporation, R-2388-CSA/RF, November 1978, and the sources cited therein. See also David L. Jaquette and Nancy Y. Moore, with Albert J. Lipson, *Efficient Water Use in California: Groundwater Use and Management*, The Rand Corporation, R-2387/1-CSA/RF, November 1978.

² James H. Krieger and Harvey O. Banks, "Ground Water Basin Management," *California Law Review*, Vol. 50, 1962, pp. 56-77.

³ Since the management function itself is costly to organize and maintain, one must also consider whether benefits from managing a basin exceed the costs of the management system. See Jaquette and Moore, *op. cit.*, for a further discussion.

use the underground supply.⁴ Each was competing with the other to extract as much as possible for his own present and future use and had no incentive to consider the impact of his pumping on others. Also, little was known about the nature and extent of the underground resource. Before management could be instituted it was necessary to learn more not only about how much water was in the common groundwater pool, its boundaries, and movement, but also about how much was being tapped and by whom. Only when groundwater problems became severe and pumpers feared salt water contamination and exhaustion of supply did they seriously consider potential solutions.

However, water users were either unwilling or unable to solve their seemingly insurmountable legal and technical groundwater common pool problems without additional water. They feared that without this additional water, they would have to resort to interminable costly litigation to resolve water rights disputes and might face the unacceptable risk that their supply would be curtailed.

Even though from an economic viewpoint it would have been desirable to control competitive extraction by instituting groundwater management first, their cure for increased pump lifts and salt water intrusion was to import supplemental water through the Metropolitan Water District (MWD). But just because imported water was available did not mean that it would be used. Integrated management of imported and local supplies required control of groundwater use. In developing groundwater management plans the key issues faced by each affected area were:

- How to force groundwater producers⁵ to reduce their groundwater use and switch to more expensive imported supplies.
- How to allocate the added costs of the imported supplies and preserve the benefits of older, less expensive groundwater rights.
- How to assure that those benefiting from artificial replenishment of their depleted groundwater stocks paid their fair share of imported water costs.

To surmount their water deficiency problems, local water producers developed institutions to obtain imported water (e.g., the MWD and water supply districts). They initiated legal actions to determine rights to local surface and groundwater, and to limit their use. They developed institutional arrangements and management programs to allocate local surface supplies, control pumping, and use ground and surface water conjunctively.

The development of management solutions was influenced by a number of complex and interrelated factors. Each area faced its own special problems at a particular time. Each designed its own management approach, on the basis of the peculiar *physical constraints* imposed by area hydrology; the changing *legal framework* that served as the basis for determining water rights; the prevailing *economic factors*, such as the costs of pumping and the price of available supplemental supplies; *political-institutional factors*, including conflicts between users and among overlying public agencies that had to be resolved through local leadership before management programs could be successfully designed and implemented;

⁴ See Jaquette and Moore, *op. cit.*, for a discussion of groundwater rights. See also Anne J. Schneider, "Groundwater Rights in California: Background and Issues," *Governor's Commission to Review California Water Rights Law*, Staff Paper No. 2, July 1977.

⁵ "Producer" generally refers to those who pump groundwater for intermediate (i.e., for sale to others) or end use.

and *technology*, both managerial and technical, that was essential to solve the unique problems affecting each area.

Table 1 portrays the interesting mix of institutional arrangements and management tools that have evolved in Southern California and some of the factors that influenced their development. It is derived primarily from the case studies contained in Appendixes A through G. After analysis of these case studies, we developed the findings summarized below. Figure 1 shows the location of pertinent groundwater basins and rivers.

Table 1
GROUNDWATER MANAGEMENT IN SELECTED SOUTHERN CALIFORNIA BASINS

Basin	Physical Characteristics	No. of Parties	Basin Governance	Physical Solution	Interbasin Adjudication	Local Leadership	Estimated Adjudication Costs ^d
<u>RAYMOND</u>							
Suit filed 9/23/37	Relatively self-contained, urban, limited storage; not well suited to artificial replenishment.	31	Adjudication, DWR ^a as ministerial Watermaster with producer advisory committee.	Imported water via MWD and cutback on extractions based on "safe yield" and "mutual prescription"; "exchange agreement"; water rights transferable; new pumping enjoined; minor artificial replenishment via LACFCD ^b and other local districts; monitoring of production.	N/A ^c	Legal action initiated by Pasadena.	Plaintiff legal costs \$100,000; DWR reference study \$50,000; costs to other parties unknown.
Judgment 12/23/44							
Appeal 6/3/49							
<u>WEST COAST</u>							
Suit filed 10/24/45	Urban, confined, coastal; limited transmissivity; not well suited to artificial replenishment.	491	Adjudication, DWR as ministerial Watermaster, Central and West Coast Replenishment District authorized by General Enabling Act passed in 1953.	Imported water via MWD; cutback in extractions based on "mutual prescription"; replenishment by spreading in Central Basin; salt water intrusion barriers; set up "exchange pool"; water rights transferable; new pumping enjoined; "in-lieu" replenishment. Spreading by LACFCD financed initially by zone property tax and then "gross" pump tax levied by replenishment district; monitoring of production.	<i>Long Beach v. San Gabriel Water Co.</i> (1965) resulted in allocation of San Gabriel River water under Watermaster supervision.	Pioneered in development of local water association.	DWR reference study \$260,000; appeal costs \$41,000; one source estimated total costs to all parties at \$5 million.
Judgment 8/18/61							
Appeal 4/23/64							
Replenishment district formed 1959							
<u>CENTRAL</u>							
Suit filed 1/2/62	Confined, urban, limited transmissivity, but subject to replenishment.	over 700	Adjudication, DWR as ministerial Watermaster; Central and West Basin Replenishment District.	Generally same as for West Coast Basin.	Long Beach case (see above).	Central Basin Water Users Association.	Legal and engineering costs to district were \$225,000.
Judgment 10/11/65							
<u>UPPER LOS ANGELES RIVER AREA</u>							
Suit filed 9/30/55	Urban; large, transmissive, well suited to artificial replenishment; several groundwater basins (largest in San Fernando).	26	Adjudication, 1968 judgment established DWR as ministerial Watermaster with advisory board of producers.	Supreme Court decision in <i>L.A. v. San Fernando</i> modified "mutual prescription" preventing prescription against public entities; it eliminated mechanical application of mutual prescription, adopted more flexible definition of "overdraft" to permit extractions over "safe yield" plus temporary surplus, and clarified right to store and retrieve imported water.	N/A	Los Angeles	Not available.
Judgment 4/24/68							
Reversed on appeal 11/22/72							
Supreme Ct. Dec. 5/12/75 no final judgment							

Table 1--continued

Basin	Physical Characteristics	No. of Parties	Basin Governance	Physical Solution	Interbasin Adjudication	Local Leadership	Estimated Adjudication Costs
<u>ORANGE COUNTY COASTAL PLAIN</u>							
	Urban, large, transmissive, well suited to artificial replenishment; rapid urban growth.	N/A	Orange County Water District created by special act of the legislature in 1933 and amended thereafter.	Imported water via MWD; "gross" pump tax and property tax to purchase replenishment water; salt water intrusion barriers; "basin equity tax" to raise revenue from those exceeding "basin equity percentage" to finance "in lieu" replenishment on request of district; monitoring production.	<i>Irvine Co. v. Fontana</i> (1942); <i>Orange County Water District v. Chino</i> (1969) resulted in allocation of Santa Ana River water under Watermaster supervision.	Local farm and business interests.	N/A
<u>MAIN SAN GABRIEL</u>							
Suit filed 1/2/68 Judgment 1/4/73	Urban; large storage, transmissive and well suited to artificial replenishment.	190	Adjudication, local board as policymaker Watermaster.	Imported water via MWD and State Water Project; water rights determined by "mutual prescription" and are transferable; five classes of rights established including surface water; Watermaster sets "operating safe yield" annually; "net" pump tax used to finance replenishment; new pumping permitted with payment of "gross" pump tax; water spread by LACPCD; permits "cyclic" storage agreements; monitoring of production.	Long Beach action (see above).	Upper San Gabriel Valley Water Users Association.	Legal and engineering costs \$424,000. Total costs estimated at \$750,000 to \$1 million.
<u>TEHACHAPI^e</u>							
Suit filed 10/3/66 Judgment 3/22/71 Amendment 11/20/73	Agricultural, small, self-contained.	About 100	Adjudication, County Water District as ministerial Watermaster.	Imported water via State Water Project; cutback on extractions based on "safe yield" and "mutual prescription"; water rights determined and transferable; "exchange pool"; new pumpers enjoined; limits diversion of surface supplies; production monitored; no spreading.	N/A	Citizens Advisory Committee, Tehachapi-Cummings District.	Total costs estimated at \$300,000.
<u>CHINO</u>							
Suit filed 1/2/75 Judgment 1/27/78	Agricultural and urban; large storage, transmissive, suited to replenishment.	1300	Adjudication, Municipal Water District as Watermaster with broad policy authority exercised by producer advisory committee and "producer pools."	Imported water via MWD; suit concluded after <i>L.A. v. San Fernando</i> ; established "safe yield" and determined "operating safe yield" for appropriators; set up three producer pools, i.e., overlying agriculture, overlying non-agriculture and appropriators, and determined rights for each group; water rights for appropriators are individually determined and transferable; rights for overlying agricultural users are not individually determined; each producer pool pays a "net" pump tax but costs are distributed for individual producers according to each pooling plan; permits storage agreements.	See Orange County, above.	Chino Basin Water Users Association and Chino Basin Municipal Water District.	\$626,000 in legal, engineering and district in-house costs; total costs estimated at between \$750,000 and \$850,000.

^aDepartment of Water Resources.^bLos Angeles County Flood Control District.^cN/A, not applicable.^dDoes not include costs of interbasin adjudication.^eThere were three separate adjudications involving the Tehachapi, Cummings, and Brite Basins.

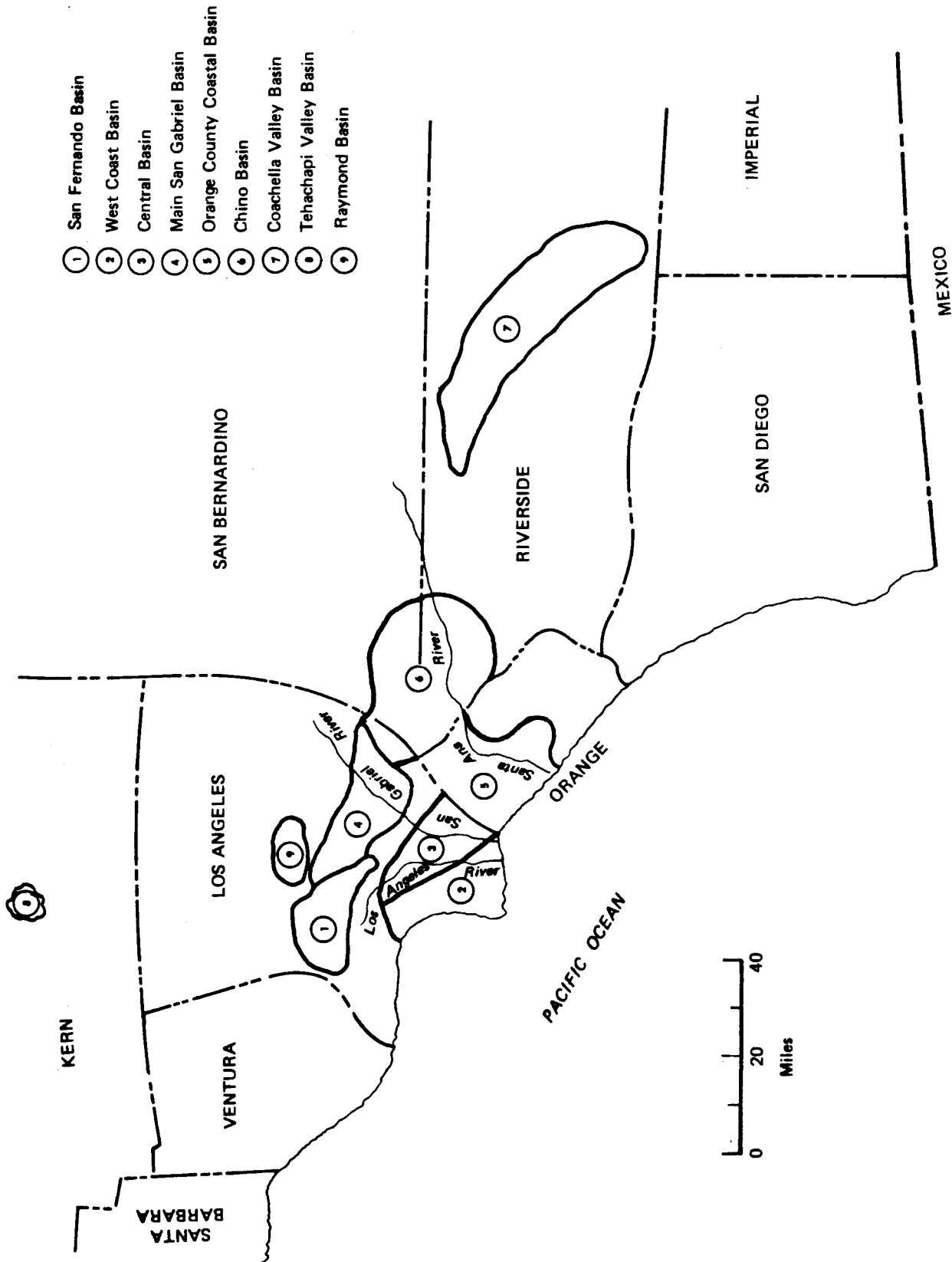


Fig. 1 — General location of Southern California groundwater basins

INSTITUTIONAL ARRANGEMENTS

A diverse set of management schemes now operates in Southern California groundwater basins. They were established either by court judgments settling water rights litigation, by a special act of the legislature specifically creating a district, by a general legislative act permitting local citizens following certain procedures to establish a district, by mutual agreement of existing overlying agencies, or by some combination of these methods. Some examples are discussed below.

In the relatively isolated Raymond Basin, Pasadena resorted to the courts in 1937 to protect its groundwater rights after first joining the MWD to obtain supplemental water. This was the first groundwater adjudication in an overdrafted groundwater basin. The courts determined that all pumpers must join the suit since the water rights of all were affected. The courts invented the doctrine of mutual prescription to cut back all pumpers proportionately on the basis of past use rather than eliminating entirely the rights of some pumpers as would have been the case had they followed previous legal rules. The State Division of Water Rights, a predecessor to the Department of Water Resources (DWR), was appointed Watermaster to monitor production and perform certain ministerial duties under continuing supervision of the court.⁶ The Watermaster is aided by a four-member producer advisory committee.

Water users in Orange County chose not to adjudicate groundwater rights. However, they created a district by a special act of the legislature in 1933, primarily to institute litigation to protect themselves from upstream Santa Ana users. The boundaries of the district were expanded in 1953 to include the entire groundwater basin area benefiting from replenishment, and it was given broad taxation powers including, for the first time, authority to impose pump taxes.

In the interconnected West Coast and Central Basins located downstream along the San Gabriel River, water users also chose adjudication. Both basins have separate DWR Watermasters to monitor adherence to the court judgment. To raise funds by pump tax to buy imported water for artificial replenishment of their groundwater basin they successfully sought state legislation in 1955 enabling them to form a replenishment district overlying both basins.

In the Main San Gabriel Basin, water rights were adjudicated in 1973 but the Watermaster is a nine-member committee composed primarily of elected water producers who exercise broad policymaking powers analogous to those of the Central and West Basin Water Replenishment District.

The small Tehachapi Basin was also adjudicated in 1973 along the pattern set by Central and West Coast Basins, but Watermaster authority under court supervision is exercised by the Tehachapi-Cummings County Water District.

The Upper Los Angeles River Area was adjudicated and placed under DWR Watermaster supervision. However, the 1975 *Los Angeles v. San Fernando* Supreme Court decision changed the legal rules of the game, requiring the parties to renegotiate their management plan.

⁶ Sections 4025 et seq. of the Water Code permit the DWR to divide the state into Watermaster service areas as water rights are determined. The state pays half the cost of Watermaster service and the other half is paid by water rights owners. The specific duties of the Watermaster depend on the determination of the court in water rights actions. In general, the Watermaster monitors pumping and performs other ministerial duties. However, the courts, as described above, have expanded the role of the Watermaster to permit parties other than the DWR to perform other discretionary duties.

The most recent adjudication in the Chino Basin (1978) has resulted in Watermaster management by the overlying Chino Municipal Water District with checks and balances on its broad powers by an elected producer advisory committee.

In the Coachella Valley, two overlying water districts chose not to adjudicate and, instead, in 1976 entered into an agreement to artificially replenish a management area within the Whitewater River subbasin, with each district obtaining special legislation giving it pump tax powers.⁷

Court judgments have resolved years of interbasin legal dispute between upstream and downstream water users along the San Gabriel and Santa Ana Rivers. The Long Beach case settlement obligated the upper area (i.e., through the Watermaster and the Upper San Gabriel Valley Municipal Water District) to make up water deficiencies to the lower area of the San Gabriel River and set up a three-member Watermaster committee to monitor adherence to the agreement. The Santa Ana judgment similarly required upper area water districts to guarantee a certain water flow to the lower area under supervision of a five-member Watermaster committee.

The existence of these diverse methods of governance illustrates that a wide range of options is available to water users who want to institute management of ground and interconnected surface water systems.

MANAGEMENT BY MEANS OF ADJUDICATION

Most water users in Southern California have sought to achieve their objectives through stipulated judgments in court adjudication proceedings. The stipulated judgment permits producers, by mutual agreement, to avoid strict adherence to certain legal rules that might otherwise frustrate the achievement of their objectives.⁸

The Role of the Watermaster

One of the most striking characteristics of the recent evolution of adjudication by stipulated agreement is the expansion of what used to be the ministerial role of the Watermaster into that of a political instrumentality with powers probably more expansive and flexible than those accorded to public districts established by statute.

⁷ The development of groundwater management in the Coachella Valley is not the subject of a specific case study. It has been included for descriptive purposes, since it is a case of management by mutual agreement of two overlying agencies. The Desert Water Agency and the Coachella Valley County Water District both obtain imported water for basin replenishment through exchange agreements with the MWD. Under the agreements, the MWD takes the State Water Project entitlement of these agencies and delivers an equal amount of Colorado River water to them. In 1977 the Desert Water Agency successfully sought legislation permitting it to levy a pump tax (A.B. 266). The Valley District obtained similar legislation in 1978 (A.B. 2513). Both districts abandoned efforts to adjudicate after the Supreme Court's decision in *Los Angeles v. San Fernando*. The water management agreement between the two agencies provides for a groundwater replenishment program and divides the costs in the designated management area in proportion to pumping within the two agencies. It also requires metering of major wells and sets up a monitoring and data collection program.

⁸ John F. Mann, remarks contained in *Proceedings of 1965 Biennial Conference on Ground Water Recharge, Development and Management*, University of California at Los Angeles, September 1-2, 1965, pp. J5-12.

This has been done as part of the "physical solution" arrived at between the parties to attain the constitutional mandate of "reasonable and beneficial" water use.⁹

In the Raymond and Central and West Coast Basins and the Upper Los Angeles River Area, the function of the DWR as Watermaster is confined to such ministerial actions as monitoring the parties to assure that they adhere to the judgment of the court. The DWR performs this function pursuant to statute authorizing the establishment of Watermaster areas. In the Tehachapi Basin, the stipulated judgment delegates Watermaster powers to an overlying local water district, thereby expanding the powers of the district beyond those authorized by statute.

A number of groundwater management innovations were developed in the Main San Gabriel Basin adjudication. It did not seem practical to create a new political instrumentality like a replenishment district or a joint powers agency to govern the basin so a new quasi-public entity was created through the courts. The role of the Watermaster was substantially expanded to include major policymaking powers, some of which are analogous to those exercised by the statutorily authorized replenishment district. The nine-member Watermaster, composed predominantly of elected water producers, not only performs the essentially ministerial duties to enforce the judgment of the court, as in the Raymond and Central and West Coast Basins, but also levies assessments under court supervision. This judgment also provides greater flexibility for groundwater management than in previously adjudicated basins. It does not rigidly define safe yield, but sets operating criteria for the determination of operating safe yield to give basin managers flexibility in using replenishment assessment powers to manipulate basin water levels.¹⁰ Moreover, these Watermaster powers are not exercised by a public agency such as the DWR or a district; they are exercised by a committee composed predominantly of water users who operate through existing overlying public agencies. Furthermore, the committee majority is elected by producers on the basis of their share of water rights, creating in effect a quasi-political instrumentality controlled by water producers. The adjudication also determined surface rights affecting safe yield of the groundwater basin and identified five classes of water rights.

The most recent evolution of the Watermaster role is contained in the Chino Basin stipulated judgment, where an overlying water district, checked by an elected producer advisory committee, exercises broad policymaking and management authority as part of the physical solution. Not only does the Watermaster levy assessments and set operating safe yield, but a major innovation in this judgment also authorizes producer committees to establish operating policies for three separate user "pools," which levy different types of replenishment assessments.

Establishing Valuable Water Rights

One of the primary factors stimulating adjudication has been the desire of water users to establish valuable water rights. Water rights have value for several reasons. First, when water is in short supply, those with rights to cheaper ground-

⁹ Article 14, Section 3, of the California Constitution adopted in 1928 has been interpreted to permit and authorize court imposition of arrangements between parties aimed at eliminating waste while protecting water rights priorities.

¹⁰ Safe yield is the average annual extraction that can be continued indefinitely without a long-range effect on the quality and quantity of groundwater in the basin. See Jaquette and Moore, *op. cit.*, for more discussion of groundwater management terminology.

water receive an economic benefit not enjoyed by those who must directly use more expensive imported supplies. Second, in most adjudicated basins once rights are specified they may be sold within the basin for whatever the traffic will bear.¹¹ Third, those with water rights may pay less taxes than those without them. For example, in the Main San Gabriel Basin, users pay a "net" replacement water pump tax only on production exceeding their water rights.

Management by "gross" pump tax (i.e., a tax on all production), as occurs in Orange County, gives no value to past production either by specifying it and thereby permitting its market transfer or by exempting a share of production from taxation. It also gives no value to type of production, since overlying users who theoretically have rights superior to those of appropriators pay the same pump tax.¹² It does not penalize newcomers without historic rights.

Adjudication Costs

In most areas of Southern California, users who saw the benefits of secure water rights favored adjudication. The early pathbreaking adjudications were complex, time-consuming, and expensive. Later ones cost less and accomplished more. The Raymond Basin case took seven years for the initial judgment and another five years on appeal. One-time engineering and legal costs can be estimated conservatively at about \$10 per acre-foot of adjudicated right.

In the West Coast Basin, one source estimated total costs at \$5 million or about \$76 per acre-foot of adjudicated right over a full 19 year period. In the Upper Los Angeles River Area, the adjudication begun in 1955 has not yet been finally resolved. In the Central Basin, a judgment was reached in three years that probably had a one-time cost somewhere between \$1 and \$2 per acre-foot. In addition, there were time and money costs involved in organizing a replenishment district to finance artificial recharge for the two interconnected basins.

Subsequent adjudications in the Main San Gabriel and Chino Basins that determined water rights and set up broad Watermaster policymaking authority took less time (five years and three years, respectively). One-time costs in these two basins were in the neighborhood of \$4 to \$6 per acre-foot of adjudicated right.

Rather than go through an expensive intrabasin adjudication, Orange County water users chose to purchase replenishment water by instituting a pump tax. Water users there receive no benefits associated with having an adjudicated transferable water right, but they have benefited by maximum use of the Coastal Plain Basin as a storage, transmission, and filtration facility. Orange County, however, has been aggressive in water rights litigation to protect its water supply from upstream Santa Ana River users.

