

PUBLIC ENTREPRENEURSHIP: A CASE STUDY IN
GROUND WATER BASIN MANAGEMENT

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Public Entrepreneurship: A Case Study in
Ground Water Basin Management

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PREFACE

Any study of public entrepreneurship inevitably requires that large demands must be made upon many persons who occupy different positions in public life in order to secure the essential information and data. Without their ready cooperation a study of this type could never have been completed. Many individuals gave generously of their time and provided valuable insight into the problems faced by public entrepreneurs in West Basin. Many persons went far beyond what one might reasonably expect in making information available. I am especially indebted to Carl Fossette, John Johams and Florence Langford of the West Basin Water Association for their kindness in providing information and for their willingness to read and comment upon major segments of the manuscript at various stages of development. Robert Chun, Carlos Madrid and their associates at the California Department of Water Resources, and Howard Haile and his associates at the Los Angeles County Flood Control District, also spent many hours answering detailed technical questions and educating a political scientist concerning some of the physical problems associated with the attempt to regulate a ground water basin. F. R. Bowerman of the Los Angeles County Sanitation Districts, Warren

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ABSTRACT OF THE DISSERTATION

Public Entrepreneurship: A Case Study in
Ground Water Basin Management

by

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The traditional literature of political science and economics has given little consideration to the strategy used by individuals in organizing public enterprises to provide public goods and services. Economists have long been concerned with entrepreneurship, but have largely confined their analysis of entrepreneurship to the private market economy. Political scientists most often take a Governmental agency as given and rarely investigate the problems of undertaking new public enterprises. The perspective of public entrepreneurship was taken in this study in order to better understand the process of launching new public enterprises and of devising a public enterprise system to undertake a ground water basin management program. The study was based primarily upon the use of documentary materials.

Increasing salt water intrusion in a ground water basin was the stimulus which evoked the efforts of entrepreneurs seek public solutions to their common problem. The physical and institutional conditions confronting water Producers in the West Coastal Basin of Southern California as they began to organize for public action in 1945 is described in an introductory section. Next, the strategies of those who functioned as public entrepreneurs are examined in a case study which involves (1) the organization of a water producers' and users' association to function as a forum for the consideration of common problems, (2) the creation of a municipal water district to provide a supplemental surface supply, (3) the use of litigation to achieve a limited pro-rata rationing of the local ground water resources, (4) the development of institutional arrangements to test the effectiveness of a fresh-water barrier against the sea and to place a prototype barrier into operation along a one-mile section of the exposed coastline, (5) the design and creation of a water replenishment district as a ground water basin management enterprise and (6) the development of a management plan involving the coordinated action of several public water agencies to assure the continued use of ground water supplies in conjunction with imported surface supplies.

Finally, the performance of this public enterprise system was evaluated in relation to its capacity (1) to

realize its physical objectives, (2) to secure operational agreements with other agencies and (3) to develop an optimal program in terms of economic efficiency. Physical objectives and operating agreements have been attained but a non-optimum program has been developed. The institutional arrangements implicit in the structure of this ground water basin management system have not motivated ground water producers to take full account of the social costs of their actions. By developing a more economic source of water supply than the alternative sources now being developed by state agencies this local ground water basin management program will, to that extent, be an important long-term force contributing to the more efficient use of water resources in Southern California.

SECTION I

INTRODUCTION

CHAPTER I

PUBLIC ENTREPRENEURSHIP AND THE WEST BASIN EXPERIENCE

Public Entrepreneurship as a Focus of Inquiry

Entrepreneurs perform essential functions in organizing and guiding enterprises to provide the goods and services which are demanded as a condition of life in contemporary society. One of the principal attributes of American society is its emphasis upon the freedom and initiative which entrepreneurs can exercise in organizing new undertakings to meet changing demands for goods and services. The freedom and initiative which entrepreneurs can exercise have led to the characterization of the American economy as a free enterprise economy and of American society as an open society.

The function performed by private entrepreneurs has received considerable attention by economic theorists. Frank Knight, for example, stressed the role of the entrepreneur in bearing the risks faced by an enterprise in a changing environment.¹ In Knight's theory, profits were

¹ See Frank H. Knight, *Risk, Uncertainty and Profit* (Boston: Houghton Mifflin Company, 1921).

the residual income that entrepreneurs earned for performing the risk bearing function for an enterprise. Joseph Schumpeter, on the other hand, considered innovation as the major function of the entrepreneur and profits as the proper return to the entrepreneur for performing the innovative function.² The classical concept of the entrepreneur as the organizer and manager of a going concern has also been retained in modern discussions of private entrepreneurship.³

The concept of entrepreneurship will be used in this study as implying a combination of all three functions. Entrepreneurship is an essential function at the time that a new organization is being formed. Someone has to envision the possibilities of joint action and bring together the necessary factors of production into one unit. Entrepreneurship is also an essential function performed in the going concern operating in a changing environment. Someone must choose which of the available alternatives have the possibility of yielding the best payoff and be prepared to assume responsibility for the consequences of those choices.

² See Joseph A. Schumpeter, The Theory of Economic Development, translated by Redvers Ople (Cambridge, Mass.: Harvard University Press, 1936).

³ See Frederick Harbison, "Entrepreneurial Organization as a Factor in Economic Development," The Quarterly Journal of Economics, LXX (August, 1956), 364-66, and Edith Tilton Penrose, The Theory of the Growth of the Firm (New York: John Wiley & Sons, Inc., 1959).

Innovation also continues in the going concern as decisions are made about new products, new plant locations and new production processes.

The economic study of entrepreneurship has involved the study of men organizing enterprises to produce and sell private goods within the context of the private marketplace. However, many of the goods desired in any society are not amenable to private provision. Some goods cannot be excluded from those who do not pay for their use. Other goods have such a range of joint and alternative uses that the priority of claims for a discriminate use or user cannot be determined through the functioning of a normal market. When the goods desired by individuals are not exclusive, determinate and easily transferable, individuals have problems in their attempt to achieve a satisfactory manner of allocating scarce resources to their most valuable use. Frequently, individuals invoke public authority in their attempt to provide goods which are not readily exchanged in a market. They may seek to establish new laws which transform the basic operation of the market or to create public enterprises to provide these goods. Because of the necessity of reliance upon public provision or extensive public regulation, goods which are not exclusive, determinate and easily transferable can be considered to be public goods.

The existence of entrepreneurship in the private sector raises the question of whether there is a comparable

function performed by those who undertake to provide public goods and services in the public sector, which might appropriately be characterized as public entrepreneurship. Concepts of home-rule, local self-government, and local autonomy in the conduct of local governmental affairs reflect some of the same elements of freedom and openness which provide the essential conditions for the exercise of an entrepreneurship in the public sector. In addition, the vast variety of organizational forms among municipal and public corporations would appear to provide substantial latitudes for the exercise of a public entrepreneurship. In such an institutional setting there should be opportunities for persons to engage in public entrepreneurship by organizing new enterprise to secure appropriate forms of community action in providing common goods and services.

The conduct of public entrepreneurs, one might anticipate, is similar to but not identical to the conduct of private entrepreneurs. The working rules governing the behavior of private entrepreneurs allows a greater freedom of action. Private entrepreneurs decide when and if they want to enter into competition with other entrepreneurs; and, as long as they pursue legal strategies, how they want to compete. Private entrepreneurs operating in a competitive market are free to pursue their own self interest. This self interest is frequently related to the interest of a firm since the primary focus of competition in the modern

corporate economy is among firms rather than among specific individuals.

By vigorously pursuing his own self interest within the structure of an effective market, the private entrepreneur produces goods and services which are desired by a community. The market represents an institutional structure of incentives and deterrents to enable individuals to pursue their own opportunities and at the same time, to perform socially valuable functions.

The capacity to engage in public entrepreneurship is defined by a political system. Constitutional ground rules which stress the right of local communities to self-determination lay a framework for an extensive and varied public enterprise system. Legislative enactments which specify the general rules of procedure for incorporation of municipalities or public districts or other public corporations provide the working rules which public entrepreneurs must follow in proceeding to undertake a new enterprise. These same general laws also specify the working rules that public entrepreneurs must follow in the pursuit of opportunities in the public sector. The possibility of new legislation creating facilities for the establishment of new districts or expanding the capabilities of existing enterprises always exists in a political system devoted fundamentally to the coexistence of an active public enterprise system together with a vigorous private enterprise system.

Public entrepreneurs can exercise fundamentally different powers to develop, control and allocate resources than private entrepreneurs. Public entrepreneurs have access to the use of such powers as eminent domain and taxation which extend the range of activities in which they can engage. However, holders of entrepreneurial positions within existing public enterprises are limited to the pursuit of specific opportunities utilizing only those powers assigned to them by legislation as interpreted by the courts. While the private entrepreneur may pursue any legal activity by any legal means, the public entrepreneur is constrained by the organic legislation which created or authorized the creation of his district. The purposes of the enterprise are designated and cannot be changed without a change in the relevant legislation. And equally important, the techniques which may be used in the attempt to fulfill the purposes of the public enterprise are also specified. While the powers or capabilities he wields may be great in scope and extent, his capacity to introduce new measures for dealing with new problems on his own initiative and authority is usually much more limited than that of the private entrepreneur. Public entrepreneurs, as a result, are much more intimately involved in the political process generally in order to be able to authorize and to validate new programs of action and new institutional arrangements for accomplishing their purposes.

The motivation of the public entrepreneur is somewhat more complex than that of the private entrepreneur since the working rules affecting the behavior of public and private entrepreneurs differ significantly. The working rules affecting the behavior of public entrepreneurs restrict their capacities to seek personal gain. An entrepreneur usually cannot create a public enterprise for the sole purpose of seeking opportunities for his own gain. He must seek authorization either by action of a legislative body or by an affirmative vote of the people included within the boundaries of the district, that the public requires the organization of a new public enterprise. The public entrepreneur who then becomes a public official is held accountable for continuing to serve these public interests. Public officials, who seek to gain private benefits at the expense of their public, are subject to special remedies and sanctions. Members of the public can bring charges and invoke other officials to apply sanctions to an errant holder of a public trust.

By using the orientation of public entrepreneurship to pursue a case study of water resource development and ground water basin management, emphasis is given to the strategies which people followed in seeking to solve a common problem through public actions which could not be solved by individual private actions. The focus is upon the multiple strategies followed rather than the operation

of any particular agencies or set of agencies. A study in public entrepreneurship provides an opportunity to develop a natural history of the evolution of a program in public administration where all of the different components can be viewed as being fit together as essential elements in a total program.

The balance of this introductory chapter will provide a general overview of the West Basin experience in public entrepreneurship. First, the ground water "problem" of West Basin will be considered. Second, the structure of the West Basin water industry as it existed in 1945 will be described. Third, the course of public entrepreneurship between 1945 and 1963 will be summarized. Fourth, the resulting structure of the water industry in 1963 will be outlined with explicit reference to the creation of a super-structure composed of numerous public agencies responsible for the joint management of a conjunctive use system. The more detailed analysis will be contained in the chapters following this preliminary overview.

The Ground Water "Problem" of West Basin

West Basin is the name of a ground water basin which is the last of three interconnected ground water basins underlying the south coastal plain upon which the Los Angeles metropolitan complex has developed. The original source of the water flowing into West Basin is precipitation

falling on the foothills surrounding and valley floor of the San Gabriel Valley. The Rio Hondo and San Gabriel Rivers drain the San Gabriel Valley, and a large proportion of the flow sinks below the surface to move slowly downward through the subsoil toward the sea. In the San Gabriel Valley, the communities of Alhambra, El Monte, Monrovia, Baldwin Park, West Covina, Duarte, Azusa and Glendore utilize the water of the Rio Hondo and San Gabriel Rivers and their tributaries, as well as withdrawing considerable quantities of ground water from the valley fill.

Central Basin also receives its supply of fresh water from the San Gabriel Valley, where surface and subsurface water flows through the Whittier Narrows. The communities of Huntington Park, Whittier, Vernon, Bell, Norwalk, Montebello, Downey, South Gate, Paramount, Lakewood, Compton, Bellflower and parts of Inglewood, Los Angeles, Signal Hill and Long Beach have utilized the water flowing into Central Basin. In most cases, this is their primary source of water supply.⁴

⁴ Historically, West Basin was related to the Los Angeles River and the San Fernando Valley, as well as the Rio Hondo and San Gabriel Rivers flowing through the San Gabriel Valley. However, the City of Los Angeles, through its pueblo right claims all the water flowing in the Los Angeles River and has diverted most of the water flowing out of the San Fernando Valley into its water supply system.

The official name of West Basin is West Coast Basin. However, since the basin is most frequently referred to by the shorter name, I have used the shorter term throughout this dissertation.

A fault zone separates West Basin from Central Basin and partially interrupts the free flow of water between these two basins. However, historically between 10,000 acre-feet and 30,000 acre-feet of water per year have flowed from Central Basin into West Basin. The cities of El Segundo, Manhattan Beach, Redondo Beach, Hermosa Beach, Palos Verdes Estates, Gardena, and Hawthorne, as well as portions of the cities of Los Angeles, Inglewood, Torrance, Signal Hill and Long Beach are included within the surface boundaries of West Basin. The Pacific Ocean functions as the western and southern boundary of West Basin.

The development of water resources in this area has been the result of both private and public entrepreneurship. The first exploitation of ground water resources in West Basin occurred during the 1880's when hundreds of small farmers pumped water for agricultural purposes. The use of local ground water by individual proprietors as a factor of production for another product has continued up through modern times. In addition to agricultural products, ground water has been used as a factor of production by numerous large oil producers and other industrial concerns. The capture of ground water for use by private concerns who produce non-water services has remained consistently within the structure of the private economy.

As soon as a series of resort towns was established along the ocean front prior to the turn of the century,

enterprises were developed to provide water as a service to others. The production of water for sale to other enterprises involves the construction of extensive works and requires the capacity to gain rights of way across private land. While water can be packaged for sale to those who pay for its use, private entrepreneurs functioning within the normal working rules for private individuals do not have sufficient powers to build an appropriate system. And, once such a system is constructed, individual purchasers on the other side of the market face a natural monopolist who could exert considerable power over the market to be able to set his own bargain. For both of these reasons--the need for extraordinary power to constitute the enterprise and the need for special precautions to preclude the unfair exercise of this power--the organization of water supply agencies has either been extensively regulated by public agencies or public agencies have produced this water and provided it to the citizens within their jurisdictions.

By the 1930's, the total annual production by all water producers located in West Basin regularly began to exceed the annual supply of fresh water to the basin.⁵ Water

⁵ The annual supply of fresh water to West Basin varies greatly depending upon the relative levels of demand made in West Basin, Central Basin and the San Gabriel Valley. The early development of ground water supplies in West Basin increased the annual supply as more water flowed in from Central Basin. The annual supply in the 1910's was around 10,000 acre-feet. This was increased to over 20,000

levels throughout the basin began to fall and, thus, increased the costs of production for all water producers. As water levels along the coast fell below sea level, salt water entered the basin in some areas underlying the coastal communities. The economy of the area continued to expand, especially during World War II, with the result that still larger quantities of water were withdrawn each year. As water levels fell further, salt water entered all along the coast and began to move inland, threatening the rest of the basin.

Ground water production increased from over 52,000 acre-feet in 1941 to over 75,000 acre-feet in 1945; during the same period salt water intrusion also increased from close to 30,000 acre-feet to almost 47,000 acre-feet per year. From 1932 to 1945, a total of 400,000 acre-feet of salt water entered West Basin to replace an equivalent amount of fresh water withdrawn through the years in excess of the annual supply to the basin.⁶ The degree of salt water intrusion was dramatically demonstrated in the mid-1940's as grass in school and park lawns died as a result

acre-feet during the 1930's and close to 30,000 acre-feet during the later 1940's. While the supply of fresh water was increased by heavy pumping, the basin was in an overdraft condition since the actual withdrawal of fresh water exceeded the replenishment.

⁶California, Department of Public Works, Report of the Referee in California Water Service Company v. City of Compton, case No. 50636 in the Superior Court of the State of California in and for the County of Los Angeles, p. 98. Hereinafter referred to as Ref. Rpt. I.

of irrigation by ground water high in chloride content. Persistent salt water intrusion posed a serious threat to continued use of West Basin in a water supply system.

Unfortunately, during the early 1940's, West Basin water producers did not, and could not know the total volume of annual withdrawals from the basin or the extent of natural replenishment. Most water producers were aware that total demand for ground water was far greater than the natural supply. They had evidence of overdraft conditions in their own well records which showed continuously falling water levels, but total demand and supply figures were only available in the 1950's after extensive investigation by a court appointed referee.

Individuals who had access to limited information about overdraft conditions in the early 1940's held positions of responsibility in different independent water supply agencies. Individuals in one agency viewed individuals in other agencies as competitors, and considered minimization of information about the growing evidence of a water supply shortage as the appropriate strategy for dealing with competitors. As long as the individual firm was considered to be the appropriate unit for solving water supply problems, communication among firms was held to a minimum. Water producers engaged in a quiet, competitive race with each other to establish and perfect their individually most advantageous legal claims to water rights

in case someone challenged their right to continue production at expanded rates of withdrawal.

Individuals who considered the single firm no longer an appropriate unit for dealing with water supply problems in the basin had considerable difficulty in discussing mutual problems with other water producers. Acknowledgment by all water producers that a common problem existed, and the establishment of effective channels of communication between water producers were needed before the diseconomies of this competitive situation could be avoided.

If West Basin water producers continued their competitive actions, salt water would eventually degrade fresh water supplies throughout the basin. A ground water basin intruded with salt water is of little, if any, value for use in a water supply system. Properly managed, West Basin had the potentiality of providing a small but regular supply of relatively inexpensive and high quality water, as well as functioning as a storage reservoir and a partial distribution system.⁷ If the problems of how to utilize the basin in some optimal manner could be solved, West Basin is

⁷Demands for water follow an uneven oscillating pattern over hourly, daily, seasonal and cyclical periods. The water demands at the peak hour of the peak day of the peak season may be as much as ten to twenty times greater than the average annual rate of use. Any water system designed to provide water to a variety of customers free to make demands for water whenever they desire, must provide regulation between demand and supply in some manner. Construction of surface reservoirs is one method of introducing regulation into a water supply system. Ground water basins can also provide this function for water suppliers

a natural resource of considerable value. Estimates of the capital cost of replacing the water storage capacities of the basin by surface reservoirs have ranged from \$90,000,000 to \$150,000,000.⁸ The annual wholesale value of the water supply derived from the basin is currently worth about \$1,200,000.⁹

The first steps in reaching public solutions to the common ground water management problems in West Basin were initiated in 1945 with the formation of the West Basin Water Association. The course of public entrepreneurship which followed was built upon the foundation of the West Basin water industry as it existed in 1945. In order to understand the structural foundations with which the public

who utilize them in such a manner as to take advantage of their regulatory capacities. Since water is available wherever a well can be drilled, ground water basins can also save some water users the cost of building a distribution system to transport water from its source to its place of use.

⁸Los Angeles County Flood Control District, Report on Required Facilities for Replenishing and Protecting Ground Water Reserves in the Central and West Coast Ground Water Basins (Los Angeles, '1961), p. 9; and statement by Carl Fossette printed in the Daily Breeze, January 15, 1954.

⁹At the present time Colorado River water is the next alternative source and water supply agencies pay \$30.00 per acre-foot of softened water. Pumping currently costs about \$10.00 per acre-foot in West Basin. Ground water production is about 60,000 acre-feet per year. Total cost of pumping 60,000000 acre-feet is \$600,000 as compared with \$1,800,000 as total cost of purchasing the same quantity of Colorado River water. Future sources of alternative supplies will cost far more than Colorado River water, and thus the relative value of ground water will increase even though water producers may not be able to continue to withdraw as much as 60,000 acre-feet per year.

entrepreneurs had to work in fashioning public solutions to their water problems, the structure of the West Basin water industry as it existed in 1945 will be briefly examined in the following section.

The Structure of the West Basin
Water Industry--1945

The structure of the water industry in West Basin in 1945 was relatively simple even though the number of enterprises involved was large. Most agencies produced ground water for their own use or for sale to other enterprises. One water wholesaler existed which sold limited quantities of surface supplies to three cities located in the basin. Two agencies existed which were concerned with ground water basin replenishment, but their activity only indirectly affected water supply conditions in West Basin.

Water Producers

Enterprises Producing Water for Their Own Use

Ten oil companies.--The oil companies were relative newcomers, most of them moving to West Basin during the 1930's, but by 1945, the ten firms as a group produced about 27,250 acre-feet of water, which was approximately 36 per cent of the total basin production for the year.¹⁰

¹⁰Unless otherwise noted the statistics cited in this section on the structure of the water industry in 1945 can be verified by reference to Ref. Rpt. I, pp. 67-78 or to

Individual oil companies produced from 100 acre-feet to over 6,000 acre-feet during the year. Richfield Oil Corporation, Shell Oil Company, Standard Oil Company and the Texas Company each produced more than 4,000 acre-feet per year.

Even though their water production from the basin was expanding annually, many of these firms had established water conservation programs within their refineries, including facilities for recirculation of fresh water. At Standard Oil and Richfield Oil, in particular, efforts were made to recirculate fresh water wherever practical. It is interesting to note that one of the larger water companies offered to provide water service to Richfield Oil at a price which would have been less than the cost of recirculation. Richfield refused to purchase additional water since the supply would still have been withdrawn from the basin.¹¹ Standard Oil also utilized a large quantity of ocean water in addition to the fresh ground water produced by their wells.¹²

Ways and Means Committee of the West Basin Ground Water Conservation Group, Report(Manhattan Beach, 1945), p. 6.

¹¹Interview with W. C. Farquhar, February 3, 1961.

¹²By 1949, the El Segundo Refinery of Standard Oil was using 100 cubic feet per second of sea water for cooling and washing processes where high quality water was not required. is amounted to about 72,000 acre-feet per year. Ref. R I, p. 110.

Twenty industrial producers.--Individual industrial firms produced from less than one acre-foot in 1945, to more than 1,800 acre-feet. The largest industrial producer was Columbia Steel Company, with General Chemical Company and Johns-Manville Products Corporation following in second and third place. These twenty companies produced a total of approximately 5,500 acre-feet which was 7 per cent of the total production from the basin. The Redondo and Long Beach steam plants of the Southern California Edison Company used large volumes of sea water for cooling purposes in addition to relatively small quantities of fresh water utilized for special processes.¹³

Two hundred and fifty nonindustrial users.--Ground water production by nonindustrial users varied from less than one acre-foot to over 400 acre-feet during 1945. Dominez Estate Company was the largest water producer in this group with the Hollywood Turf Club in second place. Several land development companies, cemeteries, parks, golf courses and schools were among other users in this group. Farmers who used water to irrigate land to grow vegetables for sale in the metropolitan Los Angeles market constituted by far the largest number of users within the

¹³By 1949, Southern California Edison was using sea water equivalent to a continuous flow of 400 cubic feet per second at Redondo for condensers and 1,000 cubic feet per second at Long Beach. This is equivalent to 218,000 and 730,000 acre-feet per year respectively. Ref. Rpt. I, p. 110.

non-industrial group. In 1945, the nonindustrial users produced approximately 8,000 acre-feet, which was about 10 per cent of the total production from the basin. Many of the nonindustrial water producers were completely dependent upon their own wells for a supply of water since over 12,000 acres of land on the coastal plain within West Basin, and close to 8,000 acres of land in Palos Verdes Hills, were not served by any public or private water company. Some of these water producers, who owned land in both West and Central Basin, produced water in Central Basin for use in both basins. Approximately 1,150 acre-feet of ground water produced in Central Basin was imported into West Basin by water users in this group.

Enterprises Producing Water for Sale

Seven cities.--The cities of El Segundo, Manhattan Beach, Hawthorne, Torrance, Inglewood, Las Angeles and Lang Beach organized water departments or water districts to sell water to individuals and firms located within their boundaries.¹⁴ El Segundo, Manhattan Beach and Hawthorne supplied their residents with West Basin ground water only.

¹⁴A large portion of the City of Torrance was served by two Municipal Water Districts and one Municipal Improvement District; however, the rest of the city was served by a County Waterworks District and several private water companies. In 1945, many residents complained about water service and requested the City Council to expand the service areas of the Municipal Water Districts. For a discussion of water problems in Torrance in 1945, see the Torrance Herald, July 19, 1945.

The City of Inglewood produced ground water in both Central and West Basins, and prior to 1943 imported water from Central Basin into West Basin. Long Beach produced most of its ground water in Central Basin for importation into West Basin. Los Angeles imported water from the Owens Valley for use by its residents in West Basin. The cities of Los Angeles, Long Beach and Torrance were members of the Metropolitan Water District of Southern California and provided their residents with imported Colorado River water, as well as ground water supplies.

As shown on Table I, during 1945, these seven cities produced a total of about 12,000 acre-feet of ground water from West Basin, which was approximately 16 per cent of the total production from the basin. During the same

Table I
Source and Quantity of Water Supplied by Municipalities
(in acre-feet)

Municipality	Amount Supplied		Total Water Supplied
	Ground Water	Imported Water	
El Segundo	1,120	--	1,120
Hawthorne	1,906	--	1,906
Inglewood	3,704	--	3,704
Long Beach	1	21,454	21,455
Los Angeles	1,503	27,331	28,834
Manhattan Beach	1,114	--	1,114
Torrance	2,519	36	2,555
Total	11,857	48,831	63,685

period, the cities of Los Angeles, Long Beach and Torrance imported a total of nearly 49,000 acre-feet from Central Basin, Owens Valley and Colorado River sources for use in West Basin.

Two county waterworks districts.--County Waterworks District Number 22 operated a municipal water system serving an unincorporated area located between Hawthorne and El Segundo known as "Liberty Acres." County Waterworks District Number 13 operated a municipal water system serving an unincorporated area near Torrance known as "Lomita" and a portion of the City of Torrance. In 1945, these two districts produced a total of slightly over 1,000 acre-feet of ground water, which was about 1 per cent of the total production from the basin.

Twenty-one private water companies.--Five of these companies provided water to relatively large service areas. Dominguez Water Company had the largest service area in the basin, serving 13,379 acres of land west of Torrance and north of Wilmington, as well as portions of the City of Torrance. California Water Service provided water to the cities of Hermosa Beach and Redondo Beach and surrounding land; Palos Verdes Water Company served parts of the Palos Verdes peninsula; Southern California Water Company served Gardena, Lawndale and surrounding sectors; and the Noneta Mutual Water Company served portions of Torrance and unincorporated land around Torrance. All of these larger

water companies sold only West Basin ground water to residents within their service areas. The ground water production of these five companies in 1945 was:

	<u>Acre-feet</u>
Dominguez Water Company	10,466
Southern California Water Company	4,238
California Water Service	2,777
Moneta Mutual Water Company	1,273
Palos Verdes Water Company	814

The remaining sixteen water companies served areas which varied from ten acres to over 1,200 acres. The ground water production of these smaller private water companies varied from eight acre-feet to approximately 500 acre-feet in 1945. Several of the small private water companies serving the Gardena area produced ground water in Central Basin and imported it for use of residents in their West Basin service areas. The total ground water production from West Basin of the twenty-one private water companies was estimated to be 21,750 acre-feet, which was approximately 30 per cent of the total production from the basin for that year.

Water Wholesalers

Metropolitan Water District of Southern California

In 1928, Los Angeles and eight surrounding cities joined together to develop water rights to Colorado River

water, to transport Colorado River water to Southern California and to sell and deliver this supplementary supply at wholesale to water users located within their boundaries by forming the Metropolitan Water District of Southern California. In 1931, the cities of Long Beach and Torrance voted to annex their territory to Metropolitan. During 1933, Metropolitan began construction of a 242-mile aqueduct to bring water from the Colorado River to its terminal reservoir at Lake Mathews. The first water deliveries were made in 1941.

While Los Angeles, Long Beach and Torrance were the only West Basin cities belonging to Metropolitan in 1945, Metropolitan had considerable interest in West Basin. The West Basin cities that had refused to join Metropolitan during the 1930's argued that they were not in need of a supplemental supply and that membership in Metropolitan was too costly. Land owners resident in member cities paid a substantial ad valorem tax to Metropolitan for the privilege of using Colorado River water, as well as paying higher water rates reflecting the high cost per acre-foot of transporting water from the Colorado River. The original intention of the founding members of Metropolitan was to construct an aqueduct large enough to supply most of Southern California with a surface supply of water. The Colorado River aqueduct was a costly venture. Sales of water were far below their expected level and water revenues fell below

capital and operating costs. Metropolitan needed to extend its boundaries so that other communities, like those in the West Basin area, would help bear the cost of building, maintaining and operating the Colorado River aqueduct through the payment of taxes. Metropolitan had a second reason for its desire to expand. The District had established a preliminary claim to 1,212,000 acre-feet per year of water from the Colorado River. To perfect its claim, Metropolitan needed to establish a long history of use of its full claim.¹⁵ However, in 1945, Metropolitan sold only a little in excess of 32,000 acre-feet, less than 3 per cent of its total claim.¹⁶ For these two reasons, the Board of Directors of Metropolitan had frequently suggested that the entire West Basin area should be included within Metropolitan.

Other Water Service Agencies

Los Angeles County Flood Control District

The Los Angeles County Flood Control District was established by special legislation in 1915, to provide protection and water conservation to most of Los Angeles

¹⁵See Vincent Ostrom, Water and Politics: A Study of Water Policies and Administration in the Development of Los Angeles (Los Angeles: The Haynes Foundation, 1953), pp. 182-83

¹⁶Metropolitan Water District of Southern California, Annual Report 1951-1952 (Los Angeles, 1952), p. 50. Hereinafter cited as MWD, Annual Report (year).

County except Lancaster and Mojave Desert areas. During the first two decades of its existence, the Flood Control District was primarily concerned with the prevention of damage to property caused when the rivers and streams crossing Los Angeles County overflowed their banks and spread out over broad areas.

Actions undertaken by the Flood Control District outside the boundaries of West Basin had indirect consequences on the water supply of the basin. As a part of its flood control program, the District straightened the Los Angeles, San Gabriel and Rio Hondo Rivers and lined large segments of their channels with impervious concrete. In order to offset the reduction in natural percolation caused by lining these channels, the Flood Control District began in the 1930's to construct spreading grounds adjacent to these rivers. The Flood Control District operated two spreading works on the San Gabriel and Rio Hondo Rivers which connected with the aquifers underlying West Basin. From 1937, when the District began to spread flood water, through 1945, a total of approximately 25,000 acre-feet of water were spread at these two locations.¹⁷ No estimate has been made of the net loss to West Basin resulting from the

¹⁷California, Department of Water Resources, Report on Proposed Central and West Basin Water Replenishment District (Sacramento: State Printing Office, 1959), p. 51. Hereinafter cited as Dept. of Water Resources, Proposed Replenishment District.

reduction of natural inflow to the aquifers of the basin from the Los Angeles, Rio Hondo and San Gabriel Rivers. Since 1930, the Flood Control District has maintained an active water quality program throughout its territory. This program involved sampling and analyzing the water from forty shallow wells in the San Gabriel Valley and fourteen shallow wells in Central and West Basin. In the early 1940's, the Flood Control District became aware of the increased chloride content of wells located in Manhattan Beach. The Chief Engineer of the Flood Control District wrote several letters to West Basin producers calling their attention to the possibility of dangerous salt water intrusion. However, the Flood Control District could only investigate and report and could not initiate a program to prevent salt water intrusion.

California Division of Water Resources

The Division of Water Resources of the California Department of Public Works performed an investigational role in gathering and analyzing data for the legislature concerning such matters as water supply in relation to future water requirements, geology and hydrology of ground water basins and water quality problems. In 1930, the Division initiated a study of water problems in the South Coastal Basin including West and Central Basins and the San Gabriel Valley. In 1934, the Division published a bulletin describing the geology and ground rwater storage

capacity of all basins comprising the South Coastal Basin. At this time, the Division pointed out the possibility of salt water intrusion into West Basin, but also inferred that an impervious clay cap protected the basin to some degree.¹⁸ In 1944, the Division issued a short report on West Basin which dramatically illustrated falling water levels and salt water intrusion in West Basin.¹⁹ However, the Division lacked power to intervene in any manner to prevent further damage to the basin and could only report its findings.

The Water Industry and the Basin in 1945

The West Basin water industry in 1945 was primarily concerned with the production and distribution of local ground water for immediate consumption. More than half of the ground water produced in the basin was pumped by enterprises for their own use. The largest single class of users was the petroleum industry. As shown on Table II, the basin provided 60 per cent of the total water demanded

¹⁸California, Department of Public Works, Geology and Ground Water Storage Capacity of Valley Fill, Bulletin No. 45, South Coastal Basin Investigation (Sacramento: State Printing Office, 1934), p. 203. Hereinafter referred to as Dept. of Public Works, Bulletin No. 45.

¹⁹California, Department of Public Works, Division of Water Resources, Underground Water Conditions in West Coast Basin, Southern California (Sacramento: State Printing Office, 1944).

Table II

Total Water Supply of West Basin Enterprises, 1944-1945
(in acre-feet)

Type of Enterprise	Total Water Supplied	Ground Water	Imported Water
Supplied for Own Use:			
Petroleum	27,250	27,250	--
Industrial	5,500	5,500	--
Nonindustrial	9,150	8,000	1,150
Supplied for Sale:			
Cities	61,000	12,000	49,000
County Water Districts	1,000	1,000	--
Private Water Companies	22,250	21,750	500
Total	126,150	75,500	50,650

during the year. Even more significant is the fact that the basin provided all of the water demanded by the majority of water producers in the basin. Most of the demands met by the use of an imported water supply were concentrated in two cities--Los Angeles and Long Beach. The City of Torrance was beginning to use some Colorado River water and would increase its importations greatly in the years to come. Some small private utilities and a few individual farmers, investment companies and a cemetery imported water from wells located in Central Basin, but West Basin was the only source of supply for the rest of the water producers.

Continued use of West Basin as the main source of supply threatened to destroy the potential capability of the basin to function in conjunction with a surface supply. If West Basin water producers continued to mine the basin, they would gain high short-run pay-offs. However, the possibility of a greater long-run pay-off existed if supplementary supplies were developed to satisfy growing base demands for water, and production from West Basin was reduced to an amount that would not destroy its future use for local peaking purposes.

The Course of Public Entrepreneurship--1945-1963

Formation of the West Basin Water Association

In 1945, a group of water producers took a crucial step towards converting the competitive race among the large number of poorly informed and, in some cases, deceptively competitive water producers into some form of cooperative enterprise which could develop and utilize the basin for their joint benefit. The first step was the creation of the West Basin Water Association, a permanent association of all the major water producers extracting water from West Basin. The creation of the association was an acknowledgment on the part of all those who joined that a deficiency in ground water supplies existed which could adversely affect every West Basin pumper. The

association provided the forum in which water producers could discuss their mutual problems, expand their level of knowledge about alternate supplies, and investigate a variety of methods for solving their problems through various forms of cooperative enterprise.

The association from its very beginning was committed to a strategy of cooperation with all existing water agencies. The structure of the water industry as it existed in 1945 was accepted as the beginning point for the creation of additional institutional arrangements to prevent the adverse consequences of uncontrolled competition and to provide joint benefits for all of the producers utilizing the basin. This also meant that the West Basin Water Association was committed to a policy that every water producer should be able to gain a continuing benefit from the basin.

The Provision of an Alternate Supply

Many members of the association considered access to a supplemental source of water an important first step toward halting salt water intrusion. Water producers would not reduce withdrawals from the basin until they could use an alternate supply to fulfill their own needs or those within their service area. Several sources of additional water were potentially available, but membership in the

Metropolitan Water District with access to Colorado River water appeared to be the most feasible from technical, legal and economic considerations. Theoretically, each city in West Basin was eligible to annex to Metropolitan independently, but this was an unsatisfactory solution for both the association and Metropolitan. Creation of a Municipal Water District was a means of including the entire basin within one public entity that could annex to Metropolitan. However, many inland communities opposed the move to create a new district. Political leaders in these inland areas argued that they were not facing a water shortage and should not be forced to pay high property taxes to enable the beach communities to gain a supplemental supply of water.

After an unsuccessful attempt to create a district encompassing the entire basin, the areas most severely affected by salt water intrusion settled for a smaller district which was voted into existence on November 25, 1947. The conflict between the beach communities and the inland areas was resolved within a few years, when the inland communities recognized that they shared a common problem with the rest of the basin. These areas all asked to annex to the West Basin Municipal Water District within two years. The first deliveries of Colorado River water to West Basin were made in 1949.

The Rationing of West Basin Water Supplies

A second modification of the structure of the West Basin water industry was initiated in 1945, but not completed until 1961. This was an effort to use litigation to curtail total production and to apportion the reduced ground water supply among water producers who had historic claims to use this supply. In October, 1945, two private water companies and a city filed a suit in Superior Court against a long list of known water producers in West Basin.²⁰ In 1946, the Court referred the case to the Department of Public Works to serve as Referee in determining the physical facts involved.

The Referee's report, filed in 1952, provided the technical information necessary before any agreement could be reached. The Referee also recommended that production from the basin be curtailed to a "safe yield" of 30,000 acre-feet per year. By 1952, total ground water production had reached 90,000 acre-feet, so this represented a proposed reduction of two-thirds. Most large water producers opposed the proposal. As a result, the association established a legal settlement committee to negotiate a physical settlement that would be agreeable to major water producers. After three years of intensive negotiation, forty-six

²⁰California Water Service Company v. City of Compton, Case No. 500606 in the Superior Court of the State of California in and for the county of Los Angeles.

producers responsible for over 75 per cent of the total ground water production from the basin entered into a voluntary interim agreement to reduce their production by 25 per cent. The Division of Water Resources, Department of Public Works, was appointed by the Court as Watermaster to supervise the operation of the interim agreement.²¹ An integral part of this agreement was an exchange pool which allowed those who had physical and economic difficulties in adjusting to a replacement of ground water with imported water to purchase rights to withdraw ground water in excess of their assigned quota from others who could purchase imported water more easily.

During the first year of the interim agreement, ground water levels through most of the basin increased in elevation from five to ten feet. Since then, ground water levels have remained relatively stable. From 1955 to 1961, the production of those who signed the interim agreement was held constant at less than 60,000 acre-feet per year. Total production from the basin was estimated to range between 64,000 acre-feet and 67,000 acre-feet per year. One major water producer refused to sign the interim agreement and increased production to the harm and consternation of its neighbors.

In August of 1961, sixteen years after the case was

²¹In July, 1956, due to an administrative reorganization, the Department of Water Resources succeeded to the duties and powers of Watermaster.

initiated, the trial court rendered a final judgment on the basis of a stipulated agreement presented to the court by all but one major West Basin water producer. Under the final judgment ninety-nine parties were decreed to have a total adjudicated rights of 64,000 acre-feet. The court retained jurisdiction to order a further curtailment, if necessary, at some future time. Watermaster services were continued to insure adherence to the judgment by all water producers and to inform the court and parties each year concerning ground water elevations, extent of salt water intrusion, total production from and importation to the basin, and any infractions of the judgment. The final judgment was challenged by the one major producer who refused to sign the stipulated agreement and upheld by the District Court of Appeals. The California Supreme Court has denied a motion to review. Since October, 1961, all parties have reduced their production to equal their adjudicated rights under the judgment.

While the West Basin case did not achieve the balance between demand and supply of ground water desired by some, several beneficial results were achieved by the protracted litigation. First, litigation ended the competitive race among water producers by returning total production to the 1942-43 level. Total ground water production from the basin has stabilized at less than 60,00000 acre-feet per year since 1961. Secondly, the question of who should benefit

from the continued use of the basin and who should pay the costs of using an alternate supply were resolved. All major water producers active when the case was initiated were considered eligible for a share of future benefits, as well as a share of the proportionate costs of utilizing alternative supplies. Each producer's share was determined on the basis of the use he had made of the basin between 1944 and 1949. An adjudicated right gave a water producer the right to produce a certain quantity of water each year or to sell or lease his claim to that right.²² If a future curtailment is ordered by the court, each water producer will share the cost of this reduction proportionately.

Third, litigation was successful in slowing down the rate of salt water intrusion. While the salt water front has advanced further into the basin since the curtailment was effected in 1955, the rate of advancement is slower than it was before 1955, or what it would have been without the court enforced curtailment. Annual demand for water in West Basin exceeded 255,000 acre-feet in 1963. To meet that demand, 196,000 acre-feet were imported and 59,000 acre-feet were pumped from the basin. If litigation had

²²How valuable the right is to a water producer depends upon his need for storage to meet peak requirements or his need for water of particularly high quality. Now that rights to water are defined and can be bought and sold in a relatively free market, it is assumed that rights to water will move from uses with relatively low marginal value to uses with higher marginal value. A considerable number of transfers are taking place each year and appear to confirm this hypothesis.

not occurred, a much larger proportion of the current annual demand would be withdrawn from the basin which would have greatly accelerated the inland movement of salt water.

By the 1950's, however, many individuals in West Basin became aware that litigation alone would not solve their problem of salt water intrusion and they began to think about the possibility of additional approaches toward solution. The first two attempts to prevent further salt water intrusion were indirect in that they affected elements of supply and demand in relation to the basin. The third approach was a direct attempt to prevent salt water intrusion itself by building a barrier against the sea.

The Creation of a Barrier Against the Sea

Even to contemplate building a barrier against the sea was an approach that took considerable imagination and courage. West Basin was exposed to the ocean along an eleven-mile western front between Palos Verdes and the Ballona escarpment, and to a lesser degree, along two four-mile southern fronts between Long Beach and Newport Beach. No one knew how or whether a barrier could be constructed. Engineers had made several suggestions. Creation of an underground fresh water ridge to hold back the sea appeared to be both technically feasible and the most economic solution. Individuals in West Basin appealed to the County Flood Control District to undertake a small

scale experiment to ascertain if fresh water injected into a well under pressure would create a fresh water mound beneath the well to prevent salt water from entering the basin at that point. Early experimentation in Manhattan Beach was successful. Individuals in West Basin next appealed to the State to finance a large prototype experiment to establish whether a series of injection wells could prevent salt water intrusion along a one-mile western front. The State appropriated \$750,000 for this project in 1951.

While experimentation proceeded, individuals in West Basin began to search for appropriate institutional facilities that would enable them to construct and maintain a fresh water barrier along the eleven-mile western coast line. None of the existing public or private agencies had an appropriate combination of boundaries, powers or mode of representation. As a temporary measure, the association drafted legislation that would enable West Basin to form a zone of benefit within the Flood Control District roughly to coincide with the basin boundaries. Revenue could be raised within the zone from an ad valorem property tax to finance the maintenance of the one-mile barrier once the experimental phase was completed.

By the end of 1953, the prototype barrier was declared a technical success. Not only did water injected into a series of wells function to hold back the sea, but most of the water entered the basin to help provide an additional

inflow of fresh water. However, the cost of a full barrier would greatly exceed the original expectations of water producers in West Basin. As a result of the experiment, the Flood Control District estimated a cost of \$5,000,000 to construct the series of injection wells and an annual operating cost of \$500,000, not including the cost of water. Water costs would vary from \$312,000 to \$1,040,000 per year depending upon the type of water used in the barrier.

The Search for an Appropriate Management Enterprise

Individuals who wanted to solve the water resource problems of West Basin and to insure the long term use of the basin as a peaking reservoir were in a quandry. They had tried several approaches to solution, but they had not yet forged an adequate set of institutional tools to permit them to insure the continued use of the basin as part of a water supply system. Some important steps had been made. Availability of an alternative surface supply would enable water producers to rely upon Colorado River water for a base supply and to meet peaking requirements from the basin. Litigation would eventually establish the proportionate rights of all water producers to water supplies in the basin, half the pumping race, give the court power to curtail withdrawals from the basin to an amount equal to the annual supply to the basin, and provide the necessary

technical information for an effective management program. The establishment of a barrier against the sea, the technical feasibility of which had been determined, would free water producers from natural constraints resulting from low subsurface inflow and the basin's proximity to the sea.

There were a number of problems yet to be resolved. One of the first was a determination of an appropriate means of financing the construction, operation and maintenance of a barrier. In essence, the question of who would pay for the barrier had to be settled. Many private water companies argued that funds should be raised by an ad valorem tax on the land which had benefited from the availability of reserves of inexpensive ground water in the basin. This would place the burden of paying for the barrier on land owners regardless of their use of water. Many cities argued that the barrier should be paid for by water users in proportion to the amount of water used by placing a tax on the amount of water pumped by each producer. The incidence of cost under this proposal would fall primarily on the large water users. A third alternative was posed by a diverse group who argued that preservation of West Basin was of considerable interest to the State and that the association should attempt to gain State funds to finance the barrier.

A second problem was the determination of the appropriate boundary for seeking to achieve control over

significant events affecting water resources in West Basin and for containing the benefits of remedial actions. Prior to the early 1950's, association members had operated-under the assumption that the boundary of West Basin was the appropriate boundary for any action or assignment of cost. However, West Basin was so related to Central Basin that actions undertaken in either basin often had adverse or beneficial consequences for the other basin. As ground water production increased in Central Basin, the subsurface flow into West Basin decreased, reducing West Basin's fresh water yield. On the other hand, spreading imported water in the forebay areas of Central Basin, where aquifers underlying both basins rose near to the surface, increased the replenishment of West Basin as well as Central Basin. Furthermore, the construction of a barrier not only protected West Basin against salt water intrusion, but it also afforded Central Basin a similar protection in the long run. If West Basin producers paid for the barrier by themselves, Central Basin producers would gain a benefit without sharing the cost. Water producers in both basins were beginning to acknowledge that the two basins were so interrelated that future attempts to solve water resource problems in either basin should be coordinated with action in the other basin. There was also the question of whether the San Gabriel Valley should also be included.²³

²³One of the first steps taken toward increased

A third set of unresolved problems related to the institutional facilities available for undertaking a more ambitious management program. Several existing agencies were quite interested in expanding their powers and duties to include ground water basin management. However, association members feared the control of other agencies, such as the State, the Metropolitan Water District of Southern California, and the Los Angeles Flood Control District over West Basin. Many association members wanted to create a completely new entity which would be independent from existing agencies even though it might cooperate with other agencies to accomplish its functions.

These questions, and many more, were discussed, argued and negotiated in the context of two different committees. The first was a committee of twelve men who held important positions in the water industry throughout Southern California, sponsored by the Conservation Association of Southern California. Two men active in the West Basin Water Association were members of this Committee of Twelve, one of whom served as chairman of the group. This committee

cooperation between the two basins was the establishment of a Central Basin Water Association in 1950. The new association employed as executive secretary the man who had served in this capacity in West Basin since the association's formation there. Since he continued to function in the same capacity in both basins he provided an essential communications link between the two associations. A third related water association was established in San Gabriel in 1956, called the Upper San Gabriel Valley Water Association, and again the same person was employed as executive secretary.

attempted to draft legislation to alleviate many of the problems faced by West Basin and other Southern California ground water basins. One of the most important results of the work of this committee was the drafting of a Ground Water Replenishment District Act which would enable an area like West Basin to create a new public enterprise with adequate financial powers to undertake an extensive ground water basin replenishment and management program. This draft was submitted to and enacted by the California Legislature in 1955.²⁴

The second committee which functioned as a forum for the discussion and negotiation of these unresolved issues was the Water Replenishment District Boundary Committee appointed at first by the West Basin Water Association but soon merged with a similar committee appointed by the Central Basin Water Association. This committee recommended to both associations that a new Water Replenishment District be created including both Central and West Basin to finance a program to replenish ground water supplies in both basins. Based on the recommendation of this committee, the Central and West Basin Water Replenishment District was organized in November, 1959.

²⁴California, Water Code, secs. 60000-60449.

Joint Operation of a Conjunctive Use System

Most of the unresolved problems perplexing individuals interested in developing a ground water basin management program in West Basin were settled in the negotiations which led to the creation of the Central and West Basin Water Replenishment District. The question of appropriate methods to finance the barrier was resolved by relying upon two sources of revenue: the Replenishment District and the zone of benefit within the Flood Control District. The major source of revenue for the Replenishment District is a replenishment assessment or "pump tax" levied on all water production in both basins. This money is utilized by the Replenishment District to purchase water from Metropolitan and from the Los Angeles County Sanitation Districts for spreading in Central Basin and for injection into the barrier in West Basin. Therefore, the cost of water to seal off the sea, to increase the annual supply of ground water and to replenish prior overdrafts is borne by water producers and eventually by the users of that water.

In addition, the zone of benefit within the Flood Control District has been retained as a means of raising additional funds from a \$.05 ad valorem tax used for constructing the full barrier along the west coast. Participants in the negotiation of this settlement felt that land owners in the basin should bear the cost of constructing the barrier since the great increase in West Basin land values

had been made possible by the overdraft of the ground water supplies.²⁵ Serious thought was given to the possibility of appealing to the State for funds to construct the barrier as an emergency measure. In fact, the association employed a professional lobbyist and introduced a bill which would have made State funds available for projects like the West Basin barrier. However, the association lost control of the legislation; and the State Department of Water Resources was given such extensive control over projects using the appropriated money that no one in West Basin attempted to gain funds from this source.

The boundary problem was resolved partially by the creation of a Replenishment District to include both basins and partially by the initiation of two separate but related court actions. At the present time, the Replenishment District operates under the assumption that it can achieve its purposes of replenishment and management by having jurisdiction over the combined territory of West and Central Basins. Within its jurisdiction, the Replenishment District has acted so as to restore subsurface flow from Central Basin into West Basin and to reduce the annual overdraft in Central Basin. This was done by initiating litigation to adjudicate water rights of all water producers

²⁵The Cities of Los Angeles and Long Beach are not included within the boundaries of that zone, since both of these cities have long relied primarily on imported water.

in Central Basin.²⁶ An interim agreement similar to the one used in West Basin was successfully negotiated within nine months after litigation began. Ground water production in Central Basin has been reduced 20 per cent under this agreement. The City of Long Beach initiated the second civil action against water producers in the San Gabriel Valley.²⁷ The effect of this case is to expand the boundaries to include the San Gabriel Valley in decisions affecting the flow of ground water from the San Gabriel Valley to Central and West Basins. Negotiations between parties to this suit appear to be leading toward an agreement whereby the lower basins will be guaranteed a stipulated annual surface and subsurface flow from the San Gabriel Valley regardless of increasing demands for water in the upper basin. The combined effect of creating the Replenishment District and initiating the two law suits will be the regulation of flow from the San Gabriel Valley and the control of the amount of water withdrawn in both Central and West Basins. It is expected that the San Gabriel Valley water producers will adjudicate water rights as among themselves some time in the near future which will

²⁶Central and West Basin Water Replenishment District V. Charles E. Adams, et al., Case No. 7bb,656 in the Superior Court of the State of California in and for the County of Los Angeles.

²⁷City of Long Beach v. San Gabriel Water Company, Case No. 722,647 in the Superior Court of the State of California in and for the County of Los Angeles.

mean that relative water rights of all water producers along the entire water system will be determined and controlled.

The resolution of problems related to the provision of appropriate institutional facilities to undertake a ground water basin management program was accomplished by adding a new public agency, the Central and West Basin Water Replenishment District, to the already existing structure of agencies involved in water resource problems affecting West Basin. The new district has come to play a central role in an evolving management system dependent upon the joint operation of a number of diverse public and private water agencies. The Replenishment District has extensive powers of its own, but it is also authorized to act jointly with or cooperate with any public or private agency which can help it to accomplish its purposes economically. The fact that the Replenishment District has extensive powers to accomplish the task of replenishing Central and West basins gives it strong bargaining power in negotiations with other districts which are interested in providing certain goods and services essential to the accomplishment of an effective management program.

As a result of the efforts of West Basin water producers to avoid the costs of salt water intrusion, to gain supplementary supplies of water, to ration their production of ground water, to replenish ground water supplies and

generally to seek common solutions to common problems, a whole new superstructure has been added to the West Basin water industry. Extensive interagency negotiation has produced a management system which involves the services of the Central and West Basin Replenishment District, the Los Angeles County Flood Control District, the Metropolitan Water District, the Regional Water Pollution Control Board, the Los Angeles County Sanitation Districts, the State Department of Water Resources, a private engineering firm, several attorneys and the West Basin Water Association. The new structural configuration of the West Basin water industry can best be indicated by a recapitulation of the structure of the water industry in 1963.

The Structure of the West Basin Water
Industry--1963

The number of enterprises involved in the West Basin water industry in 1963 is much smaller than in 1945 even though the structure is much more complex. The decrease in numerical size is largely the result of consolidation of enterprises which produce water for sale to others and the elimination of a large number of agricultural producers. Only seventy-seven enterprises remain out of the 310 enterprises that formally constituted the basic structure of the West Basin water industry.

Water Producers

Enterprises Producing Water for Their Own Use

Nine oil companies.-- While the same ten oil companies that produced water for their own use in 1945 have all continued in business, one of them, Tidewater Oil Company, has discontinued water production entirely, even though it has an adjudicated right to 167 acre-feet per year.²⁸ A second firm, Superior Oil, produced only one and one-third acre-feet of water even though this company possessed an adjudicated right to twenty-six acre-feet. Six of the remaining water producers withdrew in excess of 2,500 acre-feet each and Richfield Oil produced over 5,000 acre-feet. Total production for the group in 1963 was approximately 21,000 acre-feet. While the total production for this group has dropped 6,000 acre-feet since 1945, the oil companies have retained the same proportionate share (36 per cent) of the total yield of the basin that they possessed in 1945.

However, total demand for water by the oil companies has increased considerably since 1945. Water purchased from neighboring public or private utilities has made up

²⁸California, Department of Water Resources, Report of the Watermaster Service in the West Basin, Los Angeles County, for period October 1, 1962 thru September 30, 1963 (Sacramento: Government Printing Office, 1963), p. 24. Hereinafter cited as Watermaster, Report for _____ to _____. unless otherwise noted, statistics presented in this section on the structure of the water industry in 1963 come from this Watermaster Report.

the difference between ground water production allowed under the court order and the demand for water by these companies. As a group the oil concerns purchased 47 per cent of their total supply of fresh water during 1963. In other words, most of the oil companies were able to meet at least 50 per cent of their fresh water requirements by their own production. The one major exception is Standard Oil, which purchased 72 per cent of its fresh water from the City of El Segundo. Standard Oil has adjudicated rights to 4,601 acre-feet per year, but the company has followed the strategy of producing only about one half of its adjudicated rights each year in order to slow down the encroachment of salt water on its well fields located close to the advancing saline water. When the fresh water barrier is completed to the ocean side of Standard Oil's water well field, Standard Oil plans again to produce its full 4,601 acre-feet of ground water per year and reduce the quantity of fresh water purchased from the City of El Segundo. Standard Oil continues to use vast quantities of ocean water. During 1963, Standard Oil consumed about eight times as much sea water as its total use of fresh water.

Most of the oil companies have introduced extensive facilities to conserve and reuse ground water. The quality of Metropolitan water is inferior to that of local ground water. For some specialized processes, Metropolitan water

has to be given an expensive purification treatment prior to its use. As a result, the oil companies have been very concerned about the preservation of the basin as a source of a high quality water for specialized industrial processes.

Ten industrial producers.--While twelve industrial concerns possess adjudicated rights, only nine of these continue to be active producers. One industrial producer, a paper stock company, has no adjudicated rights, but produced two and one-half acre-feet of ground water during 1963. Individual production ranges from less than one acre-foot to nearly 900 acre-feet. U. S. Steel Company, Johns-Manville and Stauffer Chemical were the three largest ground water producers in this group during 1963. The industrial concerns as a group produced a total of 3,024 acre-feet, which constituted 5 per cent of the total production from the basin.

Water purchased from public or private water agencies composed only one third of the total supply used by the industrial producers. Two sand and gravel concerns produced all of their water from the basin. In fact, both of these firms produced a greater quantity of ground water than their adjudicated rights by purchasing exchange water through the exchange pool administered by the Watermaster Service. U. S. Steel was able to produce 90 per cent of its supply from the basin, Johns-Manville produced 69 per

per cent, and Staufferer Chemical produced 50 per cent of its total fresh water supply from West Basin.

Forty-three nonindustrial Producers.--A total of fifty-eight nonindustrial enterprises possess adjudicated rights to water in West Basin; but of this number, only twenty-seven produced a total of 1,802 acre-feet during 1963. This represented about 5 per cent of the total ground water production from the basin. In addition, sixteen enterprises without adjudicated rights withdrew 373 acre-feet from the basin during the same period. Only one of these sixteen producers without rights purchased exchange water to cover his production of ground water. The largest producer in the nonindustrial group is Los Angeles County, which produced 443 acre-feet to irrigate a county park. The Hollywood Turf Club and the Dominguez Estate Company were the second and third largest ground water producers in this group. Fifteen of these producers withdrew less than ten acre-feet.

Most of the nonindustrial producers are farmers who are primarily dependent upon the basin for a source of relatively inexpensive water to irrigate truck farms. There are also several nurseries included within the group. Twenty-one of these producers do not purchase any water supplies from public or private water agencies except for their domestic consumption. The other producers in this group purchased a total of 1,314 acre-feet from public

and private water agencies serving their localities, which represented 58 per cent of their total supply. Seven enterprises, including three schools and four private individuals, possess adjudicated rights but did not produce any ground water and purchased a total of 356 acre-feet from public or private water agencies.

Enterprises Producing Water for Sale

Seven cities.--Since 1945 there has been no change in the number of cities which maintain municipal water departments or municipal water districts to sell water to individuals and firms located within their boundaries.²⁹ As shown on Table III, the cities as a group produced a total of 12,727 acre-feet which represented 21 per cent of the total production from the basin. The cities as a group are currently producing about 600 acre-feet more than they were in 1945. Their proportionate share of the basin yield has increased from 16 per cent to 21 per cent.

The demand for water in the seven cities providing water to their residents has doubled since 1945. Water to meet this increase in demand has been provided by imported supplies. Most of the 110,000 acre-feet currently imported

²⁹One Municipal Water District now serves almost the entire area included within the boundaries of the City of Torrance. Several private water companies have been purchased by the city in order to consolidate its water system and to provide more efficient service to an expanding urban area. One County Waterworks District still serves a small portion of the City of Torrance, as well as surrounding unincorporated territory.

Table III
 Source and Quantity of Water Supplied by Municipalities
 1963
 (in acre-feet)

Municipality	Amount of		Percentage of Imported Water	Total Water Supplied
	Ground Water Produced	Imported Water		
El Segundo	514	11,358	94	11,872
Hawthorne	1,928	2,942	60	4,879
Inglewood	4,308	6,968	62	11,276
Long beach	0	26,764	100	26,764
Los Angeles	1,658	42,330	96	43,988
Manhattan Beach	1,075	4,240	77	5,315
Torrance	3,244	15,316	82	18,560
Total	12,727	109,918	90	122,645

by these cities was purchased from the Metropolitan Water District through the West Basin Municipal Water District. However, the City of Los Angeles also imported water from its Owens Valley aqueduct and the City of Long Beach imported some ground water from Central Basin to meet demands in West Basin.

Two county waterworks districts.--These two districts still operate municipal water systems in the same locations near El Segundo and Torrance. The current ground water production of these two districts is approximately 1,000 acre-feet per year. During 1963, they sold the right to pump 400 acre-feet of water to the County of Los Angeles for park maintenance through an exchange pool arrangement between the two County Waterworks Districts and the County of Los Angeles, approved but not administered by the Watermaster.

Six private water companies.--Four of the five relatively large water companies remain as active producers in West Basin. California Water Service Company, Dominguez Water Corporation, Palos Verdes Water Company and Southern California Water Company serve areas somewhat enlarged beyond the service areas that they served in 1945. Moneta Mutual Water Company continued in operation until early 1963, when the City of Torrance won an action condemning the real property of this company; and the water distribution system and water rights of Moneta Mutual were

transferred to the City of Torrance. Only two of the smaller companies which previously served West Basin remain as water producers. Belvidere Mutual Water Company is a very small company serving a section of land located between Hermosa Beach and Gardena. The Park Water Company is a somewhat larger enterprise serving an area just west of Gardena. As shown in Table IV, these six companies produced a total of 19,111 acre-feet during 1963. This represented a drop in their total production of over 2,500 acre-feet, compared with 1945, but a slight rise of 2 per cent in their proportionate share of the total yield of the basin.

The total demand for water in areas served by the private water companies has tripled since 1945, and approximately 73 per cent of the water supplied by these firms was imported Colorado River water purchased through the West Basin Municipal Water District. The Park Water Company remains totally dependent upon the basin for its supply of water and has met its growing demand by the purchase of exchange water beyond the limit of its adjudicated rights.

New Water Production and Reclamation Agencies

California Department of Water Resources.--Eventually, the California Department of Water Resources will be the largest water producer providing water for use in Southern California. As the initial unit of the California Water Plan, the Department plans to build a 444-mile aqueduct

Table IV
Source and Quantity of Water Supplied by Private Water Companies during 1963
(in acre-feet)

Water Company	Amount of		Percentage of Imported Water	Total Water Supplied
	Ground Water Produced	Imported Water		
Belvidere Mutual Water Company	41	44	50	85
California Water Service Company	2,992	8,459	74	11,451
Dominguez Water Company	8,925	22,225	71	31,150
Palos Verdes Water Company	606	7,910	93	8,516
Park Water Company	304	0	0	304
Southern California Water Company	6,243	18,075	73	24,318
Total	19,101	56,713	73	75,824

to bring water from the Sacramento-San Joaquin Delta region to Southern California. As plans are currently formulated, some water will be delivered at the southern terminus of this aqueduct during 1972. West Basin water users will gain indirect access to Delta water through membership in Metropolitan, which has signed a contract with the State to purchase 1,500,000 acre-feet per year.

In connection with the California Water Plan, the State has exhibited considerable interest in West Basin and other ground water basins located in Southern California. The three surface reservoirs planned as part of the proposed aqueduct system have limited capacities and will not be able to fulfill peaking requirements in Southern California. State officials have made repeated references in official documents and public addresses to the need to use Southern California ground water basins to store water to meet seasonal and cyclical peaking demands in the area. Some of these statements have implied that the State might find it necessary to manage these basins directly if the local users cannot manage them for voluntary conjunctive operation with the State aqueduct system.

Los Angeles County Sanitation Districts.--The Los Angeles County Sanitation Districts have considered entering the market as a water producer since the mid-1930's.³⁰

³⁰While there are 25 Los Angeles County Sanitation Districts located within Los Angeles County, these Districts function largely as one unit since they share engineering

County Sanitation Districts engineers have established that a large portion of the sewage water wasting to the sea from Los Angeles County is of a quality that is amenable to relatively inexpensive reclamation for reuse. On the basis of a four-way contract, the Sanitation Districts built a reclamation plant at Whittier Narrows which was put into operation in July of 1962. The plant was designed to produce between 10,000 and 13,000 acre-feet of reclaimed water per year, using the activated sludge process, which can be used for spreading at the Montebello forebay to replenish Central and West Basins. Under the terms of the contract each of the four public agencies involved undertook the following obligations:

1. The County of Los Angeles loaned \$1,000,000 from reserve funds to finance the construction of the plant. The County will be repaid from the revenue received by the Sanitation Districts. It is estimated that the plant will be paid for in thirty years.
2. The County Sanitation Districts built and will operate the plant.
3. The Flood Control District is responsible for

and administrative personnel. Los Angeles County Sanitation District No. 2 acts as the central office for the other Districts and negotiations are carried on by sanitation engineers working out of this office. See Winston Crouch, et al., Sanitation and Health, Vol. VI of Metro-Dolltan Los Angeles: A Study in Integration (Los Angeles: The Haynes Foundation, 1952).

transporting water from the plant and spreading the reclaimed water at Montebello Forebay.

4. The Central and West Basin Water Replenishment District agreed to pay \$12.75 per acre-foot for all reclaimed water produced at the plant until July 1, 1964. Thereafter, the Replenishment District agreed to pay the Sanitation Districts the rate charged by Metropolitan for untreated water sold for replenishment purposes. On July 1, 1964, this rate was \$15.25 an acre-foot.³¹

The County Sanitation Districts are interested in expanding the capacity of the Whittier Narrows Reclamation Plant and in constructing several other plants at locations in Central and West Basins. Representatives from the Sanitation Districts and the Replenishment District have discussed the type of contractual arrangements that would be necessary to expand the production of reclaimed water for use in the replenishment program. So far, the Replenishment District has moved cautiously.

The City of Los Angeles

The City of Los Angeles should be considered as a potential supplier of reclaimed water from its Hyperion Treatment Plant located at Playa del Rey in West Basin.

³¹Contract between County of Los Angeles, County Sanitation District No. 2, Los Angeles County Flood Control District and Central and West Basin Water Replenishment District, signed February 1, 1961.

The current plant was constructed by Los Angeles after surrounding communities obtained a court order requiring Los Angeles to end contamination of the Santa Monica Bay beaches by constructing a treatment plant and discharging treated effluent through a submarine outfall. The Hyperion Plant was placed into operation in 1950. In 1955, an expansion program was funded to enable the plant to handle the increased flows from the City's North, Central and North-Central outfall sewers. At the present time, the plant discharges from its one-mile long outfall 100 million gallons per day of secondary effluent which has received the full activated sludge treatment. An even greater quantity of primary effluent is discharged five miles out to sea.³²

Since early in 1951, active consideration has been given to the possibility of using the secondary effluent produced at Hyperion for replenishment purposes. In 1951, the Los Angeles City Engineer estimated that it would cost between \$3.50 and \$5.00 per acre-foot to spread Hyperion water on two potential spreading sites located in West Basin.³³ Early plans for the barrier were based on the

³²Los Angeles, Department of Public Works, Bureau of Sanitation, Hyperion Treatment Plant (Los Angeles: 1958) and interview with George Callahan, Sanitation Engineer, Hyperion Treatment Plant, on October 25, 1960.

³³Letter from Lloyd Aldrich, City Engineer, to the Board of Public Works of the City of Los Angeles, February 9, 1951.

assumption that Hyperion water would be available at a cost of \$6.00 per acre-foot. The Los Angeles County Flood Control District has performed several tests using Hyperion water and has found it satisfactory for injection into the barrier after additional filtration.

However, after extensive negotiation and testing through the years, the City of Los Angeles has not yet officially approved the idea of selling rHyperion water for use by others. At the present time, consideration of whether Hyperion water should be sold has been assigned to a committee appointed by the Mayor of Los Angeles. The committee has met infrequently in the three years since its creation. Individuals in West Basin are still hopeful that they will eventually be able to purchase Hyperion water, as this would greatly reduce the total operating costs of the west coast barrier.

Water Wholesalers

The Metropolitan Water District of Southern California

The Metropolitan Water District of Southern California continues as the largest wholesaler of water in Southern California. A total of 113 cities and many large tracts of unincorporated land are included within the boundaries of the District, which now comprises an area in excess of 4,000 square miles. While Metropolitan has held monopoly control over water from the Colorado River within its

territory, the Colorado Aqueduct has not been successful as a revenue-producing venture.³⁴ Accumulated operating losses exceed \$125 million.³⁵ Operating losses are offset each year by taxes levied on residents within Metropolitan territory. Since 1928, total tax revenue has comprised four times as much income to Metropolitan as water sales. During 1962, Metropolitan collected in excess of \$28 million from taxes as compared with \$16.5 million in water sales revenue.

Metropolitan's water sales have increased considerably since 1945, but do not yet constitute the full Metropolitan claim of entitlement to the Colorado River of 1,212,000 acre-feet per year. Metropolitan's claim to water from the Colorado River is fourth in priority after three agricultural agencies which have a total claim to 3,850,000 acre-feet per year. In order for Metropolitan to divert its full claim, there must be 5,062,000 acre-feet of main stream water available to California from the lower basin of the Colorado River. The Supreme Court, in Arizona v. California, allocated a total of 4,400,000 acre-feet to California and instructed the Secretary of the Interior

³⁴For a discussion of the history of economic problems of the Metropolitan Water District, see Jerome W. Milliman, "Economic Problems of the Metropolitan Water District of Southern California," Proceedings of the Thirty-Second Annual Conference of the Western Economic Association, Salt Lake City, Utah, August, 1957.

³⁵All statistics in this section on Metropolitan and the following section on the West Basin Municipal Water District are derived from the MWD, Annual Report, 1961-62, except where otherwise noted.

to devise a formula for allocating shortages of water if the yield of the Colorado River falls below the full allocation.³⁶ As a result of a series of dry years and the construction of the Glen Canyon Dam, the supply to the lower basin may fall below the full allotment during 1964. The possibility of shortage will increase as more projects are constructed in the future. It is paradoxical that at a time when water sales are finally approaching its full claim, that Metropolitan is faced with the prospect of operating an aqueduct at low capacity and purchasing water from the State to make up the deficits.

Representatives of Metropolitan and of the State Department of Water Resources have been meeting at regular intervals to work out plans for the delivery of northern water within Metropolitan territory. Water will be delivered by the State beginning in 1972 to a terminus at Castaic Reservoir near Newhall in Los Angeles County. Metropolitan will have the responsibility for constructing distribution lines within its own territory to transport this water to its constituent members. The chairman of Metropolitan's board of directors has estimated that a \$600 million bond issue will be required by Metropolitan to cover its added construction costs for distribution

³⁶Arizona v. California, 373 U.S. 546 (1963).

facilities.³⁷ In addition, under its contract with the State, Metropolitan is obligated to pay approximately 75 per cent of the construction costs of the California Aqueduct. Most of its financial responsibilities to the State will begin with water deliveries in 1972, but as a first payment, Metropolitan delivered a check in excess of \$1.3 million to the State in December, 1963. The annual payments by Metropolitan to the State will reach an estimated maximum of about \$69 million per year in 1991.³⁸

West Basin Municipal Water District

The West Basin Municipal Water District performs two functions in the West Basin water industry. The primary function is as a re-wholesaler of Metropolitan water. Seven cities and four private water companies have service connections to the major Metropolitan feeders in West Basin. These enterprises pay to the West Basin Municipal Water District an amount equivalent to the water rate established by Metropolitan plus a \$.50 service charge per acre-foot to cover administrative expense. In this way, the cost of the West Basin Municipal Water District is borne directly by the users of Colorado River water.³⁹ The Flood Control

³⁷Speech by Joseph Jenson before the West Basin Water Association, Minutes, August 22, 1963, p. 8.

³⁸Metropolitan Water District of Southern California, Colorado River Aqueduct News, XXX (November-December, 1963), 2.

³⁹The District does have the power to levy ad valorem

District also has a connection to Metropolitan's feeders in order to obtain softened water for use in the barrier. The Municipal Water District bills the Replenishment District for water used by the Flood Control District for injection in the west coast barrier.

The functions of the West Basin Municipal Water District as a re-wholesaler are performed largely in an administrative sense rather than a physical sense. Record keeping responsibilities occupy much of the time of the three part-time employees of the District. Metropolitan constructed the Palos Verdes Feeder, the West Basin Feeder and the West Coast Feeder, the major distribution lines serving West Basin, largely at its own expense. Smaller feeder lines have been constructed by Metropolitan, but paid for by the service area to be supplied from the line. Service connections have also been constructed by Metropolitan and paid for by the enterprise desiring a direct service connection. Public and private water supply agencies are individually responsible for building smaller distribution lines from their Metropolitan connections to water users within their service areas. As a result, the Municipal Water District has not constructed and does not own any of the distribution lines in West Basin.

taxes but it has only used this power during its first year in operation in order to provide revenue to meet the unusually large administrative expenses involved in setting up a new public district.