APPROACHES TO LIMIT PUMPING

The solution to the problem of excessive pumping from the groundwater pool

¹¹ In the recent Chino Basin adjudication, water rights for the pool of all overlying agricultural users were established, but individual water rights for them were not determined. Also, rights of overlying users are not transferable.

¹² James L. Markman, "Presentation on California Ground Water Management Experience to the Arizona State Legislature," Groundwater Management Study Commission, February 23, 1978, p. 5.

requires that measures be instituted to eliminate incentives to overproduce. This could be done either by specifying and limiting water rights or by imposing a pump tax to help equalize the private and social costs of groundwater extraction.¹³ Methods to limit pumping in Southern California have taken the four forms outlined below, depending primarily on basin hydrology, the desire of users to establish valuable water rights, water costs, and developing management concepts.

1. Regulation establishing individual water rights through adjudication and limiting pumping to a prorata share of basin safe yield on the basis of production (as in the Raymond Basin).
2. Regulation establishing individual water rights through adjudication, limiting pumping to a prorata share of safe yield, and imposing a gross pump tax (i.e., one on all production) to control use and to purchase replenishment water (as in the Central and West Coast Basins).
3. Regulation establishing water rights through adjudication without limiting pumping but imposing a net pump tax (i.e., one only on production exceeding producers' share of allowed pumping as determined by adjudication) to finance replenishment (as in the Main San Gabriel and Chino Basins).
4. Regulation without either determining individual water rights through adjudication or limiting pumping but imposing a gross pump tax to finance purchase of replenishment water and a "basin equity tax" to control use (as in Orange County).

Appropriate implementation of these methods could tend to eliminate incentives to overproduce. However, specific implementation in various basins may vary from optimal efficiency. For example, establishment of quotas based on historic use tended to promote a race to the pump house to establish a high quota. Also, failure to specify or permit transfer of overlying rights, as in the Chino Basin, prevented transfer of water to its most productive uses. In addition, pump taxes, as in Orange County, may be set so as to subsidize use of surface water.

Early adjudications were based on a rigid concept of safe yield. Those involved determined that overdrafted basins (i.e., those for which use exceeded replenishment) should be returned to previous levels and the overdraft eliminated because of its undesirable effects. More recently, water resources planners have rejected these concepts in favor of more flexible approaches aimed at permitting variations in water levels to balance use over wet and dry cycles, to account for the price of alternative surface supplies, and to allow overdraft or mining under specified conditions.¹⁴ More recent adjudications in the Main San Gabriel and Chino Basins have reflected a more flexible approach in line with the San Fernando decision that defines overdraft to include safe yield plus a "temporary surplus."

The "exchange pool" (pioneered in the Central and West Coast Basins and used as well in the Tehachapi Basin) eliminates the need for additional surface distribution systems to accommodate mandatory exchanges between those having access to surface supplies and those dependent on groundwater. The exchange pool per-

¹³ Private costs are those borne by individual pumpers; social costs are those borne by pumpers collectively because of competitive extraction.

¹⁴ Department of Water Resources, *California's Ground Water*, Bulletin No. 118, Sacramento, California, September 1975, pp. 119-134.

mits those with no surface water connections to *increase* their groundwater production above their legal entitlement. It also requires those with surface connections to *cut back* on groundwater use below their legal entitlement. Those with surface connections are reimbursed for the higher cost they pay for imported water and those using more groundwater pay that higher cost.

To deal with the particular problem of pumping holes that develop in some areas, the "in lieu" feature of the Main San Gabriel and the Chino adjudications allows recharge to occur by requiring certain producers to take surface supplies rather than pump groundwater, with compensation for their increased costs.

Adjudicated settlements also permit users to carry over a share of unused water rights from year to year and permit minor overextractions. All management programs require accurate recordation of production primarily through metering, but usually small pumpers are exempted from controls.

KEY FACTORS INFLUENCING INSTITUTIONAL DEVELOPMENT

Our analysis of the case studies described in Appendixes A through G suggests that the evolution of local groundwater management in Southern California was influenced primarily by the following key factors:

1. *A water deficiency that propelled action.* Groundwater levels were declining. Pumping lifts were increasing. The coastal areas of Los Angeles and Orange Counties were being invaded by salt water. With urban growth, shortages moved up the San Gabriel, Santa Ana, and Los Angeles River systems. Local supplies were inadequate to meet growing water demands and local users feared that their groundwater basins could suffer irreparable harm.

2. *The availability of imported water and the need to develop controls and incentives to use this more expensive supply and cut back on cheaper native groundwater use.* Water users facing declining groundwater and local surface supplies in Southern California were able to meet their requirements by first importing water from the Owens Valley, then from the Colorado River, and later from Northern California. They did not have to cut back overall use but instead could satisfy their growing demands by using imported water supplied by the Los Angeles Department of Water and Power, the MWD, and the State Water Project.¹⁵ Rather than arguing interminably over rights to a depleted supply, pumpers and upstream and downstream users could settle their disputes by negotiations over who would pay the cost of more expensive imported supplies to meet their mutual deficiency. Potentially irreconcilable battles over limited water became negotiable conflicts over money.¹⁶ However, this was at the price of expensive imported projects, which some have concluded were built too early and too large.¹⁷ The result was tax

¹⁵ The legal battle with Arizona over rights to the Colorado River was an added incentive for California to import water. This would enhance its legal position to divest a larger amount when the case was finally settled. When *Arizona v. California* was filed in 1952, California was taking 200,000 acre-feet from the Colorado. When the case was decided, California was diverting more than 91 million acre-feet.

¹⁶ Comments of Donald D. Stark contained in *Proceedings of the Seventh Biennial Conference on Ground Water*, University of California at Los Angeles, September 10-11, 1969, pp. 217-235.

¹⁷ For a critical analysis of the history and policies of the MWD, see Jerome W. Milliman, "The History, Organization, and Economic Problems of the Metro Water District," unpublished Ph.D. Disser-

subsidies to water users by property taxpayers who paid off project bonds while increments of water were sold at low rates because demand was low.

3. *The need to devise institutional approaches to compel those benefiting from artificial replenishment to pay its cost.* The economy built on local ground and surface water was called upon to pay the higher cost of imported water. However, despite the availability of imported water, many pumpers persisted in using local supplies because they were cheaper and under the *Pasadena v. Alhambra* court decision there was a danger that unless they used their water rights they could well lose them. Paradoxically, local entities that had joined the MWD found themselves paying taxes for imported water that was not being used. To meet the problems of declining groundwater tables and lack of incentives to use imported supplies, local water user groups sought means to encourage or compel the use of more expensive imported water either directly or for artificial replenishment of groundwater basins. (It is reasonable to speculate that pumpers might have been more willing to use imported water if pump taxes had been imposed earlier. This is because the price differential between pumping and surface imports could have been less because of the pump tax and the need for a smaller project.

Water users in Orange County first devised the pump tax as a means of financing artificial groundwater replenishment. When the pump tax was instituted in 1953, the boundaries of the district were enlarged to include major pumpers from the groundwater basin. Pumpers paid for imported replenishment water on the basis of their total groundwater production.

Similarly, producers in the Central and West Coast Basins created a replenishment district to overlie the area of benefit and also imposed a gross pump tax. In the Main San Gabriel and Chino Basins, net pump taxes to finance replenishment were imposed as part of a basinwide adjudication.

4. *The hydrology of each area that helped determine its particular management approach.* The evolution of local management programs was strongly influenced by each area's location on a stream system and the interconnection between its groundwater and local surface supply. In basins along the San Gabriel (i.e., Main San Gabriel, Central, and West Coast Basins) and Santa Ana (i.e., Chino and Orange County) River systems, management was achieved by allocating gross surface supplies between upstream and downstream users under Watermaster supervision, by importing surface water, and by developing a groundwater management plan for each basin. Areas at the lower end of the stream system, farthest from the source of supply and along the coast (i.e., West, Central, and Orange County Coastal Plain Basins), as pointed out above, were the first to face salt water and dry well problems. They also were first to organize water management programs and took early legal action aimed at preventing upstream users from encroaching on their local surface supplies. On the other hand, those upstream, closest to the source of supply and last to face shortage problems, were the last to organize water management programs (i.e., Main San Gabriel and Chino Basins). A legal action filed by Long Beach, Compton, and the Central Basin Municipal Water District was instrumental in stimulating upstream San Gabriel River management. Under the 1965 Long Beach judgment, water users in the Main San Gabriel Basin

tation, University of California at Los Angeles, 1956. See also Jack Hirshleifer, James C. DeHaven, and Jerome W. Milliman, *Water Supply, Economics, Technology, and Policy*, The University of Chicago Press, 1970, Chapter XI and postscript. The authors argue that the State Water Project was premature.

could no longer diminish the supplies of downstream users. The same year the Long Beach suit was filed, the Upper San Gabriel Valley Municipal Water District was formed for the purpose of obtaining imported water from the MWD. Soon after settlement of the Long Beach case, groundwater management planning began in earnest in the Main San Gabriel Basin and adjudication action was filed in 1968.

Downstream Santa Ana River users in Orange County fought for years to protect their source of supply from those upstream by legal actions. A suit filed in 1932 by the Irvine Company helped stimulate formation of the Orange County Water District in 1933. Later suits culminated in a 1969 agreement allocating river flows under Watermaster control. After settlement of this long-standing dispute, water users in the Chino Basin began developing their groundwater management program.

The stipulated judgments settling these interbasin disputes have not involved the determination of individual water rights, but instead have allowed overlying water districts to make up downstream water deficiencies. The allocation of costs was left to be determined by each area as part of its groundwater management program.

The type of management solution adopted in each basin was dictated in large measure by its proximity to the coast and its transmissive and storage capacities. Coastal areas facing salt water intrusion had to solve that problem as part of an overall management plan. Urban areas with limited surface for natural or artificial replenishment, because of paving and limited transmissivity (i.e., the Raymond and West Coast Basins), were forced to limit groundwater production and to rely heavily on surface distribution systems. Other areas that could use groundwater basins as large storage and distribution systems (i.e., the Main San Gabriel, Orange County, and Chino Basins) were able to artificially replenish them and did not have to cut back pumping or to rely as heavily on surface distribution systems.

5. *Uncertainty about physical facts including basin boundaries and overlying use that required many years of study and complicated negotiations before agreement on a management plan could be reached.* One of the major difficulties encountered in groundwater management has been the need to determine the physical characteristics of the underground water resource. A second has been the need to determine the specific quantities of overlying use. This was made more difficult in cases involving many producers.

In the Raymond Basin, the state reference study to determine physical facts, including overlying use, took two and a half years, and in the West Coast Basin it took six years. All managed basins have been the subject of intensive geological, engineering, and economic study. State studies authorized by the Porter-Dolwig Act, and Recordation Act requirements that producers in four Southern California counties report their groundwater use, have helped shorten the time necessary to determine important basin physical characteristics. Gradually, with experience, data collection approaches and methods improved, but long-term study was required in all cases before a management plan could be formulated.

Uncertainty about basin boundaries has complicated and sometimes substantially prolonged management negotiations. One of the principals in the West Coast Basin adjudication negotiations pointed out that the whole litigation could have been upset on the boundary question alone. This uncertainty has given some hold-outs leverage to improve their bargaining position and has substantially delayed some settlements.

6. *The exercise of local leadership that stimulated development and implementation of a groundwater management plan.* In the West Coast, Central, and Main San Gabriel Basins, local producers organized themselves into water user associations that were the driving forces behind not only the design of management plans but also efforts to garner support for their acceptance and to create institutional arrangements and management tools to implement them. They pushed for creation of local water districts to import water and aided the process of arriving at negotiated settlements through the courts. They promoted state legislation to permit organization of the Central and West Basin Replenishment District and to require recordation of pumping. In the Chino and Tehachapi Basins, water producers, operating through advisory committees or local water districts, were instrumental in developing management plans.

Given the technical complexity and political difficulty of arriving at agreements between many overlying users with conflicting interests, local producer leadership groups played a key role in developing local management solutions.

7. *Changes in the legal framework used to determine water rights.* Landmark court decisions in the cases of *Pasadena v. Alhambra* in 1949 and *Los Angeles v. San Fernando* and *Niles Sand and Gravel Co. v. Alameda County Water District* in 1975 have dramatically influenced the development of local management plans in overdrafted basins. In the Pasadena case, the courts developed the doctrine of "mutual prescription" by which producers in an overdrafted basin were given a prorata share of the basin's safe yield determined by their water use five years before the filing of a court action. This doctrine became the basis for mechanical allocation of rights in succeeding court actions in the West Coast, Central, Tehachapi, and Main San Gabriel Basins, and others. It became the legal vehicle for requiring groundwater producers to use more expensive imported surface supplies. However, it also had the probably unintended effect of stimulating a race to the pump house by those outside the Raymond Basin who sought to protect and enlarge their groundwater rights by continued and expanded use.

The San Fernando case eliminated the mechanical application of mutual prescription by concluding that the rights of public entities could not be lost by prescription and that many more factors had to be considered to determine an equitable allocation of water rights. It also clarified the right to store and retrieve imported water from a groundwater basin. The Niles case clarified the right of recovery after spreading in a groundwater basin.

Subsequent adjudications were significantly affected by the San Fernando decision. In the Chino Basin, the San Fernando decision set a new framework for the negotiations between the parties. In the Coachella Valley, the Desert Water Agency and the Coachella Valley County Water Agency chose to achieve their objectives by mutual agreement and legislation when both their storage rights were clarified and the acquisition by new pumpers of prescriptive rights against them was precluded by the San Fernando decision. The faltering Mojave River negotiations that began in 1966 were finally terminated, in part because the proposed stipulated judgment would not conform to the ground rules established in the San Fernando case, which appeared to preclude imposition on objecting parties of pumping limits based on historical use.¹⁸

¹⁸ The Mojave adjudication was dismissed in 1976 after dissatisfied water users formed the Desert Well Owners Association and recalled two pro-adjudication Mojave Water Agency Directors.

The conclusion of the Chino Basin adjudication *after* the San Fernando case shows that the decision has not prevented subsequent negotiated settlements. In fact, the decision helped resolve a pre-San Fernando dispute between large and small farmers arising from rigid application of mutual prescription, and according to some participants stimulated a more equitable result. Also, since recent adjudications have been resolved through uncontested negotiated settlements, the effect of precluding imposition of mutual prescription may not have significant impact. One major effect, however, is that future transferability of overlying rights could well be impaired by the San Fernando court's determination that overlying users retain their overlying water rights.

8. *The existence of overlying agencies with separate functions and the need to integrate their activities as part of a groundwater management plan.* The large MWD overlies most of Southern California. Southern California groundwater management was influenced not only by the availability of Colorado River water from the MWD but also by the MWD's annexation policies and rate structure.

During the late 1930s, MWD policies were intended to promote annexation areas "so located as to control production of water from underground water basins."¹⁹ However, this policy was never successfully implemented. Water districts created to finance and deliver imported water did not overlie entire basins. They also had no means of controlling pumping. Moreover, overlying areas were in competition with each other and with pumpers, since areas that took imported supplies and reduced their pumping would only leave more groundwater for others. Thus, the creation of new institutions was necessary to integrate the use of imported and local supplies.

MWD's preferential rate for artificial replenishment has provided an economic incentive for use of groundwater basins as distribution, filtration, and storage systems. This incentive has been justified because it reduces the need for added MWD and local storage facilities to meet peak water demands and, more importantly, because it helps assure the availability of groundwater supplies during periods of drought and emergencies.²⁰

The existence of overlying agencies without jurisdiction over entire groundwater basins and with sometimes conflicting purposes and separate sources of financing have conditioned the management plan that was developed in each basin. For example, the management program for the West Coast and Central Basins required not only the creation of a new district to overlie the entire groundwater area benefiting from replenishment but also the coordination of existing public agencies such as the Los Angeles County Flood Control District, which spreads and injects water, the West Basin Municipal Water District and the Central Basin Municipal Water District, which supply water, and County Sanitation Districts, which reclaim waste water.

In the Main San Gabriel Basin, three districts overlie the basin; two are members of the MWD and one contracted directly with the state for State Project Water. The groundwater management plan accounted for these differences and uses these agencies to supply replenishment water and to collect assessments.

¹⁹ Vincent Ostrom, *Water and Politics*, Haynes Foundation, Los Angeles, California, 1953, p. 187.

²⁰ Los Angeles Metropolitan Water District, *MWD Water Pricing Study, Vol. II*, Report No. 912, November 1974, pp. 189-193. For 1976-77, the MWD rate for untreated Colorado River water was \$36 per acre-foot and \$62 for the same water used for domestic and municipal purposes.

9. *The absence of overall state policy affecting groundwater use that has left groundwater management in the hands of local users.* Despite the recommendation of some state officials, the legislature has been unwilling to establish overall state policies governing groundwater use. This has been justified because of the diverse nature of groundwater problems requiring different types of local solutions and the opposition of local groundwater producers to state intervention.²¹ In fact, most state groundwater legislation has been proposed by local water users seeking the establishment of management instruments that would aid them in the development and implementation of local plans. The absence of statutory policy has encouraged local users to resort to the courts to implement groundwater management plans.

²¹ See California State Legislature, *Hearings of the Assembly Interim Committee on Water*, Sacramento, California, 1961 and 1962, and *Groundwater Problems in California: A Report of the Assembly Interim Committee on Water*, Vol. 26, No. 4, Sacramento, California, December 1962. In 1969, legislation was enacted allowing the State Water Resources Control Board to initiate adjudication proceedings to restrict pumping when groundwater quality was threatened with irreparable injury, but this power has not yet been used. There have been recommendations made to expand the state's role to include (1) the establishment of basin boundaries; (2) the powers to initiate groundwater adjudications on petition of local users; (3) determination of annual safe yield; and (4) issuance of preliminary injunctions. See A.B. 3042 (1961).

III. SUMMARY OF FINDINGS

A diverse system of local groundwater management has evolved in Southern California since the State Supreme Court's landmark *Pasadena v. Alhambra* decision in 1949 approved the doctrine of mutual prescription. Local producers faced with severe water deficiencies gradually developed institutional arrangements and management plans to secure imported water, control groundwater pumping, and divide the costs and benefits of cheaper groundwater and more expensive imported supplies. Those downstream also sought to protect their sources of local surface supply from growing use upstream. Interbasin conflict and adjudications allocating stream flows were an integral part of the process of developing and implementing groundwater management plans within Southern California basins.

Most producers sought to gain recognition of their valuable water rights on the basis of past production. Groundwater management has been imposed primarily through court action in which water rights have been determined and producers have agreed on a negotiated physical solution. Through the device of a stipulated agreement between parties to a groundwater adjudication, a complex and sophisticated system of court-supervised basin management has evolved on a piecemeal basis in each basin.

The development and implementation of a management plan for each adjudicated area has been slow, arduous, and costly. Local producer associations (e.g., West Coast and Central Basin Water Users Associations) took leadership to define the problem, examine alternatives, and bring about a settlement tailored to fit the particular needs of each groundwater basin. First efforts were devoted to securing an imported supply. Then it was necessary to force groundwater users to use this more expensive supply, cut back pumping, and/or finance artificial replenishment. This involved not only complex studies of basin hydrology and the determination of past groundwater production, but also difficult negotiations between producers and among overlying water agencies to determine basin boundaries and an equitable settlement under which the beneficiaries of artificial replenishment would pay the costs. Early adjudications in the Raymond and West Coast Basins involved adversarial court proceedings and took ten to twenty years to resolve. Gradually, producers realized they had little to gain from such expensive, time-consuming litigation. Aided by previous experience, study, and know-how learned from other basins, they developed negotiated settlements.

Recent adjudications have developed complex management solutions in only three to five years, involving more parties and diverse producers than participated in earlier ones. The physical solutions implemented in the Main San Gabriel and Chino Basins created new policymaking and management institutions with flexible powers to control groundwater use and finance replenishment under court supervision. The 1975 *Los Angeles v. San Fernando* decision complicated subsequent adjudications, since it eliminated mechanical application of a formula to determine water rights based on past production.

The use of adjudication was *necessary* only in cases where it was essential to reduce groundwater production and force users to obtain supplemental imported water directly. Users in the large, transmissive, and replenishable Main San Gabri-

el and Chino Basins could well have developed a management plan without adjudication. However, users in these areas wanted to place a value on past production. They did so in the Main Basin by establishing water rights and applying a net pump tax. In the absence of overall state policy governing groundwater use, adjudication has been increasingly used as a means of developing a management plan by the process of negotiation between producers without the need to create new statutory political instrumentalities (i.e., districts, joint powers agencies).

In Orange County, producers resorted to the courts to settle interbasin issues but not to determine water rights within their basin. Instead they chose to create a groundwater management district and to institute a pump tax to purchase replenishment water. Although these producers were thus able to avoid litigation costs, they also lost the benefits of water rights transferability, which cannot be realized unless individual rights are determined.

Overall, groundwater management in major Southern California groundwater basins has been locally instituted over a long slow process primarily through court action that has stopped the clock on the acquisition of additional water rights. Those with adjudicated rights have something of value that is transferable. Area users where management has been instituted receive the benefits of safe emergency water supply requiring little or no treatment to meet their peak demands, transmitted to the point of use without pipelines or added surface reservoirs.

ADJUDICATION—SOME ISSUES

While water users have developed flexible management instruments by means of stipulated agreements in adjudication proceedings, there are several issues that should be addressed by policymakers considering more widespread use of this approach. First, recent settlements substantially expanding Watermaster powers are not specifically authorized by statute and have not been tested in higher courts. This may raise some question about their legitimacy and certainty.¹ In addition, there are other related issues that concern the status of new Watermaster committees as public agencies, public participation in their decisionmaking, and potential administrative difficulties with these court-supervised management arrangements.

Status as Public Agency

Since the nine-member Watermaster committee set up by the Main San Gabriel adjudication has no statutory authorization, there is question about its status as a public agency. For example, must its meetings be held in public under the state's open meeting law? Do its members have to adhere to disclosure requirements of the Political Reform Act? Can it receive and expend public funds? These questions do not apply in the same way to Watermasters in the Chino or Tehachapi Basins that are public agencies, but even in those cases the public agency role of these districts has been expanded by the court and there may be some question about whether their groundwater management activities are governed by the same rules as their statutory duties.

¹ The certainty of a stipulated agreement might also be threatened by a pumper who has not agreed to the judgment but later chooses to take legal action to establish water rights. This conceivably could result in readjudication.

Public Participation in Decisionmaking

The adjudicated settlements in the Main San Gabriel and Chino Basins both provide for the election, by producers, of producer committees with substantial policymaking authority including the power to levy assessments that are passed on to the public. The right to vote in these elections is based on water rights owned, and therefore the public has little opportunity to participate in the groundwater management decisionmaking of these committees.² This can be contrasted with public participation in the election of board members of the Central and West Basin Replenishment District or the Orange County Water District, and public access to board members of public agencies governed by state law.

Potential Administrative Problems

Since management under stipulated judgment requires the concurrence of all the parties, it is possible for those with minority interests to prevent or delay administrative actions that would benefit the majority. This could well inhibit flexible management.

Advantages

Even though stipulated judgments have the character of private agreements, they are the product of negotiations between those with property rights to groundwater, and all parties are bound by their terms. They have resulted in the successful development and implementation of detailed management plans, subject to court review and using assessments paid by water users rather than general property taxes to finance their programs.

POLICY IMPLICATIONS³

What can be learned from the Southern California experience that has statewide policy implications that should be considered by the legislature?

Since there already is a locally developed management program in place in major Southern California basins, there is no need for the state to impose yet another management scheme. However, this does not mean that all Southern California groundwater agencies are operating at optimal efficiency or that they should be exempted from any state policies and standards aimed at improving groundwater management that may be developed to promote statewide interests. It does mean that local management in place should be retained, subject to appropriate state review.