The second function performed by the West Basin Municipal Water District is to represent the interests of water users in West Basin on the Metropolitan Board of Directors. Each member agency of Metropolitan is entitled to have at least one representative for each \$750,000,000 of assessed valuation within the member-agency. The member-agency is entitled to cast one vote for each \$10,000,000 of assessed valuation of property taxes by Metropolitan in the member-district. The directors from each member-agency cast votes to which their agency is entitled as a unit on the basis of a majority vote among those directors present.⁴⁰ West Basin Municipal Water District is entitled to cast 160 votes, which is approximately 9 per cent of the total vote entitlement for all members of Metropolitan. Four representatives are sent by the District to sit on the Metropolitan Board of Directors. In addition to the votes cast by directors representing West Basin Municipal Water District, the City of Torrance possesses twenty-five votes and the City of Long Beach possesses sixty-three votes.⁴¹

Land owners residing within West Basin Municipal Water District pay taxes directly to Metropolitan to offset its operating losses and to retire bonded indebtedness on

⁴⁰California, Statutes. 1963, ch. 1778, sec. 1, p. 3557.

⁴¹The 542 votes of the City of Los Angeles cannot be considered as possible votes for proposals made by the West Basin Municipal Water District.

construction costs. Since annexation to Metropolitan, West Basin Municipal Water District taxpayers have paid a total of \$27.6 million in taxes to Metropolitan. This has amounted to a \$55 per acre-foot subsidy for water users. The West Basin Municipal Water District could choose to pay all or part of the amount of Metropolitan taxes directly to Metropolitan in lieu of levying these taxes on West Basin land owners. In 1962, the total tax levied by Metropolitan on the West Basin District was in excess of \$3.3 million. If the Municipal Water District had chosen to pay directly to Metropolitan in lieu of the tax assessed on land owners, water rates would have been increased by \$44 an acre-foot during 1962 to raise the necessary funds from water users.

Agencies Concerned with Ground Water
Basin Management

Los Angeles County Flood Control District

The Los Angeles County Flood Control District is charged with the dual responsibility of flood control and conservation of flood and waste waters. The Flood Control District has been able to take an active part in the attempt to work out an effective ground water basin management formula, but it has not possessed either the appropriate boundary or an adequate range of powers to undertake a basic management program itself. Among the limitations imposed on the range of actions that the Flood Control District could undertake was its lack of power to use its

general revenue fund to purchase water for conservation. The water used in its early fresh water injection experiments was provided free of charge to the District. The State funded the large prototype experiment which resulted in the creation of a one-mile barrier against the sea.

In 1951, the Los Angeles County Flood Control Act was amended to enable the County Board of Supervisors to establish zones within the Flood Control District from time to time for the purpose of ". . . financing the acquisition of imported or reclaimed water . . .,"⁴² The creation of zones of benefit for levying special taxes within the Flood Control District expanded the capabilities of the Flood Control District to undertake a larger program of ground water basin replenishment as a part of its water conservation program. Once the zones of benefit were created to purchase water, the Flood Control District was empowered to spend money from its general revenue fund for the purpose of conserving water so acquired.

Zone I was created in Central Basin in 1951 and has provided enough revenue to purchase a total of 526,300 acre-feet of raw Colorado River water to be spread by the District at the Montebello Forebay. Zone II, established in West Basin in 1952, has provided enough revenue to purchase a total of 26,600 acre-feet of treated Colorado River

⁴²California, Statutes, 1951, ch. 971, sec. 1, p. 2592.

water to be injected in the one-mile barrier along the west coast.⁴³

However, until the Replenishment District was created, the Flood Control District could not invest a very large portion of its general fund in the construction of additional injection wells to complete the barrier. Since zones of benefit are not permanent institutional arrangements, there was no means to guarantee the Flood Control District that sufficient funds would be available to purchase the water needed to supply the barrier. In 1960, the Flood Control District and the Replenishment District were able to negotiate an agreement as to their future joint responsibilities in replenishment and conservation measures.

Since 1961, the Replenishment District has provided the funds needed to purchase all water injected or spread by the Flood Control District in either West of Central Basin. Funds collected from Zones I and II ad valorem taxes and a proportionate share of the Flood Control District's general fund have been set aside in a construction fund for future barrier construction. Design plans and specifications for the west coast barrier are complete, several contracts have been awarded and the initial construction of the extended barrier is in process. In addition, the Flood Control District plans to construct two

⁴³Central and West Basin Water Replenishment District, Annual Survey Report for 1963 (Downey, California: 1963), p. 13.

additional barriers along the southern exposure of West Basin.

California Department of Water Resources

The Southern District of the California Department of Water Resources plays a variety of roles in the evolving management system in West Basin. One of the most important functions performed by the Department is that of Watermaster. As Watermaster, the Department performs the essential service of enforcing the 1961 judgment in the West Basin case and the 1962 interim agreement negotiated in the Central Basin. The Watermaster insures that each water producer under its jurisdiction withdraws only the agreed quantity of water each year. The Watermaster also administers an exchange pool which enables water producers who have difficulties using imported water to purchase the right to pump more ground water than their agreed allocation from others who give up equivalent rights to pump and substitute imported water for ground water.

The Watermaster maintains a small crew of men in the field to spot check the accuracy of production reports submitted by pumpers to the Replenishment District and supplied by that District to the Department of Water Resources. The field crew also calibrates water meters, checks the water levels in key wells and attempts to ascertain the status of salt water intrusion at various times of the year. At the end of each water year, the Watermaster submits a

report to the court and to all parties in the West Basin litigation. The information collected and published in this report is the major source of current technical information about the basin and is a valuable document to all other agencies which are interested in evaluating the effect of their regulatory actions upon the basin. In this annual report, the Watermaster also lists any infractions of the West Basin judgment or the Central Basin agreement and recommends what it considers to be appropriate actions to the court. Though it does not have formal sanctions of its own, the power to publish its findings and to recommend sanctions to the court appears to have enabled the Watermaster to keep the number of infractions to a minimum.

The Department of Water Resources is also charged with the responsibility for investigating water quality conditions throughout California. In this role, the Department cannot be considered as an active party of the management system affecting West Basin, but its studies in the past have provided important information about water quality problems for the agencies which have taken a more direct role in decisions affecting West Basin. The Department lacks specific regulatory powers in relation to quality control, but can formulate recommendations to be submitted to the State Legislature, and has performed investigations for the Regional Water Pollution Control Board. At the present time, the Department of Water

Resources is collecting carbon filter samples of ground water above and below Whittier Narrows to evaluate possible changes in water quality due to the spreading of reclaimed water from the Whittier Narrows Plants.

In 1959, the State Legislature approved a special appropriation for the Department of Water Resources to undertake a study of the planned utilization of ground water basins in Southern California. A group of geologists, hydrologists and economists, within the Department, has attempted to use computers to simulate ground water basins in order to devise an ideal management plan that could be used when Delta water is available. The first area to be studied was the southwest portion of Los Angeles County, including both Central and West Basins. The Department has published several preliminary reports which summarize the early results of this study.⁴⁴

Regional Water Pollution Control Board No.4

The Regional Water Pollution Control Board No. 4 was created by the Legislature in 1949 to establish the minimum standards for the control of water quality conditions in the coastal basins of Los Angeles and Ventura Counties. The Los Angeles board, like the eight other regional boards

⁴⁴California, Department of Water Resources, Planned Utilization of the Ground Water Basins of the Coastal Plain Of Los Angeles County, Appendix B, Safe Yield Determinations, Bulletin No. 104(Sacramento: State Printing Office, 1962). Hereinafter cited as Dept. of Water Resources, Bulletin No. 104, Appendix B.

throughout the State, is composed of seven members appointed by the Governor and representing the following groups within the region: waste-producing industry, water supply industry, irrigated agriculture, county government, municipal government, recreation, and one member-at-large. Regional Pollution Control Board No. 4 must approve and issue permits for all methods of large-scale waste disposal. The existence of the board protects the ground water supplies in West Basin from pollution that could be caused from some methods for discharging industrial waste or by the construction of dump sites in contact with the water table.

While the board is not frequently an active participant in decisions affecting the management of West Basin, it does have to approve any plan to use reclaimed water for injection or spreading. The board has set the minimum quality standards that have to be fulfilled before reclaimed water from the Whittier Narrows Plant can be spread on the Montebello Forebay. In order to meet these standards, the Replenishment District has had, upon occasion, to mix reclaimed water with raw Metropolitan water to dilute prior to spreading.

California State Water Quality Control Board

While the regional board has initial responsibility for pollution control in West Basin, the State Water Quality Control Board can intervene if in its judgment the regional board has failed to take adequate action to correct water

pollution problems found in the local area. The State board is normally responsible for setting statewide criteria and policies for control of water pollution and for conducting an extensive research program in problems of water quality control, including several studies on the utilization of reclaimed sewage water. The State board has issued a number of technical reports which are of direct interest to West Basin. It is currently sponsoring several studies that concern the control of detergents and viruses in the use of reclaimed waste water.

Metropolitan Water District of Southern California

In addition to its role as the major wholesaler of water for consumptive use, the Metropolitan Water District has also been an active participant in decisions affecting the management of West Basin. Metropolitan's interest in ground water basin management has largely developed as a result of the relatively low demand for its treated water, and its desire to perfect its claim to Colorado River water by actual use of its full entitlement. Metropolitan has hoped to make greater use of its Colorado River aqueduct by encouraging local areas to purchase large quantities of untreated water to replenish the ground water basins. In an abortive attempt to enter the replenishment field directly, Metropolitan introduced a bill in the State Legislature in the early 1950's which would have given it the power to create special replenishment districts within its

boundaries. This proposed legislation was defeated by local areas which were opposed to Metropolitan's assuming ever greater control over their water supplies. Since 1952, Metropolitan has arranged with the Flood Control District to make large quantities of raw Colorado River water available for spreading at the Montebello Forebay. Since 1955, Metropolitan has also established a price differential between water used for municipal purposes and water used for replenishment purposes.

Metropolitan has participated in all major negotiations concerning the barrier projects and the expansion of the spreading program in Central Basin. As part of its agreement with the Replenishment District and the Flood Control District, Metropolitan constructed, with its own funds, a \$9.2 million west coast feeder which would deliver enough water to supply a completed barrier along the eleven-mile front. Since the completion of this feeder in 1961, Metropolitan has urged the other agencies to speed up their programs in order to make fuller use of the supplementary supply provided by Metropolitan. Since 1960, representatives from Metropolitan and from the Replenishment District have frequently met to work out operational details of the current replenishment program, to plan the future program by estimating future demand patterns in major feeders, and to set the price of water to be charged for replenishment purposes. Formalization of agreements

between Metropolitan and the Replenishment District have taken the form of resolutions passed separately by the Board of Directors of each of the districts. These agreements are also supported by formal contracts between the Central Basin Municipal Water District or the West Basin Municipal Water District acting as a re-wholesaling agency for Metropolitan, the Replenishment District as the purchaser and the Flood Control District as the recipient of the water to be spread in the Montebello Forebay for the benefit of the Replenishment District.

The Central and West Basin
Water Replenishment District

The Central and West Basin Water Replenishment District was established late in 1959 to accomplish three major purposes for the Central and West Basin water producers who sponsored its creation. First, the Replenishment District was expected to establish a balance between the supply and demand for ground water in the basins by reducing the legitimate demands that could be made and by artificially increasing the supply. Secondly, the new District was formed to eliminate the threat of salt water to both basins by financing the injection of fresh water into barriers to be constructed along their western and southern exposures. Third, the District was supposed to attempt to replace some of the water which had been withdrawn in excess of natural replenishment in the past.

In the pursuit of these objectives, the Replenishment District has entered into a wide variety of contractual arrangements with other agencies to put its plans into operation rather than creating an internal organization which could perform the services itself.⁴⁵ The District has collected over \$6 million in replenishment assessments levied on ground water producers within its boundaries. These funds have been used to purchase a total of 450,000 acre-feet of water from Metropolitan through the Central Basin Municipal Water District and the West Basin Municipal Water District and from the Los Angeles County Sanitation Districts. The Replenishment District has not constructed its own conservation works, but instead has contracted with the Flood Control District to build and operate the necessary works associated with the barriers and spreading grounds.

The reliance upon market-like contractual transactions pervades all aspects of District organization, even to the employment of full-time personnel. The District has employed only one full-time employee--a secretary-bookkeeper. The position of general manager is held on a part-time basis by the man who functions as the executive secretary of the West Basin and Central Basin water associations.

⁴⁵For a classic discussion of the alternative forms of organization within a firm or through a market, see R. H. Coase, "The Nature of the Firm," Economica, IV (November, 1937), 386405.

Five elected directors meet formally every two weeks and often spend considerable time during the interim in meetings with representatives of other public and private agencies.

All engineering services for the Replenishment District are performed by a firm of consulting engineers. This firm has undertaken a large number of studies for the District including a comprehensive study of the ways and means to accomplish a ground water basin management program in Central and West Basins. The final report of this study has functioned as a major policy guideline for the district. Another study performed by this firm has been the verification and certification of ground water production by Central Basin pumpers from 1956 to 1961. The firm is functioning, in essence, as an informal referee in regard to the Central Basin litigation. The District's five annual reports were written by the engineering firm and submitted to the District with recommendations concerning new programs and the amount of replenishment assessment to be levied. The Replenishment District has also contracted for its legal services with two law firms instead of employing attorneys on its own staff.

The Replenishment District has come to play an active role at the center of all activities relating to ground water basin management for both West and Central Basins. While the Replenishment District has not assumed operational responsibility for numerous basin management

activities, the District has utilized its considerable bargaining power with other agencies to attempt to gain its objectives. The Replenishment District is not capable of imposing its will on other conservation and regulatory agencies, nor does it have to accept the demands of any of these agencies as superior to its own. When the goals of the Replenishment District and other agencies involved in managing West Basin coincide, an accepted formula for cooperative action can usually be negotiated. However, when the operating goals are contradictory, the Replenishment District does have the power to undertake regulatory actions on its own and is not bound to continue to seek joint solutions.

West Basin Water Association

Analysis of the structure of the West Basin water industry is not complete without an understanding of the role played by the West Basin Water Association. Until 1960, the association has been the forum for discussion concerning each new step taken to gain control of salt water intrusion and to evolve a program for ground water basin management in West Basin. Not only has the association provided a means whereby people representing conflicting interests could discuss mutual problems and search for satisfactory solutions, the Association has developed its own formal structure which insured the continuation of

sustained negotiation and communication by all affected parties.

The work of the association has fallen largely on the shoulders of the executive secretary and the members of the executive committee of the association. Formally, this committee consists of nine members: three representing industry, three representing cities and three representing private water companies. In addition to the formal members of the executive committee, representatives from the Flood Control District, from the Metropolitan Water District and from the Department of Water Resources have frequently attended long work sessions in which different views were presented in an attempt to reach satisfactory settlements of existing problems. Frequently, decisions regarding the appropriate actions of several governmental agencies were negotiated within the context of the West Basin Water Association.

The association has also played a major role in representing local interests before the State Legislature. West Basin water producers lacked adequate powers at the local level to achieve a solution to some of their problems. In some cases they needed financial assistance from the State. However, more frequently, they needed legislative help in the creation of new institutional facilities to enable them to solve their problems at the local level. The executive secretary and members of the executive committee have

frequently drafted legislation which they subsequently guided through the State Legislature. Experience in state politics has taught association members that they needed close to unanimous consent and support of all affected local public and private agencies prior to seeking legislative action. This fact of political life has reinforced the original tendency of the association to function as a forum for the open discussion of conflicting views. Association leaders tried to confine local conflicts within the association by waiting until they had unanimity before taking positive local action or seeking legislative help.

Prior to 1960, none of the public agencies concerned with water resource problems in West Basin had either the appropriate powers or boundaries to function as the center of a complex management system. In this void, the association was able to coordinate the actions undertaken by several public and private agencies. By 1960, the Replenishment had been established with the appropriate boundaries and powers to either coordinate the actions of other agencies or undertake many actions on its own. Since 1960, the Replenishment District has slowly taken over much of the former activity of the association as the center of discussion and negotiation among agencies concerned with ground water basin management. Several active association members are serving on the board of directors of the Replenishment District and, as mentioned above, the

executive secretary of the association functions as the general manager of the Replenishment District. There is, therefore, a continuity of personnel and philosophy of operation that has made this a smooth and unobtrusive change.

The association still plays a key role in the overall structure of the West Basin water industry. The association is the means of mobilizing political support for legislation introduced in the State Legislature. In addition, the association continues to provide water producers in West Basin with a forum for discussing mutual problems, for hearing regular reports from all agencies involved in ground water basin management, and for airing any dissatisfaction they may have with the way in which the basin is being managed for their use and benefit.

The Water Industry and the Basin in 1963

The West Basin water industry has developed into a complex system for the conjunctive utilization of surface water supplies, distribution facilities, and ground water supply and storage facilities. Since 1945, the total amount of water supplied in West Basin has doubled. The amount of imported water supplied the area has tripled, while the amount of ground water produced has been reduced by 21 per cent. As shown in Table V, West Basin enterprises imported 77 per cent of the water supplied in the

basin during 1962-63. Enterprises that supplied water for sale imported an even larger percentage of their total water supply than those who supplied water for their own use. Cities, county waterworks districts and private water companies utilized most of the ground water they produced

Table V

Total Water Supply of West Basin Enterprises
1962-63

	Total Water Supplies (acre-feet)	Ground Water	<u>Percentage Imported</u>
<u>Supplied for Own Use:</u>			
Petroleum Industry	44,768	47	53
Industrial Concerns	4,532	67	33
Nonindustrial Concerns	3,845	59	41
Total	53,145	49	51
<u>Supplied for Sale:</u>			
Cities	122,645	10	90
County Districts	3,476	27	73
Private Companies	75,824	25	75
Total	201,945	11	89
Grand Total	255,090	23	77

to furnish peaking requirements. As shown in Table VI, this group produced more than half of the total regulated yield of the basin during 1962-63. Therefore, at least half of the water produced from West Basin is utilized primarily for peaking purposes.

Table VI
 Percentage of Total Ground Water Withdrawals
 Supplied by Different Classes of Water Users

	<u>Percentage</u>	
	1945	1963
<u>Supplied for Own Use:</u>		
Petroleum Industry	36	36
Industrial Concerns	7	5
Nonindustrial Producers	10	5
Total	53	46
<u>Supplied for Sale:</u>		
Cities	16	21
County Districts	1	1
Private Water Utilities	30	32
Total	47	54

Among water producers, the greatest structural changes have been the consolidation of many water companies into fewer large companies and the elimination of an even larger group of private proprietors from the field of water production. However, the most important structural change has been the incremental development of a superstructure composed of diverse public enterprises, private associations and private engineering and law firms which have evolved a ground water basin management program for West Basin and are placing the basic elements of this program into

operation. Through the coordinated efforts of the Central and West Basin Municipal Water District, the Central Basin Municipal Water District, the Metropolitan Water District of Southern California, the Los Angeles County Sanitation Districts, the Los Angeles County Flood Control District, the State Department of Water Resources, the West Basin Water Association, an engineering firm and several law firms, a relatively sophisticated management system has been developed that has already made significant changes in the use of West Basin in conjunction with surface water supply facilities. While elements of competition exist among the agencies that function as components in the new superstructure, elements of horizontal and vertical specialization are an even more important aspect of their interaction. The Flood Control District provides the engineering expertise and operational knowledge relating to the construction and maintenance of the barriers and spreading works. Colorado River water used in these projects is transported by Metropolitan and sold to the Replenishment District through the two municipal water districts. The reclaimed water used at the spreading grounds is produced by the County Sanitation Districts, transported to the spreading grounds by the Flood Control District and paid for by the Replenishment District. The Department of Water Resources, acting as Watermaster, oversees the annual production of ground water in both West and Central Basins

to insure that total withdrawals remain within agreed limits.

Summary

Examination of the West Basin ground water management system composed of numerous formally independent public and private agencies exhibiting a high degree of horizontal and vertical specialization leads to questions about why it developed in the manner it did. West Basin producers were strongly committed to the dual values of economic growth and local control of their basin. Many of these water producers perceived the need for cooperative action and the organization of arrangements to take joint action in managing the local basin. As a result, they adopted a strategy which involved searching for new organizational arrangements or institutional devices that would enable them to solve most of their problems at the local level and provide for an expanding level of water services to the entire community. This strategy resembles that of the private entrepreneur who creates new organizations in order to join together diverse products and operations in developing a more effective enterprise. However, the problems individuals attempted to solve in West Basin differed from those private entrepreneurs usually attempt to solve. In order to reach satisfactory solutions of these problems, use of public

facilities was required and public enterprises were created. The strategy followed by individuals in West Basin might be viewed as a series of undertakings in public entrepreneurship.

Public entrepreneurship is a strategy followed by many individuals in California associated with the water industry and with other municipal service industries. The home rule tradition in California, formalized in the Constitution of 1879 and expanded by numerous organic laws which enable individuals at the local level to create specialized public enterprises, provides a foundation upon which a fairly vigorous public enterprise system has grown, along with and mixed with an equally vigorous private enterprise system. The West Basin Water industry is an example of a mixed public and private enterprise system seeking to solve problems of water supply and use at the local level. Public enterprises make decisions that control the allocation of resources in a general way, but private agencies retain significant autonomy to continue making decisions regarding the mix of water to be used from ground and surface supplies.

The background of events which form the setting for the adventures in public entrepreneurship undertaken by those who were concerned with West Basin ground water problems is examined in Section II, "Background to Action." One chapter in that section is concerned with the physical

setting, the other with the institutional setting. When individuals attempt to solve complex problems, they may be facilitated or constrained by physical, legal, economic and political factors which affect their problems. Efficient solutions depend upon a search for satisfactory strategies among the perceived opportunities and risks which are involved in the situation. It is only through an understanding of the constraints and the opportunities that exist at various stages of development that a meaningful evaluation can be made of the end product.

The detailed case study of West Basin's experience in public entrepreneurship will then be discussed in Section III. Six chapters beginning with forming the West Basin Water Association and including reference to gaining access to a supplemental supply of imported water from the Colorado River, adjudicating ground water rights in West Basin, attempting to build a fresh water barrier against the sea, designing and creating a management enterprise and developing and implementing a management program, provide the account of this experience.

The final section of the study will be devoted to an evaluation of the West Basin experience in public entrepreneurship. The result of efforts by public entrepreneurs in West Basin is an unique institutional pattern in the history of water resource management in California. Many other areas dependent upon ground water in basins adjacent

to the sea are faced with similar problems. Water producers in those basins are interested in the experimental nature of the new institutional facilities developed in West Basin for dealing with the problem of ground water basin management. On the basis of this analysis others may be able to draw upon the West Basin experience without the necessity of having to repeat the process by which entrepreneurs in West Basin arrived at their settlements.

While the final result of efforts by individuals in West Basin is unique, their strategy of public entrepreneurship is not unique. Many individuals associated with the water industry in California are attempting to solve perplexing water resource management problems in creating new public enterprises that will be able to provide goods and services needed in their community or to enable individuals to engage in cooperative actions. However, the traditional literature of political science and economics has given little consideration to the strategy used by many individuals in providing public goods and services through the organization of new public enterprises. Economists have long been concerned with entrepreneurship, but have largely confined their analysis of entrepreneurship to the private market economy. Political scientists most often take the unit of government as a given and rarely investigate the problems of launching new public enterprises. A better understanding of the process of organizing new public

enterprises should lead to clearer perceptions of how and why local governmental units function the way they do. The study or the process of forming new special districts to meet specific problems in local areas should be particularly helpful in understanding the system of relationships that evolve among local governmental agencies and public districts.

SECTION II
BACKGROUND TO ACTION

CHAPTER II

WEST BASIN: ITS POTENTIAL UTILITY AS A COMPONENT IN THE CONJUNCTIVE MANAGEMENT OF A WATER SUPPLY SYSTEM

The development of the water resources of West Basin and the surrounding area can be viewed as a process of interaction between those who developed the area and the underlying and surrounding physical system. The physical system imposes constraints on the actions which individuals can take in relation to it while, at the same time, the patterns of water production and local development change the way the physical system operates.¹

The geologic formation of the area of which West Basin is an integral part establishes the basic structure for the flow of water down from the mountains, across the inland valleys and coastal plains and out to sea. While the geologic structure affects the way water flows across and through the area, the quantity and reliability of supply is determined by meteorological factors. The division of the year into a dry season and a wet season, the generally

¹See Harold E. Thomas and Luna B. Leopold, "Ground Water in North America," *Science*, 143 (March 6, 1964), 1002.

sparse rainfall on the average, the long term variation between flood and drought years, all create special problems for those concerned with providing an adequate water supply to a growing metropolitan area.

While the water industry is constrained by the fundamental geologic, hydrologic and meteorological characteristics of the area, settlement patterns and early water resource developments have changed the way the system functions as compared with its natural state. A flow of water which was once a major source of supply to the ground water basins of the coastal plain is now captured higher in the system and effectively removed as a source of replenishment for lower areas. Channelizing and paving river beds which cross the plain has prevented costly flood damages, but has also reduced the natural percolation. Construction of buildings, roads and other impervious surfaces has increased surface runoff and reduced the amount of water that can enter underlying ground water basins. The use of outfall sewers to discharge sewage into the ocean rather than using cesspools which allow waste water to return to the ground water supply has also affected the quantity of percolation that can occur under less intensive settlement patterns. Increased demands for water have lowered water levels near the coast, causing salt water to intrude and threaten ground water supplies.

Some of the patterns of social development in this

area have had the effect of reducing local water supplies. Other developments have been undertaken to compensate for some of those factors and to increase the total quantity of available water supply. Sewage water is again becoming a source of supply with new efforts to reclaim waste water and to make the reclaimed water available for ground water replenishment. Aqueducts have been constructed to import water from distant sources and to increase the amount of water available primarily for consumptive uses. The availability of "surplus" water from these imported supplies has provided an additional source of water to be used for the replenishment of ground water basins. The artificial injection of fresh water has been initiated along the coast to prevent salt water intrusion and to protect local ground water supplies.

The interaction between a complex physical system and a complex social system is apt to involve an intricate process that is difficult to comprehend without extensive information and effective tools of analysis. Collection of data concerning the behavior of the physical system related to West Basin began in 1904 and has accelerated since 1930.² There is now an extensive collection of geologic,

²Walter C. Mendenhall, Development of Underground Waters in Western Coastal Plain Region of Southern California, United States Geological Survey, Department of the Interior, Water-Supply and Irrigation Paper No. 139 (Washington: Government Printing Office, 1905).

hydrologic and meteorological information concerning the entire South Coastal Basin.³ Information about the action of men in relation to this system is becoming more complete as time progresses. In West Basin, there is relatively reliable information about pumping patterns that date back to 1932.⁴ Similar information is available for Central Basin and San Gabriel Valley since 1955.⁵ The Metropolitan Water District has maintained active recorders concerning water purchased from it and produced locally within member-agencies.⁶ The Flood Control District, the Department of Water Resources and the County Sanitation Districts have maintained records which provide information about the effect of urbanization.⁷ In addition, engineers

³California, Department of Public Works, Division of Water Resources, South Coastal Basin, a Symposium, Bulletin No. 32 (Sacramento: State Printing Office, 1930); California, Department of Public Works, Division of Water Resources, South Coastal Basin Investigation, Geology and Ground Water Storage Capacity of Valley Fill, Bulletin No. 45 (Sacramento: State Printing Office, 1934); California, Department of Public Works, Division of Water Resources, South Coastal Basin Investigation, Overdraft on Ground Water Basins, Bulletin No. 53 (Sacramento: State Printing Office, 1947). Hereinafter referred to by Bulletin numbers.

⁴Ref. Rpt. I.

⁵Since 1955, all ground water producers extracting twenty-five acre feet annually in Los Angeles County have been required to record their ground water production with the State Water Rights Board.

⁶Metropolitan has issued annual reports since 1938-39 with an extensive compilation of statistical data about its own activities and those of its member agencies.

⁷See, for example, California, State Water Resources

have developed relatively sophisticated tools of analysis which enable them to comprehend the effect of changes in several sets of variables upon the behavior of water in a ground water basin.⁸

As a result of the information available and the analytical tools developed to utilize this information, decision-makers in the water industry of West Basin and the surrounding area can develop alternative procedures for the conjunctive use of diverse sources of water supply from the local ground water basin, from local surface run-off, from imported supplies and from reclaimed waste water. The range of alternative supplies permits the selection of management procedures which enable decision-makers to realize certain goals in the local management of the industry. An optimum system would make the most efficient use of each component, including the local ground water supply in relation to the long-term yield of the combined system.

The goals of those who are interested in developing a conjunctive use system were summarized in a 1961 report of the Central and West Basin Water Replenishment District to

Board, Los Angeles County Land and Water Use Survey 1955
Bulletin No. 24 (Sacramento: State Printing Office, 1956).

⁸Some of the classic works in the field include David K. Todd, Ground Water Hydrology (New York: John Wiley & Sons, 1959); D. V. Tolman, Ground Water (New York: McGraw-Hill Company, 1937); and O. E. Meinzer, Hydrology (New York: Dover Publications, 1942).

include the following:

1. The maximum amount of local water supply will be conserved.
2. The ground water supply will be protected against the intrusion of sea water.
3. The withdrawals of water from the ground will be limited as to (1) the quantity of water that will be received from local and imported supplies for replenishment, and (2) the quantity of water which the ground water body can transmit to each of the locations within the basin without progressively lowering the pressure levels to a point where the pumping lifts make the cost of water production prohibitive.
4. The water needs to serve the balance of the requirement within the area will be satisfied by delivery from direct pipeline connections from the distribution system supplying imported water, and delivery schedules for these supplemental requirements will be such that maximum use is made of distribution pipelines, thus minimizing their cost.⁹

The physical opportunities and risks inherent in attempting to achieve these goals will affect the type of program that can be evolved. In order to comprehend the nature of the physical constraints, this chapter will be devoted to a discussion of the water supply system in West Basin and the surrounding area as it has evolved and as it will affect the possibilities for achievement of the goals listed above. The first part of the chapter will focus on the structure of the physical system as it affects water

⁹Central and West Basin Water Replenishment District, Report on Ground Water Replenishment in the Central and West Basin Water Replenishment District and Basin Management (Downey, California: 1960) p. 5. Hereinafter Cited as CWBWRD, Basin Management Study.

supply and the potentials for ground water basin management. The second part will analyze some of the physical and cultural factors that affect the quantity and quality of the water supply and its adaptability to management as a conjunctive use system. While extensive information and tools of analysis have been developed to provide a better understanding of ground water management problems, there are still many unknown variables that may cause serious problems for those who attempt to achieve an effective ground water basin management program.

The Structure of the Physical System

Topography

West Basin is one of many ground water subbasins that form a part of a distinct hydrologic unit that is called the South Coastal Basin. This hydrologic system is bounded by a series of mountains running generally from the northwest to the southeast and by the ocean on the west and south. The Santa Monica Mountains, the Simi Hills and the Santa Susana Mountains separate the South Coastal Basin from the neighboring Santa Clara Valley on the north. The San Gabriel and San Bernardino Mountains to the north and east, and the Santa Ana Mountains to the east and south form the rest of the perimeter. The two highest peaks in the range, the San Antonio Peak in the San Gabriels and

Mount San Gorgonio in the San Bernardinoos attain elevations in excess of 10,000 feet.¹⁰

An intermediate range of low mountains that include the Verdugo, San Rafael, Merced, San Jose and Puente hills, divides the area into several distinct valleys and separates the inland valleys from the coastal plain. The elevation of this intermediate range varies from less than 1,000 feet above sea level to a little more than 2,000 feet. The inland valleys that lie between the low-lying hills and the principal mountains include the San Fernando, San Gabriel and Upper Santa Ana Valleys. The coastal plain is relatively smooth, with a gentle slope from sea level to elevations around 300 feet above sea level.

The presence of a series of relatively high mountains surrounding the South Coastal Basin has been a very important factor affecting water supply conditions. These mountains intercept the limited moisture that moves inland during winter storms to provide most of the local water supply. In addition, this chain of mountains forms an insulating barrier against the extreme temperatures that exist in the interior desert. Without the moisture and protection against climatic extremes that result from the presence of these mountains, it is unlikely that a large

¹⁰For more detailed information on the topography of the South Coastal Basin see California, Department of Public Works, Bulletin No. 53, PP. 21-23 and Bulletin No. 45, pp. 23-35.

metropolis would have developed in the South Coastal Basin.

The Inland Valleys and the River Systems

Three large structural valleys lie adjacent to the coastal range and receive a large portion of the run-off from the higher mountain slopes. For ages past, water descending the mountainsides during winters has carried sediments which were deposited on the valley floors. Porous alluvial deposits, which range in depth to several hundred feet, underlie the San Fernando, San Gabriel and Upper Santa Ana Valleys. Most of the subbasins located within these valleys are so closely interrelated that, for the purposes of this discussion, the area underlying each of the valleys can be thought of as one large ground water basin.¹¹ These loose sedimentary deposits function as natural reservoirs which can store vast quantities of water. Riverlets which carry the surface run-off often disappear into gravel cones at the base of the mountains and the water moves underground across the basin toward

¹¹However, the Raymond Basin, located in the western portion of the San Gabriel Valley, is divided from the rest of the valley by the Raymond fault. An adjudication of the water rights of enterprises producing water from the Raymond Basin was initiated in 1937 and completed, after an appeal to the Supreme Court, in 1949. While there is some subsurface outflow from the Raymond Basin into the main San Gabriel Valley, it does not constitute an important contribution to the ground water supplies of the main valley. All discussion of the San Gabriel Valley contained herein will pertain to the main Valley and will not include the Raymond Basin.

the lower levels of the valley floor.¹²

At the lower reaches of the valleys, bedrock underlying the valley floors is uplifted and forms the intermediate hills which constrict the flow of ground water to narrow outlet channels. As a result of the geological barriers which are formed by the intermediate hills, some of the underflow of ground water rises and appears again as surface streams. Prior to development of water resources in the inland valleys, the Los Angeles, San Gabriel and Santa Ana Rivers regularly flowed in surface channels from areas at the outlet for each valley. Rising water was at a maximum following a period of wet years and gradually declined during dry years. During heavy or prolonged rains, surface streams flowed from the foothills toward the narrows to form into three continuous river systems.

Because of the regular flow of rising ground water, the Los Angeles, Whittier and Santa Ana narrows were logical sites for early development of water resources through surface diversion. El Pueblo de Nuestra Senora la Reina de Los Angeles was originally founded immediately below the Los Angeles narrows, the outlet for the Los Angeles River from the San Fernando Valley. The small agricultural community of Los Angeles was able to irrigate crops and derive a domestic supply from the regular flow of the river.

¹²See United States Army Corps of Engineers, Los Angeles and San Gabriel Rivers and Their Tributaries, in House Documents, 76th Congress, 3d session (Washington, D.C.: Government Printing Office, 1940).

After the 1870's, when the population of the community began its rapid growth, Los Angeles augmented the natural flow of the river by constructing underground tunnels in the sedimentary fill to capture the flow of water in infiltration galleries above the narrows before it rose to the surface. Los Angeles claimed exclusive control over the Los Angeles River by virtue of its pueblo rights and annexed a large portion of the San Fernando Valley in order to maintain physical control of the subsurface flow through the valley. As a result, the regulatory capabilities of the San Fernando Valley were captured by a single enterprise and developed for conjunctive use with the surface water supply acquired by the City of Los Angeles from Owens Valley.

Los Angeles diverts almost the entire surface and subsurface outflow from the San Fernando Valley into its municipal water system. As a consequence of this basic structural change, subsurface flow through the Los Angeles narrows has been reduced to a minimum in modern times. During the eleven-year period from 1927 to 1938, the subsurface outflow from the San Fernando Valley was estimated to average 7,110 acre-feet per year.¹³ But this amount has been reduced further in more recent years to an average of

¹³California, Department of Public Works, Bulletin No. 53, p. 97.

only 300 acre-feet per year.¹⁴

While there is a history of early surface diversions at the Whittier Narrows, from the San Gabriel River and its distributory, the Rio Hondo River,¹⁵ and at the Santa Ana Narrows from the Santa Ana River, no one was able to develop exclusive claim to the full flow of these rivers. Until recently, the land in both the San Gabriel and the Upper Santa Ana Valley was largely devoted to agriculture. Farmers in both the upper valleys and the coastal plain drilled their own wells to produce water for irrigation. A portion of the water so applied returns to the underground supply and is available for reuse by another producer lower in the system.

The Coastal Plain and Underlying Ground Water Basins

The structure of the coastal plain reflects the action of the three river systems, as well as the ocean. Over the

¹⁴California, Department of Water Resources, Bulletin No. 104. Appendix B, p. 74. Los Angeles' monopoly control over the Los Angeles River is a result of its assertion of pueblo rights to the river. So far, this claim has been supported by the Court in several attempts made by surrounding communities to challenge this exclusive claim. The Cities of San Fernando, Glendale and Burbank have recently initiated a new case which again challenges the basic right of Los Angeles to divert the entire flow for its own use. See San Fernando, Glendale and Burbank v. Los Angeles, Case No. 650079 in the Superior Court for and of the County of Los Angeles.

¹⁵The Rio Hondo splits from the San Gabriel River high in the San Gabriel Valley, crosses the Whittier narrows, and joins the Los Angeles River on the coastal plain.

course of time, each river created a forebay of fairly porous alluvium beyond its narrows. The coarse subsoils of the Los Angeles forebay were deposited by the Los Angeles River, of the Montebello forebay by the Rio Hondo and San Gabriel Rivers, and of the Santa Ana forebay by the Santa Ana River. The unconfined porous deposits in the forebay region are capable of receiving immense quantities of water. Historically, much of the water flowing in the rivers as they crossed their forebays disappeared into the alluvium and moved underground toward the sea. Precipitation which fell on the forebay area was also a source of supply for adjoining ground water basins.

While the upper portion of the coastal plain was formed predominately by the action of the Los Angeles, San Gabriel and Santa Ana River systems, the lower reaches were largely of marine origin. Alternating layers of sediments of varying degrees of coarseness and permeability were deposited along the coast as the shore line of the coastal plain shifted landward and seaward during geologic history. The coarser deposits can store and transmit considerable quantities of water. The finer deposits, such as clays, are relatively impervious. The structural arrangements of these strata is crudely horizontal to the surface with a downward trend toward the ocean. The impervious strata confine the water moving in the aquifers (water-bearing zones of pervious materials) and the accumulated column of

water acquires hydrostatic pressure depending upon the elevation of water confined within an aquifer. Aquifers underlying the pressure zones are not replenished to an appreciable extent by water flowing across the surface soil or by the penetration of rainfall in the area. The aquifers of the pressure zone are replenished by water flowing across or falling upon the three forebays higher in the system. However, the areas of contact within the forebays between the aquifers of the coastal plain and the nonpressure zone, "where supplies from the ground surface can provide replenishment, are limited, and do not directly overlie each other. . . ."¹⁶ Consequently, the path of percolating waters from the forebay to the ocean is long and circuitous.

While the underlying structure of the coastal plain is extremely complex, the general arrangement can be conceptualized as "a series of superimposed aquifers spreading southward and westward to the ocean and southeasterly into Orange County from focal points at the . . . Narrows. . . ."¹⁷ Water which enters the underlying aquifers at the forebay, moves into and through the aquifers under hydraulic pressure "much the same as water is pushed through a pipe which is connected to an elevated tank. 18 The hydraulic

¹⁶CWBWRD, Basin Management Study, p.39.

¹⁷California, Department of Water Resources, Bulletin No. 104, Appendix B, p. 20.

¹⁸Ibid., p. 21.

gradient represents "the level to which water would rise from a given aquifer at any point if an open standpipe were inserted into the aquifer at that point."¹⁹ Before extensive development of ground water resources on the coastal plain, the hydraulic gradient extended almost horizontally from the forebay and water flowed from artesian springs in the lower reaches of the coastal plain.

The development of ground water resources underlying the plain led to changes in the hydraulic gradient and subsequent changes in the velocity and direction of ground water movement. Water pumped from wells caused small depressions in the hydrostatic level surrounding the wells. As more wells were drilled and more water withdrawn, the hydraulic gradient surrounding a well or series of wells sloped downward at a sharper angle. Water from the surrounding area began to move toward the lower level. Because water moves very slowly in ground water aquifers, a differential in pressure levels was created between the coastal regions and the forebay. Pumping troughs were established in some places by extensive withdrawals. A deep pumping trough developed under the City of Hawthorne as a result of concentrated pumping in that area. A second and larger trough was developed parallel to the Newport-Inglewood fault in the southern portion of West Basin, which resulted from the large volume of production

¹⁹California, Department of Water Resources, Bulletin No. 104, Appendix B, p. 21.

by a number of larger producers in a relatively small area. As soon as pressure levels fell below sea level along the coast, ocean water moved inland toward the lowest pumping troughs.

Movement of water in the ground water basins underlying the coastal plain has, therefore, been affected by the geologic structure of the forebay and pressure zones and by pumping patterns which alter the slope of the hydraulic gradient. A third factor affecting movement of water through these aquifers has been the presence of faults or breaks in the water bearing zones. The Newport-Inglewood fault is the most extensive fault line on the coastal plain. The fault extends roughly along a line from Inglewood southeast to Newport Beach and inhibits the westward movement of water from Central Basin into West Basin. Other minor faults exist to break the continuity of flow from one place to another.

The interaction between geologic features and pumping patterns within the coastal plain has created relatively distinct characteristics in the direction of water flow. These structural patterns have led to the conceptualization of the underlying strata of the coastal plain as being divided into eight ground water basins. Four basins, the Central, West, Santa Monica and Hollywood Basins, are located in Los Angeles County and are primarily related to the Los Angeles and San Gabriel River system. The other

four basins (East Coastal, La Habra, Anaheim and Yorba Linda Basins) are located in Orange County and are primarily related to the Santa Ana River system.

Ground water movement between the basins adjoining West Basin has shown a historical movement from Santa Monica Basin and Hollywood Basin into West Basin and Central Basin, and from Central Basin into West Basin. However, these movements may show slight variation from year to year.²⁰ The nonpressure zone of Central Basin, the largest basin of the group, underlies the Montebello Forebay and a portion of the Los Angeles Forebay. The pressure zone of Central Basin extends from the forebay southward and westward to West Basin. Hollywood Basin underlies a portion of the Los Angeles forebay and a small inland area to the west. Ground water resources have not been extensively developed in the Hollywood Basin. Santa Monica Basin is an even smaller coastal basin to the west of Hollywood Basin and to the north of West Basin. The boundary between West Basin and Santa Monica Basin is a ground water divide created by the lack of any significant amount of pumping. As a result, water levels slope away to the north and south, with only limited movement of ground water in either direction across the divide. The Ballona escarpment is used as the surface indication of this boundary between Santa Monica

²⁰California, Department of Water Resources, Bulletin No. 104, Appendix B, p. 75.

and West Basins.

West and Central Basins are separated by the Newport-Inglewood fault. The movement of ground water from Central Basin into West Basin is dependent upon the existence of a water level differential across the fault. The lower water levels drop in West Basin in relation to Central Basin, the greater the amount of water which will flow through the Newport-Inglewood fault. The Baldwin, Rosecrans and Dominguez hills are the surface evidence of the Newport-Inglewood fault. The ocean functions as the western and southern boundaries of West Basin.

The impervious clay strata that underlies most of West Basin has been eroded away along the coast from the Ballona escarpment to the Palos Verdes hills, exposing the aquifers of the basin to direct contact with the sea. The action of the Los Angeles River and the San Gabriel River has also eroded the protective clay cap and created two gaps susceptible to salt water intrusion. The Dominguez Gap is located where the Los Angeles River passes through the Newport-Inglewood fault into West Basin and the Alamitos Gap is located where the San Gabriel River passes through the Newport-Inglewood fault. As a result, West Basin is located between two potential water sources, the ocean on the west and south and fresh water on the east. One of the sources is a high quality water, while the other exceeds quality tolerances for most human uses. The direction of

flow into West Basin depends upon the difference in the hydrostatic pressure of the two bodies of water. Historically, the hydraulic gradient of the fresh water supply was above sea-level and water flowed only from east to west, eventually flowing into the ocean.²¹ However, when the hydraulic gradient was drawn down below sea level during the 1920's, salt-water began to enter the basin along the coast.

Intruding sea water functions as a density current, since it has a higher specific gravity than that of fresh water. Intrusion occurs whenever the pressure of the fresh water does not equal that of sea water at all points in a vertical section. Sea water displaces fresh water in a similar process to that of underflow of a silt-laden stream into a clear water reservoir. "The two liquids will stay apart, will not mix, the sea water intrusion will take place in the form of a wedge, creeping slowly but steadily landward, thereby displacing an ever increasing volume of fresh water."²²

While the boundary between Central and West Basins is a relatively impervious fault line, the boundary between

²¹In fact, in the early 1900's, fishermen off the coast were reported to have lowered jugs lightly corked into the ocean so that the fresh water stream flowing up from the springs on the ocean floor would push in the cork and fill the jug with drinking water.

²²Speech by Paul Baumann, before West Basin Water Association, Minutes, November 13, 1954, p. 17.

Central Basin and the ground water basins in Orange County is usually considered to be the Los Angeles-Orange County political boundary. The direction of flow at the boundary dependent upon the relative elevation of ground water in the two basins. Prior to 1951, the predominant movement was from Central Basin into Orange County. Since 1951, the flow has reversed.²³ The ground water basins of Orange County are primarily dependent upon the Santa Ana River system as a source of supply and Central Basin is primarily dependent upon the Los Angeles and San Gabriel River systems.

While there is general agreement among geologists and hydrologists about the general configuration of water flow within and among the ground water basins of the coastal basin, there is considerable disagreement about the exact basin boundaries. Even the boundary between West and Central Basin designated by the referee in the West Basin case has been subjected to considerable dispute about its solidity. This boundary is a geological formation which is easier to designate than boundaries created by pumping patterns that may vary over time. The use of the Los Angeles-Orange County line as the eastern boundary of Central Basin and a portion of West Basin is probably the most questionable boundary designation on the coastal

²³California, Department of Water Resources, Bulletin No. 104, Appendix B, p. 74.

plain. The use of the political boundary has been an expedient practice to avoid creating public districts which include portions of more than one county.²⁴

Structural Constraints on Ground Water Basin Management

As a result of the geological and hydrological structure of the South Coastal Basin, West Basin is the last in a series of interrelated ground water basins primarily related to the Los Angeles and San Gabriel River systems. The attempt to regulate West Basin for use in conjunction with surface supplies is subject to a number of constraints of which the six factors recapitulated below would appear to be the most important:

1. The City of Los Angeles has effectively removed the Los Angeles River system as a source of supply to West Basin. As a result of the control exercised by Los Angeles over the flow of the Los Angeles River, precipitation which falls on the mountains surrounding and the valley floor of the San Fernando Valley is no longer a source of replenishment to the ground water basins of the coastal plain. In addition, the large storage capacity of the valley fill underlying the San Fernando Valley cannot be integrated for

²⁴For a very interesting discussion of the fourteen major types of basin boundaries frequently used in Southern California, see John F. Mann, "Tentative Classification of Ground-Water Basin Boundaries" (La Habra, California, 1961, mimeographed).

use in conjunction with the surface and subsurface water supply facilities of the coastal plain except for those in the City of Los Angeles.

2. Extraction of water in the San Gabriel Valley affects the quantity of surface and subsurface outflow to the coastal plain. Water producers in the San Gabriel Valley are located in a strategic physical location to affect the water supply conditions of the entire coastal plain. Any attempt to regulate the use of ground water in West Basin would be futile without the regulation of the use of ground water supplies in the higher valley to insure a continued outflow from the San Gabriel Valley. If the San Gabriel Valley could be integrated into a conjunctive use system with the coastal basins, the vast storage capacity of this valley would be of great value to users lower in the system.

3. Extraction of water in Central Basin affects the quantity of subsurface inflow into West Basin. The amount of fresh water subsurface inflow into West Basin is dependent upon the relative elevation of water on both sides of the Newport-Inglewood fault. The greater the differential between water levels across the fault line, the greater the quantity of flow. As a result, ground water production in Central Basin is not the only major determination of the amount of subsurface flow in West Basin. West Basin water producers can augment the quantity of flow into their basin by lowering water levels in West Basin relative to those in

Central Basin.

West and Central Basins are so closely related that a management program developed for either basin should include the other. Collective action undertaken to benefit one basin as a whole will create long run benefits for the other. In addition, regulatory actions undertaken in one basin, without the inclusion of the other, may result in a net loss for the basin initiating action. For example, the curtailment of production in one basin without an equivalent action in the other basin results in less water available for use in the basin which reduces its pumping.

4. Salt water enters West Basin along the coast when ground water levels are drawn below sea level. The quantity of storage capacity available for use in West Basin is dependent upon how far water levels can be drawn down without causing physical harm to the basin. Protection of ground water supplies against salt water intrusion can be accomplished either by restricting the draw-down of the basin to elevations above sea level or by constructing some form of barrier against the sea.

5. The geological structure of the area limits the potential sites and techniques which could be used to increase the replenishment of West Basin by artificial means. Spreading is the most economical method of artificial replenishment. The injection of fresh water under pressure through recharge wells is a second, but more expensive

method of artificial replenishment.

There are only a few locations in West Basin where spreading facilities could be used effectively. Underlying conifers are in contact with the surface in the coastal areas south of Playa del Rey, the sand dune area east of Redondo, the tract to the west of the International Airport and the sands along the north rim of the Palos Verdes Hills.²⁵ However, the major locations with the necessary physical conditions for spreading activities are found outside West Basin in the Los Angeles and Montebello forebays. There, water may enter aquifers connected with West Basin water bearing zones, but even these locations are not ideal for highly effective use of spreading to increase the ground water supply of West Basin. Only limited contact exists between the principal water producing aquifers of West Basin and the overlying nonpressure zone connected with the surface in the forebay. In addition, the aquifers surrounding the forebay to the west and southeast have limited transmissibility. Water moving into the forebay will move into the pressure zones at a very slow rate, in any case, but in areas of limited transmissibility the normally slow rate will be reduced even further. Another problem is the movement of water from the forebay into the

²⁵Los Angeles County Sanitation Districts, Report Upon the Reclamation of Water from Sewage and Industrial Wastes of Los Angeles County, California (Los Angeles: 1949), p. 41.

pumping depressions and troughs in Central Basin instead of across the Newport-Inglewood fault. The large water producers in Central Basin may be able to draw all of the replenishment water toward their wells instead of allowing it to enter West Basin.

Injection of fresh water under pressure through recharge wells is another technique for accomplishing replenishment. Fresh water injection through recharge wells is possible in many sectors of West Basin, but the construction and maintenance costs are high. The economic cost of using injection wells limits this method of artificial replenishment, apart from its use to create a barrier against the sea.

6. Pumping depressions and troughs in West Basin affect the flow of water within the basin. Salt water is apparently being drawn toward these depressions. Eventually, fresh water injected along the coast as part of the barrier program will replace the salt water. The efficiency of the barrier program will be considerably reduced if the injected fresh water is rapidly drawn away from the coast toward pumping troughs. A management program will have to change the areal distribution of pumping patterns to gain the full advantage of a barrier project.

Factors Affecting the Quantity and Quality
of Water Supply

In addition to the effect of the structure of the physical system, the capacity to achieve the goals of a management program is also affected by the characteristics of the over-all water supply system. Water supply problems are particularly difficult in West Basin and related areas because of the scarcity of the local supply and the extreme seasonal and cyclical variation. The presence of ground water basins underlying the San Gabriel River system has been an important factor enabling water producers to withdraw enough water to meet their demands regardless of the quantity of the water crop during any particular year or series of years. However, ground water reserves have been depleted and ground water basins can no longer function as the major source of water to the entire area. The increased dependence of the area on imported water has changed the water supply picture, and the relation of ground water basins to surface water supply systems.

Urbanization has affected the nature of the water supply to the area and the range of alternative procedures that can be undertaken in a ground water basin management program. Construction of buildings and paved areas, and the development of sewer systems, has reduced the quantity of water which can percolate naturally into underlying ground water basins. At the same time, urbanization has

created a sufficient economic base that large quantities of water from distant sources can be imported. In addition, the expanded economic base has made it possible to invest in facilities to conserve local, imported and reclaimed water, and to undertake a program of ground water basin management.

The Local Water Crop

The quantity of precipitation in the watershed tributary to West Basin is generally sparse and varies greatly with elevation. The high mountain peaks in the San Gabriel Mountains may receive forty-five inches or more during some years, but the precipitation for the major area of the range draining into the San Gabriel River varies from twenty-five to thirty inches per year on the average. Precipitation on the valley floor varies from an average of sixteen inches per year at Whittier narrows to twenty inches per year at the higher elevation of the foothills. Precipitation on the plain varies from an average of twelve inches at Redondo Beach to fifteen inches per year in the central Los Angeles business district.²⁶

The average annual gross water crop for the San Gabriel River system is roughly estimated at 900,000 acre-

²⁶California, Department of Water Resources, Bulletin No. 104 Appendix B, plate 8, and California, Department of Public Works, Bulletin 53, plate 21.

feet per year.²⁷ A large portion of the water crop is lost each year as a result of evapo-transpiration and storm runoff. In addition, consumptive use of water in the San Gabriel Valley and Central Basin reduces the amount of water that eventually enters West Basin as subsurface flow through the Newport-Inglewood fault. The usable local water supply to Central and West Basins, after losses due to evapo-transpiration, storm runoff and consumption by enterprises in the San Gabriel Valley, has been estimated to average 142,000 acre-feet per year.²⁸

Of this total usable supply, approximately 100,000 acre-feet originates as outflow from the San Gabriel Valley and the rest originates as percolation of rainfall on the coastal plain.²⁹ Fresh water inflow into West Basin has shown considerable variation, depending upon relative ground water elevations on both sides of the Newport-Inglewood fault. A peak volume of approximately 30,000

²⁷Max Bookman and Thomas Stetson, Joint Engineering Reconnaissance Study (Los Angeles: 1961), SGV I, indicates that surface inflow to the San Gabriel Valley has averaged 283,500 acre-feet and precipitation on the valley floor has averaged 160,000 acre-feet. The Department of Water Resources, Bulletin No. 104, Appendix B, 8-1, has indicated that the precipitation on the Los Angeles Coastal Plain has averaged 461,400 acre-feet.

²⁸CWBWRD, Basin Management Study, p. 20.

²⁹Parties in the litigation concerning the outflow from the San Gabriel Valley have agreed upon the estimate of 100,000 acre-feet as representing the historical average usable surface and subsurface outflow from the San Gabriel Valley.

acre-feet was reached during the late 1940's, but since then fresh water inflow has declined steadily to approximately 10,000 acre-feet or less at the present time. Fresh water replenishment is somewhat augmented by the percolation of rainfall on West Basin, but reliable estimates of the quantity of water added to ground water storage through natural percolation are not available.³⁰

The shortage of local water supplies is one of the most important factors characterizing the water supply picture in West Basin. The current annual subsurface inflow to West Basin, 10,000 acre-feet or less, is sufficient to support a population of only about 60,000 people if the per capita consumption averages 150 gallons of water per day. The largest natural subsurface inflow to West Basin, 30,000 acre-feet, would support only 180,000 people. The population of West Basin currently exceeds 625,000 people.³¹ If West Basin producers were prohibited from extracting water in excess of the current average yield of 10,000 acre-feet, they could serve only one tenth of the population living in West Basin with water from local sources.

Areas higher in the water system are not as severely affected by the shortage of water supply as West Basin.

³⁰The Department of Water Resources estimated as a result of deduction, rather than measurement, that the average percolation of rainfall in West Basin between 1934 and 1957 was 16,500 acre-feet. Bulletin 104, Appendix B, p. 8-5.

³¹MWD, Annual Report 1961-62, p. xxxii.

The average yield to Central Basin, if 30,000 acre-feet of water were allowed to flow into West Basin, would be approximately 112,000 acre-feet. This is a sufficient annual yield to support a population of 666,000 people or about one half of the current population in Central Basin assuming a per capita consumption of 150 gallons of water per day. It appears that the current average supply to San Gabriel Valley is sufficient to meet the demands of the people residing in the valley at the present time. However, the local water supply in the San Gabriel Valley is not large enough to meet the growing demands of an increasing population.

Seasonal and Cyclic Variation in Precipitation

More significant than the sparse quantity of water is the large variation in precipitation from season to season and year to year. The year is normally divided into a dry season and a wet season. Rainfall occurs when the demand for water is relatively at its lowest levels during the winter months. If rainfall were to occur during the growing season, the demand for water during the summer months would be reduced considerably.

In addition to seasonal variation, cyclic variation in precipitation has produced long periods of both dry and wet years which deviate greatly from the average. For example, during the seventeen-year period between 194 and 1961,

fifteen years received below average rainfall. During 1961, precipitation in the Los Angeles area was the lowest on record. Only three inches fell in the beach communities, while five inches were measured higher on the plain. Other extended drought periods occurred during the years 1922 to 1931 and between 1893 and 1904.

The other side of the problem created by the extreme cyclic variation in precipitation is the extreme variability or flashiness of storm runoff that occurs during many of the wet years. Much of the high flow during these major storms is lost as a source of ground water replenishment since it is channeled out to sea. As a result the net percolation into the forebay may actually be less during a year of high runoff than during a year of average precipitation. For example, the estimated flow across the Whittier narrows in 1937-38 was 343,970 acre-feet which was more than three and one-half times the average for a thirty-year period. Of that amount only 83,850 acre-feet of water percolated into the forebay. Precipitation during the next year was about an average quantity and 98,870 acre-feet of water crossed Whittier narrows. Of the much smaller flow, 88,250 acre-feet was estimated to have percolated into the forebay--nearly 5,000 acre-feet more than the percolation from the exceptionally wet year that preceded it.³²

³²California, Department of Water Resources, Report on Proposed Central and West Coast Basin Water Replenishment District (Sacramento: State Printing office, 1959), p. 49. Hereinafter cited as Rpt. on Prop. Replen. Dist.

The Effect of Ground Water Basins on the Quantity
and Quality of Water Supply

The presence of ground water basins in much of Southern California has been an extremely important factor affecting the quantity and quality of water available to those who settled in the region. Demands for water during summer months were met by withdrawing water that had been stored underground in previous winter seasons. Falling water levels during extended dry periods increased the storage capacity available to receive a new supply of water during the next series of wet years. As long as demands for water remained below or equal to the long-run average yield, these basins functioned to reduce the variation in the supply of water and to provide a reserve to meet periods of peak demand.

Besides functioning as regulating reservoirs, these ground water basins have also provided a large reserve of high quality water available for withdrawal in excess of average annual yield. Since the long-run average supply of local ground water was small in relation to the growing demands of the metropolitan area, withdrawals from ground water basins drew upon reserves in excess of the average annual yield. These reserves have been compared to a bank. By borrowing from the ground water "bank," the water industry helped to increase the economic base of the overlying communities. However, utilizing ground water basins in

this fashion eventually involves the problem of repaying or replenishing ground water reserves. Intensive artificial replenishment, strict pumping curtailments or a combination of both techniques are ways of "paying back" the bank.

If members of a water industry persist in withdrawing more than the amount that is replenished over a long period, they may "break the bank." Eventually, water levels fall so low that it is no longer economical to pump. Continued overdrafts can also harm the future quality of the remaining ground water. Overdrafts occurring in basins located along the coast permit salt water to enter from the sea, to replace the potable water which had been previously stored, and to pollute the remaining reserves. As ground water levels are drawn down in some areas, brackish connate waters located in sediments surrounding and underlying fresh water aquifers may infiltrate into the fresh water supplies and seriously impair quality. In addition, "when the consumptive use of water in a valley or basin is increased, there is a tendency for the salt content of the water therein to increase in concentration."³³ As the outflow from a basin is reduced, the outflow of salts is also lowered and there 'is a further tendency toward an adverse salt balance.

³³Statement by Herbert A. Howlett, Southern District Engineer, Department of Water Resources, before the Assembly Interim Committee on Water, Hearings held in Anaheim, California, November 29, 1961, p. 14.

The water industry in both West and Central Basin has come close to "breaking the bank." The accumulated overdraft in West Basin was estimated to be 830,300 acre-feet in 1957. ³⁴ If one assumes that annual overdraft has continued at a rate of 45,000 acre-feet per year since 1957, the total accumulated overdraft by the end of 1963 would be 1,100,300 acre-feet.³⁵ The accumulated overdraft in Central Basin was estimated at 940,000 acre-feet at the end of 1962.³⁶ Demands for water in the San Gabriel Valley have not expanded at the same rate as those in West and Central Basin. Consequently, the San Gabriel Basin has not yet experienced a significant long-run overdraft.³⁷

³⁴California, Department of Water Resources, Bulletin 104, Appendix B, p. 8-5.

³⁵Some of the accumulated overdraft should properly be considered as developmental overdraft which cannot be replaced. Developmental overdrafts are frequently necessary in order to draw down a basin sufficiently for effective use as a reservoir. In West Basin, some of the shallow water zones have been dewatered and cannot be replenished economically. Also, some of the storage space which contains salt water will be abandoned to the sea. For a discussion of various types of overdraft, see Herbert J. Snyder, Ground Water in California: The Experience of Antelope Valley, Giannini Foundation Ground Water Studies No. 2 (Berkeley: University of California Press, 1955), p. 82.

³⁶This estimate was made after several years of intensive replenishment activities designed to offset annual overdrafts and to contribute to the reduction of the accumulated overdraft. See CWBWRD, Annual Survey for 1963, p. 52.

³⁷Studies of ground water conditions in the San Gabriel Valley during 1926-27 and 1940-41 estimated that a surplus of water was available in the underlying basin during those years. In 1951, the Flood Control District estimated that an overdraft of 4,000 acre-feet may have occurred. There

The existence of large accumulated overdrafts in West and Central Basins, and the consequent necessity to replace at least a large portion of these water reserves, signifies that the cost of water supply to the area will never again be as low as it has been. The depletion of local reserves ends an era of rapid economic growth largely based on the easily accessible ground water reserves beneath the coastal plain. Imported water has become the major source of water in West Basin, and will soon become the major source in Central Basin.

However, the substitution of imported water for local water as the basic source of supply will not lead to the diminished use or importance of ground water basins. In fact, their value will be increased as time progresses. The cost of importing water vast distances is very high. Aqueducts are designed to operate at a continuous flow, so large amounts of terminal storage must be maintained to meet variations in demand. Construction of surface reservoirs is costly. If local ground water basins can be used in conjunction with the massive aqueduct systems to meet these variations in demand, the over-all costs of water

have not been any recent studies of the present balance between supply and demand for ground water in the San Gabriel Valley by a public agency. See Los Angeles County Flood Control District, Report on Required Facilities for Replenishing and Protecting Ground Water Reserves in the central and West Coast Ground Water Basins, Part I Los Angeles: 1961), p. 29. Hereinafter cited as LACFCD, Rpt. on Required Replen., Part I.

supply systems will be much less than if it is necessary to build surface structures to replace them.³⁸

The Effect of Urban Development on the Quantity
and Quality of Water Supply

Land Use

The urbanization of large tracts of land that were formerly devoted to agricultural use has significantly reduced the amount of water that percolates naturally into the ground water basins underlying the area. Water that is now discharged through storm sewers and flood control channels into the ocean had previously penetrated directly into the basins underlying the San Gabriel Valley, the Central Basin nonpressure zone, and, to a limited extent, the West Basin. Surface run-off from open, porous regions devoted to agriculture is estimated to be no more than 20 per cent of the gross precipitation. Run-off will approach 80 per cent in an area completely covered with streets, buildings and paved areas.³⁹

Prior to World War II, the San Gabriel Valley was predominately agricultural. In 1932, only 21 per cent of the land in the valley was used for residential, commercial, industrial, school or street purposes. By 1955, the amount

³⁹See discussion of the value of West Basin in Chapter I, p. 16, infra.

³⁹California Department of Public Works, Bulletin 32, p. 13.

of land devoted to these urban uses had increased to 60 per cent. A similar trend has occurred in the nonpressure area of Central Basin. In 1932, 43 per cent of the surface overlying the forebay was devoted to urban uses, while in 1955 the amount had risen to 84 per cent.⁴⁰

While the quantity of deep percolation that can occur in West Basin is relatively small, construction of buildings and streets has reduced the amount of natural percolation still further. In 1932, 67 per cent of the land in West Basin was devoted to irrigation, non-irrigated agriculture or native vegetation. This open space was reduced to 16 per cent in 1960.⁴¹

Flood Control

Urbanization of an area increases the potential for damage by flood flows. Flood control measures to reduce this potential damage usually includes upstream storage, storm drains, and straightening, deepening and lining of major river channels. The Los Angeles County Flood Control District, which is responsible for both flood control and the conservation of local water resources, has constructed fourteen major reservoirs in the San Gabriel mountains designed to hold back approximately 106,000 acre-feet of

⁴⁰Bookman and Stetson, op. cit., pp. 1-72 and II-82.

⁴¹California, Department of Water Resources, Bulletin 104, Appendix B, p. 6-5.

run-off from local storms.⁴² During periods of high risk from additional storms, every effort is made to discharge flood water from flood control reservoirs as soon as possible. When the risk of further rainfall is low, these structures are used to conserve local water by releasing stored water gradually for percolation into the porous deposits of the valley floors and nonpressure zones at the forebays.

The Flood Control District has also straightened and lined most of the river channels crossing the coastal plain. Since 1927, the Los Angeles River has been lined from its forebay to the ocean. None of the flow of this river can percolate into the ground water basin below. In fact, the flow increases in volume as it crosses the plain, since many storm sewers discharge surface runoff of waste water into the lined channel. The San Gabriel River flows from Whittier narrows across the forebay in a permeable channel for the most part so that large quantities of its flow can still percolate into the underground. The Rio Hondo channel was unlined and relatively pervious prior to 1951, but the Flood Control District began construction of a concrete lined channel in that year and percolation has consequently been reduced. The estimated average annual net percolation in the forebay from the San Gabriel River and the Rio Hondo

⁴²Los Angeles County Flood Control District, Syllabus on Flood Control and Water Conservation in Los Angeles County (Los Angeles: 195), p. 1.

River between 1927 and 1959 was 61,930 acre-feet. Since 1951, the average annual net percolation has been reduced to 33,706 acre-feet.⁴³

Disposal of Waste

Extensive urbanization of an area brings with it severe problems related to the disposal of both domestic and industrial waste products. With a relatively low population density, it is possible to deal with the disposal of domestic waste by means of individual septic tanks and cesspools. Water from this source returns to the water supply with a quality level which would meet most standards for human use. The return flow from individual septic tanks and cesspools may be an important component of the ground water supply for areas lower in the system. However, the water so returned does contain a higher concentration of dissolved salts--as much as 300 parts per million higher than was contained in the water prior to use. It has been estimated that the mineral increment from domestic use averages seventy pounds per person per year or about 35,000 tons of salt a year for a population of a million people.⁴⁴ As more intensive urbanization occurs, individual efforts to deal with domestic waste disposal are no longer satisfactory and conversion to sewers becomes necessary. However, the use

⁴³California, Department of Water Resources, Rpt. on Prop. Replen. Dist., p. 48.

⁴⁴Statement by Herbert A. Howlett, op. cit., p. 15.

of sewer lines improves the quality of the remaining ground water, but significantly reduces the quantity of replenishment.

The City of Los Angeles and the County Sanitation Districts provide waste disposal service to the Los Angeles metropolitan area. Most of the waste water collected in these systems is discharged directly to the ocean after treatment. The Los Angeles City system originates in the San Fernando Valley and serves the cities of San Fernando, Burbank, Glendale, Beverly Hills, Santa Monica and Culver City on its route to the Hyperion Treatment plant and ocean outfall near El Segundo. The County Sanitation Districts system originates in the San Gabriel Valley and serves sixty-five cities and large unincorporated areas prior to treatment at its Lomita Treatment plant and discharge to the ocean at White's Point. During 1958, more than 500,000 acre-feet of sewage water was discharged through these facilities to the sea.⁴⁵

The disposal of industrial wastes poses related, but even more serious problems. Industrial waste products frequently contain deleterious materials which are very harmful even when present in small quantities. When industries dispose of their wastes individually, wastes are

⁴⁵H. E. Hedger and A. M. Rawn, A Report Upon the Potential Reclamation of Sewage Now Wasting to the Ocean in Los Angeles County (Los Angeles: County Flood Control District and County Sanitation Districts, 1958), p. 3.

usually discharged into the nearest stream or river channel. In 1947, for example, a serious problem of pollution was caused by the discharge of industrial wastes into the Los Angeles and San Gabriel Rivers. In 1948, the Los Angeles River Pollution Control Committee was formed to eliminate this condition.⁴⁶ Since 1949, the Regional Water Pollution Control Board Number 4 has set the standards for industrial waste disposals into the Los Angeles, San Gabriel and Dominguez channels. Most industrial waste in the Los Angeles area is discharged into the Los Angeles City or County Sanitation Districts sewage lines. This increases the problems related to the reclamation of sewage water, but reduces the risk of contamination of ground water supplies by industrial wastes.

The disposal of solid refuse in pits located within or above ground water basins is another serious problem in the maintenance of ground water quality. Since the burning of refuse and rubbish has been prohibited in Metropolitan Los Angeles as a smog control measure, the "volume of refuse and rubbish collected for ultimate burial in fills has more than doubled."⁴⁷ People in the water industry are quite concerned about the number and size of these rubbish pits

⁴⁶Max Bookman, Activities of Public Agencies in Water Quality Investigations and Water Pollution Control in the San Gabriel River System (Glendale: West Basin Water Association and Central Basin Water Association, 1962), p. 18.

⁴⁷Statement by Herbert A. Howlett, op. cit., p. 15.

since the decomposition process generates gases which may dissolve and enter underlying ground water basins. Furthermore, precipitation "may percolate through the refuse, leaching out deleterious minerals and salts and carry them to the ground water."⁴⁸ Refuse pits may also affect the quantity of available ground water storage, as well as the quality, when decomposable refuse is placed in pits. The water table must be kept at a level which will not come in contact with the decomposable waste.

The Regional Pollution Control Board Number 4 has adopted a resolution which classifies disposal sites according to their relation to ground water basins and specifies the nature of the wastes acceptable for dumping in each general class.⁴⁹ However, there is a shortage of potential sites which do not have contact with water bearing zones and the regional control board has been subject to considerable pressure to modify some of its standards regarding the disposal of refuse in gravel pits located

⁴⁸Statement by Herbert A. Howlett, op. cit., p. 16.

⁴⁹Regional Water Pollution Control Board No. 4, "Adopting Objectives for Prevention and Control of Water Pollution with Respect to Disposal of Wastes on Land in the South Coastal Basin within the Los Angeles Region," Resolution No. 55-1. This resolution is a guideline rather than a prescription on the actions of the control board. In the regulation it is stated that "it is the intent of this Regional Water Pollution Control Board that the foregoing objectives shall be considered as the general policy of the Board in its review of each disposal site and may be modified from time to time as conditions change or as special circumstances indicate" (pp. 4-5).

within a ground water basin.⁵⁰

The Development of an Imported Water Supply

The development of the metropolitan Los Angeles area led to the gradual depletion of local ground water supplies, and at the same time created an economic base that was capable of developing new water supplies by the importation of water from more distant sources. In the early 1900's, the City of Los Angeles was among the first to recognize that the future growth of the area was limited by the scarcity of local water. Early studies of alternative supplemental supplies indicated that it would be feasible to construct an aqueduct from the Owens River Basin, some 250 miles away on the eastern slope of the Sierra Nevadas, to Los Angeles. After approval of a \$25,000,000 bond issue by the voters of Los Angeles City, construction of the aqueduct was initiated in 1905. The first Owens River water entered San Fernando Valley on November 5, 1913.⁵¹

The yield of the Owens River did not equal early expectation and Los Angeles began to extend the aqueduct system into Mono Basin located north of Owens Valley during the early 1930's. The additional supply has enabled the City to operate the Los Angeles aqueduct at its full capacity of 325,000 acre-feet per year. The control Los Angeles

⁵⁰See discussion in Bookman, Activities of Public Agencies, p. 20.