The Southern California experience has a number of implications for groundwater management in other areas of California. Local groundwater management evolved in overdrafted Southern California basins *only after more expensive imported water became available*. Producers were not required to cut back on overall

² It should be noted that three of the Watermaster committee members are nominated by overlying municipal water districts.

³ Section IV of the companion report R-2387/1-CSA/RF contains groundwater policy conclusions and recommendations.

water use. The primary issues they faced were how to divide the costs of imported water and how to control pumping. Perhaps a more economically efficient approach would have been to institute groundwater management *before* importing water on a large scale. Making more efficient use of existing supplies might have reduced the demand for and cost of imported water and might also have limited the need to force local areas to pay higher prices for it.

Considering the experience of Southern California, it does not seem likely that users in overdrafted areas in the San Joaquin Valley will by themselves choose to implement basinwide controls over groundwater unless they have access to added supplemental imported water.⁴ Also, access to imported water does not ensure that basinwide management will be adopted. For example, portions of Kern County received State Project Water, but pumpers with access to cheaper groundwater chose not to limit their extractions and the new water was used to irrigate new lands.

There has been a start at management in the urban Bakersfield areas where the Kern County Water Agency's Improvement District No. 4 imposes a pump tax to help pay part of groundwater replenishment costs. Unfortunately, regulation occurs only in a part of the very large San Joaquin Valley Basin and adjacent pumpers who benefit get a "free ride."

Other valley areas served by the federal Central Valley Project and the State Water Project accomplish groundwater recharge by taking surface deliveries in lieu of pumping, spreading surface water, or over-irrigating in wet years. The Arvin-Edison Water Storage District operates its own wells in conjunction with surface supplies to serve a fully developed agricultural economy. Water levels in some previously overdrafted areas have been recovering as a result of added surface supplies. However, where surface water is available, only partial management exists, through a patchwork quilt of overlying agencies with varying contracts and programs. Those who have received relatively inexpensive Central Valley Project water have seen no need to control pumping. They take this water when it is available and pump when it is not. Where surface supply is inadequate outside the boundaries of water agencies, overdraft occurs. In many areas overlying the San Joaquin Valley Basin, it appears that no agency has control over a large enough share of valley basin water supply to most efficiently and equitably promote its long-term use. In general, pumping is not monitored or controlled as it is in Southern California, and because of varying recharge programs and pumping rates, some areas pay for recharge that benefits others. There is no coordinated planning or management to serve basinwide needs.

In general, it appears that most valley water users prefer either localized recharge projects or groundwater mining to adjudication or basinwide regulation imposed by the state. Some still anticipate that future federal and/or state rescue projects will bail them out with inexpensive subsidized surface water, despite rising opposition to such projects on economic grounds.⁵ Others suggest that their problems would be solved by construction of additional facilities to meet State Water

⁴The San Joaquin Valley is the largest groundwater basin in California, covering 13,500 square miles and containing more than 80 million acre-feet of usable storage space. Annual overdraft in the valley has been estimated by the DWR to be 1.5 million acre-feet.

⁵ Current policies of the Carter administration suggest that future water projects will have rough sledding. The future of recent 1978 state legislation (S.B. 346) also indicates that water projects will encounter opposition at the state level as well.

Project contractual commitments. If surface water cannot be brought in, then many favor pumping until this is constrained economically by increased pumping costs. There has been opposition to adjudication, in part because differences would be too difficult and costly to resolve and because the complex hydrology of the large interconnected underground subbasin would present too many technical problems.⁶ Also there has been fear that adjudication would result in unacceptable production cutbacks. The pressure to manage is probably less than it was in coastal Southern California, because valley pumpers located inland have not been plagued by salt water intrusion. Also, many believe that management is unnecessary because of the vast amount of groundwater in storage.

At the same time, state officials are appropriately concerned that long-term overdraft in the San Joaquin Valley will result in either greater demand for additional water projects, with costs that local users are unwilling to bear, or in damage to long-term basin storage and transmissive capacity. This suggests the desirability of developing a water plan for the valley that is aimed at establishing long-term state policy governing both future water project financing and groundwater management. *Such a policy should require that any future water projects be economically justified, with those benefiting paying their fair share of the costs, and that basinwide management be instituted before added imported surface supplies are made available.* A local groundwater management plan could serve as a basis for evaluating the costs and benefits of various long-term options, including groundwater mining. Even though the valley basin is large and complex, it may be possible to divide the area into manageable units. This was done over many years in Southern California and might be accomplished in the future more expeditiously.

It is important to note that local users can benefit from management, even if supplemental water is unavailable.⁷ Appropriate local management should help ensure higher pumping levels and lower pumping costs than would occur without it and should help forestall premature projects to import water by encouraging efficient use of existing supplies. Even though management imposed after court proceedings could well cut back production for some, it could also provide substantial economic value to those with water rights. Imposition of pump taxes could yield revenues for later purchase of supplemental water or for redistribution to users or the community in ways not related to water use.

It is probably unlikely that locally initiated groundwater management will evolve in the near future in the Sacramento hydrological study area basin. Groundwater levels there are for the most part high, and basin users have abundant inexpensive surface water.⁸ Although the basins in this area offer major potential for conjunctive management with the State Water Project to meet statewide needs, there is little local incentive to manage groundwater. Local users do not perceive a water problem; many fear that through state controls local supplies needed in the future may be diverted to other areas of the state and they see no benefit to be gained from conjunctive use. On the other hand, one of the potential benefits

⁶ Panel presentation by Denslow S. Green at the *Proceedings of the Seventh Biennial Conference on Ground Water*, University of California at Los Angeles, September 10-11, 1969, p. 21.

⁷ See Wetzell, *op. cit.*

⁸ DWR Bulletin No. 118, *op. cit.*, p. 59. The Sacramento Valley Basin alone covers 5000 square miles and contains 22 million acre-feet of usable storage capacity.

of management in some Northern California areas is that local users could lease or sell available groundwater or basin storage space to others willing to pay for it. Through management they could distribute the profits from such a sale equitably among existing users, while offsetting any negative third party effects.

Given the likely desirability of groundwater management in most areas of the state, and the likelihood that local interests in many areas of the state lack incentives to institute management programs on their own, there is a need for state action to facilitate local management in most major groundwater basins.⁹ The techniques of basin management are available but the stimulus and structure to effectuate them are not.

Analysis of Southern California experience suggests that the major objective toward which statewide legislation should be directed is to speed and simplify the formulation of a local management plan for an entire groundwater basin including relevant local surface supplies. This plan should be tailored to fit local special characteristics and should include the powers and instruments of governance necessary to implement it. Key elements of state legislation should be designed to facilitate:

1. The determination by the state of local groundwater basin boundaries and the division of complex hydrological areas containing interdependent local groundwater and surface supplies into manageable units of governance;
2. The development and analysis of management options for basin and relevant watershed management and local determination of a management plan;
3. Plan implementation by making available the necessary legal powers to a duly constituted local authority;
4. The determination of transferable water rights.

Past history has shown that serious study of basin hydrology and past water production is necessary for definition of basin boundaries and implementation of a local management plan. It has also shown that developing local management plans is not a simple engineering problem and is as much a product of negotiations as it is of scientific study. Such a plan would be based upon a review of alternative long-term objectives for a defined basin area and the costs and benefits of achieving them. The Southern California experience also strongly suggests the need for the development of local producer organizations similar to the water users associations developed in the West Coast, Central, and Main San Gabriel Basins of Los Angeles to exercise leadership and utilize existing technical capability in the search for and implementation of a local management plan.

The implementation of a local plan requires that the powers to implement it be readily available. This could be accomplished by passing general enabling legislation that would permit local groundwater managers anywhere in California to do all of the things that can now be done in Southern California. This would permit local agencies to designate an existing agency or to establish a new one to manage their area. Such an agency should be empowered to collect production data, monitor water use, control extractions, raise revenue by pump tax, initiate an adjudica-

⁹ Management should be instituted where the overall anticipated benefits to the community and the state exceed the costs of implementation.

tion, establish water levels based upon flexible operating criteria, and store and retrieve imported water.

To further stimulate local management the state should have the power to undertake the development of a plan if local entities fail to act within a reasonable time. State action could be justified to promote constitutionally mandated beneficial water use. The pattern of state supervision of local actions is well established in the field of stationary source air quality regulation. This field was initially dominated by scattered local agencies until 1967 legislation established state policy.¹⁰

Since some legal uncertainty has been created by the recent San Fernando decision, a body of statutory law should be enacted that would make legal rules governing water rights determination more certain. This should be designed to encourage negotiated settlement of water rights issues in non-overdrafted as well as overdrafted areas and to permit transferability of water rights.

¹⁰ See Division 26, Part 4 of the California Air Resources Board, *California Health and Safety Code*, in *California Air Pollution Control Laws*, 1978 ed., Sacramento, California. Air pollution control districts have been activated in all counties. Basinwide councils are charged with preparation and maintenance of a basinwide air quality plan. The Air Resources Board can assume the powers of a district if it finds that the local program is insufficient to achieve appropriate air quality standards. After assumption of district powers the board may adopt its own program. Subventions are provided to local programs. Districts that encompass an entire air basin or are party to a basinwide management agreement assuring uniform enforcement receive a larger state matching share than other districts. We have not evaluated air quality regulation in California and do not mean to imply that existing regulation in that field is ideal. However, it does represent an existing institutional arrangement potentially applicable to groundwater regulation.

Appendix A

RAYMOND BASIN GROUNDWATER MANAGEMENT

BACKGROUND

The courts established a new legal doctrine in the Raymond Basin that has been the model for subsequent determination of groundwater rights and control of extractions in neighboring areas of Southern California. The evolution of groundwater management in the Raymond Basin is described below.

The small 40 square mile triangular Raymond Basin in Los Angeles County is bounded on the north and west by the San Gabriel Mountains and on the south by the Raymond Fault, which effectively separates it from the San Gabriel Valley Basin.¹ It is urbanized and serves the cities of Alhambra, Arcadia, La Canada-Flintridge, Monrovia, Pasadena, San Marino, and Sierra Madre.

The urban growth of the overlying area was fed by pumping groundwater. By 1920 the falling water table and resulting increased pump lifts were recognized and it was feared that unless pumping was curtailed, irreparable damage might befall the entire basin with severe effects in Pasadena. Local supplies were being used faster than they could be naturally replenished and there was no effective means of requiring producers to use more expensive imported supplies to meet their expanding requirements.

INITIATING LEGAL ACTION

Recognizing that legal action would result in pumping curtailment, Pasadena first sought a supplemental water supply by becoming a charter member of the MWD, which was organized in 1928. After initial efforts to reach an out-of-court settlement among principal pumpers failed, Pasadena in 1937 initiated a suit against the downhill city of Alhambra to determine water rights in the area and to curtail pumping. The court ruled that all major pumpers be joined in the suit making it a general adjudication of all rights in the basin rather than a suit to establish Pasadena water rights.² This became an adversary proceeding. The major issues in the case were the manner in which water rights were to be determined and allocated among the parties pumping from a common source of overdrafted supply. Those with water rights would be allowed to pump and those without them would have to rely on more expensive imported supplies. Moreover, since replenishment of the basin with imported water was not feasible, it appeared that the only alternative available to preserve the area's groundwater supply was to cut back pumping so that safe yield would not be exceeded.

After petition by 20 of the original 31 parties to the suit, the court in 1939

¹ The basin receives subsurface inflow from watersheds adjoining its northern and western sides. There is subsurface outflow through the Raymond Fault.

² Kenneth K. Wright, "Underground Water Problems in California," *Journal of the American Water Works Association*, August 1952, p. 663.

referred the matter to the Division of Water Rights, then in the Department of Public Works, for investigation and appointed it referee to determine physical facts, safe yield, and overdraft. On the court's recommendation, 13 parties retained consultant engineers to work with the Division. The Division's complex study was completed in two and a half years but the results were not formally filed to give the parties an opportunity to work out a settlement. In 1941 the Division submitted the results of its investigation of basin geology, hydrology, and past production, which found continuous overdraft of the basin during the period 1927-28 to 1937-38.³ In the meantime a committee of attorneys was set up in an attempt to arrive at a negotiated settlement.

The development of a negotiated settlement to reduce pumping rested on the availability of supplemental imported water from the Colorado River and the development of a physical solution to meet the water requirements of key parties to the suit. Although MWD water was available to Pasadena in 1941, it was not put to continuous use until 1945, after a settlement was reached. Before the final judgment in 1944, 25 parties entered into a water exchange agreement approved by the court, allowing them to meet excess demands over their decreed right by purchasing pumping rights of other parties. Under the exchange agreement administered by the Watermaster, parties having water exceeding their decreed right had to make it available to other parties at cost. At the time of the adjudication, Pasadena had Colorado River water available to it by means of the MWD, while others, particularly in the Monk Hill area, had no supplemental supply. The agreement was designed in part to help the Monk Hill area meet its requirements. The City of Pasadena agreed to reduce pumping in the Monk Hill area. Pasadena also transferred water released by other parties to the Monk Hill area.⁴

THE JUDGMENT

Almost all the parties by stipulation agreed to comply with the proposed judgment. The stipulation reduced extractions in the basin by 27 percent from the more than 30,000 acre-feet pumped during 1941-42 and 1942-43 to 21,840 acre-feet. Also, diversions from surface sources contributing to the basin were limited to the maximum for five years prior to 1937. The stipulation also provided for the Division to serve as Watermaster and the Raymond Basin Watermaster Service area was created. The court's judgment entered on December 23, 1944, was binding on all parties save the California-Michigan Land and Water Company, which was included the subsequent year. The company appealed the judgment to the State Supreme Court, which affirmed it with minor modifications.⁵ The U.S. Supreme Court declined to review the case in 1950 and the litigation was terminated after 13 years.

Those who initiated the case probably presumed that the courts would apply

³ Department of Water Resources, *Report on Watermaster Service in the Raymond Basin Watermaster Service Area*, July 1, 1957-July 1, 1958, Sacramento, California, August 1958, p. 4; and C. W. Sopp, "Adjudication of Water Rights in the Raymond Basin," *Journal of the American Water Works Association*, April 1943, pp. 429-438.

⁴ As other areas gained access to Colorado River water, the use of the exchange pool declined. In 1948-49, 5265 acre-feet were exchanged. In 1976-77 the amount exchanged declined to 50 acre-feet.

⁵ *Pasadena v. Alhambra*, 33 Cal. 2nd, 908, 207 P. 2d (1949).

the previous rule of "first in time, first in right."⁶ However, strict application of the old rule would have totally eliminated the rights of certain producers. Instead, the court applied the doctrine of adverse possession saying that open, hostile, and adverse use ripens into an acceptable judicially protected "prescriptive right" after five years of continuous and uninterrupted use. It then developed the "mutuality of prescription" theory to cut back all major pumpers proportionately. Since there was not enough groundwater for all and each pumper's production reduced the amount available to all others, then they all should be cut back on a prorata basis. Rather than eliminate the rights of some pumpers, the court approved a proportionate reduction for all with prescriptive rights so that total allowable extractions would equal the safe yield of the basin.

The judgment enjoined all new pumpers and established transferable decreed rights of all parties. Those with no supplemental supply organized Municipal Water Districts to meet their water needs.⁷

The decision also established the authority of the court to approve and enforce a physical solution and to retain jurisdiction to enforce its decree and make modifications to it. The Division of Water Resources was appointed Watermaster by stipulation of the parties and order of the court. The role of the Watermaster is to monitor water use in the basin and to report all important water-related events to the court and the parties. The Watermaster receives groundwater pumping reports and assures accurate measurement of groundwater extractions. The judgment provides for assistance to the Watermaster by an advisory board representing water producers. The five-member board approves the Watermaster budget and serves as a link to the producers. The new legal theory developed by the court in *Pasadena v. Alhambra* was criticized in a lone dissent by Judge J. Carter who called it "bureaucratic communism." He said the decision was based on a division of the existing supply among the parties without regard to their prior vested rights and opposed placing prior vested rights on a par with rights acquired later.⁸

AFTEREFFECTS

However, another effect of the Raymond Basin case was to encourage what some have called a race to the pump house to protect or extend groundwater rights by beneficial use. One could lose or diminish a water right if it was not exercised. Because of this decision, water users were generally advised by their attorneys to keep pumping despite the cost, since reduced pumping might damage their groundwater rights. This encouraged pumpers to keep pumping rather than take supplemental water from the MWD. This may have been one reason why only 246,000 acre-feet of Colorado River water was delivered by the MWD in the 1953-54 fiscal year when the quota of available water was 1,212,000 acre-feet.⁹

⁶ *San Bernardino v. Riverside*, 186 Cal. 27, 198 P. 793 (1921).

⁷ The Foothill Municipal Water District includes almost all of the Monk Hill area. It joined the MWD in 1953. The City of Arcadia is a member of the Upper San Gabriel Valley Municipal Water District and has paid pump taxes to help purchase replenishment water. Sierra Madre is a member of the San Gabriel Valley Municipal Water District, which contracts directly with the state. However, Sierra Madre has no State Project Water.

⁸ *Pasadena v. Alhambra*, 33 Cal. 2nd, 940, 207 P. 2d (1949).

⁹ James H. Krieger, "Progress in Ground Water Replenishment in Southern California," *Journal of the American Water Works Association*, September 1955, p. 910.

ADMINISTRATION OF THE JUDGMENT

Several actions taken to adjust provisions of the judgment indicate that it has served as a flexible instrument for basin management.

In 1950 the court approved an agreement between Arcadia and Sierra Madre permitting Sierra Madre to use the Eastern Unit as a storage area. It spreads local street runoff and water diverted from Santa Anita Creek and Sierra Madre Wash and receives credit for that water, which may only be used after its exchange and its decreed water right. This water is credited to the account of Sierra Madre. During 1976-77, the city had 2566 acre-feet in its salvage water account.

Also in 1950 the City of Pasadena petitioned the court for a review of the safe yield determination. After an investigation by the State Engineer who was appointed referee by the court, the safe yield of the basin was increased by 30 percent to 30,622 acre-feet. This was primarily due to recovery of the basin from increased return flows to it of imported water.

To avoid excessive lowering of the water table in the central and westerly sections of the Western Unit resulting from lowered Eastern Unit levels, the judgment limited pumping in that area when the water table was low. During a dry spell in 1957 the advisory board determined that enforcement of this limitation, resulting in a 40 percent reduction in extractions, would cause severe hardship to the City of Sierra Madre, since it had no supplemental water. To alleviate this hardship Sierra Madre agreed to take water from Arcadia which was able to increase its pumping from sources outside the basin.

The Raymond Basin Advisory Board initiated a cooperative study program in 1967-68 under which a mathematical model was designed to simulate the operational effects of various management plans. As a result of these studies and of negotiations between the Watermaster and the parties, modifications in the judgment were made permitting (1) spreading and capturing surface water diversions under which diversions are metered and parties are allowed to extract 80 percent of the amount spread; (2) the carryover of decreed rights, limited to 10 percent; (3) establishment of a program for voluntary control of pumping patterns in selected areas; and (4) establishment of a water quality monitoring program. With increased supply available during the recent wet year (1978), the judgment was amended to permit those taking MWD in-lieu replenishment water from January-June 1978 to pump the in-lieu amount during the following year.

Water Use

Table 2 shows 1976-77 water use within the basin and Table 3 shows water spread for recharge.¹⁰ Most of the area's water requirements since the adjudication have been met by Colorado River imports. Because of limited spreading space and capacity to accept water, there is little artificial recharge of the basin. Only 3000 acre-feet are spread for recharge by the Los Angeles County Flood Control District and other local entities that raise revenues by property tax.

Adjudication Costs

Little data are available on the total costs of the adjudication. Wright estimated

¹⁰ One method of artificial replenishment of a groundwater basin is water spreading. Water is flooded on areas where it can percolate into the groundwater aquifers and supplement the natural supply.

Table 2

GROSS WATER SUPPLY
(In acre-feet)

Party	Total Groundwater Extractions		Total Surface Water Diversions		Total Water		Net Water Use Within the Basin
	Inside Basin	Outside Basins ^a	Tributary to Raymond Basin ^b	Montributary to Raymond Basin ^a	Imported ^c	Exported	
City of Alhambra	803.57	(6,717.80)					803.57
City of Arcadia	4,492.12	(8,436.84)				-354.37	4,137.75
California-American Water Company	2,532.15	(3,871.33)				-416.33	2,115.82
East Pasadena Water Company	281.59	(1,421.55)			89.75 ^d		371.34
Henry E. Huntington Library and Art Gallery	279.36						279.36
Kinneloa Irrigation District	277.48		169.71				447.19
La Canada Irrigation District	140.48			(75.79)	1,868.12	-197.85	1,810.75
Las Flores Water Company	265.41		43.19		444.70		753.30
Lincoln Avenue Water Company	727.18				1,190.83		1,918.01
City of Monrovia	850.19	(5,868.55)					850.19
Pasadena Cemetery Association	56.24						56.24
City of Pasadena	15,870.62		1,422.42		16,041.40	-3,972.22	29,362.22
Royal Laundry and Dry Cleaning Company	127.42						127.42
Rubio Canyon Land and Water Association	1,117.87		75.73		735.43		1,929.03
San Gabriel County Water District	1,090.98	(4,921.12)					1,090.98
City of Sierra Madre	1,888.62 ^e		445.67 ^f				2,334.29
Sunny Slope Water Company	1,329.62	(2,681.21)				-1,213.90	115.72
Valley Water Company	729.75				1,912.18		2,641.93
Totals	32,860.65		2,156.72		22,282.41	-6,154.67	51,145.11

SOURCE: Department of Water Resources, Southern District, *Watermaster Service in the Raymond Basin*, July 1, 1976-June 30, 1977, p. 27.

^aUsed by parties in areas outside the Raymond Basin.

^bDoes not include surface diversions for spreading as follows: Kinneloa Irrigation District: 1.70 acre-feet; Las Flores Water Company: 26.03 acre-feet; Lincoln Avenue Water Company: 356.02 acre-feet; City of Pasadena (Eaton Canyon): 618.34 acre-feet; (Arroyo Seco): 37.61 acre-feet; Rubio Canyon Land and Water Association: 91.42 acre-feet.

^cBlend of Colorado River water and State Project Water.

^dImported groundwater.

^eIncludes 125 acre-feet of salvage water that was extracted.

^fDoes not include 1107 acre-feet diverted for spreading to recharge groundwater.

Table 3

WATER SPREAD FOR GROUNDWATER RECHARGE

Participant	Spreading Ground	Source	Acre-feet
LACFCD	Arroyo Seco	Arroyo Seco	431.90 ^a
	Eaton Wash	Eaton Canyon	372.60 ^b
	Santa Anita	Santa Anita Canyon	10.30
Kinneloa Irrigation District ^c	Eaton Wash ^b	Kinneloa Canyon	1.70
Las Flores Water Company ^c	Rubio Canyon Debris Basin ^d	Las Flores Canyon	26.03
Lincoln Avenue Water Company ^c	Arroyo Seco ^d	Millard and El Prieto Canyons	355.31
City of Pasadena ^c	Arroyo Seco ^d	Arroyo Seco	33.65
	Eaton Wash ^d	Eaton Canyon	618.34
Rubio Canyon Land and Water Assoc. ^c	Rubio Canyon Debris Basin ^d	Rubio Canyon	91.42
City of Sierra Madre	Sierra Madre	Santa Anita Canyon, Little Santa Anita Canyon, and street runoff	1,106.60
Total			3,047.85

SOURCE: Department of Water Resources, Southern District, *Watermaster Service in the Raymond Basin*, July 1, 1976-June 30, 1977, p. 27.

^aDoes not include 10 acre-feet percolation at Devil's Gate Dam.

^bDoes not include 356 acre-feet estimated percolation at Eaton Wash Reservoir.

^cPersuant to program for spreading credit.