⁵¹Ostrom, Water Supply, p. 15.

exercised over the Los Angeles River and its new aqueduct system has enabled it to become the dominant city of the South Coastal Basin. Many surrounding communities, some of which were already incorporated, solved their water shortage problems by annexing to or consolidating with the City of Los Angeles to share its imported water supply.

Annexation to Los Angeles could not solve water shortage problems for the entire South Coastal Basin, as the city's supply, even supplemented by Mono Basin water, could not satisfy the growing demands of the entire area. Recognizing the need for an even larger source of supplemental supply, the City of Los Angeles initiated a new series of studies of alternative sources in the 1920's, even before it proceeded with the Mono Basin extension. The Colorado River appeared to be the most feasible source. However, the project was of such magnitude that it was necessary to create a new political institution, the Metropolitan Water District of Southern California, to enable other communities which required additional water to coordinate efforts with Los Angeles. After a \$220,000,000 bond issue was approved by the voters of the new district, construction was started early in 1933 on a route located entirely in California. The first Colorado River water was delivered to Pasadena in 1941.⁵² In 1952, Metropolitan began an expansion program

⁵²Ostrom, Water Supply. p. 21.

to bring its aqueduct up to full design capacity. By 1960, this program was largely completed and the main Colorado River aqueduct was enlarged to transport Metropolitan's claim to 1,212,000 acre-feet of water per year, or 1,180,000 acre-feet after average losses. Total investment in the aqueduct system has amounted to approximately \$477 million.⁵³

Use of imported water in West Basin has slowly increased through the years. The City of Los Angeles was the first to bring imported water into West and Central Basins soon after its Owens River aqueduct was completed. Los Angeles, Long Beach and Torrance were among the first cities to join Metropolitan, and they began to import small quantities of Colorado River water to West and Central Basins after 1941. The creation of the West Basin Municipal Water District in 1948 increased the utilization of imported water in West Basin. However, it was not until pumping was curtailed in 1955 that West Basin water enterprises began to import large quantities of water. During 1963, West Basin enterprises imported approximately 70 per cent of the water supplied to the area.

Until recently, Central Basin has continued to rely primarily on local ground water reserves. However, production was curtailed in Central Basin in accordance with an agreement negotiated in 1962. This is the first step

⁵³MWD, Annual Report for 1961-62, p. xxvi.

toward eventual reliance on imported water to meet base demands. During the first year of operation under the Central Basin interim agreement, the quantity of surface water imported by signatories to the agreement increased by 173 per cent over the quantity imported the previous year. A total of 67,000 acre-feet was imported for direct use by parties to the interim agreement during 1962-63.⁵⁴ In addition, 125,000 acre-feet of imported water were spread at the Montebello forebay during the year.⁵⁵

Enterprises have resisted changing from the use of ground water to the use of imported Colorado River water because of the increased cost and the poorer quality of the imported supply. Pumping costs average \$10.00 an acre-foot in the area, while the current water rate for treated and softened Metropolitan water is \$30.00 per acre-foot. The total dissolved solids contained in natural Colorado River water averaged 681 ppm during 1962, while the amount of dissolved solids normally found in West Basin ground water averaged between 400 and 500 ppm.⁵⁶ Colorado River water contains a high level of calcium carbonate. As a result, Metropolitan has invested considerable money in the construction of treatment plants to soften their water sold

⁵⁴Watermaster, Resort for Central Basin for 1962-63, p. 24.

⁵⁵CWBWRD, Annual Survey 1963, p. 13.

⁵⁶MWD, Annual Report 1961-62, p. 51, and Ref. Rpt. II pp. 28-33.

for domestic and industrial use. However, even after treatment, the quantity of calcium carbonate in Metropolitan water was 183 ppm in 1962.⁵⁷

The future availability of Colorado River water to enterprises in West Basin is subject to considerable uncertainty. According to the decision in Arizona v. California, the amount of water that Metropolitan will be able to divert from the Colorado River will depend upon the total amount of water available for use by the lower basin states.⁵⁸ The first 7,500,000 acre-feet of main stream water will be divided in the following manner: 4,400,000 to California, 2,800,000 to Arizona and 300,000 to Nevada. Arizona and California will each receive one half of any surplus. The Supreme Court held that the Secretary of the Interior is authorized to establish a formula for the allocation of water in the lower basin if the annual yield of the basin is less than 7,500,000 acre-feet. This authority includes "sufficient power to carry out an allocation of the water among the States and among the users within each State without regard to the law of prior appropriation...."⁵⁹ The Secretary of the Interior has not yet announced the

⁵⁷Prior to treatment it was 330 ppm, MWD, Annual Report 1961-62, p. 51.

⁵⁸Arizona v. California, 373 U.S. 546 (1963).

⁵⁹Ibid., p. 581. Later in the decision the Court reiterated this holding and stated that "the Secretary in choosing among users within each State and in setting the terms of his contracts is not bound . . . to follow state law" (p. 586).

standards that he will use to allocate the waters of the Colorado in a low yield year.

Metropolitan's claim to Colorado River water is fourth in priority among the California claimants. If 7,500,000 acre-feet of water is available to the lower basin and the three California entities with prior claims to that of Metropolitan exercise their prerogatives, Metropolitan will receive 550,000 acre-feet of water-45 per cent of the capacity of the Colorado River aqueduct. If the yield of the Colorado falls below 7,500,000 acre-feet per year, insufficient water may be available to operate the Colorado River aqueduct at more than a fraction of its capacity.

In the past, member agencies of Metropolitan have been able to purchase as much Colorado River water as they wanted to put to beneficial use. The total demand for Metropolitan water has never equaled the total available supply. However, in the future the supply may be less than the demand. When this occurs, the shortage of water will be borne by enterprises within Metropolitan in proportion to their preferential rights. The preferential right of a member agency is in the same ratio to the total water supply of Metropolitan as the accumulated tax assessments of the member agency bears to the total revenue received by Metropolitan.⁶⁰

⁶⁰California, Water Code App., sec. 35-5-1/2.

The effect of the application of this rule to member agencies in West and Central Basins if the aqueduct were operating at full capacity is illustrated in Table VII.

Table VII

The Effect of the Preferential Rule on the Water Available to Agencies in Central and West Basins

Agency	Percentage of Total Metropolitan Supply under Preferential	Amount if 1,212,000 Is Total Supply	Amount Treated Water Purchased 1961-62
Municipal Water Districts:			
West Basin	6.6	79,992	76,417
Central Basin	9.2	111,504	10,148
Torrance	1.1	13,332	14,942
Long Beach	5.8	70,296	13,117
Total	23.7	275,124	114,624

Enterprises which purchase Metropolitan water through the West Basin Municipal Water District already purchase close to their full preferential rights to a full yield of the aqueduct, while the City of Torrance exceeds its preferential right. On the other hand, the City of Long Beach and the Central Basin Municipal Water District have not yet begun to use a quantity of imported water that approaches their preferential right to the full flow of the Colorado aqueduct. If the flow of the aqueduct were considerably reduced, entities within the West Basin Municipal District

would collectively possess a preferential right to only 6.6 per cent of the total available flow. The preferential right of the Central Basin Municipal Water District is 9.2 per cent; Torrance, 1.1 per cent; and Long Beach, 5.8 per cent. Together, water users in West and Central Basins would have a preferential right to almost one fourth of the available yield of the aqueduct.

Another factor which will affect the quantity of imported water available to water users in West Basin is the speed with which the California aqueduct transporting water from northern California is completed. The first water deliveries by the State to Metropolitan are scheduled for 1972. If the State project is completed on time, northern water should arrive in Southern California before the flow of the Colorado River aqueduct is adversely affected in any serious proportions.

However, problems concerning the allocation of these two supplies by Metropolitan to its member agencies have yet to be resolved. One alternative is for Metropolitan to commingle the water from both sources and charge one price for all water. The City of Los Angeles and some other member agencies object to this plan, since it would effectively remove their preferential rights to Colorado River water and force them to pay what is considered a "heavy overcharge on Colorado River water to subsidize

Feather River water deliveries."⁶¹ Until some of these problems relating to the future operation of the Colorado River and California aqueducts are settled, the quantity, price and availability of future imported water to users in West Basin are subject to substantial uncertainties.

The Effect of Artificial Replenishment on the Quantity and Quality of Local Water Supplies

The communities overlying the ground water basins directly related to West Basin have engaged in a variety of techniques to increase the average annual ground water yield by means of artificial replenishment. Spreading has been the primary means of artificial replenishment utilized in the nonpressure zones of Central Basin and the San Gabriel Valley. Spreading sites are rare in West Basin, and fresh water injection under pressure through recharge wells has been the major technique utilized to achieve artificial replenishment in that area.

Conservation of Local Supplies

Artificial replenishment prior to the early 1950's represented an endeavor to compensate for losses to the

⁶¹J. C. Moller, Jr., President, Los Angeles Board of Water and Power Commissioners, quoted in Los Angeles Times, February 9, 1961. Samuel B. Nelson, General Manager and Chief Engineer of the Los Angeles Department of Water and Power, stated in the same article that Los Angeles might not need any northern water until 1990. Los Angeles is in the process of increasing its own supply by adding a second barrel to the Owens River Aqueduct. See MWD, Annual Report for 1961-62, p. xxv.

natural supply of local water resulting from urbanization, flood control projects and the increased reliance on sewer systems. Some of the earliest spreading works were constructed high in the San Gabriel Valley north of Azusa by the San Gabriel Spreading Corporation in 1917. In 1930, the Los Angeles County Flood Control District constructed the Big Dalton Canyon and Little Dalton Spreading Grounds below the Big Dalton Dam. Since then, six additional spreading basins have been constructed and operated by the Flood Control District to conserve local water and to replenish the underlying ground water basins.

In 1937, the Flood Control District moved downstream to construct spreading basins adjacent to the San Gabriel and Rio Hondo Rivers. However, the spreading works were constructed in an area that has contact predominately with only one of the major aquifers connecting West and Central Basins, the Gaspur aquifer. The Lynwood and Silverado aquifers, which are the principal water producing aquifers in West Basin and the pressure zones of Central Basin, ". . .are mainly in contact with the overlying aquifers connected with the ground surface along the upstream edge of, and further upstream than, the Rio Hondo Coastal and San Gabriel Coastal Spreading grounds."⁶² As a result, "percolating water from these facilities may have a limited effect upon the movement of water into and through these

⁶²CWBWRD, Basin Management Study, p. 39.

principal aquifers."⁶³

In 1958, the Flood Control District completed the Whittier Narrows Dam located immediately north of the spreading grounds which can retain up to 1,000 acre-feet of water when Rio Hondo surface run-off exceeds the capacity of the forebay to absorb the flow. At the end of each storm, water in the pool is released to the spreading ground for conservation.⁶⁴ Local stream flow is the highest quality water available for artificial replenishment, and the Flood Control District has attempted to conserve as much of the local runoff as is consistent with their primary purposes as a flood control agency.

Use of Imported Supplies

While the conservation of local run-off partially offsets the deleterious effects of urbanization on water supply, these efforts have not been able to augment the local ground water supply sufficiently to meet expanding demands. In 1953, a large scale replenishment program utilizing imported water was initiated at the Montebello forebay.⁶⁵

⁶³CWBWRD, Basin Management Study, p. 39.

⁶⁴Interview, Howard Haile, October 20, 1960.

⁶⁵Orange County was the first area of the South Coastal Basin to start a large scale replenishment program. Beginning in 1949, the Orange County Water District, with the early help of the Orange County Flood Control District, has purchased a total of 968,026 acre-feet from Metropolitan for ground water replenishment up through June 30, 1962. MWD, Annual Report 1961-62, p. 43.

This program was a response to the recognition that ground water reserves were being depleted and that the continued use of Central and West Basins was dependent upon the reduction of accumulated overdrafts by artificial replenishment of imported water. Since 1953, nearly 900,000 acre-feet of untreated Metropolitan water have been spread by the Flood Control District at the forebay. More than half of this amount has been spread since the creation of the Replenishment District in 1960.⁶⁶ There has been some serious criticism of the practice of spreading raw Colorado River water since this water contains such a high level of dissolved solids which are not removed in percolation.⁶⁷ However, studies made by the Flood Control District have demonstrated that the Metropolitan water thoroughly mixes with local ground water and is thereby diluted. The quantity of dissolved solids found in water produced a mile or two downstream from the spreading grounds has been quite low.⁶⁸

Among the variables which will affect plans to continue spreading large quantities of imported water at the forebay is the capacity of the forebay to absorb such

⁶⁶CWBWRD, Annual Survey 1963, p. 13.

⁶⁷See statements by Assemblyman Beaver at the Hearings of the Assembly Interim Committee on Water held in Anaheim, California, November 29, 1961, pp. 29-32.

⁶⁸Bookman, Activities of Public Agencies, p. 24.

quantities of water. In 1960-61, a record total of 209,300 acre-feet of water was spread. As a result of the large quantity of water spread, a ground water mound was "created under the spreading grounds so that the top of the mound [was] close to the surface of the ground."⁶⁹ Spreading of imported water was reduced to approximately 140,000 acre-feet in 1961-62, but water from the mound did not move into the rest of the basin as rapidly as had been hoped. To complicate matters further, the voluntary pumping curtailment negotiated in Central Basin during 1962 created a general rise in water levels and slowed down the rate of movement of replenishment water away from the forebay. As a result, the Replenishment District reduced spreading of imported water again in 1962-63 to approximately 92,000 acre-feet.⁷⁰

A second factor affecting the future replenishment program based on imported supplies is the availability of untreated Colorado River water for spreading. The supply of untreated Metropolitan water for replenishment is inversely related to the demand for treated Colorado River water for direct consumption. Metropolitan sells untreated water at a reduced rate for replenishment when this water cannot be sold for direct use to member agencies. The demand for treated Colorado River water is relatively low

⁶⁹CWBWRD, Annual Survey 1963, p. 53.

⁷⁰Ibid., pp. 13 and 53.

during the fall and winter months. Consequently, considerable capacity exists during these months to transport untreated Metropolitan water to an outlet above the spreading grounds. However, the fall and winter months are also the months during which rainfall occurs and spreading of imported water may be interrupted frequently to allow local runoff to enter the spreading grounds.

Another variable affecting the future supply of replenishment water will be the total demand for imported water for direct use made during an entire year. As demands for Metropolitan water increase, the availability of replenishment water during any season of the year will decrease. In 1960, an estimate was made of the future Metropolitan water available for replenishment at the Montebello forebay after other demands were met (see Table VIII). Since then, neither the demands for water for direct use nor the amount of water spread by the Replenishment District have fulfilled expectations. This estimate was made prior to the final decision in Arizona v. California, and the quantity of water available for replenishment is consequently subject to even greater uncertainty.

Use of imported water supplies to replenish West Basin has been related primarily to the construction of an artificial barrier against the sea. Since 1952, a total of 38,370 acre-feet of treated Colorado River water have been

Table VIII
 Colorado River Water: Estimates and actual Use for Direct Replenishment Purposes

Year	Direct Use of MWD Water		Replenishment Water	
	Estimated ^a (water-year)	Actual ^b (fiscal year)	Estimated ^c Available (water-year)	Actual ^d Used (water-year)
1960-1961	702,000	792,042	154,000	147,800
1961-1962	774,000	752,644	157,000	208,122
1962-1963	793,000		249,000 ^e	125,200
1963-1964	930,000		250,000	78,700
1964-1965	930,000		250,000	
1965-1966	955,000		225,000	
1966-1967	985,000		195,000	
1967-1968	1,015,000		165,000	
1968-1969	1,045,000		135,000	
1969-1970	1,070,000		110,000	

Table VIII (continued)
 Colorado River Water: Estimates and actual Use for Direct Replenishment Purposes

Year	Direct Use of MWD Water		Replenishment Water	
	Estimated ^a (water-year)	Actual ^b (fiscal year)	Estimated ^c Available (water-year)	Actual ^d Used (water-year)
1970-1971	1,095,000		85,000	
1971-1972	1,135,000		60,000	
1973-1974	1,145,000		35,000	
1973-1974	1,180,000		--	

^aDerived from chart in Central and West Basin Replenishment District, Report on Ground Water Management, p. 41. Includes use by Orange County Water District for replenishment.

^bMWD, Annual Report, 1961-62, p. 38.

^cCWBWRD, Report on Ground Water Management, p. 41. Replenishment water available to Orange County not included.

^dCWBWRD, Annual Report, 1963, pp. 13 and 53, adjusted to omit water purchased from Sanitation Districts.

^eLower treatment plant goes into operation.

injected into wells along the coast.⁷¹ Most of this water has contributed to the ground water supply in West Basin since less than 10 per cent of the injected water is lost to the sea. However, the small quantity of water injected into the basin has not made a significant difference in the ground water supply picture in West Basin. After construction of the barrier is completed in 1965, an average of 50,000 acre-feet a year will be injected along the eleven-mile front if that quantity of water is available for injection. This quantity of water would more than offset the average annual overdraft in West Basin and a portion of the injected water would function to reduce the accumulated overdraft.

Use of Reclaimed Water

Uncertainty about the future availability of Colorado River water has led to the search for an additional source of water for replenishment purposes. Since industrial development has been quite concentrated on the coastal plain near the ocean, the sewage flow in upstream sewers is largely residential and susceptible to reclamation and reuse. The first significant step to develop this source was taken in 1962, with the construction of the Whittier Narrows Water Reclamation Plant. This plant currently produces approximately 13,000 acre-feet of reclaimed sewage effluent

⁷¹CWBWRD, Annual Survey 1963, p. 13.

per year, but can be expanded in the near future to produce 50,000 acre-feet per year. Sites for several small reclamation plants have been located in West and Central Basins which could produce an additional 32,000 acre-feet of reclaimed water per year.⁷² In addition, the City of Los Angeles may make the secondary effluent produced at its Hyperion Treatment Plant available as a source of supply for the West Coast barrier.

Several problems still exist in the utilization of reclaimed water. Ordinary sewage treatment processes have little effect on the amount of salt present in sewage influent. Currently there are less dissolved solids present in the reclaimed water produced at the Whittier narrows plant than are found in Colorado River water. However, as more Colorado River water is used in the San Gabriel Valley, the quantity of dissolved solids present in sewage water will rise markedly. And, if reclaimed water is introduced high in the system to be reused more than one time as it moves toward the sea, the problem of salt balance is again compounded. The widespread use of nondegradable detergents has created problems, since they are not removed by an activated sludge treatment and the quantity of detergent builds up with each reuse. Viruses present in water are difficult to detect and to remove by normal treatment.

⁷²West Basin Water Association, Minutes, May 24, 1962, p. 15.

Consequences of the Quantity and Quality of the
Water Supply System on the Management of
West Basin

The nature of the water supply system in the Los Angeles metropolitan area has many important effects on the type of program that can be developed to use West Basin and its linked neighbor, Central Basin, as components in a conjunctive use system. Among the most important consequences are the following:

1. The average annual local supply of water to West Basin and the surrounding area is inadequate to meet the needs of the present and future population of the area. As a result, several aqueducts have been constructed or are planned to bring large quantities of imported water to the region. West Basin and the related ground water basins which have provided a source of supply for the expanding economy of the Los Angeles metropolitan area will continue to play an even more important role in the future. As part of a conjunctive use system, these basins can function as regulating reservoirs which are replenished by local and by imported water delivered during off-peak periods. The use of West Basin will probably be limited to seasonal regulation since (1) it has a relatively low natural yield and the storage capacity is limited as a result of its small size, (2) the immediate threat of salt water intrusion and (3) the difficulty and expense of achieving direct artificial replenishment in a pressure zone. Central Basin

and the San Gabriel Valley probably can be used to reduce long-run variations in supply and demand. During extended droughts, when the demands for water are highest, water levels in these basins can be drawn down to create storage capacity for replenishment during subsequent wet seasons when demands for water are low. Under a management formula, water levels in West Basin probably will not vary to an appreciable extent from year to year, while water levels in Central Basin and the San Gabriel Valley may show considerable variation between wet and dry years.

2. Both seasonal and cyclical variations in the local water supply affect the planning of replenishment activities. Because of the seasonal variation in precipitation, activities related to the conservation of the local water supply must be concentrated during the winter months. The extreme cyclical variation creates the need for conservation reservoirs in the higher valleys to regulate the release of water for replenishment purposes. Without surface reservoirs to retain the large quantities of water that fall during relatively short periods of time in the wet years, only a small portion of the run-off would enter the underlying ground water basins. Surface reservoirs are also necessary to reduce damage to property caused by excessive flood flows. However, it is often difficult simultaneously to accomplish both flood control and conservation of local water. To achieve flood control protection, reservoirs

should be emptied immediately after one storm so that storage capacity is available to retain flood flows from the next storm. To achieve maximum conservation, storm water should be released slowly from reservoirs to insure as high a rate of percolation as possible. The Flood Control District, charged with both the responsibility to prevent flood damage and to conserve local water, is faced with some difficult decisions in the operation of these reservoirs.

3. The availability of excess capacity in the Colorado River aqueduct during the next few years presents an opportunity to replace depleted ground water reserves with a relatively inexpensive imported supply. While the quality of this source is not as high as local supplies, it would appear from present research that replenishment by this source will not cause long-run damage to the basins. Two physical problems affect the attempt to reduce accumulated overdrafts in West and Central Basins by using "surplus" Colorado River water. The first is the build-up of a fresh water mound under the forebay as a result of the large scale spreading program initiated in 1960 and the limited transmissibility of the aquifers surrounding the forebay. The forebay may not be able to absorb the water which will be available for replenishment purposes during the next decade. The second problem is less severe. Imported water for replenishment is available primarily during winter when the demands for consumptive use of imported water are at a

minimum. Winter is also the time when the heaviest local run-off from rainfall can occur. The use of spreading works to insure optimum conservation of local and Colorado River water becomes a difficult problem in scheduling when both water sources are primarily available during the short winter season.

4. The uncertainty concerning the availability and price of future imported water supplies increases the problems of planning and adds a special urgency to the immediate replenishment program based upon the excess capacity in the Colorado River aqueduct. If the supply of water from the Colorado River diminishes with the growth of demands in other states, then the base supply for the area will be the very costly water imported from Northern California after 1972. Water use patterns may change significantly as the price of water rises. The future demand for water may be less than present studies have predicted, since most projections have assumed that the demand for water is relatively inelastic. Water producers are motivated to use the least expensive supply and to resist purchasing the most costly imported water. The development of institutional facilities which will lead to an optimal pattern of conjunctive use of imported and ground water supply systems will require the most creative abilities of the people associated with the water industry in Southern California.

Many individuals associated with the water industry

have viewed reclaimed water as a reserve supply to be utilized after other supplies have been depleted. If the flow of the Colorado River aqueduct is reduced, one would assume that the replenishment program will rely heavily on the use of reclaimed water. However, many technical problems related to water quality need to be solved in the course of using this water as the major source for ground water basin replenishment.

5. The success of a long run management program is dependent upon the accuracy of the information available about the physical system to be regulated. Probably more information exists about the linked system of West and Central Basins than exists for most ground water basins in California. However, considerable uncertainty also exists concerning many factors. Since geologic and hydrologic studies are based upon many estimates concerning inter-related events, and well-respected experts can disagree about the estimates used as input and output factors in accepted formulas, the conclusions based upon these estimates may vary considerably.

The management of a ground water basin is far more complex than the regulation of a surface water supply system because of the existence of so many unknowns which may substantially affect the water supply of a ground water basin. To a large extent, trial and error must be utilized in attempting to create a conjunctive use system. While

it is possible to obtain more accurate information about the physical system, the cost of improving the state of knowledge is very high. The various agencies involved in developing a management plan for West Basin can take advantage of the considerable information that they do have by undertaking actions which they think will produce the most favorable consequences. Evaluation of the effectiveness of past actions provides useful experience upon which to base future action. While feedback is slow, it is possible to learn from past errors. As time progresses a more accurate picture of the state of the ground water basin can be developed if efforts are made to evaluate the consequences of prior actions.

CHAPTER III

INSTITUTIONAL ARRANGEMENTS AND THEIR EFFECT ON THE ALLOCATION AND DEVELOPMENT OF GROUND WATER RESOURCES

The previous chapter was devoted to a discussion of the interaction between the physical environment and those who made demands upon that environment for water supplies. The development of water resources in West Basin and the surrounding area can also be viewed as a process of interaction between water producers and the existing economic, legal and political institutional arrangements for allocating water resources. Institutional facilities create both opportunities and risks for those seeking to provide water supplies for the area in addition to opportunities and constraints posed by the physical system. This chapter will be devoted primarily to a general discussion of the type of economic and legal structures that affected the behavior of water producers in West Basin and the opportunities to change them through political action.

The development of water supplies in West Basin has been a problem of allocating scarce resources. Many problems relating to the allocation of resources are successfully negotiated within the context of the marketplace.

If conflicts concerning the use of resources can be resolved in the market, there is no need for substantial investment in other institutional facilities to allocate resources. However, West Basin water producers have never been able to establish an effective market to allocate water resources. The law defining rights to ground water has been so uncertain and confusing that it has led to the overdevelopment of ground water resources to the injury of all producers using the common supply. As a result, entrepreneurs have been led to turn more and more to political action to create new institutional structures to deal with their problems.

The remainder of this chapter will be organized in five parts: (1) a brief analysis of the market as an institutional device for the allocation of resources and of the type of goods and services that are readily exchanged in a market; (2) a discussion of the problems involved in allocating ground water supplies and storage in a market; (3) a study of the effect of ground water law in California on the allocation of ground water resources; (4) a discussion of the opportunities and risks involved in solving water resources allocation problems through the political process in California; and (5) a discussion of the effect of institutional structures on the development and allocations of West Basin water resources.

The Market as an Institutional Facility for the
Allocation of Resources

The need for an institutional facility to aid individuals to allocate scarce resources results from the competing demands for the use of scarce resources. Conflict among individuals over the use of water resources concerns questions of who may gain access to use water and for what purpose. The use of a resource by one individual frequently prevents the use of that resource by another. Individuals making conflicting demands may exist in different physical locations or in different periods of time. For example, the use of ground water for domestic purposes by the residents of Manhattan Beach precludes the use of the same water for domestic purposes by residents in the neighboring El Segundo or for industrial purposes by the nearby Standard Oil Refinery. And, the present use of ground water which is withdrawn from accumulated reserves by both the cities and the refinery precludes the use of that water by future residents of these cities or refineries for any purpose.

Direct physical confrontation is one way individuals settle disputes over the allocation of scarce resources, but the costs of this method are great.¹ Much of human energy is devoted to the task of devising institutional

¹The use of violence in the allocation of water resources in California has a long history. See Ostrom, Water and Politics, pp. 122-25 and 222 for a description of the open violence resulting from disputes over water resources in the Owens Valley and Colorado River.

facilities to enable individuals to compete peacefully for scarce resources in a manner that leads to satisfactory allocation of currently available or potential supplies of scarce resources.

The market is a mechanism in which those who control the use of certain goods and services, and wish to sell them, can signal their intention to others who wish to gain access to the use of these goods. Competition among sellers to sell their goods at as high a price as possible and among buyers to purchase the goods they desire at as low a price as possible creates market dynamics. Markets are efficient facilities for allocating resources when information about surrounding transactions is available, when anyone can readily enter or leave the marketplace, and when the goods being exchanged meet certain requirements.² If a market functions properly, the marginal value in use of the last item purchased by all buyers will be equal to the price paid for the good.³ In addition, the marginal value in use

²"In the market economy, prices are the signaling device that informs each person of other people's economic decision; and the merit of perfect competition is that it would cause prices to transmit information reliably and people to respond to this information properly." Tibor Scitovsky, "Two Concepts of External Economies," The Journal of Political Economy, LXII (April, 1954), 150.

³See Jack Hirshleifer, James C. De Haven and Jerome W. Milliman, Water Supply: Economics, Technology and Policy (Chicago: The University of Chicago Press, 1960), p. 37. The value in use of a unit of water is defined to be "measured by the maximum amount of resources (dollars) which the consumer would be willing to pay for that unit." As a result, there will be times when value in use is

of the last unit sold by all sellers will be equal to the price received for this good. When this happens, both buyers and sellers are relatively satisfied with the manner in which goods and services are allocated and do not attempt to devise other institutional facilities to allocate resources. In addition, society benefits from an efficient allocation of resources into their most valued uses with minimum effort spent in accomplishing this task.⁴

Private Goods

Goods to be readily exchanged in a market need to be relatively exclusive, determinate and easily transferable. Exclusiveness implies that a good can be contained in some way to exclude those who do not purchase the good from using or enjoying it.⁵ Determinateness implies ease of definition

higher than exchange value, which is what is actually paid for the unit, unless a market is functioning perfectly.

⁴If the market functions satisfactorily, the price of various goods and services desired serves as a regulator. "If insufficient resources are being employed in making a particular article and oversufficient resources are going into another article, an increase in the price of the first and a fall in the price of the second will stimulate individuals controlling the necessary resources to divert a part of them into the first activity and out of the second. . . ." United States National Resources Committee, The Structure of the American Economy, Vol. I (Washington, D.C.: Government Printing Office, 1939), p. 97.

⁵Richard Musgrave discusses the relation of the exclusion principle to private goods in the following way: "If a consumer wishes to satisfy his desire for any particular commodity, he must meet the terms of exchange set by those who happen to possess this particular commodity and vice versa. That is to say, he is excluded from the

of the nature of the goods. Determinate goods are divisible from other similar goods and are usually concrete objects like houses and cars, which have distinct limits or boundaries. Transferability implies that the good is readily exchanged for another good. Goods which meet these criteria are usually considered to be private goods.

Private goods are easily packaged. Packaging refers to some method for delimiting the boundaries of a good and excluding it from those who do not pay for it, while, at the same time, making it fairly easy to sell. A loaf of bread on a market shelf is frequently cited as an example of the packaged private good available for exchange in the marketplace. A house or car is packaged by a set of legal documents which define the boundaries of the good, who has exclusive control over it and how it can be transferred from one individual to another. The capital assets of a large corporation are packaged by the stock certificates issued to represent assets which it is still using.

Public Goods

However, not all the goods and services desired by individuals can meet the requirements of the easily packaged private good which is readily exchanged in a market. Some

enjoyment of any particular commodity or service unless he is willing to pay the stipulated price to the owner." The Theory of Public Finance: A Study in Public Economy (New York: McGraw-Hill Book Company, inc., 1959), p. 9.

goods cannot be excluded from those who do not pay for their use. Other goods have such a range of joint and alternative uses that the priority of claims for a discriminate use or user cannot be determined through the functioning of a normal market. When the goods desired by individuals are not exclusive, determinate and easily transferable, individuals have problems in their attempt to achieve a satisfactory manner of allocating scarce resources to their most valuable use. Frequently, individuals invoke public authority in their attempt to provide goods which are not readily exchanged in a market. They may seek to establish new laws which transform the basic operation of the market or to create public enterprises to provide these goods. Because of the necessity of reliance upon public provision or extensive public regulation, goods which are not exclusive, determinate, and easily transferable are considered to be public goods.

Economists since the time of Adam Smith have recognized that some goods were public in nature since they were enjoyed by everyone, once they were produced, regardless of whether persons contributed a payment for their enjoyment. Economists variously refer to public goods as collective goods, indiscriminate goods or indivisible goods. Collective public goods have been defined as "having the property that, once produced, their enjoyment by each and every individual does not reduce their availability for the

enjoyment of others.⁶ In other words, collective public goods are difficult to package.⁷ National defense is used as the classic example of a collective good. Flood control is another collective public good. A public good is a good enjoyed by all who form a part of a common collectivity, association or community. A flood control program benefits all those who own property in an area threatened by potential flood damage, regardless of their willingness to pay for the protection.

While collective public goods are difficult to package, it may be possible to "package" them to some extent in relation to the set of events being provided as a "good" and to delimitate the collectivity to which they apply. It may be possible to make the good available to those who pay for it and to exclude those who do not pay for it. Packaging a collective good involves the creation of a public

⁶Robert H. Strotz, "Two Propositions Related to Public Goods," The Review of Economics and Statistics, XL (November, 195), 329. See also, Paul A. Samuelson, "The Pure Theory of Public Expenditure," The Review of Economics and Statistics, XXXVI (November, 1954), 3; Paul A. Samuelson, "Diagrammatic Exposition of a Theory of Public Expenditure," The Review of Economics and Statistics, XXXVIII (November, 1956), 345; Charles M. Tiebout, "A Pure Theory of Local Expenditures," Journal of Political Economy, LXIV (October, 1956), 416-24; and Paul A. Samuelson, "Aspects of Public Expenditure Theory," The Review of Economics and Statistics, XL (November, 1958), 332-39.

⁷See Vincent Ostrom, Charles Tiebout and Robert Warren, "The Organization of Government in Metropolitan Areas: A Theoretical inquiry," American Political Science Review, LV (December, 1961), 833.

organization whose scale of operation is coterminous with the boundaries of those who enjoy the good.⁸ Flood control can be packaged by creating a public district to include all of the areas which are threatened by potential flood damage. Persons who benefit from the provision of flood control pay for its provision in the form of taxes assessed in relation to benefit. Taxes are a means of capturing a form of payment for the benefits received.⁹

Public provision of collective goods does not have to involve public production of collective goods.¹⁰ A public agency can make contractual arrangements with private firms or other public agencies to undertake the actual construction of flood control channels and operation of flood control works. The private agency can maintain the production function, but a public agency with the power of

⁸The creation of a public district to provide flood control is an extra-market operation in the sense used by E. Ronald Walker, From Economic Theory to Policy (Chicago: University of Chicago Press, 1943), p. 100. Walker began to develop a theory of extra-market operations by analyzing the type of behavior adopted by individuals who were dissatisfied with the workings of the market.

⁹This is not to imply that packaging in this sense is as "neat" as packaging a private good. It is very difficult to tell who will benefit and to levy taxes which will reflect the differences among individuals in the extent of enjoyment. If a political system does not provide facilities for the creation of special authorities to provide specific public goods and services, it may not be possible to package public goods at all. See A. C. Pigou, Economics of Welfare (4th ed.; London: Macmillan & Company, Ltd., 1932), p. 401.

¹⁰See Ostrom, Tiebout and Warren, op. cit.

taxation assumes part of the market function by determining what quantity and quality of services shall be provided and assessing the costs against members of the community who will benefit.

Closely related to the problem of providing collective goods are the diverse problems involved in the provision of goods and services which have sizeable external economies or diseconomies. While some goods can be packaged by a private firm, not all the costs or benefits flowing from the good are excluded from affecting others. External economies or diseconomies are generated whenever there are significant indirect consequences of a transaction which affect others than those directly concerned.¹¹ These "spillover effects" may be either beneficial or harmful for those who are external to the original set of transactions.

External economies occur when the productive activities of one enterprise lower the production costs of another firm. External diseconomies are exactly the opposite. They occur when the productive activities of one enterprise increase the production costs of another firm. External

¹¹See R. H. Coase, "Problem of Social Cost," The Journal of Law and Economics, III (October, 1960) 4; James M. Buchanan and William Craig Stubblebine, "Externality," Economics, XXXIX (November 1962), 371-84; E. J. Mishan, "Welfare Criteria for External Effects," American Economic Review, 51 (September, 1961), 594-61; K. William Kapp, The Social Costs of Private Enterprise (Cambridge, Massachusetts: Harvard University Press, 1950); and Ralph Turvey, "Optimization and Suboptimization in Fishery Regulation," The American Economic Review, LIV (March, 1964), 64-76.

economies or diseconomies "represent defects in the pricing arrangements as a result of which the firm is not compensated (or compensating) for what it does to other firms in the industry."¹² It is assumed that the normal private entrepreneur seeking to maximize his private returns will attempt to internalize favorable externalities and to externalize diseconomies. Private firms may be able to internalize favorable spillovers by merging with other affected forms or by entering into voluntary cooperative agreements with others. Private firms seek to externalize unfavorable spillovers by attempting to withdraw from involvement or responsibility toward those who are affected.

Where private entrepreneurs cannot make satisfactory arrangements, public action may be necessary to find ways to internalize favorable externalities. A public enterprise with the appropriate boundaries and with the power to tax may be able to encompass all those who are benefited and receive compensation for the provision of the benefits. Public action may also be necessary in seeking to deal with the problem of external diseconomies. The problem is one of devising an institutional arrangement whereby the private entrepreneur takes into account the full range of costs involved in some activity when he calculates his production function. The imposition of a tax or the establishment of

¹²William Baumol, Welfare Economics and the Theory of the State (Cambridge, Massachusetts: Harvard University Press, 1952), p. 33.

restrictive regulations may be the appropriate means, in some cases, to cause the individual firm to internalize the social cost.¹³ If public regulation is not appropriate, public ownership and management may be a method by which the affected public can be taken into account in decisions affecting the production of goods with sizeable external diseconomies. Another method for dealing with the problems of external diseconomies may be the redefinition of property rights so that individuals are precluded from acting in such a way that will have adverse consequences on others.

The Market and the Allocation of Ground Water

The production, allocation and distribution of water is plagued with such problems of packageability and externalities that a major portion of the economic activity related to water is found in the public sector. But, since significant quantities of water are produced and distributed by private enterprises within a market-like context, water can be considered as both a public and a private good. The allocation of water as a private good in the market usually involves water that has been removed from its natural

¹³This is not to say that all external diseconomies need to be internalized. In any society, certain harms to third parties are considered beneficial to the society as a whole, and, as a result, no attempt is made to regulate the activity.

environment to be used on the land for consumptive purposes.¹⁴ Using bottled water is a clear example of a consumptive use of water which is almost always organized in the private sector. But, even the provision of bottled water is subject to public regulation.

The provision of a municipal water supply is a problem of an entirely different dimension from the problem of providing bottled water. A domestic water supply can be packaged in that water is contained in reservoirs and artificial conduits and is then offered for sale to those who pay for it. However, the agency which provides water for use requires access to public powers in order to construct a water supply system. The capacity to gain easements across private land and to dig up streets and private property to place and repair distribution lines are powers that any water supply agency must possess to build the enterprise. In addition, the expense involved in constructing such a system is so large that the agency and the public need protection from the aggressive type of competition which follows the construction of duplicate water supply systems.

The assumption of public powers and the monopoly status guaranteed by public agencies are a potential threat to the interests of the water consumer on the other side of

¹⁴See Vincent Ostrom, "The Political Economy of Water Development," The American Economic Review, VII (May, 1962), 450-58.

the market. The lack of effective competition means that water supply agencies have power over the market. Regulation of water prices, types of services, and the conditions of entry and exit are ways that a public can have its interests taken into account in the decisions made by a private firm engaged in water supply. Or, the organization of a public agency in which the users are also voters is another method of giving the consumers public powers to act as a counterbalance to the public powers held by the agency which provides municipal water supplies.

While production of water for use on land may be organized either by a public or private enterprise, the allocation of water as among users is accomplished within a price structure which resembles the market. Water used on the land can be allocated to those who pay and can be excluded from those who do not pay. Frequently, water price structures favor a certain class of users such as farmers or large industrial users. Some public water agencies hide part of the price of water in a tax imposed on property owners and water users do not pay their full share of the cost of providing water to them. As a result, water may be allocated to users who do not put water to its most valuable use.

While on-the-land, consumptive uses of water which has been removed from its natural water course frequently can be allocated in a satisfactory manner in a market-like

structure, the use of water which remains in its natural environment involves more difficult problems. Most in-the-channel uses of water are organized in the public sector because of the numerous competing joint and alternative uses that can be made of water in a stream or river channel. Ground water basins also possess capabilities for many joint and alternative uses that can be made of water in a stream or river channel. Ground water basins also possess capabilities for many joint and alternative uses. A ground water basin provides a supply of relatively high quality water at a lower cost than imported water brought considerable distance, as well as functioning as a reservoir and limited distribution system. However, demands to utilize the basin primarily as a source of supply may have adverse effects on capacity of the basin to function as a reservoir. The use of the basin as a distribution system implies that water levels remain relatively constant which is not consistent with the use of the basin as a source of supply or as a reservoir.

If a community of water producers wishes to utilize a ground water basin to realize joint goods, some way must be found to coordinate the actions of most producers using the same ground water basin. The market is not an effective mechanism for reaching an agreement on a management plan which individuals must follow in making demands upon the basin. Coordination can be accomplished by the creation of

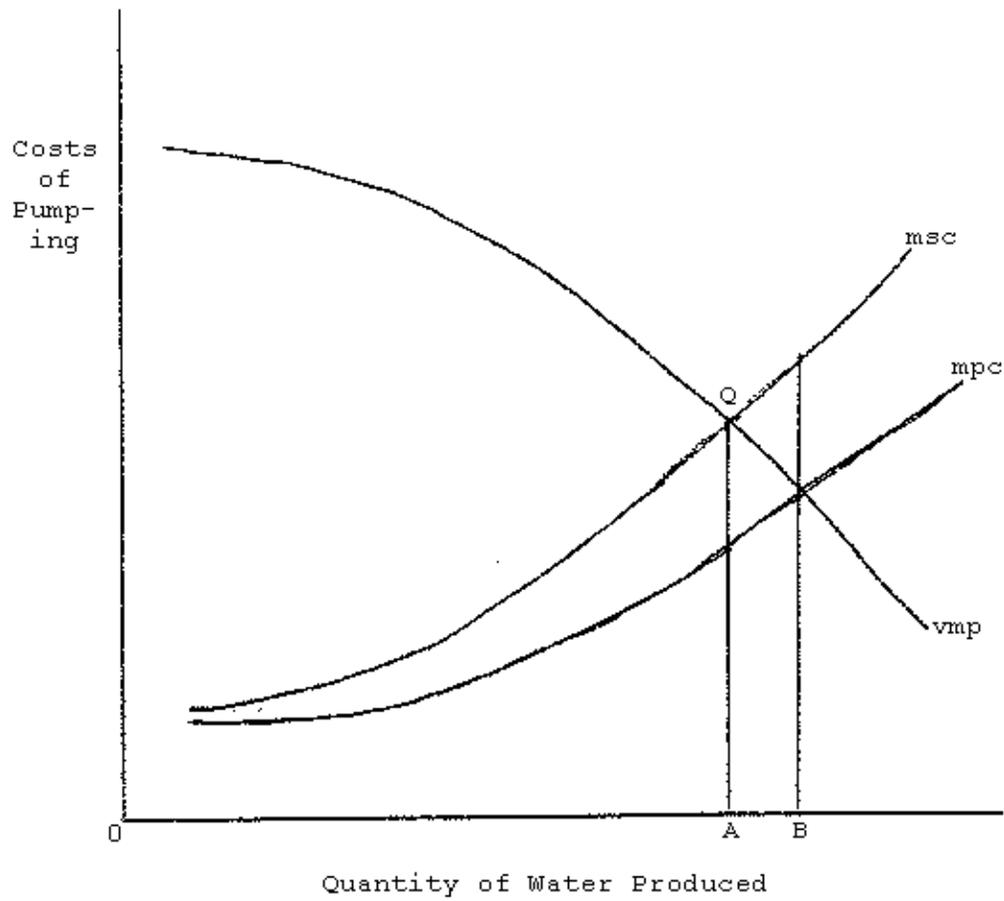
a voluntary private association which functions as a clearing house and coordinator. But those who agree to a voluntary management plan developed by a private association may find that some water producers refuse to cooperate. The "holdouts" can receive a considerable pay-off from the coordinated action of others without having to conform to the plan themselves.¹⁵ For this reason, it may be necessary to form a public organization with the power to devise a management formula and enforce compliance with its plans. In this way, those who benefit from the joint utilization of a ground water basin as a component in a conjunctive use system will also share the costs of managing the basin to accomplish this end.

Related to the problems of joint use of a ground water basin are the problems of ground water allocation which occur because of the differences between social and private costs which are accentuated by the market. A ground water basin may be overdeveloped because individuals calculate their private costs in utilizing a ground water basin and do not take into account the social costs (external diseconomies) resulting from their actions. This phenomenon is illustrated in Figure 1.¹⁶

¹⁵See Hirshleifer, De Haven and Milliman, op. cit., p. 61.

¹⁶Figure 1 is the same as the figure used by Hirshleifer, De Haven and Milliman, op. cit., at p. 65.

Figure 1
Cost of Ground Water Production



The curve labeled mpc represents the marginal private costs of withdrawing water from a ground water basin. The line slopes upward toward the right since the costs of production rise as the quantity of water withdrawn increases and ground water levels are drawn down beneath the individual well. The curve labeled msc represents the marginal social cost resulting from the lowering of water levels throughout the basin as a result of the increased production of the single pumper. The curve vmp represents the value of the marginal product produced by this water.¹⁷ The individual producer, taking his own costs into account, would be led to produce a quantity of water equal to OB where his marginal private costs are equal to the value of the marginal product. However, this would represent a net loss to the community of water producers utilizing the same basin. This social loss might be corrected if a public district were created which could impose a tax on the individual equal to the difference between his private and the social costs. If this were done, the individual pumper would make production decisions using the msc curve as his own. He would then be led to produce a quantity of water equal to OA at point Q where the marginal social costs are equal to the value of the marginal product--an optimum level of

¹⁷This curve could be labeled mr to represent the "marginal revenue" received from selling the water.

development for the ground water basin.¹⁸

On the other hand, underdevelopment, or underinvestment, may occur when individuals do not take into account the external benefits resulting from their actions. A problem such as this frequently happens when individuals calculate the private costs and benefits of a water replenishment program. In Figure 2, the curve mc represents the marginal costs of spreading units of water to replenish a ground water basin. The curve mpb of A represents the marginal private benefit that producer A would receive if he spread specific quantities of water in a porous region overlying a ground water basin. Producer A would receive a positive benefit from such a program in the form of lower pumping costs, but the benefits to him are not equal to or greater than the costs at any point. As a result, Producer A would not undertake the project even though the marginal social benefit to all producers (msb) exceeds the marginal cost at every point on the curve to the left of Z.

In Figure 3, the private benefits to Producer B resulting from investment in replenishment is greater than the marginal cost at every point on the line to the left of M.

¹⁸A public district would probably levy a constant per unit tax on water production which would not result in the optimum of the ideal solution. But the tax would function to reduce the social loss resulting from the private decision to produce water which only takes private costs into account.

Figure 2
Benefits from Water Spreading

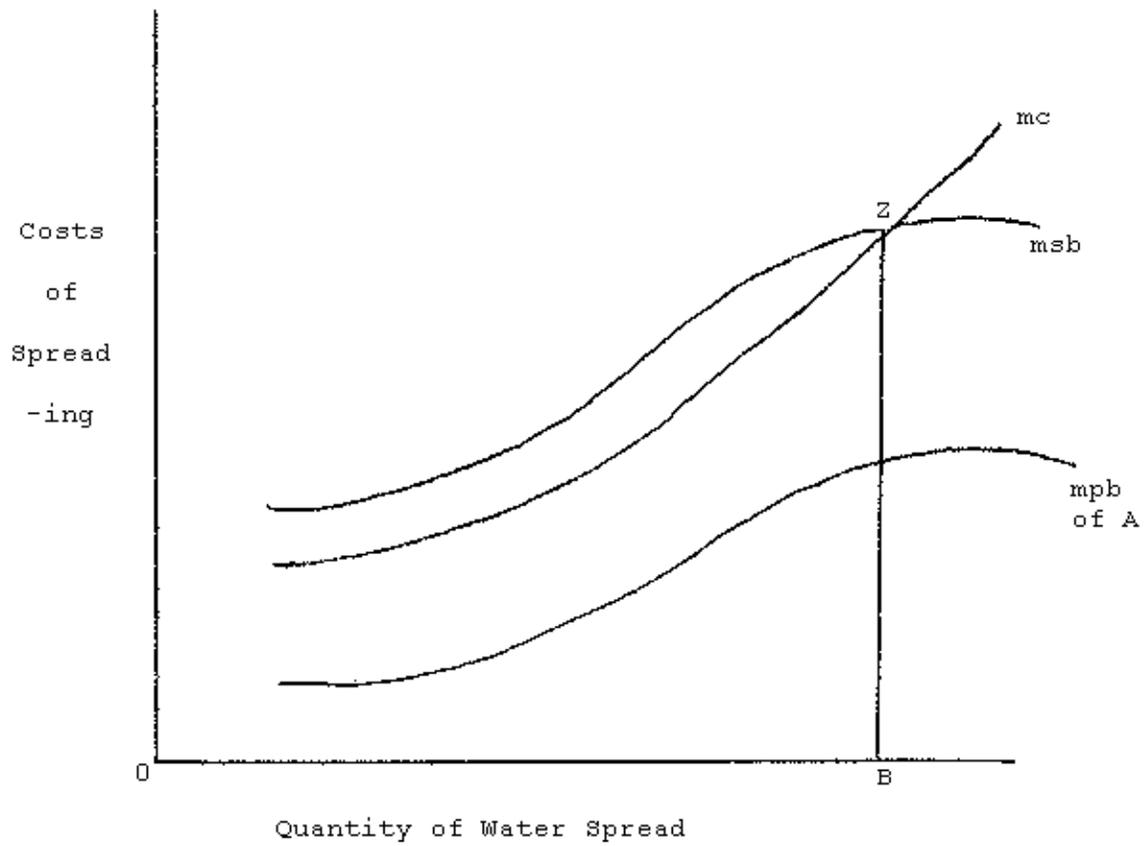
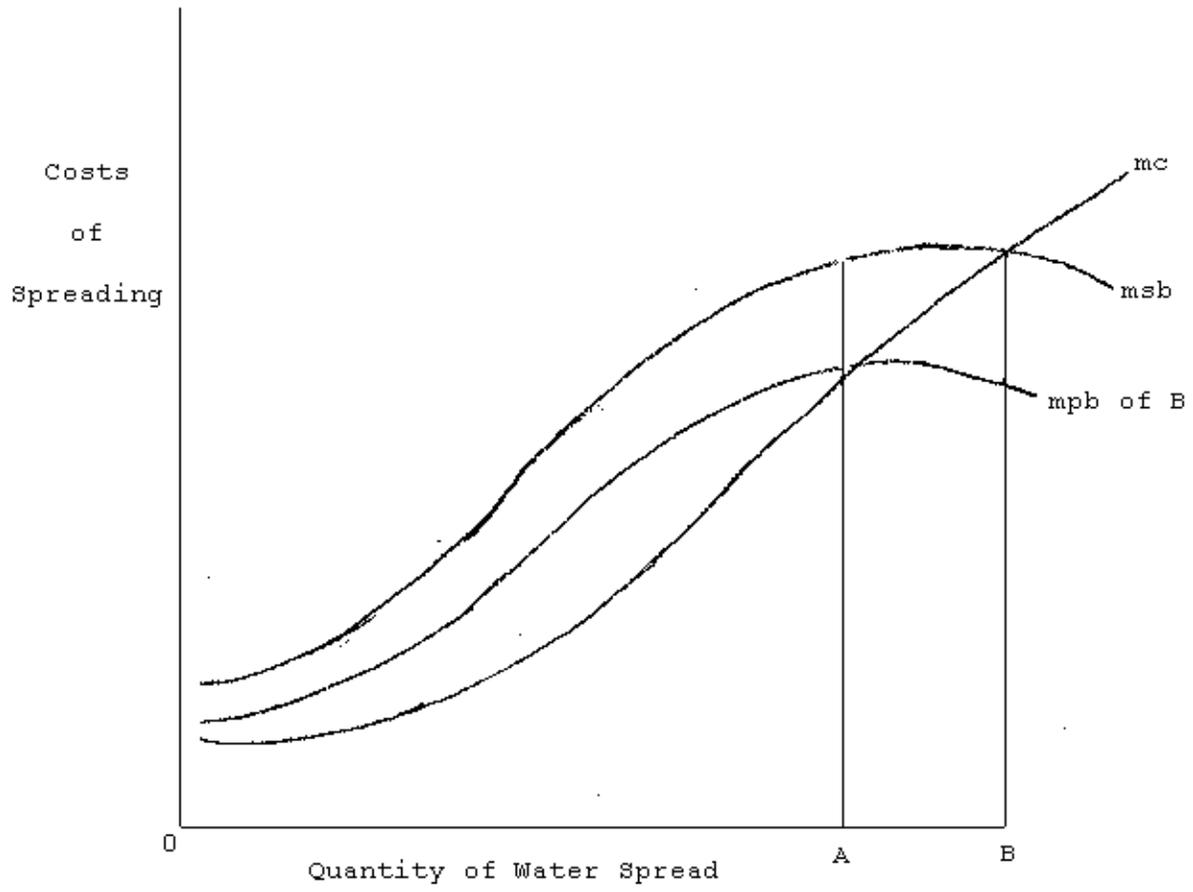


Figure 3
Benefits from Water Spreading



In this case, producer B would spread a quantity of water equal to OA and would reap a benefit in the form of lower pumping costs. In addition, the other producers from the basin would also gain a benefit from the individual action of the private individual. Producer B would not be compensated for the social benefits he had created.

In both Figures 2 and 3, an unrealized social benefit exists under a market solution. An opportunity exists for a community of water producers to gain a joint benefit by spreading an amount of water equal to OB. The creation of a public agency with the power to assess each water producer in proportion to the benefit received would be one way of raising the level of investment to the point where the marginal social benefit from spreading equaled the marginal cost of the program.¹⁹ If such a public agency could be formed, it would be able to spread an amount equal to OB in both Figures 2 and 3 in order to capture the full social benefit of a replenishment program.

¹⁹Again the tax would most likely be a constant per unit pump tax which would not lead to the optimum, but would enable a community of producers to gain a larger total benefit than the regular dynamics of the market. A part of the tax might also be levied on the land owners overlying the basin which could be justified economically if the value of land overlying the basin increased in value as a result of the replenishment program.

California Ground Water Law and the Allocation
of Ground Water Resources

The number of joint and alternative uses that can be made of a ground water basin and the difficulty in equating private and social costs and benefits creates problems of allocation and control that cannot be taken care of entirely within the context of the private market. Because of the difficulties in achieving a satisfactory solution to the problem of allocation of ground water resources, water producers have frequently turned to the courts in an attempt to settle questions concerning who may use ground water and for what purpose. Most of the litigation related to the use of ground water basins has concerned the right of an individual producer to withdraw ground water that is considered to be part of the natural local supply. The first part of this section will be devoted to the effect of ground water law on the allocation of private property rights to ground water supplies. The rights of a public agency to store water in a ground water basin as a part of a conjunctive use system have not yet been litigated. However, those that are beginning to undertake conjunctive use programs have attempted to explore the meaning that can be attached to fragmentary elements of law for use in governing the conduct of conjunctive operations in ground water basins. The second part of this section on ground water law will consider the legal questions involved in developing a conjunc-

tive use system.

Allocation of Private Rights to Ground Water

Under the traditional common law, it was generally understood that anyone who owned land overlying a ground water basin possessed complete ownership of the waters percolating beneath his lands. Many of the early California cases concerning ground water seemed to support the doctrine that percolating waters belonged unqualifiedly to the owner of the soil who had an absolute right to extract and sell all he could pump. However, significant development of ground water sources did not occur until shortly before the turn of the century when farmers and others began to use turbine pumps to bring ground water to the surface from relatively deep levels.

In 1902 the California Supreme Court was presented with a case in which the plaintiff claimed that she had been harmed by the excessive water withdrawals made by her neighbor under a claim of absolute ownership. The court took this opportunity to hold that the common law doctrine of absolute ownership was inapplicable to the ground water conditions existing in California.²⁰ The court noted that the abundance of land "with the scarcity and high price of water, furnish a constant stimulus to the further exhaustion

²⁰Katz v. Walkingshaw, 141 Cal. 116 (1902).

of the limited amount of underground water, and a constant temptation to invade sources already appropriated."²¹ It was predicted that there would "ensue in years to come a fierce strife, first to acquire and then to hold every available supply of water."²² Since the doctrine of absolute ownership offered so little protection for any water producer against "others having stronger pumps, deeper wells, or a more favorable situation," the court concluded that "public policy or a regard for the general welfare" did not require the application of the common law doctrine in California.²³ In its place, the court substituted the doctrine of "reasonable use" which would afford "some measure of protection to the property now existing, and greater justification for the attempt to make new developments."²⁴ The doctrine of reasonable use was intended to limit the rights of all land owners to the reasonable use of ground water as

²¹Katz v. Walkingshaw. 141 Cal. 116, 127 (1902).

²²Loc. cit.

²³Ibid., pp. 133-4. The court cited the ancient robber barons creed from Wadsworth's "Elegy at Rob Roy's Grave" in criticism of the concept of absolute ownership of percolating waters:

The good old rule
Sufficeth them, the simple plan,
That they should take who have the power,
and they should keep who can. P. 128.

²⁴Ibid., p. 134.

was necessary for some beneficial purpose.

Since the court was applying the principle of correlative rights derived from the common law definition of riparian rights to water flowing in a stream, it was felt necessary to consider how this doctrine should be interpreted in future cases. Controversies would divide naturally into three classes. The first class of disputes would involve persons "claiming to take . . . waters from the same strata or source for use on distant land."²⁵ In these cases, the principle applied to protect appropriators of surface water should be applied even though there was no statutory provision for appropriation from ground water basins. Appropriative rights were usufructuary only and applied a rule of priority by which "the first taker who with diligence put the water to use will have the better right."²⁶ In cases relating to appropriators, the law of prescriptive title and the statute of limitation should apply.²⁷

The second type of dispute postulated was one between

²⁵Katz v. Walkingshaw, 141 Cal. 116, (1902), 135.

²⁶Loc. cit.

²⁷To perfect title by prescription, the use has to be actual, open and notorious by the claimant, hostile and adverse to other producers, and continuous for a five-year period. An overt act of appropriation by pumping ground water and diverting to other lands fulfills the actual, open and notorious requirements. Once an overdraft occurs, the appropriation becomes hostile and adverse.

an appropriator of water for use on distant lands and the owners of the land overlying the water bearing strata. In this type of conflict, the court argued that the rights of landowners are paramount to those who take water to distant lands, "but the landowner's right extends only to the quantity of water that is necessary for use on his land, and the appropriator may take the surplus."²⁸ In the third class of potential conflicts--those between overlying owners for use on their own land--the overlying landowners were to have equal rights to continued access to water. When the supply of water was insufficient for all, each overlying owner would be given a fair and just proportion of the available supply.

In Katz v. Walkingshaw, the court outlined an allocation scheme for use in determining who could use ground water and for what purpose in order to assure the fullest development of the available ground water supplies while protecting the vested property rights of the overlying owners. Overlying owners were to be assured access to enough water to meet necessary uses on their land. If a surplus of water was available, appropriators could export ground water for use on non-overlying lands. If a shortage of water subsequently occurred, the most junior appropriators were to be the first to bear the burden of adversity under

²⁸Katz v. Walkingshaw, 141 Cal. 116, 135-6. (1902)

this allocation scheme. All appropriators were to be exposed to limitation, or elimination in the inverse order of their priority before the use of water by overlying users would be curtailed. As among overlying owners, each would receive a proportionate amount of the total supply, thereby sharing the costs of adversity with other overlying owners. It was the responsibility of overlying landowners to initiate litigation when they felt that the total yield of the basin was devoted to beneficial use. Overlying owners could seek to curtail the production of the last appropriator or prevent further appropriation by those who seek to gain access to ground water supplies. If overlying owners did not seek judicial remedy within five years of the first overdraft, appropriators could gain superior prescriptive rights through their open, notorious and adverse use of ground water to the injury of the overlying owner. Senior appropriators could also initiate litigation to eliminate the claims of junior appropriators, but a junior appropriator could gain prescriptive rights against a senior appropriator.

The two goals of the allocation scheme developed in Katz v. Walkingshaw--full development of ground water resources and protection of property rights--appeared to be consistent and easily applied to the first cases which arose under the new doctrines.²⁹ However, conflicts soon arose

²⁹Decisions were rendered in cases involving two

in which the dual goals of full development and the protection of property rights were not so easy to apply simultaneously.³⁰ A major contest between the City of San Bernardino and the City of Riverside over rights in the San Bernardino basin provided the first major test of the correlative rights doctrine formulated in Katz v. Walkingshaw. The water levels in the artesian basin underlying a portion of the City of San Bernardino had been falling for several years. San Bernardino claimed rights as an overlying owner and brought suit to enjoin further ground water production by the City of Riverside for use outside the ground water basin.³¹

The court held that both municipalities stood as appropriators under the law. A city could claim water rights as overlying owners only for land owned by the city. When the city acquired water to supply land owned by its inhabitants, the city could not assert the claim of an overlying owner,

appropriators (Cohen v. La Canada Land and Water Company, 142 Cal. 437 (1904)), an overlying landowner dependent upon a common source of water (Hudson V. Dailey, 156 Cal. 617 (1909)) in which the court was able to assure the full development of ground water resources without ignoring the claims of those with traditional property rights.

³⁰For example, see Newport v. Temescal Water Company, 149 Cal. 531 (1906).

³¹San Bernardino v. Riverside, 186 Cal. 7 (1921).

but stood as an appropriator even though supplying water to landowners whose land overlay the ground water basin. Since both cities were considered to be appropriators, San Bernardino's location over the ground water basin was immaterial in its claim against Riverside. Any water service agency, public or private, supplying water to others, thus, stood as an appropriator in relation to any ground water supplies without regard to the location of the agency's water service area in relation to a ground water basin.

The court also held that even though water levels were falling, there was a surplus of water available for both appropriators to continue pumping. The court noted that "in dry years, they might be compelled by necessity to bore more wells or to put in more pumps or substitute more powerful ones, in order to obtain the supply now in use...."³² Such measures were "no more than a reasonable requirement, at least under the conditions existing in that part of the state so long as this process does not result in using quantities of water exceeding the quantities that would be restored to the basin during succeeding wet years."³³

The trial court, in this case, had reserved the right to determine at any time on its own initiative, or on the initiative of either party, whether or not the surplus

³²San Bernardino v. Riverside, 186 Cal. 7, 17-18 (1921).

³³Loc. cit.

still existed. If it were found that the local supply had been exceeded, the lower court could issue a supplemental order curtailing the use of ground water by the respective parties. In this way neither party could gain prescriptive rights against the other. However, the California Supreme Court reversed the decision on this point and charged that the determination of "surplus" as envisioned by the trial court was an impractical plan since it required knowledge of physical facts concerning ground water inflow and outflow which the court could not ascertain.³⁴ The Supreme Court also noted that any additional determination and order to curtail would be binding only on the parties to the action at bar. Future orders would not affect other water producers who were taking more water from the basin than the parties to the particular case before the court.

San Bernardino v. Riverside did not formally break with the allocation scheme outlined in Katz v. Walkingshaw. The court used the same language and classification system to reach its decision. However, it was clear from the nature of the decision in relation to the facts of the case, that the court had weighed the goal of full development of

³⁴ ". . . [I]t is apparent that the first factor in the computation of the surplus, the amount of water rightfully and properly reaching the basin, cannot be ascertained. The other factor, the 'artificial rightful drafts' upon the basin, could not in any event be computed or ascertained without extraordinary expense" San Bernardino v. Riverside 186 Cal. 7, 22 (1921).

ground water resources for public use more heavily than the Protection of previously developed property rights of senior appropriators and overlying landowners. The critical difference in interpretation involved the finding that surplus waters were still available for continued exploitation even though water levels had been falling steadily over several years and water producers were drilling deeper and deeper wells.³⁵ This combined with the fact that the court refused to undertake continuing responsibility for determining when the surplus waters were fully appropriated gave overlying landowners and senior appropriators notice that their rights to ground water were no longer very secure. The burden of proof rested upon them to demonstrate when "surplus" water had been fully developed in a ground water basin. At the same time they were exposed to the possibility that junior appropriators could defend the taking of water by the assertion of a prescriptive right on the basis of only five years of adverse use. Five years was a relatively short time in relation to the long periods of cyclical variation between drought conditions and excess rainfall conditions.

The over-all effect of the *San Bernardino v. Riverside*

³⁵In a previous case, the court had curtailed the production of an appropriator so that an overlying landowner could continue to take the water necessary to irrigate his land from a well that was only twenty-four feet deep. The appropriator was prohibited from lowering water levels below this point. See *Burr v. Maclay Rancho Water Company*, 154 Cal. 428 (1908).

case was to introduce an element of considerable uncertainty. If overlying landowners went to court too soon, the court might declare that a surplus still existed and that appropriators were entitled to continue to produce water to meet the growing requirements of their water service areas. The overlying landowners would bear the costs of litigation without any benefit if this were the holding. If overlying landowners waited too long to initiate litigation, the court might find that the appropriators had gained prescriptive rights as against the overlying landowners. In this latter case, the overlying owners would bear the costs of litigation only to be deprived of their superior rights. Senior appropriators hesitated to initiate litigation also since they might fail to gain any judicial relief at all or find that junior appropriators had gained prescriptive rights against them. In this environment of legal uncertainty, attorneys often advised water producers to pump as much as they needed and to defend later.³⁶ The pumping race was on.

The adjudication of claims to produce water from ground water supplies in a basin subject to a long-term overdraft was finally initiated by the City of Pasadena in 1937, in an action to enjoin continued production in excess of safe yield. Pasadena's action came after several unsuccessful

³⁶The ancient creed of the robber baron to take what you can get and keep what you can became the basic rule for proprietors using ground water supplies.

attempts to negotiate a voluntary allocation of the safe field among the water producers using the Raymond Basin.³⁷ The trial court referred the matter to the Division of Water Resources of the Department of Public Works for a technical determination of the facts relating to water supply and water production.

The Referee reported that Raymond Basin was divided into two units, and that since 1913 the average water production from the western unit of the basin had exceeded the annual replenishment to the unit. "The safe yield of the unit was found to be 18,000 acre-feet, but the average annual draft was 24,000 acre-feet, resulting in an average annual overdraft of 6,000 acre-feet."³⁸ On the basis of the Referee's report, all parties involved except one agreed to restrict future production from the western unit of Raymond Basin to equal the average rate of replenishment. In addition, they agreed to share the burden of adversity in equal Proportions on the grounds that each water producer had gained a mutually prescriptive right to the use of a proportionate share of water in relation to all other producers for a specified period of use prior to the initiation of the suit. Each producer agreed to reduce future ground water production by one-third. A stipulated agreement was

³⁷Pasadena v. Alhambra 33 Cal. 2d. 908 (1949).

³⁸Ibid., p. 921.

presented to the trial court to formalize the negotiated settlement. After a trial in which the stipulated agreement was challenged by one party, a judgment was entered which was in substantial conformity with the stipulated agreement. The trial court appointed a watermaster to enforce the provisions of the judgment and retained continued jurisdiction in order to modify the judgment in case further adjustments in the rate of production were warranted.

The California Michigan Land and Water Company appealed the decision.³⁹ The District Court of Appeals reversed the original decision holding that appropriators had gained superior rights to overlying owners through prescription. According to the District Court of Appeals, right to produce water from Raymond Basin should have been allocated among those with prescriptive rights according to their priority of use instead of ratably among all water producers.⁴⁰

³⁹Pasadena v. Alhambra, 180 Pac. 2d. 699 (1947).

⁴⁰The logic of the decision by the District Court of Appeals is best summarized in the statement by Judge Shinn in his concurring opinion:

Any withdrawal of water from the Basin by the appropriators was necessarily adverse to the rights of all overlying owners in that it diminished the total supply which would be available for their use. They had a right to the whole supply if they had need for it. . . . It was the circumstance of the withdrawals by the appropriators . . . rather than the extent of them, which furnished the basis for the claims of appropriators to title by prescription as against overlying owners. . . .

Priority of right is as sacred as any other type of

The California Supreme Court reversed the appellate court, affirmed the decision of the trial court and implicitly approved, while explicitly disclaiming, the concept of mutual prescription upon which the original decision was based. The Supreme Court described the main issue of the case as the determination of "which of the parties shall bear the burden of curtailing the total production of the unit to the safe yield and what proportion, if any, of the pumping by each particular party should be restricted."⁴¹ The court noted that the problem could be solved easily if prescriptive rights were not involved since the overlying owners would then have superior rights. However, the Supreme Court held that all water producers had partially invaded the rights of all other water producers to continue to pump as much water as they needed in the future. As a result, the Supreme Court agreed with the plan formalized by the trial court that all water producers would share in the necessary curtailment. The Supreme Court formulated the doctrine, which is commonly referred to locally as the doctrine of mutual prescription, in the following language:

ownership. It is the rule rather than the exception in our water law. The appropriative system is wholly one of priority. . . . Priority is of consequence only in times of actual or threatened deficiency of supply, and if it is not to be protected under such conditions, the right means nothing. *Pasadena v. Alhambra*. 180 Pac. 2d. 699, 733-4 (1947).

⁴¹*Pasadena v. Alhambra*, 33 Cal. 2d. 908, 923 (1949).

The pumping of each group, however, actually interfered with the other group in that it produced an overdraft which would operate to make it impossible for all to continue at the same rate in the future....

Although the pumping of each party to this action continued without interruption, it necessarily interfered with the future possibility of pumping by each of the other parties by lowering the water level. The original owners by their own acts, although not by judicial assistance, thus retained and acquired a right to continue to take some water in the future. The wrongdoers also acquired prescriptive rights to continue to take water, but their rights were limited to the extent that the original owners retained and acquired rights by their pumping.⁴²

For nearly a half century prior to the Supreme Court's decision in Pasadena v. Alhambra, the court had used the allocation scheme developed in Katz v. Walkingshaw as a guideline in settling contests over the allocation of ground water. Prior to Pasadena v. Alhambra, ground water producers were considered to be overlying landowners, appropriators or prescriptors. The costs of adversity fell differently on each class. In the Raymond Basin case, all producers were placed in one class, and all shared the costs of adversity proportionately. If the plan used in Pasadena v. Alhambra had been based on a decision explicitly overruling Katz v. Walkingshaw, some of the uncertainty would have disappeared from ground water litigation. Since all would share the benefits of future use, as well as the costs of curtailed production, water producers relying upon a common source might have been motivated to move more

⁴²Pasadena v. Alhambra 33 Cal. Ed. 908, 930-1 (1949).

rapidly toward adjudication in order to avoid adverse consequences of long-run overdrafts.

However, the decision in Pasadena v. Alhambra did not explicitly overrule the earlier decision, and considerable uncertainty remained about its status.⁴³ The decision of the trial court had been reached by a stipulated agreement. The litigants themselves, with the aid of the Referee, decided how they wanted to solve their problems and presented the court with an agreement to accomplish the goal of curtailing excess production. As a result, many issues that might have been raised in an adversary proceeding were avoided. One of these was the question concerning the right of an overlying owner to become a water producer in

⁴³In an opinion submitted to the Assembly Interim Committee on Water in 1962, the Legislative Counsel, A. C. Morrison, stated:

It is difficult to predict with any degree of certainty the extent to which the doctrine of mutual prescription will affect the solution of future underground basin problems.

In the first place, it is probable that each underground basin is to a large extent unique. . . . Thus, whether the same circumstances which gave rise to the application of the mutual prescription doctrines to water users in the Raymond Basin would be in existence in any other basin, is, at least to some extent, problematical.