^dMajor part of percolation occurs in the streambed.

legal costs to the plaintiff at \$100,000.¹¹ Reference costs apportioned to the parties were estimated to be \$50,000 by Sopp.¹² These include engineering and legal costs. There are no data on their in-house costs to the plaintiff or the defendants. If we assume that total costs to all parties were equal to those borne by the plaintiff, then \$300,000 would have been spent to adjudicate about 29,000 acre-feet of water rights or about \$10.30 per acre-foot of annual safe yield.

The cost of Watermaster service is shared equally by the state and the parties. The estimated cost for 1976-77 was \$48,000.

CONCLUDING COMMENT

Groundwater producers in these urban areas of Los Angeles resorted to the courts to determine water rights and to curtail pumping after continuous overdraft threatened their long-term supply. Pumping curtailment was necessary since the hydrology of the basin limits recharge because of limited spreading space and poor transmissivity. The courts in the first adjudication of groundwater rights determined that all major groundwater pumpers join the suit and invented a formula for allocating water rights based on the doctrine of adverse possession. This gave all pumpers a share of the available supply based on past use and required that their future use be cut back proportionately. Pasadena initiated the suit only after joining the MWD, thereby assuring that its long-term water requirements would be met. The adjudication forced groundwater producers to make use of more expensive available MWD supplies and to share their costs. An exchange agreement permitted those with access to imported supplies to sell their pumping rights to others, thus obviating the need for added surface distribution facilities. The adjudication process was time-consuming, requiring detailed engineering study and difficult negotiations with attendant analytical and legal costs. The adjudication has been flexible as evidenced by changes agreed to by producers and accepted by the court adjusting the safe yield and permitting other management changes.

While the mutual prescription formula provided a convenient legal means for distributing water rights, it may have had the unfortunate side effect of promoting inefficient use of water in other areas in California by encouraging increased pumping to perfect legal rights to water use.

¹¹ Wright, *op. cit.*, p. 667.

¹² Sopp, *op. cit.*, p. 434.

Appendix B

CENTRAL AND WEST COAST BASIN GROUNDWATER MANAGEMENT¹

INTRODUCTION

This and the following subsections illustrate how water users in three interconnected groundwater basins in the San Gabriel River Watershed dealt with the problems of depleted groundwater, salt water intrusion, and use of imported supplies.

The Central and West Coast Basins both underlie the southern part of the Los Angeles Coastal Plain. The West Coast Basin is relatively small (160 square miles) and abuts the Pacific Ocean on the south and west. It is bounded on the north and east by the larger Central Basin (227 square miles). These basins and the Main San Gabriel Basin to the north are part of the San Gabriel River Watershed.

The San Gabriel River serves the Central and West Coast Basins after first replenishing the Main San Gabriel Basin near the foothills of the San Gabriel Mountains. These three basins are interconnected. The foothills receive the first benefit of rainfall in the San Gabriel Mountains, which then flows through Whittier Narrows to the Central Basin. Water also moves through the Inglewood Fault to the West Coast Basin.

Groundwater management programs and institutions in the West Coast and Central Basins were developed over a 20 year period beginning in the 1940s. Their evolution included the following key phases:

- Formation of water users associations in each basin as vehicles for the development of a plan to meet the problem of supply deficiency.
- Interbasin adjudication to determine adequate flows from upstream to downstream users.
- Adjudication of water rights and curtailment of extractions based upon the formula developed in the Raymond Basin.
- Organizing to secure imported water.
- The design and implementation of methods to limit salt water intrusion.
- The design of a new form of district to finance basin replenishment with imported water.

The major issue faced by water users in the West Coast and Central Basins during the post WW II period was how to meet increasing water demand with diminishing local surface and groundwater supplies. With the availability of more expensive Colorado River water from the MWD, the area struggled with the problem of how to manage its total water resources (i.e., local and imported), efficiently and equitably. To those who had studied the problem, efficient use meant making maximum

¹ This summary draws on various sources, including interviews with the following persons who were heavily involved in the development of groundwater management programs in the Central and West Coast Basins: Carl Fossette, Max Bookman, Martin Whelan, and Ralph Helm.

use of the storage and transmissive capacity of groundwater basins to avoid construction of additional surface storage and pipeline distribution systems. More specifically, it meant using imported supplies on a uniform flow basis and groundwater storage for peaking to meet fluctuations in demand.²

THE WEST COAST BASIN—EARLY DEVELOPMENTS

As water use increased, the people in the West Coast Basin coastal areas of Redondo Beach and Manhattan Beach (located at the end of the stream system farthest from the source of supply) were first to feel the problems resulting from the continued groundwater overdraft.

In the 1920s, water levels throughout the basin dropped below sea level. Wells along Santa Monica Bay were abandoned because of salty water and by 1932 the entire coastal reach of the basin had already been invaded. Also, excessive pumping in the adjoining Central Basin reduced the underflow from east to west thereby contributing to the water deficiency in the West Coast Basin. Industrial users, particularly refineries, using about a third of the water extracted in the basin and dependent on good quality water, became increasingly concerned about finding a solution.

A 1945 study by the West Coast Basin Water Conservation Group documented the overdraft and called for the formation of a West Coast Basin Water Association to develop plans to meet the impending water shortage. In the same year, a suit was filed by the California Water Service Company, the City of Torrance, and the Palos Verdes Water Company against 151 defendants to determine the water rights of all producers.³ The relative rights of the parties were fixed as of the filing date. A West Coast Basin Water Association representing the area's water producers was then formed to mobilize support for measures to reduce the overdraft and to seek a supplemental water supply.⁴ The association played a key role in supporting the adjudication and in securing additional water for the area. The adjudication of West Coast Basin water rights was long and arduous, culminating in a court decision in 1961, 16 years after the suit was initiated.

During this long period, efforts were launched to obtain imported water. After a study by water association consultant Harold Conkling, which called for use of Colorado River water as the most practical solution to the area's water deficiency problem, an unsuccessful attempt was made to organize a municipal water district and to join the MWD. This moved failed primarily because the inland cities of Hawthorne and Dominguez and unincorporated areas not hit by salt water intrusion were opposed to paying taxes to the MWD to secure imported water to meet a problem they did not think they had. They preferred to continue pumping rather than to import more expensive supplies. The second attempt to organize the district succeeded after district boundaries were redrawn to exclude opposing inland areas.

² Max Bookman, Robert Edmonston, and William Gianelli, *Report on Ground Water Replenishment and Basin Management in the Central and West Basin Replenishment District*, Glendale, California, November 1960, pp. 1-5, 24.

³ *California Water Service Co., et al. v. City of Compton*, Superior Court, Los Angeles County, No. 506806, begun in 1945. Later, in 1949, 340 additional parties were named.

⁴ The association had 19 members making up 42 percent of total West Coast Basin groundwater production.

The West Basin Municipal Water District was formed in 1947 and in 1949 was annexed to the MWD. The annexation was not without its complications. MWD policy required that the territories of new members include an entire groundwater basin and the redrawn district did not meet this criterion. MWD policies were changed through the association's efforts, and in 1949 supplemental water was first used.⁵ After the problems stemming from groundwater depletion moved inland, the cities of Gardena, Inglewood, Hawthorne, and Dominguez joined the West Coast Basin with the help of the association, which circulated petitions supporting annexation to the MWD.

When the adjudication action was filed, the Division of Water Resources was appointed as referee with the agreement of the parties to determine the complex physical facts including boundaries of the basin, its hydrologic characteristics, and past use of defendants. The Division's study, in cooperation with producer engineers, took six years. During the period of study, 340 parties were added to the suit. The Division's 1952 report recommended reduction in extractions and a physical solution allowing the parties to meet their needs by purchasing imported water.⁶ The hydrology of the area does not permit replenishment by spreading. While the possibilities for a settlement were being explored by the parties, the basin was still being depleted. To avoid further depletion, the major parties voluntarily agreed in 1955 to a temporary injunction reducing their pumping by 26 percent to below 60,000 acre-feet and to an exchange agreement to reduce pumping by those having MWD connections. Despite this voluntary cutback, salt water intruded to the point where it was estimated to underlie 8100 acres or 8 percent of the West Coast Basin area. Finally, on August 18, 1961, the court approved a stipulation agreed to by the parties. Under the settlement, applying the theory of mutual prescription as developed in the Raymond Basin case,⁷ production was reduced to 64,042 acre-feet and pumping was reduced to each party's "adjudicated right to 64,042 acre-feet."

THE CENTRAL BASIN—EARLY DEVELOPMENTS

Benefiting from the experience in the West Coast Basin, the much larger Central Basin in 1950 organized its own water association to develop plans for dealing with groundwater overdraft.⁸ By the early 1950s the water shortage had moved upstream. DWR studies revealed that groundwater supplies were being depleted and helped gain support for the formation of a water district to buy Colorado River water.⁹ Population was growing rapidly.¹⁰ Pumping levels were as low as 120 feet

⁵ There was some fear that the City of Los Angeles might block the change of MWD policy because of their alleged desire to annex South Bay coastal areas, but no such action was taken.

⁶ The Division and the USGS also conducted engineering investigations on the geology and hydrology of the coastal area and on the problem of salt water intrusion. These were used by the courts and the parties to help define the nature of problems and the alternatives faced by water users in the West Coast and Central Basins.

⁷ On October 31, 1956, a second suit was filed bringing 76 additional pumpers under the court's jurisdiction by 1960.

⁸ The association initially had 60 members who pumped 70 percent of total groundwater production. Most pumpers in the area were either water companies, cities, or industrial users.

⁹ The Central Basin investigation (Bulletin No. 8) by the State Water Resources Control Board found that sewage export from the San Gabriel Valley substantially increased the previously estimated overdraft.

¹⁰ 90,000 homes were constructed in the City of Lakewood within a two year period.

below sea level in North Long Beach. Sea water intrusion hit the Los Alamitos Bay area. Moreover, there was discussion by certain West Coast Basin interests of legal action to halt the diminished underground flow across the Inglewood-Newport Fault from the Central to the West Coast Basin.

The Central Basin Municipal Water District was formed in 1952 and soon annexed to the MWD bringing a source of imported supply to the area. To assure its rights to downstream flows from the San Gabriel River, the district in 1959 joined with Long Beach and Compton to file suit aimed at enjoining Main San Gabriel Basin users from taking more than their share of river water (i.e., the Long Beach action).¹¹ It would be difficult to control water use within the basin unless flows to it were regulated.

CREATING A FRESH WATER BARRIER AND GROUNDWATER REPLENISHMENT

The final settlement in the West Coast Basin was reached in 1961 only after programs had already been initiated to develop a fresh water barrier to halt salt water intrusion along the coast and a method was found to allocate the costs of replenishment water.

In 1950 the Los Angeles County Flood Control District began a fresh water injection test in Manhattan Beach. State legislation was obtained at the request of the West Coast Basin Water Association that provided a \$750,000 grant to install and operate an experimental injection well. This was after a USGS study concluded that there was no natural barrier to prevent salt water from degrading the entire native water supply and suggested that expensive injection wells might successfully provide a barrier to further intrusion. Successful operation of a fresh water barrier would permit water levels to be drawn down below sea level. With the success of these tests and growing recognition of the need to replenish groundwater supplies, the association, with the approval of the Los Angeles County Board of Supervisors, initiated state legislation (A.B. 2041) in 1951 amending the Los Angeles County Flood Control District Act to authorize the establishment of conservation zones. The Supervisors were empowered to levy property taxes at a maximum rate of five cents per \$100 assessed value in these zones to raise funds to acquire and spread imported or reclaimed water. Zone I was formed in the Central Basin, sponsored by its water association, and began to spread water in 1954. In the same year Zone II was formed in the West Coast Basin, sponsored by its water association to purchase water both for spreading and injection, permitting continued funding of the experimental barrier work begun with state funds.¹²

The flood control district zone programs to finance replenishment were considered temporary measures subject to renewal every five years. The property tax levy was considered to be an equitable means of raising revenue for this program, since groundwater extractions had served the area's overall economic expansion. It was believed that restoration of the basin should be financed by all its beneficiar-

¹¹ This action is discussed more extensively in Appendix C.

¹² An indicator of support for the barrier program and the role of the West Coast Basin Water Users Association was its successful volunteer effort to raise \$25,000 to cover the costs of temporary maintenance of the fresh water barrier when delay in the availability of zone tax funds jeopardized it.

ies. However, it was also believed that current annual deficiencies should more appropriately be paid for by groundwater users. Because of the desire to shift to user taxes and the insufficiency of zone taxes to meet past and current overdrafts, a new institutional arrangement to finance replenishment, the Central and West Basin Replenishment District, was devised.¹³

ORGANIZING A REPLENISHMENT DISTRICT

The 1955 Water Replenishment District Act permitted the seven counties of Southern California to organize a new type of district to raise funds to supplement depleted underground supplies and to finance salt water intrusion barriers. This was necessary because water districts created to bring in Colorado River water by annexation to the MWD had boundaries that did not conform to underground basins and had no power to levy pump taxes. Therefore, a new instrumentality was devised to permit the formation of a district with appropriate taxing powers that would overlie an entire area benefiting from replenishment. Legislation creating the District Act was sponsored by the Water Conservation Association of Southern California at the instigation of the Central and West Coast Basin Water Associations and the Los Angeles Chamber of Commerce in response to concerns about equitable financing of replenishment water.¹⁴

Drafted by a Special Southern California Association Committee, and based in part on the experience of the Orange County Water District, the general enabling act permits the formation of a replenishment district based on petition to the Board of Supervisors by 10 percent of the registered voters of an area proposed to be included in the district. The boundaries of the district are determined by those benefiting from replenishment as determined by the Department of Water Resources. The people in the affected area then vote on the proposed district. Its board has powers to levy taxes on real property as well as on production of groundwater and to sell water and issue bonds.¹⁵

After the act was passed, a joint subcommittee of the Central and West Coast Basin Water Associations studied the formation of a single replenishment district. When replenishment district formation was being considered, some West Coast Basin producers wanted to form two separate districts. They agreed to the larger district when it was realized that a "shoe string strip" area of Los Angeles would separate the two districts and would also escape the pump tax. An additional consideration was that taking in too much Los Angeles City territory might give the city political control. Negotiations with the city revealed their unwillingness to become involved in the organization of the district, and the city fathers chose not to oppose its formation.

¹³ Bookman, Edmonston and Gianelli, *op. cit.*, pp. 31-34. Use of Flood Control Zone taxes was phased out after 1972 when the Central and West Basin Replenishment District was formed.

¹⁴ The water associations also sponsored legislation requiring groundwater production records to be filed with the State Water Rights Board in Los Angeles, Riverside, San Bernardino, and Ventura Counties. The refusal of some to divulge their pumping was a factor in lengthening the time of adjudication proceedings. A major purpose of this legislation was to make easier the accumulation of data on past use for adjudication purposes.

¹⁵ A compromise between those favoring property taxes over pump taxes as a means of raising funds for replenishment resulted in language permitting both. Another was between those favoring a gross pump tax (i.e., a tax on all production) and a net pump tax (i.e., on production exceeding an adjudicated right). The act required a net tax to be used if groundwater rights and safe yield were determined.

The Replenishment District Act was placed on the ballot after 1500 volunteers gathered 150,000 signatures on supporting petitions and the DWR approved the proposed district boundaries. District supporters saw this new institutional approach as an equitable way to get and pay for the Colorado River water necessary to repel salt water intrusion, recharge the basins, and permit reduction of pumping. In November 1959 the voters approved formation of the district by a 4 to 1 margin.¹⁶

A major early decision to be made by the district concerned what type of tax to levy and how much. A plan similar to that implemented in Orange County was proposed which, according to its proponents, would not require adjudication of water rights. Under the plan, pumping assessments would equalize the cost of ground and imported water, thereby encouraging increased use of imported supplies. This was rejected by area producers after it was concluded that groundwater extractions would have to be cut back. Producers would be reluctant to reduce pumping without adjudication because they feared jeopardizing their water rights and creating water quality problems.¹⁷ The district chose to levy a \$3.19 per acre-foot tax on all groundwater production for the year 1960-61 to finance replenishment.

THE WEST COAST BASIN ADJUDICATION—RESULTS AND AFTERMATH

Resolution of the West Coast Basin adjudication involving a cutback in pumping by agreement of the parties rested on the availability of imported water and was made easier by the creation of fresh water barriers and the development of the financing mechanism provided through the replenishment district. The barrier project permitted a less severe cutback in pumping, and the replenishment district permitted all beneficiaries to share the cost of replenishment. However, it was still necessary to curtail pumping because the rate of extraction from the basins was greater than the basins' transmissive capacity to areas of heavy pumping. This situation existed because of the unavailability of replenishment in the Los Angeles Forebay due to urbanization and paving of the channels of the Los Angeles River and Rio Hondo,¹⁸ and because water spread in the Montebello Forebay did not reach areas to the southeast and west. Also, certain aquifers in the basin (i.e., Lynwood and Silverado) were not connected directly to the spreading grounds, limiting the movement of replenishment water to these areas. Thus it was necessary to reduce pumping and to rely more heavily on imported water to preserve the utility of the basins for long-term operations. Moreover, continued pumping at existing rates would reduce the underflow across the Newport-Inglewood uplift, thereby making the West Coast Basin more dependent on expensive fresh water injected through the wells of the fresh water barrier project.¹⁹

¹⁶ Statement by Carl Fossette to Assembly Interim Committee on Water, November 29, 1961, Hearing Transcript p. 129.

¹⁷ Bookman, Edmonston, and Gianelli, *op. cit.*, p. 9. Even though 1951 legislation (sponsored by users in the area) provided that reduced extraction as a result of using an alternative supply would not result in reduction of water rights, pumpers refused to rely on a law that had not been successfully tested.

¹⁸ The river channels were paved for flood control purposes.

¹⁹ Bookman, Edmonston, and Gianelli, *op. cit.*, pp. 39-45.

Under the 1961 West Coast Basin stipulated judgment, groundwater pumping was cut back and an exchange pool instituted. A member of the exchange pool who has supplemental water in excess of his adjudicated rights and his estimated need must offer to lease a portion of that right to those without supplementary water. The exchangers are reimbursed by the exchangees so that exchangers' imported water costs equal their cost of pumping. The court, with the approval of the parties, also designated the Department of Water Resources to serve as Watermaster to monitor water use and hydrological conditions under continuing jurisdiction of the court.

The chairman of the trial settlement committee, Rex Goodcell, Jr., later commented that "90 percent of the estimated cost of this litigation, though necessary under present law to protect the rights of the parties, was wasted."²⁰ He said:

They expended \$5,000,000 to protect their rights to the waters of the basin and after sixteen years of trial found it necessary because of legal questions having to do with basin boundaries, the formulae for the quantitative determination of water rights and procedural road blocks, to stipulate to the judgment. Many of the users subordinated their claimed quantitative rights to the basin's water to the benefits the judgment afforded. In other words, half a loaf was better than none at all.

This action emphasizes the fact that existing law provides no protection to the small or average ground water user. The cost of bringing an action exceeds the value of the small user's holdings. (P. 96.)

Goodcell noted that the difficulty of describing boundaries for the basin permitted one attorney to hold out to benefit his client because others knew "he could upset the whole litigation on the boundary question alone" (p. 79).

The City of Hawthorne appealed the decision on the grounds its water right should have been larger but the State Court of Appeals affirmed the lower court decision.²¹

THE CENTRAL BASIN ADJUDICATION—RESULTS AND AFTERMATH

The problem faced by the Central Basin was similar to that faced in the neighboring West Coast Basin. Although imported water had been available for almost 10 years, individual users chose not to use it. They did not want to risk losing their pumping rights or to pay the higher cost of imported supplies. Water association leaders recognized that spreading enough imported water to prevent lowering of water tables was impossible and they supported the need for pumping curtailment through adjudication.

The bitter experience of the long-drawn-out adjudication process in the West Coast Basin taught producers the need to negotiate a settlement rather than to continue to pay legal fees and as well run the risk that an adversary proceeding judgment might have dire unforeseen results—such as the imposition of a physical solution they did not want. Thus, to avoid protracted litigation with an uncertain

²⁰ Statement by Rex Goodcell, Jr., to Assembly Interim Committee on Water, July 19, 1962, Hearing Transcript p. 96.

²¹ *California Water Service Co. v. Sidebotham & Sons*, 224 Cal., App. 2nd 715, Repr. 1 (1964).

outcome, producers in the Central Basin were ready to negotiate a solution primarily using the principles of the West Coast Basin adjudication. There was also recognition of the need for public funding to support the adjudication process and more equitably distribute its costs among all water users.

To help finance the anticipated Central Basin adjudication, the Replenishment District Act was amended with the support of the West Coast and Central Basin Water Associations to permit the district to bring an adjudication proceeding in a portion of its area. Following the example of the West Coast Basin, a water association committee was formed to develop a voluntary pumping curtailment. However, a suit was not filed until after the West Coast Basin adjudication was concluded and an agreement reached on "Principles of Settlement" in the so-called Long Beach action, which was brought by downstream San Gabriel River users to prevent those upstream from exceeding their rights. The judgment in the West Coast Basin served as a basis for the Central Basin negotiations and the anticipated settlement of the Long Beach case guaranteeing flow from upstream users to the Central Basin helped set the stage for determination of water rights and use in the Central Basin.²² The adjudication was filed (January 2, 1962) by the replenishment district at the request of the Central Basin Water Association.²³

Rather than utilize the reference procedure under which the DWR would undertake studies to determine the physical facts, the parties chose to hire their own engineering firm, believing that major savings would result from a less detailed analysis and verification of previous pumping, especially for small users. Nine months after the suit, 47 producers owning 75 percent of the assumed rights executed an interim agreement to curtail their extraction by 21 percent. The final judgment agreed to by stipulation of the parties was entered on October 11, 1965, based on the stipulated facts provided by the engineer representing all parties. This was less than three years after the suit was filed and soon after the final judgment in the Long Beach case.

The Central Basin adjudication provided for a 20 percent reduction in extractions to 217,367 acre-feet per year, for an exchange water pool to provide water for producers having no supplemental supply, and for the DWR to act as Watermaster under continuing jurisdiction of the court to monitor water use and hydrological conditions.²⁴

ADJUDICATION COSTS

As noted above, one of the key attorneys involved in the West Coast Basin litigation estimated its total costs at \$5 million. However, no information is available that describes the basis for this estimate. Data are available on reference costs for studies by the state, which totaled almost \$260,000, appeal costs of about \$41,000, and costs to bring additional parties into the action of about \$6000. These costs totaling about \$307,000 do not include significant legal costs to all

²² The Long Beach action is discussed more extensively below.

²³ *Central and West Basin Water Replenishment District v. Charles E. Adams et al.*, Los Angeles County Superior Court No. 786656, January 2, 1962. The action involved over 1000 parties and more than 140 attorneys.

²⁴ *Ibid.*

of the parties during the long trial period. If \$5 million were spent to adjudicate 65,500 acre-feet of rights, then it cost over \$76 per acre-foot.

In the Central and West Basin Replenishment District, legal and engineering costs totaled about \$225,000 to adjudicate 272,000 acre-feet of water rights.²⁵ If we assume the costs to all other parties equaled district costs, then total costs were somewhere between \$1 and \$2 per acre-foot of adjudicated right. The adjudication took a much shorter time than in the West Coast Basin case.