In the second place, it is difficult to evaluate the effect that the stipulations involved in Pasadena v. Alhambra had upon the decision of the court.

In California, Assembly Interim Committee on Water, Ground Water Problems in California (Sacramento: Government Printing Office, 1962), p. A-38.

an adjudicated basin at any time subsequent to the adjudication.

The decision in the Raymond Basin case had implicitly followed prescriptive rights to be gained against property devoted to public use. There had been a long history in California common law that public property devoted to public use could not be acquired by individuals through adverse possession. However, the contests in which this principle as established related to land rather than water. In 1935 The California Civil Code was amended to preclude the possession by "any person, firm or corporation no matter how long continued of any land, water, water right, easement, or other property whatsoever dedicated to or owned by any county, city and county, city, irrigation district, public or municipal corporation or any department thereof" from over ripening into a right or title against a public agency.⁴⁴ The Raymond Basin case was one of the first cases involving the allocation of prescriptive water rights to be decided by the courts after this provision had been added to the Civil Code. No reference to this provision as made in the decision. Mutual prescription implies that private individuals and firms can gain prescriptive rights to water as against public agencies contrary to the specific provision of the Civil Code.

⁴⁴California, Civil Code, sec. 1007, emphasis added.

The status of a right gained by mutual prescription in relation to the older forms of ground-water rights was also evaded by the court's refusal to use the term mutual prescription in its decision. In a vigorous dissent to the majority opinion, Justice Carter argued "that principles of water law were disregarded, that the Division [Referee] made a determination based upon the quantity of water available and the requirements of the respective parties and divided the water accordingly."⁴⁵ Carter felt that the litigants had evolved "a new and novel theory of each user accruing a right against the other by prescription . . . thus destroying all priorities. . ." Carter concluded that this was "certainly a 'new look' in the field of water law."⁴⁶

After the 1949 decision in Pasadena v. Alhambra. There appeared to be at least two ways to gain an allocation of ground water resources through litigation. The first method was the traditional use of the courts to adjudicate purely adversary proceedings among party litigants.⁴⁷

⁴⁵Pasadena v. Alhambra, 33 Cal. 2d, 908, 939.

⁴⁶Loc. cit.

⁴⁷For example, see Orchard v. Cecil F. White Ranches, Inc., 97 Cal. App. 2d 35 (1949) in which the court asserted its traditional role as the independent decision-maker; refused to refer the matter to the Department of Public Works as referee; found that the defendant appropriator of ground water had gained a defined quantity of prescriptive rights against plaintiff overlying landowner; and enjoined Defendant from producing any more ground water in the

Water producers possessed general knowledge of the logic which the court would apply in reaching its decision, but could not predict with any precision where they might stand in a final allocation. The position of any water producer in a final outcome could be drastically changed depending upon a court's determination regarding the adequacy of supply, the first occurrence of an overdraft, the existence of prescriptive rights, and the effect of a right acquired by adverse use as against the right which had been lawfully prescribed. The costs of adversity could shift from one class of producers to another depending upon the findings made by a court about the complex physical events occurring and the relative priority of different claims to right in relation to each other.

A second method for achieving ground water allocation through litigation was used in the Pasadena v. Alhambra case.⁴⁸ This case provided a model for a community of litigants to follow if they wished to negotiate their own future than the defined quantity of prescriptive rights.

⁴⁸The court, in an equity proceeding, is not limited to these two formulations. However, the plans developed in Katz v. Walkingshaw and Pasadena v. Alhambra are the predominant allocation patterns that have been developed in California. For an example of an unusual negotiated agreement, see the judgment in Yucaipa Water Co. No. 1 v. Moreno Mutual Irrigation Co., case no.24570 in the Superior Court of San Bernardino County, discussed in a later and related case, Moreno Mutual Irrigation Co. v. Beaumont Irrigation District, 94 Cal. App. 2d. 766 (1949).

settlement.⁴⁹ Since the formula had been upheld by a Supreme Court, a group of water producers using a common supply were assured that, if they could negotiate a similar agreement, the courts would formalize and legitimize it. The second method had some definite advantages from the perspectives of many water producers. By negotiating their own settlement and agreeing to share the costs of adversity proportionately, water producers could remove some of the uncertainty about their future rights to produce ground water involved in the first type of litigation. In a normal adversary proceeding, each water producer had the possibility of a high payoff; but each water producer also faced the possibility of a great financial loss. By negotiating their own agreement, they could guarantee a proportionate payoff for all water producers.

Many water producers have not been willing to initiate

⁴⁹The use of the Pasadena v. Alhambra decision as an alternative model for use by water producers who want to avoid the costs involved in relying upon the court to apply the classifications developed in Katz v. Walkingshaw was alluded to by the Legislative Counsel in his opinion submitted to the Assembly Interim Committee on Water, op. cit., p. A-38:

. . . [[T]he case illustrates a method which may be used under certain circumstances to solve a complex problem as to relative water rights in an extensive underground basin. It would appear the stipulation of the mutual prescription doctrine would probably shorten immeasurably the length of time it might otherwise take to identify all of the various types of rights involved and to determine the relative priorities thereof.

efforts to negotiate an agreement allocating ground water supplies. As long as water producers feel secure that their own individual supplies are relatively certain, they will rely upon their claim to a superior right under the doctrine which is most favorable to their position. If there is a high probability that production cannot be continued unless some joint action is taken to ration the supply, the security of a limited yield for all appears to be a more attractive possibility than full production for a few without knowing who will be among the few surviving producers.

The indeterminacy implicit in the allocation schemes used by the courts to settle conflicts over ground water rights has meant that potential water users in California have had easy access to water supplies. But the ease of access has also meant that water producers have been exposed to the adverse claims of others and the necessity of defending their own claims against the free entry of other producers. Water producers have been motivated to withdraw as much water as could be put to use without challenging other water producers who were following the same strategy. However, this strategy has led to a gross over-development of ground water resources before litigation has been considered to be either available or necessary. By the time that water producers have moved to adjudicate their rights to water in a ground water basin, water resource allocation problems have become so severe in many areas that litigation

alone has been insufficient to solve the range of problems that have evolved.

The distribution of the costs of adversity equally among all water producers under the mutual prescription doctrine tends to encourage a search for public solutions. All producers share the costs of any adverse development and they thus have an interest in taking joint actions to avoid developments which will limit or impair the value of their resource.

Legal Questions Involved in Developing a Conjunctive Use System

Settlements reached in basin-wide water rights adjudications provide an answer to one of the necessary legal questions to be resolved in developing a conjunctive use system. Adjudication determines who can use the water naturally occurring in a ground water basin. Once this question is answered for a particular ground water basin, two additional questions remain in regard to the legal relationships involved in the use of ground water basins as components in conjunctive use systems. The first question concerns the "ownership" of the storage capacity. The second question involves the capability of an agency to store and to retrieve water that would not naturally percolate into a ground water basin. Definitive answers to these two questions are not yet available, but evidence exists about the structure of law within which these questions will be

resolved.

The question of who owns the storage capacity of a ground water basin is closely related to questions involving the ownership of land in general. Under common law, the ownership of land implies the ownership of everything under that land into the core of the earth as well as the air space above the land. In 1872, the California legislature formally adopted this rule.⁵⁰ In regard to the water beneath the land, this rule was modified by Katz v. Walkingshaw.⁵¹ There have also been a number of cases which have modified the concept of private ownership of the air space above the land to include only that space which is necessary or convenient to the use of the land.⁵² It would appear from these analogous holdings that an overlying landowner could not prevent others from storing water beneath his land, but if he were harmed in his use and enjoyment of his land or in the use and enjoyment of water storage under his land, he could recover damages from those adversely affecting his interests by their use of that storage. An overlying landowner could be harmed if an agency stored so much water underground that water levels rose to saturate

⁵⁰Now codified in the California Civil Code, sec. 829. "The owner of land in fee has the right to the surface and to everything permanently situated beneath or above it."

⁵¹Katz v. Walkingshaw, loc. cit.

⁵²See Hinman v. Pacific Air Transport, 84 F. 2d 755 (1936).

his lands or, if he were a ground water producer, harm could occur from a severe drawdown of water levels by an agency using an underground basin for storage purposes. While these concepts have not been settled by specific case law, attorneys advising public agencies desiring to store water underground have generally agreed that such an agency can utilize the available space in a ground water basin to store water that would not naturally percolate into the underground basin. Such management agencies would be liable to pay for any damage caused overlying landowners by their management operations.⁵³

The second question relates to the capability of different types of agencies to place water underground artificially and to retrieve a portion of the water so stored at a later time. The experience of Los Angeles in using

⁵³See, for example, James H. Krieger and Harvey O. Anks, "Ground Water Basin Management," California Law Review 50 (March, 1962), 56-77; Russell Kletzing, "Adequacy of Existing Laws for Conjunctive Operation of Ground-Water Basins," speech presented before the March 19, 1958 meeting of the Irrigation Districts Association of California; Statement of Rex B. Goodcell before the Assembly Interim Committee on Water, Hearings in Long Beach, California, July 19, 1962, pp. 71-73 and James H. Krieger, "Ground Water Regulation--State or Local," a paper presented on October 26, 1961 at the California Section, American Water Works Association Meeting, Sacramento, California, mimeo. at page 4 of the last, Krieger states:

In view of the questionable damage to any local pumper, it would appear prudent and in the best interest of the public for a public agency to proceed to use the underground and meet the problem of damages later.

the San Fernando Valley for ground water storage and transportation as a part of its conjunctive use system provides some precedent in dealing with this problem. In connection with its Owens Valley aqueduct, Los Angeles has constructed spreading works high in the San Fernando Valley. Water brought from Owens Valley is released into the spreading facilities to percolate underground and move toward the City's diversion works lower in the valley. Besides constructing its own spreading works, Los Angeles sells some of the Owens Valley water to farmers and estimates that 27 per cent of this irrigation water joins the other water underlying the valley to move toward the City's diversion works.

In the early 1940's, Los Angeles initiated legal action to clarify its title to the Owens Valley water that it had placed into storage by spreading or by selling as irrigation water.⁵⁴ The court held that Los Angeles had a prior right to use the water it transported in its aqueduct and did not abandon that right "when it spread the water for the purpose of economical transportation and storage."⁵⁵ The court pointed out that the legislature had adopted a rule that enabled water producers to use natural surface facilities, such as stream beds, dry canyons and river channels, to

⁵⁴Los Angeles v. Glendale, 23 Cal. 2d. 68 (1943).

⁵³Ibid., p. 76.

transport water.⁵⁶ The court reasoned that in passing this law "designed to encourage the use of natural facilities, the Legislature could hardly have intended to abrogate the right to use other natural facilities for similar purposes."⁵⁷ The court further argued that "it would be as harsh to compel [Los Angeles] to build reservoirs when natural ones were available as to compel the construction of an artificial ditch beside a stream. . . . Thus, in selling water to the farmers, as in spreading water, [Los Angeles] was interested in its economical transportation and storage."⁵⁸

At the same time that Los Angeles was able to establish that it maintained legal control over the waters it placed into storage, the City was also able to establish its ownership, under pueblo rights, of all the water in the San Fernando Valley. This meant that Los Angeles was mingling Owens Valley water with its own water supply. As a result, the precedent established by Los Angeles is directly related to enterprises which can establish claims to the operation of a fully integrated production and distribution system. Los Angeles produces, transports, stores, withdraws and distributes water, while most agencies undertake only one

⁵⁶Then codified in the California Civil Code, as sec. 1413, but now in the California Water Code, sec. 7075.

⁵⁷Los Angeles v. Glendales, 23 Cal. 2d 68, 77 (1943).

⁵⁸Loc. cit.

or a few of these functions.

Several public agencies have been authorized by the State Legislature to provide a public service in placing local and imported water into ground water storage. Both the Los Angeles County Flood Control District and the Replenishment District have specific powers which enable them to make ground water available for use within their boundaries. While neither of these districts claims rights to withdraw the water they place into storage, both districts have means to recapture the benefits they create through different forms of taxation. The Flood Control District levies an ad valorem tax on the property owners within its boundaries or within special zones of benefit that enable it to receive payment for the water services which it provides. The Replenishment District, on the other hand, places a direct tax on the water producers within its boundaries in proportion to the amount pumped that represents a charge for the water the Replenishment District has provided to the pumper.

By applying to the State Water Rights Board for authority to appropriate water for beneficial use, other enterprises may be able to utilize ground water storage and recapture water at a later time period. Section 1242 of the Water Code specifies that storage of water underground as a beneficial use of that water if it is later removed by an agency and devoted to a beneficial use. Under this

provision, the City of Sierra Pare has applied for and been granted authority to appropriate a defined volume of water from a surface creek to spread on its own facilities for percolation into the Raymond Basin. Since Sierra Madre is one of the parties included within the Raymond Basin Watermaster Service, as a result of the litigation in this basin, the Watermaster monitors the spreading activities and determines how much water enters ground water storage. The Watermaster also determines how much water would have percolated underground naturally and how much is lost as outflow to Central Basin. Sierra Madre is then credited with the remainder and may withdraw an equivalent amount during the course of each year. Sierra Madre, therefore, functions as its own producer of ground water for later use.

As time progresses, and the storage space within ground water basins becomes more valuable, the demand to use this space will increase. The courts may become the center of many controversies related to the allocation of scarce spreading sites and scarce storage space. Some of these contests may involve the State on the one hand demanding to use these basins in conjunction with the California State Water Development Facilities, and the local areas on the other hand demanding the right to use these basins in conjunction with a locally coordinated water service system.

Political Arrangements for the Allocation of
Ground Water Resources

Since neither the market nor the courts have proved to be very satisfactory methods for allocating ground water resources, many water producers have moved from the attempt to redress past and present injuries to an effort to take some form of future cooperative action to manage existing supplies and develop supplemental supplies.⁵⁹ In other words, they have sought political solutions to problems that were not solved entirely satisfactorily by either economic or legal institutions. By adopting political strategies they have sought to restructure economic and legal arrangements in order to achieve more satisfactory results in the normal pursuit of economic transactions.

⁵⁹The courts have upon occasion recommended a shift from traditional economic organization and judicial relief to the creation of political agencies to solve problems. See, for example, Allen v. California Water and Telephone Co., 29 Cal. 2d. 466, 474 (1946), here the court found

. . . [T]he long established practice in the valley of obtaining water by the operation of individual wells is increasingly unsatisfactory and not conducive to putting to beneficial use to the fullest extent the resources of the basin; that to use the surface and underground flows to the fullest extent of which they are capable requires nothing less than a unified control of the entire water supply of the region, either by some public agency or some private agency operating as a public utility and an abandonment of the present system of pumping, together with a substitution of a relatively few pumping plants controlled by a unified agency and a comprehensive distribution system....

These political solutions have generally included the creation of public enterprises which enable individuals to pursue common interests within the framework of an operating concern.⁶⁰

The attempt to change economic behavior through political action by seeking to restructure legal relationships has not always been successful. For example, in 1951 water producers who were concerned about the continued competitive demands made on local ground water resources after imported water had been made available, sought legislation enabling water producers to use more imported water without losing their legal claim to ground water rights. The resulting legislation provided that "cessation of or reduction in the extraction of ground water to permit the replenishment of such ground water by the use of water from an alternate non-tributary source, is hereby declared to be a reasonable

⁶⁰The need for political action was stressed by the executive secretary of the West Basin Water Association in testimony before the Assembly Interim Committee on Water when he stated:

The protection, restoration, replenishment and managed uses of a common ground water supply ca t be accomplished without some form of political endorsement, usually by public election, or by the Legislature to enact new laws, or to amend old ones, or by boards of supervisors to approve plans and levy taxes, or by city councils, chambers of commerce and boards of local water districts expressing support.

Hearings on November 29, 1961, Anaheim, California, pp. 128-129.

beneficial use of the ground water to the extent . . . that such water is applied to beneficial use not exceeding, however, the amount of such reduction."⁶¹ Even though the legislation further stated that "no lapse, reduction or loss of any right in ground water shall occur under such conditions," water producers did not voluntarily change their production patterns. To the dismay of those who drafted the legislation, pumpers continued to increase their production of ground water from local basins.

A more successful venture in changing economic behavior by political action occurred in 1955. Water producers had followed the strategy of minimizing information available to others about production patterns. Consequently, it was difficult to determine how much water was being withdrawn from a ground water basin and to estimate when the total supply was being put to beneficial use. In addition, most of the cost and time involved in litigation resulted from problems of compiling adequate production data. In 1955 the Ground Water Recordation Act was passed which required producers residing in the Counties of Riverside, San Bernadino, Los Angeles, and Ventura, who extracted more than 25 acre-feet of ground water annually to record

⁶¹California, Water Code, sec. 1005.2. Section applies to Santa Barbara, Ventura, Los Angeles, Orange, San Diego, Imperial, Riverside and San Bernardino Counties.

production with the State Water Rights Board.⁶³ The legislation further provided that "no prescriptive right which might otherwise accrue to extract ground water shall arise . . . in favor of any person required to file with the board the first 'Notice of Extraction and Diversion of Water' . . ." ⁶⁴ Since the legislation also states that "the beneficial use of water from any ground water source within the four counties . . . shall be deemed not to exceed the quantity reported in the notice filed for each year," water producers in these four counties have been required to file their production records as a part of the public record. Any person may challenge the facts filed with the board and apply for an investigation of the facts so stated. Any determination made by the board as a result of an investigation is to constitute prima facie evidence of the quantity of ground water placed to beneficial use by a water producer. Since 1955 water producers using ground water basins located in these four counties have gained considerable knowledge about the total rates of production from their basins as well as eliminating much of the time and expense involved in ground water basin adjudications.

In addition to the attempt to change economic behavior by restructuring legal opportunities through legislation,

⁶³As codified in California Water Code, sec. 4999-5007, as amended through 1963.

⁶⁴Ibid., sec. 5003.

ground water producers have also created public enterprises to transform the relationships among water producers. Instead of competing with each other according to the rules of the economic game, water producers have attempted to work for common goals within the working rules of a public enterprise. The political environment in California is highly conducive to the pursuit of opportunities for the negotiation of cooperative agreements to manage and develop ground water resources. The California Constitution of 1879 was written in the spirit of reform to restrict the powers and functions of the State Legislature regarding the management of local affairs and the encouragement of local self-determination. Under the California Constitution, the Legislature is required to pass general rather than special legislation in matters regarding municipal affairs. Municipalities are empowered to make their own decisions (and mistakes) concerning local affairs and are not dependent upon the Legislature to pass special laws for them. The Constitution requires the Legislature to establish by general law a system of municipal government within which municipal corporations can govern local areas independently.

While the State Constitution does not specifically mention the possibility of organizing a variety of governmental instrumentalities or public corporations to provide for various types of water supply functions, the Legislature has extended substantial local autonomy to local communities

organizing public water service agencies. The prohibition against special legislation does not apply to this field, but the commitment to local autonomy permeates the activity of the Legislature in relation to demands for both general acts and special acts establishing local agencies to provide a wide variety of local water services. The Legislature has shown substantial willingness to authorize the arrangements which have been negotiated by local water producers and users. As a result, individuals in local areas interested in water problems can choose among many different general law statutes which enable them to create a public enterprise to perform a wide variety of water services. More than 400 such general law districts have been established in California. General laws vary as to boundary conditions, type of voting rules, range of corporate and special powers, revenue producing and taxing capabilities and the relative freedom of entry and exit. If a local group does not find a satisfactory model from among the general district acts, it is frequently possible to design a special district which will meet the unique requirements of the particular area and problems to be solved.

Since the political structure is highly conducive to the free entry of communities of water producers and users who wish to coordinate their efforts through the use of public powers, a relatively competitive public enterprises

system has developed in California. The level of competition has also increased the risks of those who function as public entrepreneurs. Those who are interested in constituting a new enterprise need to take into account the type of strategies that existing agencies will take toward a newcomer. Existing agencies with influence in the Legislature may attempt to prevent the organization of a new agency or to disable it so that it cannot perform a service that will compete with an established agency. And, conversely, existing agencies recognize that if they do not perform satisfactorily in a particular area, local entrepreneurs may be able to establish a competitive public service agency which is better designed to meet local needs. Agencies with overlapping jurisdictions and powers may co-exist for many years providing individuals within their boundaries some degree of choice and, therefore, some power to be taken into account in public decisions.

In addition to permitting competition among agencies, the California political structure is also characterized by a high level of communication and coordination among diverse public and private agencies. Since the Legislature has hesitated to act when there is substantial disagreement among local agencies over the appropriate action to be taken, the responsibility for negotiating a mutually acceptable formula has usually fallen upon the local agencies. However, the Legislature has the formal power to act

contrary to the view of the local area in matters pertaining to the provision of municipal services by special districts. The fear that, in the event that local agencies fail to agree, the Legislature may impose a solution that all agencies find undesirable motivates local agencies to attempt to solve their own problems before submitting their proposals to the Legislature. In addition to the rich mixture of public agencies authorized to provide miscellaneous water services, there are numerous informal associations representing diverse public and private agencies interested in the water resource problems of a particular area. It is in the context of these informal associations that many decisions are made about the formal actions that public agencies will undertake.

The Effect of Institutional Arrangements on the
Development and Allocation of Water
Resources in West Basin

The lack of effective economic or legal structures for the allocation of water resources had little or no effect on the early development of ground water resources in West Basin because of the abundant water supply in relation to the demands for its use. The first use of ground water occurred in the early 1870's and 1880's when deep wells were drilled into the underlying confined aquifers. Water under pressure rose near to the surface and vacuum pumps could complete the lift to the surface. During the 1870's and

1880's the area was settled by farmers who drilled wells for their own irrigation and domestic water. A few farmers established mutual water companies by pooling resources and investing in more efficient joint water systems. The first significant urban development came in 1887, when four communities, Gardena, Hawthorne, Inglewood and Redondo Beach, were founded.⁶⁵ Periodic real estate boom occurred along the west coast from time to time and a series of resort beach towns were established. Some private utilities were formed to meet the demands of the small but growing urban population.

The turn of the century marked the end of the era of a surplus supply of ground water, and the beginning of scarcity. As ground water resources became scarce, West Basin water producers began to face problems of allocation. The total West Basin ground water supply of 10,000 acre-feet per year in 1900 was produced by 1,000 wells, owned mostly by private individuals. When W. C. Mendenhall surveyed the area for the United States Geological Survey at that time, he noted that water levels had been falling steadily for about ten years.⁶⁶ The declining water tables indicated to Mendenhall that the draft on the basin equalled or

⁶⁵Richard Bigger and James D. Kitchen, How the Cities Grew (Los Angeles: Bureau of Governmental Research, University of California, Los Angeles, 1952), p. 68.

⁶⁶Mendenhall, op. cit.

surpassed the natural fresh water input. Mendenhall noted that the "cheaper artesian water" had already disappeared, and he feared that water levels might fall below the level from which vacuum pumps could function if the amount of water produced annually increased still further. Mendenhall recommended that "there should be no further increase on the drafts upon the underground waters, and that reclaiming of lands from these as a source should cease."⁶⁷

If this recommendation had been followed in West Basin, two consequences would have occurred:

1. The water table would have stabilized above sea level. Salt water would not have entered the fresh water aquifers. Local farmers and residents in the beach communities would have been allocated 10,000 acre-feet per year of inexpensive water.
2. The economy of the area would not have grown in the way that it did. The "safe yield" of the basin was already allocated. New industries would not have settled in West Basin unless provided with access to an alternative supply of water.

West Basin water producers were unable to follow Mendenhall's recommendation even if they had wanted to. The only available methods for halting a further increase on the draft were litigation or the consolidation of all

⁶⁷Mendenhall, op. cit., p. 17.

water production under the control of one enterprise which could then limit future entry. A basin-wide adjudication in the early 1900's involving 1,000 separate wells would have been extremely costly, and the result of litigation very uncertain. Since most of the overlying land owners held only small parcels of land or produced relatively little water, the potential costs and uncertainty outweighed the potential benefit that a single producer, or even a group of overlying land owners, could gain from litigation. Consolidation could have been accomplished if one land owner had purchased all the land and water rights then existing or if the area had annexed to the City of Los Angeles. However, neither the land owners or the municipalities were willing to give up their independent status for a guaranteed water supply.

In addition, a major technological development was to transform the level of demand that could be made upon ground water supplies in West Basin. Byron Jackson, a San Francisco engineer, designed and built the first deep well turbine pump in 1901.⁶⁸ The deep well turbine pump was introduced into West Basin in 1909.⁶⁹ The new pump was able to tap reserves of water that the vacuum pump had been unable to bring to the surface. While the vacuum pump was

⁶⁸History of Byron Jackson (Los Angeles: Byron Jackson Co., 1959), p. 2.

⁶⁹Ref. Rpt. I, p. 29.

capable of raising a large volume of water, it was limited to use in shallow depths. The great advantage of the deep well turbine pump was that it could raise great quantities of water with much deeper lifts.

The introduction of the deep well turbine pump enabled the water producers of West Basin to extract larger quantities of water at costs below those of the vacuum pump. Technological improvements in the design of pumps and wells ameliorated the effects of lower water tables on the cost of production. While production costs rose as ground water levels fell, the rise was not as significant as it would have been without new and better production methods.⁷⁰

Mendenhall's warning went unheeded. Industry began to move into the area. Land was reasonable; water appeared to be abundant; and potential workers were located nearby. Both Standard Oil and Southern California Edison located in West Basin prior to World War I. Both firms built near the coast to gain access to large quantities of ocean water for cooling purposes. In addition, oil tankers could approach close to the shore, since the continental shelf falls off rapidly along the west coast, and discharge oil through a submarine pipe line. Direct delivery of oil saved time and costs involved in utilizing a harbor. After World War I, Richfield Oil, Shell Oil, Union Oil and the Texas Company

⁷⁰See Hirshleifer, DeHaven and Milliman, op. cit., p. 186.

located in the southeastern portion of the basin to be close to Los Angeles harbor facilities at San Pedro Bay.⁷¹

Urban communities also began to expand as people moved into West Basin to live and to work. Demand patterns changed in terms of the quantity of water demanded and the quality of service expected. Fire protection and public health were problems that water service agencies had to take into account. Many of the small mutual water companies and private utilities which had served these areas when agriculture was the predominant economic activity, were not designed to meet the new urban requirements. As water problems began to plague the urban areas during the 1920's and 1930's, municipal water departments were formed in El Segundo, Hawthorne, and Inglewood by consolidating numerous small private utilities and mutuals into a unified system. Private utilities grew by consolidation also. The Southern California Water Company consolidated twenty individual water firms into one system in 1929. California Water Service Company added the service area and facilities of both the Redondo Water Company and the Hermosa Beach Water Company in 1927 and has continued to serve these areas, as well as others. The Dominguez Water Corporation, originally formed by the Dominguez family to serve the holdings of the Dominguez Estate Company and neighboring land in the City

⁷¹Interview with W. C. Farquar, February 3, 1961, and Charles D. Barker, June 24, 1963.

of Torrance, expanded its facilities during this period in response to the increased demand for domestic and industrial water service.⁷² The Dominguez Water Corporation represents the oldest continuous holding of land and water rights in West Basin and is today the largest single producer of ground water from the basin.

By 1920, increased ground water production had caused ground water elevations to fall below sea level along the coast. The industrial firms were among the first to be concerned. Many started to recirculate industrial water in the early 1920's. By 1928, most major industrial concerns in the basin recirculated their water supplies to some degree.⁷³ Richfield Oil Company started gauging its wells weekly in 1928 to determine their depths and cyclic response. Shell Oil, Texas Company, Associated Oil and Johns-Manville Boon joined Richfield in gauging their wells. Water engineers in these firms reported their growing fears about the long-run supply of water and the rising costs of water production to the management of their firms. However, the industrial concerns did not want to initiate litigation to curtail production from the basin and stop the falling water table. While they were overlying land owners, and could have tried to stop additional production by appropriators, the industrial firms were the relative newcomers. A court

⁷²Ref. Rpt. I, pp. 29-66.

⁷³Interview with W. C. Farquar, February 3, 1961.

might grant prescriptive rights to others and exclude the industrial firms from using the local ground water supplies to meet the growing demands of their firms.

By 1930, ground water elevations were below sea level throughout virtually the entire basin. An early investigation of the quality of ground water in 1932 showed definite evidence of salt water intrusion as much as one and three-quarter miles inland from the coast at Ballona Creek and one mile inland at the Los Angeles River. Several wells in El Segundo, Manhattan Beach, Hermosa Beach, and Redondo Beach had already been abandoned, and it was no longer possible to pump fresh water within one-half mile of the ocean along the entire coast line. In some places wells had been abandoned as much as one mile inland.⁷⁴

In 1931, Long Beach and Torrance were concerned enough about the long-run supply of water to the basin to join with Los Angeles and other cities to take political action in forming the Metropolitan Water District and, thus, gain access to a supply of water from the Colorado River. The other West Basin communities refused to join on the grounds that they still had a sufficient supply and that Colorado River water would be too expensive. Over 45,000 acre-feet of fresh water were withdrawn from the basin in 1932-33,

⁷⁴California Department of Public Works, Division of Water Resources, Underground Water Conditions in West Coast Basin, Southern California (Sacramento: Government Printing Office, 1944), p. 3.

while over 25,000 acre-feet of salt water entered along the coast. Ground water production increased at the rate of 2 per cent per year for the next eight years. Salt water intrusion advanced at the same rate.

The overdraft was growing. Some producers had taken remedial steps, but these actions were internal to the individual enterprise. Industrial users were paying higher costs to recirculate water. The taxpayers of Los Angeles, Torrance and Long Beach were paying higher taxes to support the Metropolitan Water District and to guarantee these cities a future water supply. The municipal water departments in Manhattan Beach and El Segundo were forced to move their well fields further inland at additional costs. Water producers who were concerned about the problem had no realistic alternatives except those which they took within their own firm. The enterprises which desired an expanded supply for the future could not buy up the rights of others and preclude them from pumping in this way. There was no way to "corner" the water market and assure supplies for the future. Within the economic and legal structures of the time, the most rational strategy for a private enterprise to follow was to pump as much water as was needed and hope to be able to defend the taking by the assertion of a prescriptive right if challenged in court.

Many water producers denied that there was a problem or that there was any need for joint action. While a few

technical studies of the area had been completed, information contained in these reports was not generally circulated. No official record of the total withdrawals by all producers was maintained. To complicate the picture, some of the technical studies which were available contained misleading information about the effect of heavy demand patterns on the underground basin. A study by the Division of Water Resources, in 1934, reported that the storage capacity of the basin was so large in comparison with the annual supply and demand that differences in underflow during wet years had little effect on the water table.⁷⁵ In addition, the Division mentioned the possibility that a clay cap extended beyond the coastline to seal off the underlying fresh water aquifers from serious salt water intrusion. The idea of a natural barrier against the sea was a comforting thought to many who did not want to consider the serious possibility of saline intrusion. Engineers for one of the major private water companies were still certain, in 1945, that a clay cap extended over the ocean floor to protect the basin. After making a study of the high chlorine content of water in some wells adjacent to the sea, they reported that the source could be brines from the deeper sands.⁷⁶

⁷⁵California, Department of Public Works, Bulletin 45, p. 203.

⁷⁶Ways and Means Committee, Minutes, fourth meeting, p. 3.

A great expansion in ground water production came during World War II. Industrial production increased more than municipal and urban production. While the large private utilities were concerned about the quantity of water produced by the oil refineries, the war years were an inopportune time to challenge increased water production.

The prod to action finally came from outside the basin. Paul Baumann, who was then Assistant Chief Engineer of the Los Angeles County Flood Control District, wrote to O. A. Gierlich, City Engineer of Manhattan Beach, in July of 1942, about the steady increase in salinity shown in a well owned by Manhattan Beach over the previous six months. Baumann was anxious to locate the cause.⁷⁷

Gierlich called for a meeting of representatives from all West Basin cities to discuss the problem. However, he met a reaction of general unconcern over "his local problem." Baumann again prodded the local producers by calling a meeting of representatives from all municipalities and chambers of commerce in West Basin in March, 1943. This effort was somewhat more successful. A West Basin Survey Committee was organized within a few months with representatives from each community except Torrance.

⁴⁷Letter from Paul Baumann to O. A. Gierlich, July 14, 1942.

Within a few months, the Survey Committee asked the United States Geologic Survey and the Flood Control District to do a cooperative study of the ground water supply problem in West Basin. In July, 1943, a cooperative agreement was signed by nine communities dependent upon the basin for water supplies with the United States Geologic Survey and the County of Los Angeles. The cost of the survey was estimated at \$25,000. The federal government agreed to finance one-half and the county agreed to fund one-fourth through the Flood Control District. The nine signatory communities contributed on a pro rata basis funds equal to the remaining one-fourth.⁷⁸ However, the initial cooperative efforts included only the municipalities which stood as appropriators in relation to the ground water supply. Neither the large industrial producers nor the private water companies joined in this initial step.

When a preliminary report was completed in the fall of 1944, the investigators held meetings with representatives of major industries, public and private water enterprises and members of the Division of Water Resources. The only group not represented was the small overlying agricultural

⁷⁸Inglewood, Redondo Beach, Manhattan Beach, El Segundo, Hawthorne, Culver City, Gardena, Hermosa Beach and Palos Verdes Estates. Contributions ranged from \$50 for Palos Verdes Estates to \$1,650 for Inglewood--an average of approximately \$700 per city. O. A. Gierlich, "Chronological Outline of West Basin Water Survey Committee Organization and Activities, August 1942 to December 1944" (Manhattan Beach, 1946, typewritten), p. 2.

land owners. The investigators told the group that "the well fields that supply Redondo Beach, Manhattan Beach and El Segundo have been partially engulfed or are threatened by saline encroachment."⁷⁹ Salt water had invaded the main water bearing zones from one-half mile to as much as two miles inland all along the coast from Palos Verdes Hills northward to El Segundo.⁸⁰ With respect to invasion by ocean water," the investigators found that "there is no known natural barrier to restrain eastward advance across the full reach of West Basin to the Newport-Inglewood structural zone."⁸¹ The investigators concluded their preliminary report with the following statement:

Determination of the safe yield of the water-bearing deposits within the West Basin is now a vital issue because it must serve as the basis for formulating a long-term water-use program. Such a program should attempt so to balance the withdrawal of ground water against importation of water that the initial seaward gradient will be restored, to the end that regional encroachment of saline waters will be arrested.⁸²

Many water producers agreed with the survey report and were now willing to admit that there was a problem which

⁷⁹Speech by J. F. Poland, United States Geologic Survey, at November 17, 1944, meeting of the West Basin Water Survey Committee, Minutes, p. 2.

⁸⁰J. F. Poland, A. A. Garrett, and Allen Sinnott, Progress Report on the Cooperative Ground-Water Investigation in the Torrance-Santa Monica Area, California. United States Geologic Survey, Department of the Interior Washington: U.S. Geologic Survey, 1944; ditto), p. 39.

⁸¹Ibid., p. 52.

⁸²Ibid., p. 53.

could not be solved through individual private action. Recognition and acknowledgment of a problem was a major step forward, but now they needed to find solutions. The informal meeting of major water producers appointed a committee to study the "ways and means" for arriving at solutions to their water problems. This committee briefly surveyed the alternative sources of supplemental water and different methods for reducing the total production from the basin. The committee, which became known as the Ways and Means Committee, concluded that "the development of ground-water resources in the West Basin has been carried on with little, if any, consideration of the possibility that the safe yield of the Basin might be exceeded."⁸³ The committee feared that the accumulated conditions would lead "to the ultimate failure of the ground-water supply throughout the entire area in the not too distant future, unless remedial measures are started without delay. . ."⁸⁴ The Ways and Means Committee made three major recommendations:

1. That a permanent association be created of all interested water producers so that they could continue to discuss their mutual problems and possible joint actions.