ADMINISTRATION IN THE CENTRAL AND WEST COAST BASINS

Since the adjudication judgments that established pumping limits, growing water demands in the area have been met primarily by increased imports. Specific management developments have included:²⁶

1. Institution of a program of in-lieu replenishment in 1965-66 permitting producers to contract with the district to use imported water directly instead of pumping. The purposes of the program are to alter pumping patterns to replenish areas of low transmissiveness not subject to recharge, to reduce extractions near salt water barriers, and to cut back on extractions and the need for replenishment water. This voluntary program has not been extensively used. Annual contract amounts have ranged from 400 to about 1000 acre-feet. The only producer participating in the program has been the California Water Service Company. Some have suggested that this program could be substantially more effective if made mandatory.
2. Operation of three salt water intrusion barriers by the Los Angeles County Flood Control District (i.e., West Coast Basin, Dominguez Gap, and Los Alamitos).
3. Initiation of a water quality monitoring program by the Central Basin Water Association. The replenishment district selects imported replenishment water after considering both quality and economic factors and also recommends discharge requirements to the Regional Water Quality Control Board. It participates in the regional water quality planning activities of the Southern California Association of Governments required by federal law (Section 208 of P.L. 92-500).
4. Using reclaimed water from the Whittier Narrows Water Reclamation Plant and the San Jose Creek Water Reclamation Plant to meet some of the replenishment district's recharge requirements.
5. Temporary mining of the Central Basin during the 1977-78 drought, by court permission.
6. Water rights transfers by lease and sale in the Central Basin in 1976-77 totaling over 25,000 acre-feet (about 14,000 acre-feet leased and 11,500 sold). This equaled about 12 percent of the basin's total allowed pumping

²⁵ Ibid.

²⁶ For a description of the management activities of the Watermaster in the Central and West Coast Basins, see *Annual DWR Watermaster Reports*, for the West Coast Basin, 1961 to the present, and for the Central Basin, 1963 to the present. The Central and West Basin Water Replenishment District produces detailed annual reports describing its activities.

allocation. Water rights transfers in the West Coast Basin totaled about 10,500 acre-feet (about 10,300 leased and 200 sold). This equaled about 16 percent of total basin adjudicated rights.

Cost of administering the West Coast Basin and Central Basin judgment totaled \$150,000 in 1976-77, one-half of which was paid for by the state. 1975-76 administrative expenses for the Central and West Basin Replenishment District totaled \$257,000, paid for by property taxes.

Groundwater management in the Central and West Coast Basins involves cooperative efforts between a number of separate agencies. The Metropolitan Water District supplies imported and replenishment water. The Los Angeles County Flood Control District operates the salt water intrusion barriers and the spreading facilities for local surface, imported, and reclaimed water. The replenishment district raises funds for barrier projects and replenishment using both imported and reclaimed water.

The Watermaster monitors water use and hydrological conditions. The Los Angeles County Sanitation District supplies reclaimed water, and the Regional Water Quality Control Board enforces pollution control standards. Each of these agencies performs separate tasks necessary to the achievement of basin groundwater objectives.

Integration of the efforts of these agencies toward common objectives is accomplished in part through their water associations, which stimulate actions to develop plans to meet area water problems.

CONCLUDING COMMENT

In the urban West Coast and Central Basins of Los Angeles, water associations including major water producers took leadership to plan for and implement long-term programs to import surface water and to control groundwater use. This included (1) the establishment of water districts to bring imported supplies to the area through the MWD; (2) initiation and support for legal efforts to determine water rights and to curtail pumping within the West Coast and Central Basins and between basins of the San Gabriel River system; (3) sponsorship of state legislation to provide the management tools necessary to provide for groundwater replenishment, based in part on the experience of Orange County; (4) the development of new technology to halt salt water intrusion; and (5) efforts to maintain and improve water quality, a subject recently gaining increased attention.

Because the basins could serve as a transmission facility for available replenishment water, it was not necessary to cut total production back to safe yield, as had been done in the Raymond Basin, but some pumping curtailment was necessary because of their limited transmissivity.

The development of institutional arrangements in these two groundwater basins evolved over a 20 year period. The legal theory previously developed in the Raymond Basin became the basis for determining groundwater rights in the West Coast Basin after a long period of study and complex negotiation over a 16 year period involving almost 500 parties. Learning from experience in the West Coast Basin, water users in the Central Basin were able by negotiation to reach a settlement three years after a suit involving 700 parties was filed.

The judgments in the West Coast and Central Basins were less harsh than in the Raymond Basin where replenishment is not feasible and pumping was cut back to safe yield. In the coastal basins, pumping is greater than the estimated safe yield because of replenishment by spreading and injection. Pumping in excess of safe yield is returned to the basin through replenishment, permitting its use as a storage and transmission facility. Because the quantity of water that can be spread or injected is limited, pumping is restricted to each party's adjudicated right. In all three basins, new pumpers are enjoined and new rights may not be acquired except by transfer.

Appendix C

MAIN SAN GABRIEL BASIN GROUNDWATER MANAGEMENT¹

BACKGROUND

The Main San Gabriel Basin is closest to the source of supply from the San Gabriel River Watershed and was last to feel the problems of depleted supply. It evolved its own unique local management program through the courts without state involvement as referee or Watermaster and without forming a new district.

The Main San Gabriel Basin is located within Los Angeles County at the base of the San Gabriel Mountains and includes almost all of the San Gabriel Valley, save the Raymond Basin. It has a storage capacity of 8.7 million acre-feet and is fed by the San Gabriel River system, which also recharges the Central and West Coast Basins downstream. The overlying area is urban and includes, among others, the cities of Alhambra, El Monte, Arcadia, South Pasadena, and Azusa. Three municipal water districts overlie the basin; two are members of the MWD (Upper San Gabriel Valley MWD and Pomona Valley MWD), and one has a direct contract with the state for State Project Water (San Gabriel Valley MWD). Seventy-five percent of the basin is within the Upper San Gabriel Valley MWD. Most pumping is done by investor-owned utilities, which pump about twice as much as cities.² Rock and gravel companies are also large pumpers.

By the early 1950s water levels had declined seriously enough to prompt water users to seek a solution to the problem. Groundwater management in the Main San Gabriel Basin was accomplished in three stages. First was the determination of the obligation of upstream users of the San Gabriel River to downstream users in the Central and West Coast Basins. Second was planning to meet future water needs by producers organized into the Upper San Gabriel Valley Water Users Association. Third was the adjudication of rights within the basin and the implementation of a management plan.³ The process took about 15 years beginning with the initiation of the Long Beach action in 1959. The basin planning phase began after the Long Beach judgment in 1965. The adjudication of water rights within the basin was initiated in 1968 and a judgment was entered in 1973 in which rights were determined and a physical solution implemented.

There were two major problems that prompted adjudication of all the Main San Gabriel Basin. One was the inequitable distribution of the costs of makeup water resulting from the Long Beach judgment and the other was increasing overdraft

¹ This summary draws on various sources including interviews with the following persons who were heavily involved in the development of groundwater management in the Main San Gabriel Basin: Ralph Helm, Thomas Stetson, Max Bookman, Donald Stark, and Carl Fossette.

² The largest single pumper is the San Gabriel Valley Water Company, which produced over 30,000 acre-feet in 1976-77. (See production data in *Annual DWR Watermaster Reports*, 1975 to the present.)

³ Thomas M. Stetson, *Statement on Use and Management of Groundwater Basins*, presented at the Fall Conference of the California-Nevada Section of the American Waterworks Association, San Jose, California, October 20, 1977.

of the basin. The Long Beach case⁴ was initiated in 1959 by downstream water users in Compton, Long Beach, and the Central Basin who wanted to protect their source of supply from expanded upstream use. Major objectives were to determine water rights along the San Gabriel River and to prevent the upstream area from exceeding them. They hoped to force the upper area to meet their growing water demands by purchasing supplemental water from the MWD.⁵ Under pressure of the Long Beach suit, most communities in the Upper San Gabriel Valley in December 1959 formed the Upper San Gabriel Valley MWD with the intent to join the MWD. The four cities of Sierra Madre, Azusa, Alhambra, and Monterey Park, closer to the source of supply and believing they had least to gain by annexing to the MWD, resisted this movement and formed the San Gabriel Valley MWD. Although it considered contracting directly with the state, the upper district annexed to the MWD in 1963 after negotiations in which the MWD agreed to put in a line to bring untreated replenishment water to them. The holdout area chose to bank on the State Water Project to meet its future needs and later contracted with it.

The Long Beach judgment required the upper area to supply the lower area (cities of Long Beach and Compton, and the Central Basin MWD) with makeup water or funds to purchase it. Under this judgment, the Upper San Gabriel Valley MWD was to supply the makeup water and obtained special legislation authorizing it to levy a pump tax for purchase of replenishment and makeup water.⁶ The two other overlying districts were not being assessed and did not have power to levy pump taxes. This unequal distribution of makeup water cost stemming from the Long Beach judgment was a major factor stimulating the adjudication. The Long Beach judgment, by allocating rights between upstream and downstream areas, also permitted the development of a management solution to the upper area once its obligations to the lower area were defined.

Overdraft of the Main San Gabriel Basin began in about 1960 primarily because of the sharp increase in export of sewage into the ocean after WW II. It was estimated in 1966 that 70,000 acre-feet were being exported that previously were either mixed with other local waters to recharge the basin or flowed to downstream users. Use exceeded natural replenishment by 40,000 acre-feet annually.⁷ This condition prompted local water users to examine long-term solutions to their water problems.

Following the pattern of their down river and middle river neighbors in the West Coast and Central Basins, major water users formed a water association and sought the development of a management plan to equitably distribute the costs of supplemental supplies and makeup water under the Long Beach judgment. Main basin water users were fortunate to overlie a basin particularly suited to management by pumping and replenishment. It had adequate storage space, transmissivity, and spreading facilities located within easy reach of the proposed MWD foothill feeder.

There were a number of alternative management plans considered by the

⁴ *Long Beach et al. v. San Gabriel Valley Water Co. et al.*, Los Angeles Superior Court, Case No. 722647, September 12, 1965.

⁵ Erwin Cooper, *Aqueduct Empire*, The Arthur Clark Co., Glendale, California, 1968, p. 127.

⁶ The Municipal Water District Act of 1911 was amended to permit the upper district to levy a replenishment assessment.

⁷ Thomas M. Stetson, *Management Plan for San Gabriel Valley Ground Water Basin*, Los Angeles, California, May 11, 1966, pp. 1-5.

Water Users Committee of the Upper San Gabriel Valley Water Association. They could (1) adjudicate based on the mutual prescription doctrine, invite the DWR to serve as Watermaster, and organize a replenishment district with pump tax powers, as was done in the Central and West Coast Basins; (2) establish a district modeled after the one in Orange County and levy a pump tax on all production without adjudication; (3) invite the major overlying district to serve as Watermaster; (4) set up a joint powers agency; or (5) develop a management plan by negotiation in a "friendly" adjudication and implement it with court approval by delegating Watermaster authority to a locally selected group acceptable to producers.

In contrast to its neighbors downstream in the West Coast and Central Basins who found adjudication essential to their management plan since they had to cut back pumping, users in the Main San Gabriel Basin could have avoided adjudication because replenishment in their basin is possible without pumping curtailment. However, producers were opposed either to organizing a new district in an area already covered by three existing districts or to being managed by one of the existing districts. There was no support for creation of a joint powers agency because of conflict between overlying agencies, one of which preferred to negotiate its own water contract with the state rather than join the MWD. Rather than emulate Orange County management by pump tax, they preferred an adjudicated settlement that would recognize and give value to water rights of long-term users. Moreover, they sought to solve the problem of equitably distributing makeup water costs under the Long Beach judgment. They also preferred not to involve the state in the management of their basin either as referee or Watermaster. Overall, option five was less complicated and expensive than others and it seemed to offer the best way of meeting their objectives. Water users in the main basin sought to avoid the costly and time-consuming legal battle that characterized some previous adjudications. They wanted to develop a solution by negotiation.

After agreeing on the desirability of adjudication, the water association commissioned a consultant to develop a management plan for a negotiated settlement.⁸ The major objective of the plan was to restore the basin through replenishment and to assure a future balance between groundwater production and replenishment.

It was proposed that water rights be determined using the mutual prescription doctrine developed in the Raymond Basin with each pumper allocated a proportionate share of the basin's safe yield. Pumpers would pay either a gross pump tax or a net pump tax to finance the purchase of replenishment water. Pumpers would not be enjoined from pumping but would pay for the imported water necessary to keep the basin in balance.

According to the study the major stumbling block to implementation of the proposed plan was the different capabilities of the three overlying municipal water districts to provide imported water and to raise replenishment revenue. Two districts, the Upper San Gabriel Valley MWD and the Pomona MWD, had a contract for state water that was not expected to be available until 1972. In addition, the upper district had pump tax powers whereas the other two did not.

After several years of meetings and negotiations between members of the

⁸ Ibid. The reasons for hiring a consultant were similar to those of the Central Basin water users. Many felt DWR studies were unnecessarily detailed and costly. The consultant study did benefit from a June 1966 DWR study, (*Planned Utilization of Ground Water Basins, San Gabriel Valley*, Bulletin No. 104-2,) and from the availability of groundwater production data filed with the State Water Rights Board under the Ground Water Recordation Act.

Upper San Gabriel Valley Water Association, the essential elements of a plan to manage the district under Watermaster service were agreed upon and an adjudication action was filed on January 2, 1968, by the Upper San Gabriel Municipal Water District against the City of Alhambra and other water users.

Water users in the main basin sought to avoid the long-drawn-out legal battles fought by their downstream neighbors and tried from the beginning to develop a negotiated settlement. It took five more years to develop a specific solution agreeable to the approximately 190 parties. The added time was required to resolve complex issues concerning five different classes of water rights, to develop past production data, and to evaluate new management approaches not implemented in previous adjudications.

THE JUDGMENT

The stipulated judgment was entered on January 4, 1973.⁹ Under the judgment, natural safe yield of the basin was set at 152,700 acre-feet on the basis of 1967 conditions. All producers were enjoined from unauthorized production, recharge, or transportation of water from the basin or watershed except by a transporting party or pursuant to the physical solution. The purpose of the physical solution

is to provide a legal and practical means for accomplishing the most economic long-term, conjunctive utilization of surface, ground water, imported water supplies and ground water storage capacity to meet the needs and requirements of the water users dependent upon the Basin and relevant Watershed, while preserving existing entities. (P. 23.)

There were several important innovations developed in the Main San Gabriel Basin adjudication:

- The Watermaster sets operating safe yield on an annual basis to make best use of basin storage and pumping capacity in wet and dry years within limits set by the judgment.
- The Watermaster serves as policymaker with broad management discretion under the continuing jurisdiction of the court and is a committee comprising members who are mostly producers.
- Replenishment revenue is raised by means of a net pump tax, thereby increasing the value of adjudicated water rights.
- Storage of water under cyclic storage agreements is specifically authorized.
- Both groundwater and surface rights in the relevant watershed were adjudicated.

Each of these innovations is discussed more extensively below.

Operating Safe Yield

The physical solution empowers the Watermaster to annually determine operating safe yield, the amount that may be pumped free of replenishment water

⁹ *Upper San Gabriel Valley Municipal Water District v. City of Alhambra et al.*, Los Angeles Superior Court, Case No. 924128.

assessment. Pumpers are not enjoined from exceeding their share of operating safe yield, but when they do they pay an assessment sufficient to replace the excess production with supplemental water. Operating safe yield can be set to regulate the basin by discouraging either excessively high water levels and waste, which reduce storage capacity by preventing the capture of local supplies, or excessively low levels, which increase pumping lifts. If storage is low, operating safe yield will be set low, increasing the amount of production subject to assessment to discourage pumping, and raising revenue to increase basin storage by purchase and spreading of replenishment water. When storage is high, operating safe yield will be increased, reducing the amount of production subject to assessment to encourage pumping, capture of storable runoff, and limit recharge from imported water.

In determining the operating safe yield the Watermaster must examine the short- and long-term costs of raising or lowering water levels and must consider the price of supplemental water and makeup water under the Long Beach judgment.

One issue resolved in the process of negotiation concerned limits that would be placed on the Watermaster in determining operating safe yield. Rock and gravel interests in the basin did not want a high water table that would flood their pits, while other producers wanted lower pump lifts. In addition, some participants in the negotiations believed the basin could be operated most efficiently without establishment of a limit on operating safe yield. They contemplated management that would permit compensation by the basin to those water users damaged by planned fluctuation of water levels. The negotiated settlement resulted in setting criteria to govern the determination of operating safe yield and water spreading to protect both rock and gravel interests and other pumpers. The judgment limits the Watermaster's discretion by establishing that imported water will not be spread when the elevation of Baldwin Park Key Well exceeds 250 feet above sea level and will be spread to maintain the Key Well above 200 feet. Using DWR studies, it was estimated that between these elevations about 400,000 acre-feet would be available for use.¹⁰

Table 4 and Fig. 2, which show operating safe yield and water production for a five year period, illustrate the relationship between Key Well elevation, operating safe yield, and water production. As Key Well elevation dropped, operating safe yield was reduced.

Table 5 and Fig. 3 show that little imported water is used directly and that most water spread is from local sources. This illustrates how the basin operates primarily by pumping and replenishment.

Watermaster as Policymaker

Previous judgments in the Raymond, West Coast, and Central Basins provided for ministerial Watermaster service with little discretion or policymaking authority. In the Central and West Coast Basins, policymaking authority is exercised by the replenishment district.

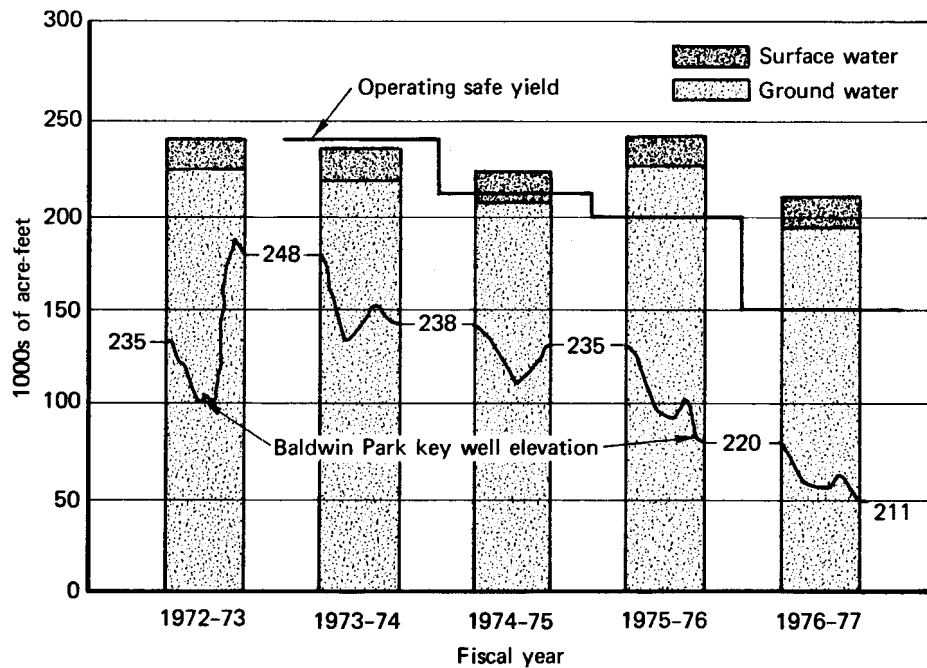
¹⁰ The Department of Water Resources (Bulletin 104-2) study of groundwater in the San Gabriel Valley, emphasizing the limits of rigid safe yield operation and the benefits of discretionary management, was credited for influencing the San Gabriel Basin negotiations toward recognizing the value of a more flexible management approach. The DWR studies of the coastal plain and the San Gabriel Valley indicated that high water levels and a safe yield operation are not necessarily the most efficient management approach, stressing the price of imported water as probably the most significant factor in determining a basin management plan.

Table 4

RELATIONSHIP BETWEEN KEY WELL ELEVATION, OPERATING
SAFE YIELD, AND WATER PRODUCTION
(Water quantities in thousands of acre-feet)

Year	Key Well Elevation (ft)	Operating Safe Yield	Production Total ^a	Ground- water
1972-73	248.1	NA	241	228
1973-74	238.5	240	235	220
1974-75	234.8	220	223	208
1975-76	220.5	200	242	226
1976-77	210.9	150	213	199

^aTotals rounded.

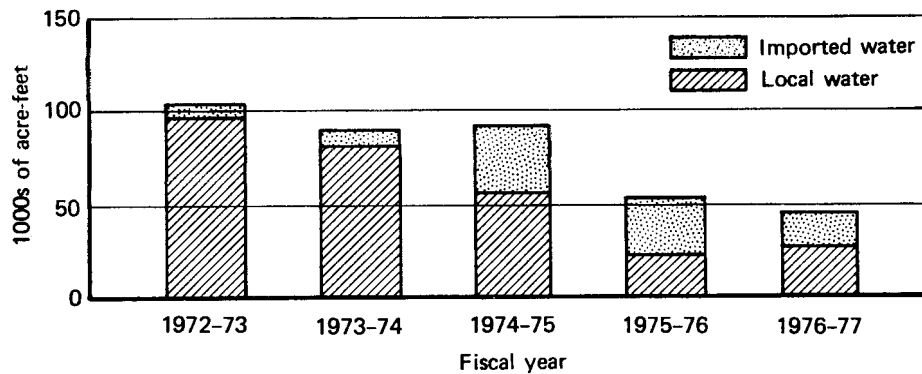


SOURCE: *Fifth Annual Report of the Main San Gabriel Watermaster for 1976-77*, p. 17.

Fig. 2 — Graphical summary of basin operations:
water production and operating safe yield

Table 5
 IMPORTED WATER DELIVERIES AND CYCLIC STORAGE IN THE MAIN SAN GABRIEL BASIN
 (In acre-feet)

Fiscal Year	Total Deliveries to Basin	USGVMND/MND Deliveries to Basin					SCVMND							
		USGVMND	SCVMND	Replenishment	Replacement	Exchange Replacement	Direct Deliveries M & I Water	Net to Cyclic Storage	Cyclic Storage at End of Year	Replacement	Exchange Replacement	Net to Cyclic Storage	Cyclic Storage at End of Year	Total Cyclic Storage
1964-65	10,000	10,000	--	--	--	--	--	--	--	--	--	--	--	--
1965-66	15,000	15,000	--	--	--	--	--	--	--	--	--	--	--	--
1966-67	20,000	20,000	--	--	--	--	--	--	--	--	--	--	--	--
1967-68	30,000	30,000	--	--	--	--	--	--	--	--	--	--	--	--
1968-69	20,700.7	20,700.7	--	--	--	82.0	--	--	--	--	--	--	--	--
1969-70	326.7	326.7	0	--	--	326.7	--	--	--	--	--	--	--	--
1970-71	205.1	205.1	0	--	--	205.1	--	--	--	--	--	--	--	--
1971-72	3,132.9	3,132.9	2,915.5	--	--	217.4	--	--	--	--	--	--	--	--
1972-73	7,316.1	7,316.1	7,087.5	--	--	228.6	--	--	--	--	--	--	--	--
1973-74	9,019.3	9,019.3	8,835.4	--	--	183.9	--	--	--	--	--	--	--	--
1974-75	35,051.1	34,219.1	20,231.8	13,731.9	--	255.4	--	--	--	--	787.1	--	--	--
1975-76	29,281.9	21,006.9	1,937.8	7,121.4	--	276.6	12,621.1	--	--	--	1,303.0	44.90	44.90	44.90
1976-77	21,668.6	14,138.6	2.9	10,752.6	2,654.9	675.8	52.4	--	--	--	6,972.10	7,017.00	19,638.10	19,638.10
Total	201,702.4	185,065.4	135,715.1	31,605.9	2,654.9	2,411.5	12,673.5	52.4	12,673.5	3,814.95	5,905.05	9,739.12	22,412.62	22,412.62



SOURCE: *Fifth Annual Report of the Main San Gabriel Watermaster for 1976-77*, p. 17.

Fig. 3 — Graphical summary of basin operations:
water spreading operations

In the Main San Gabriel Basin a new type of Watermaster was created with broad policymaking powers and discretion under continuing jurisdiction of the court. The Watermaster is a nine-member committee appointed by the court, comprising six local producer representatives nominated by an election procedure in which the quantity of water rights determines the number of votes cast, and three public representatives who are board members from the overlying municipal water districts (i.e., two from Upper San Gabriel Valley MWD and one from San Gabriel Valley MWD).

The Watermaster, with the affirmative vote of five members, has specific powers to levy assessments, acquire facilities, and require measuring devices to be installed. The Watermaster also assumes the makeup obligation of the basin under the Long Beach judgment, is concerned with water quality, and is empowered to contract with approval of members for cyclic storage of water for subsequent recovery and for purchase, spreading, and injection of water for recharge. These powers are not specifically authorized by statute and are broader in scope than the combined statutorily authorized powers exercised by the Central and West Basin Replenishment District and the DWR as Watermaster. They are imposed by a body predominantly elected by producers who control most of the water rights.¹¹

Groundwater producers did not want the state involved in management of water rights and believed they could operate the basin locally with less administrative costs than could the state. Most did not favor management by an existing municipal water district because of conflicts between them and potential conflict of interest between the role of the district as a purveyor of imported water and its role as groundwater manager. Some believed that a district would have an incentive to set operating safe yield low so as to encourage purchase of imported water and thereby maximize its revenue. The choice not to select an overlying district as

¹¹ Cumulative voting allows those with minority interests to obtain representation on the Watermaster board.

Watermaster was made easy since the upper district did not push for authority and was content to be represented on the policy committee. Producers did not favor setting up a replenishment district. Compared to Watermaster administration, it would be costly, time-consuming, and cumbersome to set up.¹² Moreover, if the program they negotiated among themselves was acceptable to the court, they would have all the tools they believed necessary for effective basin management.

The Net Pump Tax

Under the judgment all producers pay a net rather than a gross pump tax to buy supplemental water to replace production in excess of their share of operating safe yield.¹³ For example, the 1977-78 replenishment assessment (called the replacement water assessment) is \$48 per acre-foot. A producer with large adjudicated rights, who does not have to pay this assessment, derives substantial savings. This is somewhat offset by the makeup water assessment of \$3.50, which is levied on all production *not* subject to the replacement water assessment. Thus the net benefit to those with adjudicated rights is \$44.50 per acre for 1977-78 production. This was up \$11 from \$33.50 in 1976-77 and is likely to increase substantially in the future as replenishment water becomes more expensive. Not surprisingly, those with growing use wanted the filing of the adjudication held off to increase their share of rights not subject to the net pump tax, while those with declining use wanted an early filing.

All pumpers currently pay 45 cents an acre-foot gross pump tax to cover administrative expenses.

Storage Agreements

An added unique provision of the physical solution agreed to by the parties gave the Watermaster "sole custody and control of all groundwater storage rights in the basin" and power to contract for storage of supplemental water for later recovery or Watermaster credit.

The Watermaster has entered into two five year renewable cyclic storage agreements permitting the San Gabriel Valley Municipal Water District to store up to 15,000 acre-feet and the MWD (through the Upper San Gabriel Valley MWD) 85,000 acre-feet at any one time. This water can be used only to supply replacement water when requested by the Watermaster *for use in the basin*. It may not be exported to other areas. The stored water is assumed to float on top of the native water and losses, including the loss of local runoff that could have been stored if not for the additional cyclically stored water, are apportioned to the cyclic storage accounts. There is no charge for storage and no credit for benefits to others in the form of lesser pump lifts resulting from the storage. Also, the storsers assume liability for any resulting damages. The storage benefits State Water Project contractors because they may store scheduled deliveries and avoid under or over deliveries and attendant penalties.¹⁴ It also gives the Watermaster an assured

¹² District boundaries would have to be approved by DWR, petitions circulated, and an election held.

¹³ The replenishment assessment is set at the price of MWD replenishment water.

¹⁴ For example, state contractors must forecast SWP water requirements six years in advance. The forecast is not readily adjustable without penalty. Storage permits the MWD and the San Gabriel Valley Municipal Water District to avoid such penalty.

supply to meet variable basin requirements. First priority for storage is to overlying districts, next priority is to other parties, and last to other agencies.

Classes of Water Rights

Another significant aspect of the Main San Gabriel adjudication is the inclusion of surface rights in the "relevant watershed." This was because of the effects of diversions from tributary streams on the safe yield of the groundwater basin. The watershed is a hydrological area somewhat larger than the boundaries of the basin including a portion of the South Fork of the San Gabriel River outside the basin. There are five classes of water rights.¹⁵

1. Base annual diversion rights are surface rights held by parties not owning prescriptive pumping rights. They may divert up to twice this right annually without paying a replacement assessment.¹⁶
2. Prescriptive pumping rights are determined on the basis of the mutual prescription doctrine of the Raymond Basin case. These rights comprise about 95 percent of annual water rights for direct use. Each pumper's share is a percentage of the total prescriptive rights. This percentage is then applied to operating safe yield set by the Watermaster to determine how much each party may pump free of replacement assessment.
3. Integrated production rights may be held by those choosing to combine their surface and pumping rights. They may enlarge surface diversions in wet years and use less groundwater and carry over unused prescriptive rights to the following year.
4. Special category rights are allocated to the MWD for its Morris Dam and Reservoir and to the Los Angeles County Flood Control District for its Puddingstone Reservoir.
5. Non-consumptive user rights are those of parties such as the LACFCD that historically operated spreading facilities.

Rights within the basin may be transferred, assigned, licensed, or leased. Leasing occurs frequently and is usually entered into near the end of the operating year to avoid payment of a replacement assessment. During 1976-77 about 16,800 acre-feet of prescriptive pumping rights were transferred, about 8 percent of that year's groundwater production. During 1974-75 almost 25,000 acre-feet were transferred or 12 percent of groundwater production.

Another aspect of the main basin adjudication that differentiates it from those previously discussed is that new pumpers are not enjoined from production as in the Raymond, West Coast, and Central Basins. However, they must become a party to the judgment and since they have no adjudicated right must pay a replacement and administrative assessment. Rather than become new producers most parties without rights obtain their rights by transfer.

¹⁵ Stetson, 1977, op. cit.

¹⁶ But the aggregate quantity diverted over any consecutive 10 year period shall not exceed 10 times such base annual diversion right.

OTHER ASPECTS OF THE JUDGMENT

The Watermaster considered applying certain in-lieu provisions of the judgment whereby Alhambra and six other parties would be required to take direct delivery in lieu of groundwater to relieve a problem caused by declining water levels in an area that could not be recharged. The provision was not exercised because other pumpers did not want to be taxed to pay the difference between pumping and surface water costs to the affected area. Instead, a water exchange agreement was worked out in 1975 involving the MWD, overlying districts, the Watermaster, and Alhambra, permitting Alhambra to obtain surface water from the MWD.

During negotiations leading toward a settlement it was determined that the small tributary Puente Basin could be excluded from the judgment and administered separately by a two-member Watermaster committee. An agreement was incorporated into the judgment in which the Puente area agreed neither to interfere with main basin tributary flows nor impair main basin surface or subsurface flows.

An important concern of overlying agencies in the adjudication was that their service areas be protected. The judgment assures this and also assures that the Watermaster operate through these overlying agencies. For example, the Upper San Gabriel Valley MWD and the San Gabriel Valley MWD purchase replacement water and the Los Angeles County Flood Control District spreads it.

In a recent action the Watermaster approved transfer of the Morris Dam from the MWD to the Los Angeles County Flood Control District. As a result of the transfer about 23,000 acre-feet of water were released to the Watermaster as replacement and makeup water. In addition, Morris Reservoir was refilled with water, about 24,000 acre-feet of which would otherwise have flowed to the ocean. It was used to help relieve drought conditions and is being used to capture natural runoff. It will be used for water conservation in conjunction with basin and MWD operations.

COSTS OF ADJUDICATION

The adjudication involved 190 parties and cost the Upper Main San Gabriel Valley MWD almost \$424,000. This included about \$221,000 in engineering costs and about \$202,000 in legal fees. If in-house district costs and legal and other costs (mostly engineering) to other parties are considered, it is estimated that total costs of the adjudication ranged from \$750,000 to \$1 million. Since about 200,000 acre-feet of prescriptive pumping rights were adjudicated, costs total between \$3.75 and \$5.00 per acre-foot of adjudicated right.

CONCLUDING COMMENT

A number of groundwater management innovations were developed in the Main San Gabriel Basin. It did not seem practical to create a new political entity like a replenishment district or joint powers agency to govern the basin so a new quasi-public entity was created through the courts. The role of the Watermaster

was substantially expanded to include major policymaking powers, some of which are analogous to those exercised by the statutorily authorized replenishment district. The Watermaster not only performs the essentially ministerial duties to enforce the judgment of the court, as in the Raymond and Central and West Coast Basins, but also, under court supervision, levies assessments, sets operating safe yield, and makes cyclic storage agreements. Moreover, these powers are not exercised by a public agency such as the Department of Water Resources or a district; they are exercised by a committee composed predominantly of water users who operate through existing overlying public agencies. Furthermore, the committee majority is elected by producers on the basis of their share of water rights, creating in effect a quasi-political instrumentality controlled by water producers.

This judgment also provides greater flexibility for groundwater management than in previously adjudicated basins. It does not rigidly define safe yield but sets operating criteria to give basin managers some flexibility in using pump tax powers for basin replenishment. The adjudication included the determination of surface rights affecting safe yield of the groundwater basin and included complex determination of five classes of water rights. The Watermaster was given specific powers to enter into cyclic agreements for the storage of imported water.

Since the basin is well suited to management by replenishment an adjudication was not essential to control pumping. However, the adjudication did serve to equitably allocate the costs of makeup water under the Long Beach judgment. It also provides those with water rights with something of value that can be transferred. The net pump tax benefits those with large water rights, since they pay an assessment only on production that exceeds those rights. New pumping is not enjoined but those with no water rights must pay additional pump taxes on all production.

Water users in the area closest to the source of supply from the San Gabriel River were last to organize for the purpose of obtaining supplemental imported water and managing groundwater use. The interbasin adjudication filed by downstream users was instrumental in stimulating management since they could no longer indiscriminately intercept and diminish the supplies of downstream users. As in the Central and West Coast Basins, a water users association was formed and took leadership to plan and implement a long-range management plan for the area. It took fifteen years after the Long Beach action was filed to implement a management plan for the area. Five years were required to negotiate a settlement for the basin management.

Appendix D

TEHACHAPI BASIN GROUNDWATER MANAGEMENT¹

BACKGROUND

The Tehachapi Basin is one of three small adjudicated groundwater basins that lie within the area covered by the Tehachapi-Cummings County Water District in Kern County (others are the Cummings and the Brite Basins). It is below the Tehachapi Valley floor and is bounded by the Sierra Nevada and Tehachapi Mountains. Water use in the area is primarily agricultural.

Overdraft began during the 1940s, and in the 1950s residents of the area became increasingly concerned about depletion of groundwater supplies, increased pump lifts, and associated costs which some felt would hurt the local agricultural economy. After the Tehachapi-Cummings County Water District was formed in 1965 (this replaced the previous Water Conservation District), a citizens advisory committee was set up to examine the groundwater overdraft problem.

One of the key elements that permitted the development of a management program during the 1960s was the future availability of imported water. With imported water soon to be available, area residents believed they could meet their requirements from that source and were ready to support adjudication. Since imported water would be more expensive than groundwater, it was recognized that it would not be used unless groundwater rights were determined and pumping limited.

ALTERNATIVES

The major groundwater management options considered were:

1. Do nothing and continue to mine the basin. This option was rejected. To do nothing would mean that a long-range plan involving use of imported water could not be successfully implemented because groundwater users without pumping controls would have no incentive to use more expensive imported water.
2. Institute a pump tax. It was believed that special legislation would be necessary to institute this type of tax. This approach was rejected because there was no public support for it. It was opposed by predominant agricultural interests and was not seriously considered mainly because of their opposition.
3. Adjudication. This was the solution favored by most producers interested in protecting their groundwater rights. Pressure for adjudication was generated by most major users with established rights who wanted them secured. The major advocates of adjudication were the City of Tehachapi

¹ This summary draws on various sources, including interviews with Robert Jackson and Martin Whelan.

and other large users. Small farmers also favored this approach because it would protect their established rights as well.

The citizens advisory committee chose not to seek legislation amending the Tehachapi-Cummings District boundaries and not to use the DWR as Watermaster. They looked at adjudications elsewhere, particularly in the Central and West Coast Basins, and concluded that additional legislation was not needed, since their major objectives could be achieved by determining pumping rights and use. They preferred a local to a state-managed program. They did not want state involvement, which they believed would be more expensive.

In May of 1966 the citizens advisory committee recommended that the three groundwater basins be adjudicated. Their major objectives were to establish groundwater rights and to develop a physical solution integrating surface and groundwater use, thereby preventing deterioration of the basin. Adjudication suits were filed by the Tehachapi-Cummings County Water District soon after and, in December 1966, the district contracted with Kern County Water Agency for entitlement to 5000 acre-feet of agricultural water and 15,000 acre-feet of municipal and industrial water.²

To get data on water use, the district subpoenaed power records, utilized soil conservation land use studies, and performed efficiency tests on wells. The major issue during the process of negotiation concerned how much water each party would be entitled to pump. The district was able to convince almost all the parties of the reasonableness of proposed pumping allocations that were based on records of previous use.

An added important incentive to adjudicate was pressure from the Bureau of Reclamation, which said it would not advance P.L. 984 loan funds for the construction of a conveyance system to bring state water to the district unless the district had control of the groundwater basin. Bureau of Reclamation officials believed this was necessary to assure that imported water would be used and its loan repaid.

THE JUDGMENT

In 1971 a stipulated judgment was filed, five years after the suit was initiated. It was based on the legal principles established in the Raymond Basin and established the safe yield for the basin (i.e., 5500 acre-feet) as two-thirds of the "base water rights" (8250 acre-feet). Each party's base water right was determined according to his highest continuous annual extractions over any five year consecutive period after the overdraft began.³ In June 1971, district voters overwhelmingly approved a \$6.5 million, 40 year P.L. 984 Public Small Projects loan and a \$2.5 million 25 year bond issue to finance a surface water importation system. User charges are used to pay off the Bureau of Reclamation loan and property taxes are used to pay for the bonds. In 1973 after state water became available, the judgment was amended to establish allowable pumping allocations (i.e., each party's share of

² Tehachapi-Cummings County Water District, *First Annual Report of Tehachapi Basin Watermaster for the Year 1974*.

³ *Tehachapi-Cummings County Water District v. City of Tehachapi et al.*, Kern County Superior Court, Case No. 97210, March 22, 1971.

safe yield) and an exchange pool.⁴ The exchange pool system required certain selected parties who adjoin the district's pipeline to take imported water and to reduce their pumping thereby making water available for increased pumping by others. Those selected parties (exchangers) using imported water pay the cost of pumping in the basin. Those parties who pump water from the basin without sufficient pumping allocation (exchangees) pay the cost of imported water less the cost of pumping.

The judgment allows each party pumping less than his allowable pumping allocation to carry over the unused amount for the next two years, provided it does not exceed 25 percent of allowable pumping allocations. It also enjoins new pumping and the exporting of groundwater outside the basin and prohibits export of surface waters originating in the Tehachapi Basin Watershed. During 1976 about 2000 acre-feet of allowed pumping allocations were transferred within the basin by lease or assignment. The agreement requires metering, reports of production, and inspection by the Watermaster (but exempts purely domestic wells and those producing less than 25 acre-feet only if they do not exceed allowable pumping allocations) and provides for a small assessment to cover district administrative costs (\$12,500 in 1976).

It has been estimated that district costs of adjudication have been about \$300,000 since 1965. This includes engineering, legal, and other district expenses. There were about 100 pumpers involved in the suit.

THE PHYSICAL SOLUTION

The physical solution for the Tehachapi Basin was to constrain pumping by adjudication and to bring in imported water utilizing the exchange pool to promote efficient use. This approach is similar to that used in the Central and West Coast Basins. It was determined that spreading would not be cost-effective, since imported water costs would be high, added facilities would be required, and there would be losses.

One unique aspect of the Tehachapi Basin adjudication is that a County Water District, set up to bring imported water into the area, serves as Watermaster. Rather than seek special legislation to expand the authority of the district, this authority was established as part of the negotiated agreement of the parties under continuing jurisdiction of the court.

A major purpose of the physical solution was to protect the existing agricultural economy. The district's 1976 rate for imported agricultural water was \$80 per acre-foot and for municipal and industrial water, \$161. In 1977 agriculture used about 1300 acre-feet of imported water while municipal and industrial users relied almost entirely on groundwater. The City of Tehachapi benefits substantially from the exchange pool, since its pumping is increased, forestalling the need to either build a distribution system or filter the imported water that would otherwise be required (at an estimated cost of \$20-\$25 per acre-foot). Exchange pool purchases in 1976 totaled 650 acre-feet, 450 of which went to the city. Other major beneficiaries of the basin management program are area cement companies and subdivisions.

⁴ *Tehachapi-Cummings County Water District v. City of Tehachapi et al.*, Kern County Superior Court, Case No. 97210, amendment filed November 20, 1973.

The water management program was designed to benefit existing users, serve area growth, and prevent water quality problems. It was considered that all users would benefit by having an assured long-term supply.

The basin has recovered substantially since the adjudication. Imported water has been used in lieu of pumping and return flows percolate into the basin. The City of Tehachapi was rationing water on an odd-even basis before imported water became available, but since the adjudication its well levels have increased substantially. Area pumping costs have not gone up as fast as they otherwise would have because of improved groundwater levels. Also some marginal wells have been brought into production.

CONCLUDING COMMENT

Water users in the small, primarily agricultural Tehachapi Basin sought groundwater management, recognizing that available imported water would not be used unless pumping was curtailed. Management by replenishment was not economically feasible and local planners determined that the most appropriate solution for the area was to import water, cut back groundwater production, and institute an exchange pool—a solution similar to that developed in the West Coast and Central Basins. One innovation contained in the adjudicated settlement initiated by the Tehachapi-Cummings County Water District was that the overlying water district, rather than the DWR, was selected as Watermaster.

Interestingly, an important incentive to local management was the threat that a federal loan for surface facilities would not be approved unless groundwater pumping was controlled.

Appendix E

UPPER LOS ANGELES RIVER AREA GROUNDWATER MANAGEMENT

INTRODUCTION

The complex litigation of the Upper Los Angeles River Area (ULARA) began in 1955 and the Supreme Court's landmark decision in this case rendered 20 years later has significantly affected rights to store and recover groundwater and is likely to influence the future allocation of water rights in subsequent groundwater adjudications.

The ULARA consists of 123,000 acres of valley fill (i.e., groundwater basin area) and 207,000 acres of hills and mountains which drain into the Los Angeles River. The area has four subareas, the largest of which is the San Fernando Basin comprising 112,000 acres, 91 percent of the valley fill. The other subareas are Sylmar (5600 acres), Verdugo (4400 acres), and Eagle Rock (800 acres). ULARA is bounded by the Santa Susana Mountains, the San Rafael Hill, and the Santa Monica Mountains. The cities of Los Angeles, Glendale, Burbank, and San Fernando and the Crescenta Valley County Water District overlie the area. Water use is primarily municipal and industrial.

Accelerated urbanization has increased the amount of rainfall collected and routed into paved channels discharging into the Los Angeles River and emptying into the Pacific Ocean. To reduce the outflow, local Pacoima and Hansen Dams, originally built for flood control, are used to recapture water spread by the Los Angeles County Flood Control District and the City of Los Angeles. The city also spreads Owens River water. Property taxes fund these recharge operations.

THE JUDGMENT

The ULARA was established by the Los Angeles Superior Court in its 1968 judgment in the case of *Los Angeles v. San Fernando*.¹ The case was initiated in 1955 by Los Angeles to establish title to San Fernando Valley groundwater, including imported Owens Valley water stored there, and to protect the basin by reducing long-term overdraft which began in the 1940s.² In 1958 the court referred the matter to the State Water Rights Board to investigate and report on the physical facts concerning water use and hydrology. The board's report was the basis for the trial court's 1968 judgment, which applied the theory of mutual prescription to assign each party a prorata right to the annual safe yield of each basin except Eagle Rock.³

¹ *City of Los Angeles v. City of San Fernando*, Superior Court, Case No. 650079, 1968.

² In the 1930s Los Angeles brought an action against neighboring Glendale and Burbank and obtained a judgment, affirmed by the State Supreme Court, securing its right to San Fernando Valley native and imported groundwater. Because there was a water surplus at the time, Los Angeles could not then seek to enjoin other defendants from use of this water nor could they claim prescriptive rights.

³ For more extensive reviews of the case, see: Ronald Robie, "Ground Water Resources of California: Opportunities and Obstacles to Optimum Use," Melvin L. Blevins, "*City of Los Angeles v. City of San*

The decision restricted groundwater extractions to 104,000 acre-feet of water per year, approximately 50,000 acre-feet less than the previous six year average, a reduction of over 50 percent. The trial court refused to recognize the historic pueblo rights of Los Angeles to local groundwater and limited its right to recapture imported water because it could not adequately trace those commingled waters and had not demonstrated adequate intent to recapture them.⁴ The trial court order named the DWR as Watermaster to monitor pumping, report on hydrological conditions, and adjust restricted pumping rights during emergencies. The order established an advisory board representing major water users to meet periodically to review important management questions including the Watermaster annual budget.⁵

ADMINISTRATION OF THE JUDGMENT

Under the trial court judgment, restricted pumping rights are transferable and each party has the flexibility to under or over pump 10 percent of its rights during a particular year, to be paid back or taken in a succeeding year. The Watermaster has also approved several extensions permitting the carryover of unpumped rights for several years.

During 1970-71 the City of Los Angeles suffered an earthquake affecting its water supply and was permitted to extract over 2000 acre-feet under an emergency stipulation. The city was also permitted to extract over 4500 acre-feet in 1974 when it had to shut down the First Los Angeles Aqueduct to make repairs.

With restricted pumping the ULARA has become more dependent on imported supplies. During the 10 years before restricted pumping, imports exceeded extractions by 50,000 to 60,000 acre-feet. After restrictions the difference has grown to between 120,000 and 160,000 acre-feet.

SUPREME COURT DECISION

The City of Los Angeles appealed the judgment to the Court of Appeal which, in 1972, reversed the trial court and upheld the pueblo water rights of the city to all groundwater in the San Fernando Basin derived from precipitation and required to meet its needs. The Appeal Court's decision was upheld by the Supreme Court in 1975. However, the city's pueblo rights were not extended to the Sylmar and Verdugo subareas because the Supreme Court upheld the trial court's ruling that the hydrologic subareas were separate and not part of the basin.⁶ Under the

Fernando et al.—Landmark Decision in California Water Law Annals," and John F. Mann, "The San Fernando Case—Its Impact on Future Ground Water Management," *Proceedings of the Tenth Biennial Conference on Ground Water*, Water Resources Center, University of California at Davis, September 11-12, 1975, pp. 1-9, 189-208, and 209-213, respectively.

⁴ Victor E. Gleason, "Water Projects Go Underground," *Proceedings of the Tenth Biennial Conference on Ground Water*, Water Resources Center, University of California at Davis, September 11-12, 1975, pp. 19, 20. Pueblo rights are derived from Spanish and Mexican law and attach to waters of the Los Angeles River.

⁵ The board includes two members from Los Angeles, one each from the cities of Glendale, Burbank, and San Fernando, and one from the Crescenta Valley County Water District.

⁶ *City of Los Angeles v. City of San Fernando*, 14 C. 3d 199, 123, Cal. Rptr. 1, 537 P. 2d 1250 (1975).

decision, the overlying cities of Los Angeles, Glendale, and Burbank may also recapture imported water stored underground. The court also interpreted Civil Code Section 1007 to prevent private parties from gaining prescriptive rights over public entities and public entities from obtaining prescriptive water rights against other public entities. The decision made other changes affecting the rights of overlying users and appropriators that have created major uncertainties about the nature of their rights. While pumpers can still agree by stipulation to the mutual prescription formula developed in *Pasadena v. Alhambra*, the decision has virtually precluded imposition on them of this doctrine.⁷ The court determined that mechanical allocation of rights based on mutual prescription did not always result in an equitable solution and that equity demanded consideration of many more factors. It specifically noted the possible "undesirable side effect" that the mutual prescription doctrine might encourage each party to race to the pump house to increase his right. Because of the San Fernando decision it is likely that future adjudications will be judged on the particular physical and legal conditions in each basin and that the Raymond Basin formula will no longer be automatically applied.

The court also more specifically and flexibly defined "overdraft" to permit extractions exceeding safe yield plus a "temporary surplus" (i.e., an amount extracted to create storage space for recapture in wet years without adverse effects on the basin's long-term supply).

The Supreme Court has remanded the case to the trial court for redetermination of pumping rights based on its decision under which Los Angeles' rights would be increased and those of Glendale and Burbank reduced. The Supreme Court directed the trial court to work out a physical solution to these pumping adjustments permitting Glendale and Burbank to continue pumping in exchange for delivering imported water to Los Angeles. This would minimize added costs to Glendale and Burbank for modifying their distribution and pumping facilities. The three cities are continuing to extract water from the San Fernando Basin, after formulating a Memorandum of Understanding permitting Glendale and Burbank to pump 2620 acre-feet and 5170 acre-feet, respectively, from the San Fernando Basin as return flow credit for imported MWD water. An additional 4700 and 3800 acre-feet, respectively, may be pumped by the two cities with payments to Los Angeles of \$65 an acre-foot. The parties also agreed to continue DWR Watermaster service on an interim basis.

The parties have not been able to negotiate a stipulated judgment and a physical solution for submission to the court. Thus, the case initiated in 1955 has yet to be resolved.

GROUNDWATER STORAGE

The Supreme Court decision in the San Fernando case has been acclaimed for its major impact on conjunctive use of groundwater basins and major importation projects such as the State Water Project.⁸ This is because it allows the use of underground reservoirs for storage and later recapture of imported water.

⁷ See Anne J. Schneider, "The Influence of the *San Fernando* Case on the Work of the Governor's Water Rights Commission," *Proceedings of the Eleventh Biennial Conference on Ground Water*, California Water Resources Center, University of California at Davis, September 15-17, 1977.

⁸ Gleason, *op. cit.*, p. 25.

The state has for some years been contemplating storage of State Project Water in the San Fernando Basin and selected this one as a prototype for such a program. However, no storage agreement has been reached and the effort has been temporarily abandoned in favor of other ones. Negotiations for storage have been significantly affected by controversy between the City of Los Angeles and Inyo County, which could affect the quantity of groundwater available to the city from the Owens Valley. If its Owens Valley supply is limited, then the city may choose to store water in the San Fernando Basin to meet its own requirements. This would severely limit storage space potentially available to store SWP water.

COSTS OF LITIGATION

Since a final judgment in the San Fernando case has not yet been rendered, no final cost estimate can be made. The cost to the parties for state studies as referee totaled \$493,264.

CONCLUDING COMMENT

The ULARA adjudication is noteworthy for both its length and importance in the evolution of legal doctrine affecting water use. It took 20 years to resolve the legal issues and the details of a final judgment have not yet been worked out. It modified the mutual prescription doctrine initially developed in the Raymond Basin in 1949 thereby changing the legal framework for subsequent adjudications, and it clarified rights to store and retrieve water underground.

Overall, it limited the mechanical application of mutual prescription as a vehicle for allocating water rights in an overdrafted basin and recognized a more flexible standard for basin management by defining safe yield to include temporary surplus, thereby removing some potential legal roadblocks to more extensive use of groundwater basins as storage facilities.

Appendix F

ORANGE COUNTY GROUNDWATER MANAGEMENT¹

BACKGROUND

The Orange County Water District (OCWD) has pioneered in the development of groundwater management by pump tax and without adjudication. It has been able to supply replenishment water to meet growing demands without either cutting back groundwater production or determining water rights.

The Orange County Coastal Basin includes over 200,000 acres of land and is located within the Santa Ana River Watershed downstream from the Chino Basin. It is large and highly transmissive with about 1.5 million acre-feet of storage space. It is overlain by areas that experienced explosive growth and shift of water from agricultural to municipal and industrial use.

Groundwater accounts for about 60 percent of water use in the OCWD—35 percent is imported from the MWD and 25 percent is natural supply percolated from the Santa Ana River. (See Tables 6 through 9 for a description of groundwater production and tax revenues from various sources.)

Two key factors have influenced the development of groundwater management in Orange County:

1. Its location at the lower end of the Santa Ana stream system along the coast and farthest from the source of supply. This prompted water producers most affected by early water shortages to become part of the MWD in 1928. It also has stimulated a long history of litigation between Orange County producers and those upstream. The objective of this litigation has been to curtail increased upstream use of the natural Santa Ana supply and to force upstream users to seek supplementary imported supplies.
2. The size and recharge capacity of the Orange County Coastal groundwater basin. Management has not required pumping curtailment since replenishment water spread in the forebay and other spreading areas is quickly assimilated and transmitted through much of the basin.

ORGANIZING TO SECURE IMPORTED WATER

Three major cities in Orange County participated in the formation of the Metropolitan Water District, recognizing the need for imported water to meet their future requirements. Fullerton and Santa Ana first received Colorado River water for direct use in 1941. At this time these cities were not yet part of the OCWD. They increased their use of surface water, which supplied 50 percent of their requirements, thereby greatly alleviating the problems of overdraft. By 1952 most of the developed area of Orange County was part of the MWD.

¹ This summary draws on various sources, including interviews with Don Owen and Gordon Elser.

Table 6

HISTORICAL GROUNDWATER PRODUCTION
AND REPLENISHMENT ASSESSMENTS

Fiscal Year	Groundwater Production (AF)	OCWD Replenishment Assessment	Amount Collected
1954-55	148,223.6	\$ 3.50	\$ 518,783
1955-56	153,677.4	3.50	537,871
1956-57	186,032.1	3.90	725,525
1957-58	160,258.0	3.90	625,006
1958-59	208,571.5	3.90	813,429
1959-60	207,447.9	4.30	892,026
1960-61	226,024.7	5.50	1,243,136
1961-62	177,171.5	6.00	1,063,029
1962-63 ^a	71,536.2	8.00	572,290
	114,557.1	11.00	1,260,128
1963-64	62,533.9	8.00	500,271
	126,068.7	11.00	1,386,756
1964-65	52,778.1	8.00	422,225
	127,019.8	11.00	1,397,218
1965-66	42,560.1	8.00	340,481
	139,611.6	11.00	1,535,728
1966-67	36,880.8	8.00	295,046
	132,494.2	11.00	1,457,436
1967-68	43,719.4	9.50	415,334
	149,936.7	12.50	1,874,209
1968-69	34,221.7	10.30	352,484
	144,576.2	13.30	1,922,863
1969-70	41,475.9	10.00	414,759
	152,903.5	13.00	1,987,746
1970-71	41,786.5	10.00	417,865
	162,165.4	13.00	2,108,150
1971-72	43,798.7	10.00	437,987
	185,240.2	13.00	2,408,123
1972-73	29,599.1	10.00	295,991
	185,622.9	13.00	2,413,098
1973-74	28,073.7	10.00	280,737
	190,789.2	17.00	3,243,416
1974-75	25,928.8	10.00	259,288
	199,667.9	17.00	3,394,354
1975-76	29,055.1	12.00	348,661
	216,299.3	22.00	4,758,585
1976-77	25,247.3	12.00	302,968
	218,264.1	25.00	5,456,603
1977-78		12.00	
		26.00	
Totals	4,521,818.8		\$48,679,605

^aIn 1962-63 a two-rate system was devised whereby water used for irrigation was assigned one rate and groundwater used for all other applications was assigned a slightly higher assessment.

Table 7

REQUESTED 1976-77 BASIN PRODUCTION PERCENTAGE

Purveyor	Requested Basin Production Percentage	Basin Production Percentage Achieved
Costa Mesa County Water District	55	28
City of Fullerton	55	50
Irvine Ranch Water District	50	0
Tustin Water Works	50	56
Yorba Linda County Water District	55	54
All others	60	75
Average	--	66

Table 8

BASIN EQUITY FUND

Fiscal Year	Basin Production Percentage	Basin Equity Assessments (\$/AF)	Production in Excess of Basin Percentage (AF)	Production Limitations Requested by OCWD (AF)
1969-70	60	14	13,430	7,645
1970-71	60	20	21,157	5,410
1971-72	70	25	10,916	16,620
1972-73	90	26	2,893	12,516
1973-74	80	26	3,835	
1974-75	70	26	14,479	7,250
1975-76	65	18	6,136	4,578
1976-77	60	23	35,921	4,863
1977-78	70	29		

Table 9

OCWD HISTORIC AD VALOREM TAX RATES

Fiscal Year	Authorized Tax Rate	Actual Tax Rate Levied	Fiscal Year	Authorized Tax Rate	Actual Tax Rate Levied
1933-34	.05	.05	1955-56	.08	.08
1934-35	.05	.05	1956-57	.08	.08
1935-36	.05	.05	1957-58	.08	.08
1936-37	.05	.05	1958-59	.08	.08
1937-38	.05	.03	1959-60	.08	.08
1938-39	.05	.03	1960-61	.20	.20
1939-40	.05	.03	1961-62	.20	.19
1940-41	.05	.02	1962-63	.20	.19
1941-42	.05	.01	1963-64	.20	.18
1942-43	.05	.01	1964-65	.20	.20
1943-44	.05	.01	1965-66	.20	.19
1944-45	.05	.01	1966-67	.20	.18
1945-46	.05	.02	1967-68	.20	.18
1946-47	.05	.03	1968-69	.20	.14
1947-48	.05	.03	1969-70	.20	.08
1948-49	.15	.13	1970-71	.20	.08
1949-50	.15	.15	1971-72	.20	.08
1950-51	.15	.15	1972-73	.20	.08
1951-52	.15	.15	1973-74	.20	.07
1952-53	.15	.15	1974-75	.20	.07
1953-54	.08	.08	1975-76	.20	.07
1954-55	.08	.08	1976-77	.20	.0836
			1977-78	.20	.08

LITIGATION TO PROTECT LOCAL SUPPLY

Orange County has fought major legal battles to protect its Santa Ana River supplies. It took years of legal action, by incremental steps, to define the water rights of upstream and downstream users. In fact, interbasin litigation was the primary reason for creation of the OCWD.

During the 1920s, problems of salt water intrusion during a long drought period led local farmers, businessmen, and political leaders to clamor for action to protect the Orange County water supply from depletion by upstream users. The Irvine Company, which owned about one-third of the land within the county, brought suit against upstream users to protect its water supply. The Orange County Water District was formed by special act of the legislature in 1933 primarily to help spread the cost of this litigation among all those affected by the suit. The district raised money through property taxes to pay the costs of the continuing litigation, which was resolved in 1942 by three stipulated judgments restraining use by some upstream users.²

² *Irvine Co. v. Fontana Union Water Co.*, Judgment No. Y-36-M, D.C. Cal. (1942).

Litigation was initiated in 1951 against four upstream cities in an effort to protect the quantity of Santa Ana River water reaching Orange County. Although a favorable judgment was reached in 1961, this still did not solve the problem. The most recent litigation initiated in the mid-1960s was aimed at restraining almost all upstream water users. After the proposed adjudication became too complex to resolve successfully, it was scaled down to include three upstream water districts (i.e., Chino Basin Municipal Water District, San Bernardino Municipal Water District, and Western Municipal Water District). The stipulated judgment required the upstream districts to provide specified Santa Ana River flows to Orange County.³ Overall, these lawsuits have established the rights of basin users to certain surface and subsurface flows. They have also restricted upstream municipalities from taking increasing amounts of natural river flow. The most recent judgment established a five-member Watermaster committee to monitor river flows under court supervision.

MANAGEMENT BY PUMP TAX

Orange County has evolved a unique system of management by pump tax over a twenty-five year period. At first, replenishment was financed through property taxation; then in 1953, the first pump tax program was initiated and subsequent modifications made to add revenue and to deal with special pumping problems.

Early Replenishment

Between 1940 and 1951, pumping levels dropped 38½ feet and salt water intrusion moved inland as much as four miles along a three mile front.⁴ Local farmers and businesses sought water for artificial basin replenishment to help relieve this situation. It was secured from the MWD in 1948 by the Orange County Flood Control District and the next year the OCWD itself assumed the responsibility of obtaining replenishment, using property tax assessments to pay for it. Gradually use of MWD water for replenishment increased substantially from 4700 acre-feet in 1948-49 to 38,200 acre-feet in 1951-52. However, area growth was still outstripping supply and salt water intrusion continued. The existing property tax system financing replenishment seemed to some inadequate. Farm and business leaders believed:

that a sound water management program with drastic increases in the importation of water to the area was mandatory if the economy of Orange County was to develop its maximum potential.⁵

At the same time, several producers located within the boundaries of both the MWD and the OCWD complained about paying property taxes to both for imported water taken directly and for replenishment. They were particularly disturbed that

³ *Orange County Water District v. City of Chino*, Orange County Superior Court, Case No. 117628, April 17, 1969.

⁴ Howard W. Crooke, "Ground Water Replenishment in Orange County, California," *Journal of the American Waterworks Association*, July 1961, p. 832.

⁵ Howard W. Crooke, "Financing a Ground Water Replenishment Program as Part of Ground Water Basin Management in the Area of Orange County Water District," *Proceedings of 1963 Biennial Conference on Ground Water*, University of California at Los Angeles, November 1963, p. 3.

this type of financing for imported replenishment was unrelated to benefit and imported replenishment water promoted overuse. In addition, there were many who would benefit from an expanded replenishment program who were not included within OCWD boundaries. It was concluded that the financial structure and boundaries needed to be overhauled.

Instituting a Pump Tax

In 1952, a special citizens committee was appointed by the Orange County Farm Bureau and Associated Chambers of Commerce of Orange County to examine alternative approaches to meet area water demands and to equitably divide the costs of meeting them. The committee concluded that adjudication of local water rights was not desirable since this would lead to adoption of a "philosophy of scarcity." It was believed that initiating an adjudication would discourage organizational efforts necessary to bring in large quantities of added replenishment water. This was because pumpers would await the conclusion of an adjudication determining their groundwater rights before supporting a program to import adequate future supplies.⁶ Rather than support costly and time-consuming adjudication that might lead to cutbacks, they preferred to develop an equitable plan to meet their future water requirements. Apparently, they saw more benefit to supporting future growth than to establishing and protecting the property rights of historic users. A factor of some importance was that any adjudication would have involved many parties, since most use at the time was agricultural.⁷ Moreover, the West Coast Basin adjudication, initiated in 1945 and involving fewer parties, had still not been settled, suggesting that the route of management by litigation would be arduous. In fact, given the characteristics of the basin, adjudication was not essential.

The citizens committee recommended that those who benefited directly from imported water used to replace annual overdraft should pay for it. On the other hand, they called for property tax financing to redress long-term overdraft that benefited the economy. They also proposed enlargement of the district to include those served by its program.

On the basis of its recommendations, legislation was introduced and enacted in 1953 modifying the Orange County District Act to permit:

1. A pump tax on all production to be used to pay for imported groundwater needed to replenish annual overdraft.⁸
2. A tax on land and improvements to permit purchase of additional imported water and pay for administrative costs.
3. Enlargement of district boundaries to include the cities of Santa Ana, Anaheim, and Fullerton and other areas benefiting from basin replenishment.⁹ The district board of directors was also expanded to give the newly added cities representation.

⁶ Ibid.

⁷ In 1950 there were 3500 wells in operation within the district.

⁸ Authority to impose pump taxes was tested and upheld in *Orange County Water District v. Farnsworth*, 138 Cal. App. 2nd 518, 292 P. 2nd 927, California District Court of Appeals, 1956.

⁹ When the district was initially formed in 1933, it encompassed 156,000 acres. Its area now totals over 200,000 acres.

4. Acquisition of adequate water spreading devices to handle the enlarged replenishment program.
5. Metering of production and an annual report on the status of the basin.

Fill-the-Basin

Initially, the OCWD used its new powers to pursue a "fill-the-basin" policy. This stemmed from concern about the uncertainty of future availability of replenishment water from the MWD and the need to repel salt water intrusion. It also reflected the desire of water leaders to meet the requirements of future growth.¹⁰ Between 1953 and 1959-60 the district increased its average monthly importation of replenishment water by over 300 percent (from 2600 acre-feet to 10,632 acre-feet).

After reaching the full capacity of the Colorado River Aqueduct in 1960, which increased the amount of water available to Southern California, the district sought and received legislative authority in 1961 to levy an added pump tax for non-irrigation users and an added property tax to buy water in excess of annual overdraft to store available MWD water for future use. They chose to subsidize agriculture by establishing a dual pump tax and also to use a more politically acceptable property tax hike to finance the MWD water for future use.

The fill-the-basin policy helped raise basin water levels by more than thirty-five feet between 1956 and 1963, but after a 1964 engineer's report concluded that it might well return certain areas to their previously swampy conditions it was abandoned. Instead, the district adopted a more flexible management plan relating its replenishment program to maximum use of the basin over wet and dry cycles.

The Basin Equity Assessment

The district's relatively low pump tax was sufficient to finance replenishment water but was not high enough to control extraction. Initially, the district sought to control extraction by large users with a voluntary program, aimed at establishing a fifty-fifty split in their use of MWD surface water and groundwater.

With continued rapid growth placing added pressure on groundwater resources, pumping holes developed in certain heavily pumped areas. To meet this problem legislation was enacted permitting the district to levy a *basin equity assessment*. This provided an incentive to some pumpers to use imported surface supplies directly in lieu of pumping. The OCWD board annually establishes a groundwater production percentage (i.e., the ratio of groundwater to direct imported water use) for non-agricultural users (60 percent for 1976-77). Those exceeding this share pay the basin equity assessment (\$23 per acre-foot in 1976-77) on their excess production. These funds are then used by the district to offset the added imported water costs of those pumpers asked to increase their use of MWD direct surface water.¹¹

The basin equity percentage is set after consideration of desirable artificial replenishment and storage levels and is aimed at influencing the amount of ground-

¹⁰ Louis F. Weschler, "Water Resources Management: The Orange County Experience," *Institute of Governmental Affairs, University of California Davis California Government Series*, No. 14, January 1968, pp. 30-46.

¹¹ Orange County Water District, *Orange County Water District 1978 Annual Report*, April 1979, p. 64.

water pumped. The basin equity tax provides an incentive to those using more groundwater than the basin equity percentage to reduce their use. It equalizes the cost of more expensive surface water with that of less expensive groundwater. Heavy groundwater users help pay for imported water used to correct pumping problems.

Basin Recharge

Between 1933 and 1977 about 1.8 million acre-feet of Santa Ana River natural flow have been recharged into the groundwater basin, and since 1949 OCWD has bought 2.3 million acre-feet of imported replenishment water. Use of the basin as a distribution, treatment, and storage system reduces the need for surface distribution and storage facilities and treatment plants. To operate the replenishment program, spreading facilities and grounds are necessary. The district uses channels along the Santa Ana River as well as off-channel facilities for spreading and percolation.¹² OCWD owns about 3000 acres of land used primarily for groundwater recharge and conservation.

OTHER DISTRICT PROGRAMS

Salt Water Intrusion

Orange County has continually faced the problem of combating salt water intrusion through the Los Alamitos and Santa Ana (Talbert) Gaps. Even the district's fill-the-basin policy of the 1950s and 1960s could not cure this problem. To contain it the district, in cooperation with the Orange County Flood Control District in 1965, began operation of the Alamitos Barrier Project through which water is injected from wells located about two miles from the coast. It also operates the Orange County Coastal Barrier Project consisting of extraction wells that intercept brackish water and return it to the ocean through open channels and fresh water injection wells. In addition to containing salt water intrusion, the barriers increase basin storage capacity by permitting deeper extraction than would otherwise be available. The district constructed a unique advanced waste water recycling plant called Water Factory 21 to supply the injection water for the Coastal Barrier Program. The technique combines advanced water reclamation (beyond secondary treatment) on 15 million gallons per day and a reverse osmosis (RO) waste water demineralization plant to treat 5 million gallons per day of that reclaimed water.

Environmental Enhancement Projects

Although district lands are primarily for recharge and conservation purposes, an Environmental Enhancement Plan approved in 1971 has guided the development of projects designed for aesthetic improvement and recreation. These include bike and equestrian trails, use of Anaheim Lake for trout fishing, and use of Prado

¹² To construct their off-channel percolation basins at Warner Basin, Anaheim Lake, and another location, sand and gravel contractors were invited to bid for material with the revenues generated used to offset project costs. Orange County Water District, *Orange County Water District 1973 Annual Report*, April 1974, p. 17.

Dam lands for hunting. These projects are financed from concessionaire revenues and rock and gravel excavation revenues.

CONCLUDING COMMENT

Orange County has developed a unique management program employing a pump tax system to generate revenue for basin replenishment and to limit use. Water rights within the Orange County Coastal Plain have not been adjudicated but heavy investment has been made by OCWD in litigation to protect its rights to Santa Ana River water. Settlement of this litigation has resulted in allocation of stream flows between the upper and lower areas that is managed by a Watermaster with court supervision.

Its location at the lower end of the Santa Ana stream system along with the large size and recharge capacity of its groundwater basin have been key facts determining the management program of the OCWD. When water users were faced with the issue of adjudicating water rights within the basin or developing a major replenishment program to effectively meet its growing water requirements they chose to raise funds for replenishment rather than fight what promised to be a long-drawn-out legal battle to adjudicate water rights. District boundaries were enlarged and a pump tax instituted so that those benefiting from replenishment would pay for it.

Later when pumping holes developed, a basin equity tax was instituted to encourage producers to use surface water in amounts exceeding the groundwater production percentage (i.e., the groundwater share of total water use) set by the district. These funds are used to pay for the higher cost of imported water for those asked by the district to cut back pumping because of a problem in their area.

Appendix G

CHINO BASIN GROUNDWATER MANAGEMENT¹

BACKGROUND

The Chino Basin adjudication is the latest example of management by adjudication. The stipulated judgment involving 1300 parties provides for several innovations including Watermaster management by an overlying Municipal Water District, with important producer checks and balances on the exercise of its powers, and for separate management plans affecting different classes of users.

The Chino Basin contains over 8 million acre-feet of water in storage and includes portions of Riverside, San Bernardino, and Los Angeles Counties. It collects surface runoff from the San Gabriel Mountains and rainfall from the valley floor. It lies within the Santa Ana River Watershed upstream from Orange County. Groundwater use during 1975-76 totaled about 182,000 acre-feet and surface water about 36,000 acre-feet. While most water is still used for agriculture, urbanization has increased municipal and industrial uses. Agricultural production consists primarily of citrus crops and vineyards. Major industrial users are Kaiser Steel, Southern California Edison, and Sunkist. Major urban centers in the basin are Ontario, Pomona, Chino, Fontana, Upland, and Montclair. Pumping costs for appropriators in 1976 averaged between \$25 and \$30 per acre-foot, and for overlying agricultural users about \$40 to \$50 per acre-foot. Chino Municipal Water District, Western Municipal Water District, and Pomona Valley Municipal Water District overlie the basin.

The Chino Basin has been in an overdraft condition for more than 20 years. This has resulted in lowering of water tables and increased pumping costs. Existence of nitrates constitutes a water quality problem, particularly in the western portion of the basin. There has been some subsidence, although this has not been regarded as a major problem. The question of what to do to manage the basin has been an issue for the last 10-15 years. While there are some important short-term water quality problems facing the area, continued overdraft and optimal use of groundwater and surface supplies constitute long-term problems affecting the entire overlying area.

There were two important steps that preceded the development of a groundwater management program for the Chino Basin. First was the formation of the Chino Basin Municipal Water District and its annexation to the MWD in 1951 to obtain supplemental imported water to meet the area's growing water demands.

Second was an agreement governing the allocation of water supply in the Santa Ana River Watershed. This was accomplished by an adjudication action initiated by Orange County Water District in 1963 involving 4000 parties. The downstream users in Orange County wanted to assure that increased water use by upstream users in the Chino area did not deplete their supply. A 1969 stipulated judgment

¹ This summary draws from various sources, including interviews with producers, Chino Basin MWD staff, consultants, and attorneys involved in the adjudication including: Donald Stark, Fran Brommschenkel, Ed Dubiel, Martin Whelan, Adolph Moscovitz, Fred Douma, Lee Travers, and Hoite Rugge.

resolving the interbasin conflict provides for a regional allocation of Santa Ana River system water supply in a way similar to that developed for the San Gabriel River system. Under this judgment, the Chino Basin Municipal Water District (along with the Western Municipal Water District in Riverside County and the San Bernardino Valley Municipal Water District) is required to provide water to assure an average flow at Prado Dam for downstream use in Orange County.² The judgment is monitored by a five-member Watermaster committee under court supervision. With this obligation to downstream users settled, Chino Basin water users were not in a position to formulate a groundwater management plan for the Chino Basin.

EARLY PLANNING EFFORTS

After settlement of its dispute with Orange County, the Chino Basin Water Users Association and the Chino Basin Municipal Water District took leadership to develop a groundwater management plan using imported water for replenishment. There were four primary factors that stimulated the desire for groundwater management:

1. Increased pumping costs because of higher pump lifts and increasing power charges.
2. The fear that uncontrolled pumping would deplete the basin and would require future construction of expensive surface delivery systems.
3. Recognition that controls were required to force local producers to use more expensive imported water.
4. Desire to make efficient use of basin transmissive and storage capacity.

Since the basin could be managed without a production cutback through replenishment, producers could have chosen not to adjudicate and instead to institute a program similar to that in Orange County using a pump tax. Most producers did not favor this approach. They wanted vested rights protected and accorded an economic value.³ It was believed that new users would be the primary beneficiaries under a plan like the one operating in Orange County, since their water costs would be essentially the same as those with historic rights.

Early negotiations during 1970-71 failed to result in an acceptable groundwater management plan. Initially, the Chino Basin Municipal Water District proposed a gross pump tax (i.e., a tax on all production) not only to fund studies necessary for development of a management plan but also to pay the cost of replenishment water as part of an adjudicated settlement. However, this was opposed by agricultural producers. Later, during 1974, intensive negotiations by all producers were renewed at the behest of the Chino District and area municipalities, and an agreement was reached to adjudicate the basin and to make the studies necessary to develop a management plan and to evaluate its effects using finances from a tempo-

² *Orange County Water District v. City of Chino et al.*, Orange County Superior Court, Case No. 117628, April 17, 1969.

³ For example, the City of Upland had purchased water rights from a private water company and believed the value of its rights should be recognized and protected against new users. Similarly, other existing producers would benefit to the extent that their rights were established and recognized in the allocation of costs for replenishment water.

rary pump tax.⁴ Under the agreement, the Chino Basin Municipal Water District was recognized as the lead agency to develop the plan in consultation with producers. Legislation was then requested and enacted in 1975 (S.B. 222, Ayala) authorizing a \$2 per acre-foot pump tax for three years. This revenue was used to fund special studies to verify past production and to determine basin hydrology, other preliminary steps toward adjudication. The program authorized by the special legislation would provide a test of how a pump tax would work. The legislation required appointment of an advisory committee of producers and existing agencies by the board of the Chino District to develop the details of a plan. Special producer subcommittees were set up to explore ways of allocating the costs of providing supplemental water to overlying agricultural users, overlying non-agricultural users, and appropriators. The state participated in the negotiations as a major pump-er in the basin because of its correctional and Department of Fish and Game facilities. It also is the largest owner of land overlying the Chino Basin.

Basin negotiators faced several major hurdles before a settlement could be reached. They had to organize a diverse set of producers, find an acceptable means of determining their water rights, and allocate the costs of more expensive imported water among them. This represented a difficult challenge, since so many of the parties were small agricultural users. They also had to define the boundaries of the basin hydrologically and geographically, and to determine what type of institutional arrangements would be set up for basin governance. In addition, they had to deal with uncertainty introduced into their negotiations by the 1975 State Supreme Court San Fernando decision.

IMPACT OF THE SAN FERNANDO DECISION

The early Chino negotiations were based on the mutual prescription theory developed in the Raymond Basin. The San Fernando case made substantial changes in legal theory that governed previous adjudications and changed the negotiating ground rules for the Chino Basin adjudication. Probably the biggest impact of the San Fernando case was that mutual prescription could no longer be automatically applied and imposed on the parties. This was because the court ruled that in an overdrafted basin private pumpers could not obtain prescriptive rights against public entities and that overlying users retained their rights by use rather than prescription. The San Fernando decision strengthened the position of cities, since they could not lose rights by prescription. It also implied that overlying rights were for use only on overlying lands and therefore might not be separately transferred.

The superior position of cities was constrained by a changed legal notice requirement that complicated determining where adverse use began, making it difficult to effectuate prescription against overlying users. In fact, because of the notice qualification in the San Fernando decision, Chino Basin planners assumed that the rights of agricultural users would not be prescribed or reduced to a share of safe yield. Overall, San Fernando made the determination of overlying and appropriative rights highly uncertain.

While the decision created uncertainty, it also helped resolve problems between large and small farmers that had stymied previous negotiations and aided elimina-

⁴ "Memorandum of Agreement Chino Basin Plan," contained in *First Annual Report of Chino Basin Municipal Water District*, November 1976.

tion of some inequities that might have resulted from strict application of the Raymond Basin formula. For example, strict application of mutual prescription would have given some farmers with large patterns of historic use large rights and new farmers none. This caused a major split between farmers during the early negotiations. The court's determination preserving overlying rights put all farmers in the same boat. It eliminated the windfall that might have gone to some of them and helped pave the way for a settlement between them. The solution to this problem was not to specify rights for individual agricultural producers and to work out a plan for equitable distribution of assessments among them.

San Fernando also removed an inequity affecting Kaiser industries. Application of mutual prescription with rights based on five years continuous use after the overdraft began would have seriously impaired the rights of Kaiser industries because they had a strike that reduced their use for one year. The decision also complicated determination of appropriators' rights, since it eliminated interparty prescription among them. To solve this problem a negotiated agreement was worked out under which all appropriative rights were of equal priority.

ALTERNATIVE MANAGEMENT PLANS

The legislatively established advisory committee considered a variety of basin plans that had been developed elsewhere, and retained attorneys and consultants with experience in the development of other Southern California conjunctive use management programs. The stipulated judgment arrived at in the Main San Gabriel Basin helped serve as a model for their deliberation as did the method of levying assessments used in Orange County. DWR and Santa Ana Watershed Project Authority studies were also examined to help define water demand and quality problems.⁵

To stimulate resolution of outstanding issues, an action was filed on January 2, 1975, by the Chino District to adjudicate the basin with the approval of producers. Its purpose was "to act as a unifying mechanism for all producers within the basin" to develop a long-term basin plan under Watermaster management.⁶

The major objectives of the plan were to halt unregulated overdraft and stabilize the basin, to secure a long-term future water supply making efficient use of ground and surface waters, and to develop an equitable means of financing replenishment water. It was agreed that the adjudication would not be pursued unless agreements could be reached on the elements of a basin plan as part of the planning process authorized by S.B. 222. As part of this process three overall management approaches were evaluated:

1. *No Control.* This option assumed continued mining of the basin without a recharge program. It was rejected after serious consideration because all major producer groups, and especially the appropriators, believed the continuous overdraft would eventually have serious consequences for the basin. They favored a long-term management approach that would protect their future water supply and economic interests.

⁵ Ibid.

⁶ See Department of Water Resources, *Meeting Water Demands in the Chino-Riverside Area*, Bulletin 104-3, Sacramento, California, May 1971. The work of the committee was made somewhat easier by the existence of production records required by the Recordation Act.

2. *Strict Adjudication.* Under this option producers would be restricted to safe yield and would have to separately purchase supplemental surface supplies. This approach was rejected primarily because it would involve major contested litigation expense, delay, and major uncertainty as to outcome.

3. *A Physical Solution.* The negotiated physical solution controlling pumping, using pump taxes, and using ground and surface supplies conjunctively became more attractive as a compromise that benefited each producer group enough to gain their support. Also, one of the major objectives of the physical solution was to preserve the environmental values of the Chino area. Those involved in the negotiations wanted to preserve agriculture and to protect open space while assuring the long-term water supply necessary to permit controlled growth. Cost analysis of the three approaches strengthened the case for a physical solution.

It was estimated that by 1990 total costs to supply basin requirements without controls would be about \$31 million in 1976 constant dollars, whereas imposition of a strict injunction would cost \$32 million and a physical solution \$26.6 million.⁷

Appropriators, such as the cities of Pomona and Chino, several water districts (e.g., Cucamonga County Water District and Monte Vista County Water District), and private water companies (e.g., Fontana Union Water Company), spearheaded the effort to arrive at an acceptable physical solution. They had water problems and were interested in assuring a long-term water supply without being forced to bear the cost of a surface delivery system. They recognized the need to protect the agricultural economy and were willing to bear a large share of the costs of a physical solution in part because they could more easily spread these costs among many users and saw themselves as "inheritors" of the basin with the anticipated decline of future agricultural water use.

A "strict injunction" applying the principles of San Fernando would have involved expensive litigation with an uncertain outcome. From the appropriators' viewpoint, no control and a "strict injunction" were unacceptable. They were willing to shoulder the added costs of implementing a physical solution in return for basinwide management in which they would have a predominant voice.

Initial efforts were made to put industrial users with overlying rights into the appropriators' pool. This proposal was beaten back and the industrial users were placed in a separate pool. The stake of the industrial users in the outcome was not as great as the other producers. The industrial users, led by Kaiser industries, supported the need for management to protect the area's water supply and were willing to go along with an approach that gave some help to agriculture as long as they did not have to assume a disproportionate share of the costs of a physical solution.

Agriculture, which accounted for the largest share of use in the basin, was facing the cost of higher pump lifts, which would continue to be the case under no control. Agricultural producers believed they would be better off under the proposed physical solution than under no control, because they would face increased pump costs that would probably cost more than any replenishment assessment they might have to pay. They were willing to take less safe yield than they might have gotten under a "strict injunction" to gain the overall benefit they

⁷ *Economic Evaluation of Proposed Physical Solution for the Chino Ground Water Basin*, Ultra Systems, Inc., Irvine, California, March 1977, Table 3-11, p. 31.

anticipated receiving in reduced pump costs. Moreover, their replenishment assessment would be minor compared to appropriators' because they received the lion's share of safe yield. As long as agriculture did not expand, their assessments in the future would be minimal. As overall agricultural use declined, their replenishment assessments would disappear altogether because total pool rights are guaranteed in perpetuity. With use by appropriators expanding, they would pay the future increased costs of basin replenishment.

When it appeared that agreement could be reached among the parties the adjudication was activated. Spurred in part by the 1977 drought, a stipulated judgment was agreed to by them on January 27, 1978, three years after the case was filed.

THE JUDGMENT

The judgment establishes a framework for long-term basin management under a plan aimed at assuring "that all water users dependent upon the Chino Basin will be allowed to pump sufficient waters . . . to meet their requirements."⁸ Its primary objective is to permit management by replenishment with replenishment costs distributed among producer groups.

Three Management Pools

One of the unique aspects of the Chino adjudication is the division of users into three separate management groups or "pools": overlying agricultural, overlying non-agricultural (industrial users), and appropriative, with *each pool* allocated a share of the basin safe yield. In accord with the physical solution, each pool operates under its own pooling plan and pays a replenishment assessment to purchase water used in excess of its share of the safe yield or operating safe yield defined as the appropriators' share of the safe yield plus controlled overdraft authorized by the Watermaster. This permits flexibility in basin management to conserve water over wet and dry cycles. However, the initial operating safe yield was set for five years by the judgment, which also provides for limits on accumulated overdraft of the basin and on operating safe yield. Thus, flexibility is limited during the early years of basin management primarily because of appropriators' interest in maintaining an assured supply while the new program was being phased in. After five years, unused agricultural water is available for reallocation to the appropriative pool to supplement operating safe yield.

Transferability of Rights

Another special characteristic of the Chino Basin adjudication is that water rights for individual producers in the agricultural pool are not determined as they are for overlying non-agricultural users or for appropriators. Since agricultural rights are not specified, they cannot be transferable. Overlying non-agricultural rights are determined but they are considered "appurtenant to the land" and not

⁸ *Chino Basin Municipal Water District v. City of Chino*, San Bernardino Superior Court, Case No. 16437, January 28, 1978.

separately transferable. Only appropriative rights can be transferred within the appropriative pool with Watermaster approval.

Some agricultural producers (dairies) were opposed to transferability of rights because this would complicate their anticipated relocation within the basin. They wanted rights to be transferred with the land, which would assure them their required water supply. They were also concerned that transferable rights would inflate their water costs. Their position was strengthened by the Supreme Court's San Fernando ruling. Although transferability would have given agricultural rights value, this would have required the application of a formula like mutual prescription to establish them. In addition to disputes between large and small farmers that this engendered, many believed it also would reduce agriculture's share of safe yield, benefit appropriators, and result in higher agricultural costs. Overall, agricultural producers concluded that they would be better off under the proposed physical solution, anticipating that they would pay little or no replenishment assessment.

Some appropriators were also concerned about transferability of agricultural water rights. They feared that one appropriator might gain dominance by acquiring them. Also, they were concerned about uncertainty that might result from rights transfers. The judgment ties rights of overlying users to overlying land and provides a method for allocating unused agricultural rights to appropriators.

BASIN GOVERNANCE

One of the major objectives of the Chino Basin negotiators was to devise a plan for unified basin management. They explored how this might be attained within the framework of an adjudicated settlement.

The expansion of local district boundaries by special act of the legislature was unacceptable because conflicts with other overlying districts could not be resolved. For example, the San Bernardino Valley Municipal Water District would lose assessed value, some of which was being taxed to pay for State Project Water, if all the area overlying the Chino Basin were annexed to the Chino Basin MWD.

A joint powers agreement was also unacceptable, since it would involve establishing another overlying agency with attendant unnecessary administrative complexity. The Department of Water Resources was considered as Watermaster but was rejected primarily because local interests did not want the state involved in management of their basin. They also were concerned that state management might impose higher costs on them. Instead of these approaches, the negotiators chose the Chino Basin Municipal Water District as Watermaster, expanding its powers by the terms of the proposed stipulated judgment.

One of the most interesting aspects of the Chino Basin judgment is the intricate system of governance established by it. The negotiators spent considerable time formulating an institutional structure "which would give a controlled balance of authority and responsibility between Chino Basin Municipal Water District, on one hand, and producers from Chino Basin, on the other."⁹

Some opposed district management because they feared there would be a con-

⁹ *First Annual Report of Chino Basin Municipal Water District, Chino Basin Water Production Assessment Operations for 1974-1975*, p. 3.

flict between the district's role as a surface water purveyor and operator of sewage treatment works and its role as a groundwater manager. Some felt this might lead to overreliance on imported MWD water or transfer of costs to groundwater pumpers that should instead be charged to other water users.¹⁰ However, the district was acceptable to most producers because they were already governed by it (its boundaries covered about 75 percent of the groundwater basin), and it had also defended their interests in the Santa Ana River adjudication initiated by Orange County Water District. It had the capability to implement a groundwater management program and had taken leadership to develop a long-range groundwater management plan. Moreover, the district had existing authority to purchase replenishment water from the MWD and had agreed to drop the surcharge it had previously levied on use of this water if it were selected as Watermaster. It also made known that it would drop the adjudication if it were not selected. In addition some producers believed that management by public district would have greater legitimacy and be more acceptable than management by a committee of producers, such as that established in the Main San Gabriel Basin. Although producers agreed on the district as Watermaster, they placed a number of conditions on its operations to assure that their interests were protected. In fact, there is little the Watermaster can do without producer approval.

The judgment establishes the Chino Basin Municipal Water District as Watermaster but requires review and approval of all major discretionary actions by a producer advisory committee representing the three producer pools. Moreover, the Watermaster is appointed for the limited term of five years and may be removed by a motion of the advisory committee supported by a vote from the majority (where the majority represents the majority of assessments paid). Also, any party can request court review of a Watermaster action and is entitled to full court review with no presumption of fact in favor of the Watermaster. In addition, the advisory committee can *mandate* the Watermaster to take certain actions if favored by 80 percent of the eligible voters. If the Watermaster does not adhere to the advisory committee's recommendations on non-mandated actions, a public hearing must be held before a decision can be reached. Furthermore, separate pool committees, elected on the basis of member assessments, make recommendations on policies for their respective groups. The actions of the Watermaster are also limited by policies set forth in the judgment, many of which specify management parameters and limit discretion. Thus, the sophisticated institutional structure places substantial checks on Watermaster discretion and appears to assure that primary policy control remains in the hands of producers on the advisory and individual pool committees.

Inasmuch as appropriators are expected to pay the lion's share of replenishment assessments and advisory committee voting is based on these assessments, appropriators appear to be assured a primary voice in basin policymaking.

Within this institutional framework just described, the Watermaster is given the following powers:

1. To adopt rules and regulations after public hearing upon recommendation of the advisory committee.

¹⁰ Recently, some pumpers have objected to the district's proposal to tax pumpers to pay for legal costs to defend itself in a waste discharge action of the Regional Water Quality Control Board. Since the suit involved the district's role as operator of a sewage treatment plant, they felt groundwater pumpers should not pay the cost.

2. To acquire facilities, employ experts and agents, borrow, contract, account for stored water, and cooperate with public agencies.
3. To require parties to install measuring devices or meters and to inspect them.
4. To levy assessments as provided for in the separate pooling plans and physical solution.
5. With concurrence of the advisory committee, to conduct studies and adopt rules for storage agreements.
6. To submit and adopt a budget after public hearing and advisory committee review and recommendation.

Assessments

As pointed out above, a key factor in the negotiations was how the cost of replenishment water would be shared among producer groups. Under the judgment, each user pool's replenishment cost is based on the relationship of its share of the basin's safe yield to actual production. Safe yield was set at 140,000 acre-feet per year for 10 years with overlying agricultural rights set at 82,800 acre-feet (85 percent of their average use for the two previous years) and overlying non-agricultural rights at 7366 acre-feet (97 percent of average use for two previous years). Appropriators receive the remaining 49,834 acre-feet of safe yield as a residual (68 percent of average use for the two previous years), but their rights were increased to 54,834 acre-feet (72 percent of two previous years' average use) by the physical solution.¹¹ By this method overlying users will pay a lesser share of replenishment cost than appropriators because their share of the safe yield is a higher percentage of actual production. Moreover, since overlying use is expected to decline and appropriators' use increase, this disparity will continue until unused overlying rights are reallocated to appropriators.

In addition to resolving how replenishment costs would be allocated between users' pools, negotiators also had to determine how to distribute costs among users in each pool.

Members of the overlying agricultural pool pay a gross assessment on all production. Nonagricultural overlying users pay a net replenishment assessment on excess production over their share of safe yield. There was some disagreement among appropriators about how to distribute the costs of replenishment. This was resolved by a compromise under which 15 percent of replenishment water costs was to be recovered by a gross pump tax and the remaining 85 percent from a net pump tax.

Appropriators may also pay a facilities equity assessment for added facilities needed to import water and to recompense those accomplishing recharge by taking surface supplemental supplies in lieu of pumping. The judgment established one in lieu area, including the cities of Upland, Ontario, and Montclair, in which the Watermaster buys unpumped water at a price based on a predetermined formula. New pumping is permitted with the payment of the appropriate assessment with new producers assigned to the proper pool.

New non-agricultural producers will pay a gross pump tax on all production,

¹¹ Appropriators' use was cut back 27 percent during the 1965-74 production period. Non-agricultural overlying users were cut back 21 percent.

since they have no previously adjudicated right. New agricultural producers share in the safe yield of the agricultural pool and pay a gross pump tax based on the extent to which agricultural use exceeds the safe yield assigned to it.

Basin Storage

The state's interest in using the Chino Basin for storage of SWP water was an added incentive promoting a local management solution incorporating the power to enter into storage agreements. The San Fernando decision also helped clarify the right to store and recover such water from an underground basin.

It was estimated that the lower pump lifts that resulted from state storage of water would save local pumpers from \$225,000 to \$450,000 in 1985 costs (assuming that storage would range from 500,000 to one million acre-feet). However, this benefit could probably not be realized unless there was local management of the basin. In addition, some were concerned that failure to develop a local management plan might be used to justify state control of the basin, a choice most producers wished to avoid.

The judgment recognizes the existence of unused storage space and the need for Watermaster control to permit both storage and conjunctive use of basin and supplemental water under conditions that would protect both stored and basin water. It allows groundwater storage agreements with approval of the advisory committee under guidelines requiring determination of amounts to be stored and withdrawn, and priority of storage rights.

Costs of Adjudication

The agreement approved by the courts involves 1300 parties. Legal and study costs to the district from assessments raised by the Ayala bill were \$626,000. This includes about \$190,000 in district in-house staff and other costs, \$230,000 in legal costs, and \$206,000 in engineering costs. It is estimated that additional—mostly legal—costs to the parties ranged between \$150,000 and \$250,000. Thus the adjudication costs for the three year period of serious negotiations were between \$750,000 and \$850,000 or between \$5 and \$6 per acre-foot of adjudicated right.

CONCLUDING COMMENT

The Chino Basin is the most complex and sophisticated adjudication yet devised. It is noteworthy for several reasons. There were more parties involved than in previous basin adjudications (1300), most of them small agricultural producers. The case was settled by stipulated agreement only three years after the action was filed. However, negotiations were begun in earnest only after an interbasin adjudication determined the allocation of Santa Ana River flow among upstream and downstream users. The management plan contains several important innovations including the creation of separate management controls for different producer groups and an intricate institutional structure for basin governance, which married district Watermaster management with checks and balances over the exercise of Watermaster powers that appear to assure producer policy control.

Under the plan farmers, industrial users, and appropriators are permitted different pump taxes and water rights of different users are treated differently. They are not specifically determined for farmers and all overlying rights are non-transferable, whereas appropriative rights are transferable with Watermaster approval.

Like past adjudications, this adjudication was stimulated by the problem of basin overdraft, and several management tools developed in other adjoining areas were put to use here. The Main San Gabriel agreement served as the model for extending the role of Watermaster from ministerial duties to broad policymaking, and previous experience with pump tax management in Orange County was helpful in designing pooling plans. The availability of imported water and the transmissivity of the basin permitted management by replenishment and a physical solution that did not require pumping cutbacks. The key issue was how to share the cost of more expensive imported water.

Interestingly, farmers who initially opposed management by pump tax were willing to accept it as part of an adjudicated settlement under which they were guaranteed a firm long-term water supply with appropriators paying a large share of replenishment costs.

The development of a basin plan was by local producers through their water users' association and by the Chino Basin Municipal Water District, which took leadership to help negotiate an acceptable settlement and was designated Watermaster.

The adjudication action served as the basis for unifying producers as part of the process of developing a long-range basin management plan for the area. Appropriators took the lead among producers in negotiating a settlement that was acceptable to farmers and industrial users.

The negotiations were made more complex by the Supreme Court's San Fernando decision, but eliminating the automatic application of mutual prescription did not derail the negotiations. In fact, while the San Fernando decision introduced uncertainty, it also made possible the elimination of inequities and the development of a more flexible management plan. It also clarified the ability to store and retrieve imported water. However, one important impact of the court decision was to limit transferability of overlying water rights.