⁸³Ways and Means Committee of the West Basin Ground Water Conservation Group, Report (Manhattan Beach, 1945), p. 16.

⁸⁴Loc. cit.

2. That a technical survey be made of alternative sources of water for the area, and
3. That water producers consider initiating legal action similar to the action just completed in Raymond Basin to reduce total pumping and to ration the limited water supply in West Basin among all water producers.

In essence, the Ways and Means Committee was recommending that the water producers of West Basin change the basic structure of their industry through political and legal actions. The competitive development of ground water resources had led to a serious overdraft which threatened to harm all water producers. The creation of an association of water producers would enable them to explore what joint actions could be taken on behalf of their common interests. The importation of a surface supply would provide a source of water to meet the future demands. The adjudication of rights in the basin would reduce the total draft on the basin so that its capacity to function as a peaking reservoir and distribution system would not be sacrificed to short-run demands for a cheap source of water supply.

The problems were more complex than envisioned by the Ways and Means Committee and it took many years to implement their recommendations fully. But the direction away from competitive private exploitation and toward cooperative public management was set in the Ways and Means Committee

report and in the minds of the men who wrote it. The case study which follows in Section III gives a detailed description of the strategies and problems in the public entrepreneurship of those who attempted to build a system of public enterprises to enable the West Basin water industry jointly to manage West Basin as a component in a conjunctive use system.

SECTION III

THE WEST BASIN EXPERIENCE IN PUBLIC ENTREPRENEURSHIP

CHAPTER IV

ORGANIZATION FOR DETIATION AND JOINT ACTION

The development of ground water resources in West Basin has been viewed as a process of interaction between the physical system, the economic, legal and political institutional arrangements and those who attempted to organize a satisfactory water supply system for the West Basin area. Section II stressed the opportunities and constraints which affected the range of possible actions by the physical, economic, legal and political environment. Section III will focus on the attempt of individuals in West Basin to change institutional arrangements in order to create a more satisfactory water supply system.

The organization of the West Basin Water Association represented the first effort of water producers in the area to change the basic structure of the local water industry. Prior to the formation of the association, water producers in West Basin were in direct competition with each other to gain as much private return from the basin as possible. As long as competition was the predominant strategy, each individual had to compete within the rules of the game--the existing legal and economic structure relevant to ground water resource development. The creation of the association

introduced the possibility of working together to increase the joint payoff of all water producers. Once water producers were able to cooperate in dealing with some of their mutual problems, they were able to change some of the rules of the game, and thus, transform the economic, legal and political structures. After the association was formed in West Basin, proprietors began to use the political process to put together the essential components of a conjunctive use water supply system.

The West Basin Water Association will be examined in this chapter as a basic factor contributing to political change in the structure of the water industry. Specific actions undertaken by the association and its members to transform the economic and legal environment will be deferred to subsequent chapters. This chapter will be devoted to an examination of (1) the basic structural characteristics of the association including membership qualifications, finances, voting rules and other organizational arrangements, and (2) the associations capabilities to change the structure of the West Basin water industry.

The Structure of the West Basin Water Association

Membership

The West Basin Water Association is a relatively open organization. The number of members and the requirements

for membership are not restrictive in any meaningful sense. All persons, firms, corporations, districts, municipalities or other agencies ". . . taking or diverting water from the ground in West Basin may be admitted to membership as a producer member of this association."¹ In addition, all persons, firms, corporations, districts, municipalities or other agencies ". . . interested in or affected by the purposes of this association and . . . not qualified as a producer member, may be admitted to membership as an associate member in this association."² The association has also established an honorary life membership which may be awarded to an individual upon recommendation by the executive committee and a vote representing two thirds of the voting strength of the members. The association was designed primarily as an overlay organization composed of representatives designated by public and private agencies, rather than as an association of private individuals.

The business of the association and the rights and powers of membership are exercised through a board of directors. Each member agency of the association appoints an individual to serve on the association board of directors. Therefore, the member agencies determine which individuals will officially represent their interests within the

¹ West Basin Water Association, Articles of Association, Article III.

² Loc. cit.

association. The board of directors meets quarterly on the fourth Thursday of February, May, August and November. The quarterly meetings of the board of directors are equivalent to general membership meetings.

Twenty organizations joined the association within the first few months of its formation. The coastal cities, the major private companies, except the Dominguez Water Corporation, and the major oil companies were active participants in the formation process. Individuals, who had served on the Ways and Means Committee and recommended the formation of the association, brought their own enterprises into the association and have held positions of responsibility within the association since its formation. As information about the state of the basin became available, more water producers joined. The City of Inglewood and the Dominguez Water Corporation, two large water producers who refused to participate in the association at first, joined after the Referee's report was published in 1949.

At the present time there are 33 agencies which belong to the association. These members represent the following categories of water producers and users:

Private Water Companies	5
Cities which Produce Water from West Basin	4
Cities Representing Water User Interests	5
County Waterworks Districts	2
Petroleum Industrial Users	6

Other Industrial Users	8
Non-industrial Overlying Producers	4

In addition to the member agencies, the association has elected four men to honorary life membership.³

Association members possess total adjudicated rights of approximately 49,000 acre-feet, which is about 75 per cent of the adjudicated rights in the basin. The membership lists includes all of the large water producers from the basin except the Shell and Union Oil Companies, United States Steel Corporation and the City of Hawthorne. Shell and Union Oil Companies joined the association in 1946, but withdrew in 1951, when the association began to assess members to support a more vigorous program of political action. Since 1951, representatives of these two firms have regularly attended meetings and cooperated with association programs. In addition, both Shell and Union Oil have contributed funds to the association approximately equal to special assessments levied by the association on member agencies. Representatives of the United States Steel Corporation have occasionally attended meetings and contributed funds to support the legislative and legal programs of the association. The City of Hawthorne was a member of the association until 1962

³ W. C. Farquhar, Ben Haggott, R. R. Thorburn and Clyde Woodworth. These four men were all very active in the early development of the association. The association elected them to honorary membership when they retired from the agency for which they had worked in order to honor them and to encourage their continued participation in the association.

when it was expelled for failing to pay a special assessment.⁴

In addition to the thirty-three agencies which are formal members of the association, there are approximately fifteen other agencies which are effective participants in the association even though they do not belong. Many of these "quasi-members" are agencies which function as part of the political superstructure of the evolving ground water basin management system such as the Metropolitan Water District, the Los Angeles County Flood Control District and the State Department of Water Resources. A few of the non-member participants are local water producers such as the Belvidere Mutual Water Company, Shell Oil and Union Oil. Most of the quasi-members regularly attend the board of directors' meetings. In fact, written invitations are extended to them for each meeting. As shown on Table IX, one third of the attendance at the West Basin Water Association board meetings consists of representatives from non-member agencies. Another third of the attendance is composed of individuals from member agencies who are not designated as the representative for their agency. Only one third, and sometimes less, of the individuals regularly attending the quarterly meetings are actually members of the board of directors.

⁴ See discussion in this chapter under the heading of "Sanctions."

Table IX

Attendance at 1963 Board of Directors' Meetings
West Basin Water Association

	February	May	June	November
Total Attendance	75	77	84	72
Directors	23	23	25	24
Non-Directors	52	54	59	48
Additional Representatives of Members	22	25	23	21
Representatives from:				
Metropolitan Water District	4	5	7	1
Department of Water Resources	4	2	2	2
Flood Control District	2	1	2	1
West Basin Municipal Water District	4	3	5	3
Central Basin Water Association	1	1	1	1
Regional Water Pollu- tion Control Board	1	1	1	3
Los Angeles County Engineers	1	3	2	1
Replenishment District	1	1	-	1
Sanitation Districts	-	-	1	1
Hyperion Treatment Plant	-	-	2	2
Water Companies Corporations	1	1	2	-
Cities	3	2	1	5
Newspapers	-	-	1	1
Attorneys	3	2	1	-
Consulting Engineers	2	2	3	3

Besides attending meetings, non-members may be appointed to association committees and even be asked to act as the chairman of an association committee.⁵ For example, when the association established a legal settlement committee in 1952, Rex Goodcell, from the City of Los Angeles, was appointed the chairman of that committee even though his city was not a member of the association. Until 1961, Goodcell regularly presented a progress report to the association at each meeting.

The active participation of non-member agencies in association affairs has been as important for the association as the participation of formal members. While non-members do not regularly contribute financial support, their political support for a proposed program of action is frequently essential to its success. By involving a wide variety of public agencies in association affairs, the association has benefited from extensive inter-agency cooperation and avoided the costly consequences of prolonged inter-agency conflict.

⁵ According to the rules of the association it would also be possible for an individual representing a non-member agency to be elected to the executive committee of the association. Eight of the nine members must be directors of the association, but this qualification does not apply to the ninth position. However, the association has never appointed a non-member to the executive committee.

Finances

The annual dues for both producer and associate members are \$100 a year. Honorary life members are not required to pay dues or assessments. In addition, the board of directors has the power to levy annual assessments against producer members to provide sufficient revenue to meet the proposed expense of the annual budget. The amount of the assessment is apportioned among producer members on the basis of their water production from West Basin during the calendar year of 1944.⁶ Assessments against municipal and public corporations are subject to approval by the legislative body in each of these agencies. The majority of revenue each year is derived from the annual assessment. In order to meet unexpected expenses, the association has levied three special assessments in addition to the annual dues and annual assessments.

During the first ten years, the association expended an average of \$10,000 a year. Since then, expenditures have ranged between \$15,000 and \$20,000 per year except during a few years in which unusually high expenses were required to support a particular program. Association expenditures include funds for the employment of a small part-time staff and the operation of an office to carry on the association's work.

⁶ West Basin Water Association, Articles of Association, Article V.

During some years the association has incurred special financial outlays such as \$6,000 spent in 1946-47 for technical surveys and \$36,000 expended for the purchase of Metropolitan water during 1953-54 to keep the barrier project in operation. In 1958-59, the association established a Replenishment District Fund of nearly \$24,000 to support the campaign to create the West and Central Basin Water Replenishment District. From time to time in the early years, the association has incurred special legal fees. Since 1956, legal fees connected with the West Basin litigation have become a regular portion of the association's annual budget.

Voting Rules

The formal voting rules of the association are heavily weighted in favor of public districts and reflect the production pattern of 1944 rather than the current use pattern. Public corporations which are producer members of the association are "entitled to one vote for the first 250 acre-feet . . . of water produced by it from the West Basin during the calendar year 1944, and one additional vote for each additional 250 acre-feet so produced...."⁷ Other producer members are entitled to one vote for each 500 acre-feet of water produced from the basin during 1944.

⁷ West Basin Water Association, Articles of Association, Article IV.

Associate members and honorary life members are entitled to one vote each. The voting rights of member agencies can be exercised only by and through the director designated and appointed by each member agency. The voting strength of the various potential blocs of interests is relatively evenly balanced. Three major groups, the private water companies, the cities and county waterworks districts, and the oil and industrial firms, each possess approximately one third of the total votes, as shown below:

Private Water Companies	36
Cities and County Waterworks Districts	37
Oil and Industrial Firms	40
Overlying Nonindustrial Enterprises	4
Honorary Life Members	4

As a result of the formal distribution of voting power within the association, no single group of producers can combine their votes and adopt a policy opposed by the other groups. A minimum of sixty-one votes is needed to win a majority vote. Each group lacks the required number by approximately twenty votes, so it must attempt to make proposals which will have broad support if it wishes to gain formal association approval.

However, the significance of the distribution of formal voting power is reduced by the reliance upon an informal rule of unanimity. A formal roll call vote is rarely taken. Most resolutions are passed by the association unanimously

on the basis of an oral vote. When there has been considerable open conflict regarding alternative proposals of action, the association has usually appointed a committee representing the major factions to negotiate a settlement to which all entities can agree. Considerable time may elapse while negotiations are in progress, but the final resolution presented to the association is usually passed unanimously by voice vote. Probably, not more than five roll call votes have been taken in the history of the association.

Officers and the Executive Committee

The board of directors annually elects a president, vice-president and treasurer from among the directors. The board also elects an executive committee each year which consists of the president, the vice-president and seven additional members "at least six of whom shall be members of the board of directors." The executive committee has the authority to act for the board of directors in the intervals between meetings of the board with the proviso that "no action of said committee shall be binding upon said board of directors unless authorized or approved by it...."⁸ The executive committee explicitly does not have the power "to levy assessments, expend or incur any obligation . . . totaling more than \$2,500 in any one year . . . adopt or

⁸ West Basin Water Association, loc. Cit.

amend regulations, or amend or revise the Articles of Association."⁹

The officers and executive committee of the association have remained relatively stable throughout the existence of the association. The first elected officials were Ben Haggott, president; O. A. Gierlich, vice-president; and Allan Harris, treasurer. These three men remained in their respective positions until July, 1956, when both Haggott and Gierlich asked to be relieved of their active responsibility. Harris was elected president, a position he continues to retain. At that time, T. V. Tallon became vice-president and Angus McVicar became treasurer. Since 1956, the only change to occur in the officers of the association came in 1963 when T. V. Tallon left the area and the association elected William Stokes to replace him.

The executive committee prior to 1956 was composed of seven members. During the first two years, several posts remained open to allow flexibility in offering positions to some of the large water producers which were not yet members of the association. In 1948, all seven positions on the executive committee were filled and six of the men so appointed remained in office until 1956.¹⁰ When Haggott and

⁹ West Basin Water Association, loc. cit.

¹⁰The Executive committee during this eight year period was composed of Ben Haggott, Palos Verdes Water Company; O. A. Gierlich, City of Manhattan Beach; Allan Harris, Johns-Manville Corporation; Louis Alexander, Southern California Water Company; W. C. Farquhar, Richfield Oil Company;

Gierlich retired in 1956, the first major changes in the composition of the executive committee occurred. In addition to replacements for the two retiring members, two new positions were created. Since 1956, the membership of the executive committee has remained relatively stable. The few changes which have occurred have reflected internal changes within member agencies more than changes of leadership patterns within the association.¹¹ As noted in Table X, six of the current members have served on the executive committee for more than eight years.

Since 1956, three private water companies, three cities, two oil companies and one industrial firm have always been represented on the executive committee. Certain

R. R. Thornburn, Standard Oil; and Mayor England, City of Inglewood. Between 1948 and 1951, Mayor Dixon was the representative from Inglewood and served on the executive committee. The change in mayors, the action of local voters, was the only change in composition during the eight years.

¹¹Thornburn of Standard Oil retired in 1956 and was replaced by C. B. Barker of Standard Oil. Farquhar of Richfield retired in 1957 and was replaced first by Lauterbach and then Thompson of General Petroleum. Since 1962, this position has been held by Penick of Mobil Oil. The City of Hawthorne was represented on the executive committee for four years by as many different individuals, reflecting the political instability in Hawthorne's city politics. Since 1962, the position formerly held by Hawthorne has been held by Schulte of Manhattan Beach. When T. V. Tallon of Dominguez Water Corporation moved in 1962, he was replaced by Bradley of the same company.

Table X
 Current Composition of the Executive Committee
 West Basin Water Association
 1963

Member	No. of Years on Executive Committee	Quantity of Agency Rights (acre- feet)	No. of Adjudicated Votes in Asso- ciation	
<u>Cities</u>				
Angus McVicar (Treasurer) Torrance	8	8	3,435	7
William Stokes (Vice-Pres.) Inglewood	8	16	4,382	11
John T. Schulte Manhattan Beach	2	12	1,131	5
<u>Private Water Companies</u>				
J. P. Bradley Dominguez	1	8	8,728	21
Louis Alexander Southern California	16	16	6,265	8
Carl Fortner California Water Service	8	8	3,071	5
<u>Oil and Industrial Firms</u>				
Allan Harris (President) Johns Manville	18	18	881	1
J. E. Penick Mobil Oil	2	2	2,570	3
Charles Barker Standard Oil	8	18	4,601	9

organizations have been represented consistently throughout the years. Standard Oil, the City of Inglewood, the City of Manhattan Beach, Johns-Manville, Southern California Water Company and Richfield Oil Company have had official representation for more than ten years. The City of Torrance, Dominguez Water Corporation and California Water Service have been represented on the executive committee for eight years. However, the men representing these entities are considered to be highly capable, and it is hard to determine whether representation was given to these organizations as such, or if these men were chosen for their personal abilities.

The formal composition of the executive committee became more representative in 1956 than it was prior to that time. The first executive committee held a total of forty-five of the possible votes within the association, while the present committee holds a total of seventy. The composition of the present executive committee represents more than a majority of the possible votes within the association and constitutes a winning coalition if its recommendations were formally challenged in a board meeting.

The executive committee functions as the center for discussion, debate and negotiation among member and non-member agencies. The frequency of meetings reflects the urgency of problems or presence of disputes within the association. The executive committee held fifteen meetings

during its first year of organization when most members of the leadership group were concerned about the expansion of membership and the creation of an effective and permanent forum for water producers in West Basin. Executive committee meetings during the next three years were few and far between. Most of the significant action during those years to create the West Basin municipal Water District and to initiate the West Basin litigation were carried on outside the context of the association.¹² Six meetings were held in 1950-51, five meetings in 1951-52, nine meetings in 1952-53 and ten meetings in 1953-54. During this four-year period important decisions were reached within the executive committee regarding state aid for the barrier, the type of barrier that should be created, the boundaries of a zone of benefit within the Flood Control District and the entry of the association into active participation in the West Basin litigation. The next peak of executive committee activity occurred during 1958-59 when the association actively campaigned for the creation of the Central

¹²In fact, the association shunned an active political role in its first few years of existence. Several large water producers threatened to resign if the association became an active political organization. The two election campaigns were so bitter and divisive that the association would have risked its very existence as the forum for all water interests had it taken a very strong position in the fight. When the district was created in 1948, and as more and more areas annexed to the West Basin Municipal District, the association had a firmer base of support to initiate a more active program of political action.

and West Basin Water Replenishment District. During that year, eight meetings were held, one half of which were joint meetings with the executive committee of the Central Basin Water Association. Since 1959, and the creation of the Replenishment District, the executive committee has met on the average of four times a year.

Attendance at executive committee meetings has varied with the frequency of meetings. During the years of special problems and disputes, members of outside agencies were regularly invited to executive committee meetings in order to bring differences of opinion into the open for the purpose of arriving at mutually satisfactory solutions. As a result, the effective representation on the executive committee has been much broader than the extent of formal representation. Representatives from the State Department of Water Resources and the County Flood Control District have attended many executive committee sessions. The Metropolitan Water District, the City of Los Angeles and the City of Long Beach have been invited on several occasions. Member agencies of the association which have not had a representative on the executive committee have been invited to attend meetings when disputes arose concerning these agencies. The process of confrontation and negotiation occurring within the context of executive committee meetings is woven through much of the West Basin experience in public entrepreneurship discussed in subsequent chapters.

Sanctions

The articles of association confer upon the board of directors the power to expel any member who fails to pay dues or assessments within sixty days after the date fixed for payment of financial obligations.¹³ This is the only formal sanction that the association can bring to bear upon a deviant member. Consequently, the only deviation that is considered actionable is the lack of financial support for association programs. This sanction has only been employed once.

The City of Hawthorne initiated an appeal against the decision in the West Basin litigation in 1961. The association decided to oppose the appeal and employed the services of a law firm for this purpose. The board of directors approved a special assessment to be levied on all members of the association to support the defense of the stipulated judgment. Hawthorne requested that the rules of the association be changed to remove the obligation of a member agency to pay a special assessment levied to oppose litigation brought by that member agency. The executive committee adopted a resolution to recommend such a change in the rules, but the board of directors in a rare move voted against the recommendation of the executive committee. Hawthorne refused to pay the assessment. At the May 24,

¹³ West Basin Water Association, Articles of Association, Article V.

1962, meeting of the board of directors, Hawthorne's membership in the association was terminated "without prejudice to the renewal by the City of such membership upon final settlement of the appeal from the judgment in the West Basin Case."¹⁴ Following this decision by the board, the executive secretary of the association expressed his wish that Hawthorne would continue to attend meetings and would rejoin the association after the litigation was settled.

Other than this instance, the association has not taken negative sanctions against members who have been in disagreement with proposed programs. The association has attempted to gain unanimous support for mutually satisfactory programs rather than conformity to policies decided upon by a small group and imposed upon the membership as a whole. As a result, member agencies with divergent views are encouraged to participate more rather than less in the formation of association plans and strategy. Frequently, positions on the executive committee have been offered to member agencies which have disagreed with one or another of the policies of the association. The Dominguez Water Corporation and the City of Inglewood, for example, vigorously fought the creation of the West Basin Municipal Water District. Both agencies at first refused to join the association. When Inglewood joined the association in 1949, the

¹⁴West Basin Water Association, Minutes, May 24, 1962, p. 6.

mayor was immediately placed on the executive committee and a representative of Dominguez Water Corporation has served on the executive committee since 1956. The Southern California Water Company once threatened to withdraw from the association and the California Water Service Company was involved in a dispute over the effect of the barrier on a salt water front, but both companies continued to be represented on the executive committee. The City of Hawthorne, which has fought many aspects of the association's program, held membership on the executive committee for the four years prior to the final termination of its membership.

The Executive Secretary and the Staff

The articles of association authorize the board of directors to appoint and employ "an executive secretary and such consultants and employees as may be necessary who need not be members of the board."¹⁵ The development and maintenance of a staff has been a critical element in the survival and success of the association. Within a few months of its founding the association employed Carl Possette as executive secretary, a post he has retained ever since. The creation of this position insured that at least one individual would devote his full energies toward making the association a success. At times, serious

¹⁵West Basin Water Association, Articles of Association, Article III.

disagreement between member agencies over appropriate actions to be taken might have disrupted the entire association. Instead, Fossette arranged countless meetings between conflicting groups and served as an intermediary in seeking resolutions to their conflict. At times Fossette handled the most delicate of negotiations by keeping tempers from flaring and by keeping communications open between the parties in disagreement. To have let any group become inflexibly committed to one position would have threatened the survival of the association and the possibility of reaching common agreements. Fossette was the only man whom water producers could consider as neutral. He had no private interests involved in the adoption of one solution as compared with others. His only private interest in the basin was the important one of reaching successful solutions and thus maintaining his position in the association.

During the early years the executive secretary sought to increase the general level of information shared by all members of the association. He spent considerable time writing weekly or bi-weekly newsletters sent to all members describing the events with which they should be familiar, and appealing for the active participation and cooperation of all members. He also wrote frequent news releases for local newspapers to inform the citizens of the area about basin water problems. Fossette has been responsible for selecting the speakers for quarterly

meetings. He has regularly asked members of the Department of Water Resources, Metropolitan and the Flood Control District to describe the activities of their agencies. As a result, association members have up-to-date reports on all activities directly related to West Basin as well as information about the more general water problems of Southern California. Technical experts have also been invited to report on scientific advances which might be of interest to West Basin water producers.

The creation of a staff enables an organization to maintain records and to implement the decisions made at past meetings. Fossette has maintained detailed notes on all board meetings and executive committee meetings. Arguments over what has been decided in the past are avoided by producing the written evidence of past decisions. The association has maintained a policy of open files. Any interested person can gain ready access to a wealth of information about the basin by going to the association office. As a consequence, all producers in West Basin have equal access to the same information.¹⁶ No one enterprise can exploit a favored position in the association and control the action of others by eliminating their sources of information. Also, the superior capacity of some of the larger

¹⁶This policy of an open office and open files also enables a researcher to gain access to a wealth of information about how an organization such as this arrives at decisions and implements its decisions--for which the present writer is deeply appreciative.

water producers to gain information about the physical system is thus balanced by the association which has command of sufficient resources itself to gain detailed information about the operation of the basin.

Through the years the role of the executive secretary has undergone several transformations. At first, the most important function to be accomplished was holding the association itself together. However, as the common interest became more and more apparent, and the tendency to split off into separate groups was consequently reduced, Fossette spent more of his time representing the internal interests of the association before external groups. The executive secretary has attended many legislative sessions and has often functioned as the official lobbyist for the association. He has also presented the West Basin "case" before the Los Angeles County Board of Supervisors, the Southern California Water Coordinating Conference and in many informal conferences with the Los Angeles County Flood Control District and the State Department of Water Resources.

As the role of the executive secretary has turned outward, Fossette has become very active in water affairs generally in the Southern California area. He has become the executive secretary of the Central Basin Water Association and the Upper San Gabriel Water Association and secretary of the Municipal Water Districts Section of the Irrigation Districts Association of California. In addition, he

also functions as the general manager of the West Basin Municipal Water District and the Central Basin Municipal Water District. When the Central and West Basin Water Replenishment District was formed, he was also asked to hold the critical position of general manager for this new district.

The scope of the combined positions held by Fossette encompasses the entire area of the interrelated physical system of the San Gabriel River system. He has become intimately familiar with the specific problems of each of the areas and consequently has developed an overview of the entire system possessed by few others in the water industry. Fossette acts as one of the essential links that tie the operation of the three basins together.¹⁷

Fossette's position is one of substantial influence. He is involved in the discussion, debate and negotiation of all major decisions relating to the entire San Gabriel River system. Yet, Fossette has used his influence primarily to keep channels of communication open rather than to impose his will on others. The minutes of executive committee meetings reflect a process which has been repeated many times. Representatives of various agencies present their views on what future plans should be placed into operation.

¹⁷Other links exist as well. Many of the large water producers have enterprises in more than one basin and are active in the associations organized in more than one area. As a result, the tendency toward interbasin conflict is reduced by those with interests in developing an optimal plan for all basins.

Sometimes these proposals are in written form and sometimes they are made in an oral presentation. Some presentations may challenge certain aspects in other presentations. If resolution is not possible within the context of one meeting, the interested parties are invited to meet with the executive secretary prior to the next meeting of the executive committee. At times, these special ad hoc committees may meet together numerous times. Final proposals emanating from these committees usually reflect elements of many of the original ideas. Rarely does it appear that Fossette initiated the original proposals. However, his skill in helping members to search out a mutually acceptable plan has been an important ingredient in the process of negotiation within the association.

The association and the West Basin Municipal Water District share the services of a full-time secretary. In fact, the association and the District share the same office. In 1954, the association employed its own attorney to attempt to reach an agreement in the West Basin litigation. In 1961, another law firm was employed to defend the decision in the West Basin case. In 1962, a field secretary was employed to help Fossette directly with the many duties associated with the position of executive secretary. The field secretary also serves the Central Basin Water Association in this same capacity.

The Association as an Instrument of Political Action

When the association was first established it served as the institutional facility to enable water producers to learn more about the physical system upon which they were all dependent and about alternative possibilities for solving some of their problems. The purposes of the association as listed in the articles of association stressed the role of the association as an organization to increase the level of information about ground water resource problems rather than serve as an instrument of change through direct action.

The first purpose of the association was "to take an active interest in the problems arising because of the deficiency existing in the supply of ground water in the West Basin."¹⁸ The second avowed purpose of the association was "to investigate problems, formulate and disseminate factual and educational data in connection with the supply of ground water [and] its depletion and methods of recharge. . . ."¹⁹ The third purpose related to the possibility of taking political action since the association was "to investigate legislative measures . . . which bear on, relate to, or control the preservation or recharge of the West Basin ground water supply or a secondary source of supply . . ." but the association was only to "express

¹⁸West Basin Water Association, Articles of Association, Article I.

¹⁹Loc. cit.

opinions" about proposed legislation "if advisable."²⁰ The fourth enumerated purpose of the new association was Cooperation with "its members and other persons . . . interested in or affected by such problems and the solution thereof by any and all matters relating thereto."²¹

The first official action of the association was to authorize a technical study concerning alternative sources of supplementary water for the basin. However, when Harold Conkling, the engineer employed to make the survey, recommended the creation of a municipal water district, the association shunned an active role in the heated campaign which followed. Many individuals active in the association also campaigned to create a municipal water district. As it was, the association almost lost the participation of one of the large water companies because the company at first opposed the creation of the district, and felt that the association was taking an active role in attempting to gain voter support for the establishment of the district.

The possibility of taking an active role in West Basin affairs was again considered in 1947 when the executive committee discussed whether the association should attempt "to aid in facilitating the work of the Referee in connection with the adjudication suit as a means of cutting down

²⁰West Basin Water Association, loc. cit.

²¹Loc. cit.

the cost of the suit and speeding up the proceedings."²² The discussion centered on "whether or not it was advisable to have the Association attempt this sort of program or whether it could better be handled by members of the Association on an individual basis."²³ The executive committee referred the question to the entire board of directors which decided not to take an active part in the West Basin litigation at that time.

The West Basin Municipal Water District was formed in 1948. By 1950, almost the entire West Basin area had annexed to the District and was sharing the cost of providing a supplemental supply to the area. In 1949, the California Supreme Court confirmed the trial court's decision in the Raymond Basin case; and as a result, it appeared that the water producers involved in the West Basin case would share proportionately in the curtailment of production which would inevitably come. Water producers were growing more aware of the mutuality of their interests and the importance of working together to arrive at satisfactory solutions. As this happened the association was able to change from an organization primarily devoted to the provision of additional information to one which could actively seek to change its physical, economic, legal and political environment.

²²West Basin Water Association, Executive Committee, Minutes. March 2, 1947, p. 2.

²³Loc. cit.

This change was reflected in many ways. A legislative committee was created in 1950 to investigate and report to the association on legislative matters including amendments of existing statutes governing water service and water supply. Specifically, the committee was "to study and resort on suggested amendments to the Municipal Water District Act of 1911 and the County Flood Control Act."²⁴ Many subsequent meetings were held with representatives of the Flood Control District to decide upon the appropriate strategy in introducing and assuring passage of legislation to enable West Basin to create a zone of benefit within the Flood Control District. Later in the year, the executive committee considered the possibility of asking for "an emergency grant of State funds . . ." to build an experimental fresh water barrier against the infiltration of ocean water.²⁵ The participation of the association in negotiations concerning all aspects of the barrier project as discussed further in Chapter VII.

In 1953, the association formalized its role as a politically active group by adopting a "Statement of Purposes, Policies and Plan for Conserving the Underground Fresh Water Supply of the West Coast Basin, Los Angeles

²⁴West Basin Water Association, Legislative Committee, Minutes, September 1, 1950, p. 1.

²⁵West Basin Water Association, Executive Committee, Minutes, December 20, 1950, p. 3.

County, California."²⁶ The statement reflected the view of most members that "an ultimate and permanent plan" for West Basin was "imperative" if they were to succeed in the attempt to conserve the basin and its fresh water supply.²⁷ The association agreed that "such a plan must include provision for (1) reducing the overdraft, and (2) the control of sea water intrusion by repressurizing the depleted aquifers."²⁸ Next the members agreed that the plan "must provide for taking all steps necessary to accomplish these objectives . . . [and] provide the funds needed for new water and for plant and equipment."²⁹ As part of this plan, the association listed nine proposals which would lead to the conservation of the basin and its ultimate use as a component in a conjunctive use system.

However, the association itself could not perform the actions which it was proposing. Since public powers were needed, the association could only "urge," "sponsor," "request," "persuade," and "propose." From the list of nine proposals, the association was able to accomplish only one itself. This was the proposal that the association assess its own members to purchase Metropolitan water temporarily until a zone of benefit for the West Basin area could be created to finance the barrier project.

²⁶(mimeo), Hermosa Beach, 1953. ²⁷Ibid., p.2.

²⁸Loc. cit. ²⁹Ibid., pp. 2-3.

The association was successful in persuading others to accomplish many of the proposals, but often not within the time period originally intended. For example, the first proposal was that "the 'Committee on Settlement' on pending litigation be urged to expedite their work to the end that curtailment of pumping from West Basin be instituted at the earliest possible date . . . and in any event by January 1, 1954. . ."³⁰ The Committee did gain a voluntary agreement but the interim agreement did not go into effect until March 1, 1955, more than a year after the association deadline. The final judgment was not entered until 1961, more than six years after the original deadline.

Summary

The association possesses no more power than any of its members. The success of the association has come in areas where it has persuaded either an external political entity or its own members or quasi-members to do something which the entity is empowered to do. Agreements within the association are dependent upon the voluntary acceptance of a course of action which individual member agencies could do independently. The association has provided the essential clearing house where members could confer and agree upon joint actions.

³⁰"Statement of Purposes, Policies and Plan for Conserving the Underground Fresh Water Supply . . .," p. 3.

By involving a number of public agencies in association affairs, the association has had access to the use of public powers, even though it could not use them directly. Frequently, decisions about the future actions of governmental agencies have been reached within the association, but then the association is dependent on the good faith and capabilities of the representatives from public agencies to carry out the informal agreements reached in association meetings. For example, plans concerning the financing and operation of the barrier were first made in the executive committee of the association. However, once the decision was made to tax the land owners who would benefit from the barrier to finance its cost of operation, the association could not implement the plan itself. The association had to gain approval from the County Board of Supervisors to create a zone of benefit within the Flood Control District. Thereafter the association was dependent upon the Flood Control District to operate the barrier in the manner proposed by the executive committee.

The association has not been able to compel enterprises to comply with negotiated agreements. As a result, its successes have materialized in areas where the association was able to provide a forum in which conflicting interests could work out mutually advantageous plans of action. The major successes of the association have been related to evolving new institutional devices whereby public and

private agencies could coordinate actions in providing services to West Basin. Its major failures have resulted from the inability to enforce compliance on all when a very large majority of member agencies approved a proposed action. The "hold-out" problem has been a recurrent event throughout association history. The inability of the association to secure the City of Hawthorne's compliance with the interim agreement is perhaps the most striking example of the "hold-out" problem.

The necessity of gaining close to unanimous support prior to taking any affirmative action has meant that the negotiation process within the association has often been long and tedious. However, while the costs of decision making have been high, the process has produced solutions that were considered satisfactory to almost all parties involved. As long as the association had the time to spend in lengthy negotiations, the avoidance of a solution being imposed upon a minority was a benefit which all members of the association favored strongly. In any on-going private association, each member has to consider that he may be in the minority about proposed actions at some future time. As a result, if time is not a critical factor, it is to the advantage of each member to support the right of the minority to delay decisions until all interests are fully taken into account. In this way, the individual member insures that an unacceptable plan will not be forced upon

him when others form the temporary majority in opposition to his views. However, if time becomes a critical factor, the costs of decision-making also have to be taken into account. An individual member may be willing to risk being on the losing side from time to time and having to accept an undesirable settlement, in order to gain the benefit of reducing the time necessary to arrive at any decision to act.³¹

As time became a critical factor for the members of the West Basin Water Association, members became dissatisfied with the association's lack of power to act for itself and to gain compliance of the minority after a large majority had agreed upon an acceptable program for action. As the years passed, members helplessly observed the continued intrusion of salt water along the coast. At the same time, they were aware that "surplus" Colorado River water used for replenishment would not be available for more than ten to twenty years. If the association could not negotiate a satisfactory plan for purchasing and utilizing this water for replenishment purposes when it was still available, it might be too late to take any effective action against the intrusion of the sea in their fresh water supply.

As more and more members of the association recognized that a private association was handicapped in the attempt

³¹See discussion in James M. Buchanan and Gordon Tullock, The Calculus of Consent (Ann Arbor: The University of Michigan Press, 1962), pp. 97-118.

to develop a conjunctive use system, the need to create a new public enterprise with the appropriate boundary conditions and with adequate authority to act came to be generally accepted. Association members were active in drafting general enabling legislation, in the negotiation of a settlement with potentially competitive public agencies, and in conducting a campaign that led to the creation of the Central and West Basin Water Replenishment District. In essence, the Replenishment District was created by the association to take over some of the public functions which the association had attempted to accomplish in the past.

Once a public enterprise is created, it has an existence apart from the private association which was responsible for its creation. The Replenishment District cannot be considered as a "front" for the association. However, the overlap of leadership and policy goals between the Replenishment District and the association has enabled the responsibility for decision-making regarding the future of the basin to shift from the association to the Replenishment District without any significant conflict. Three out of five of the members of the newly elected board of directors were active in either the West Basin or the Central Basin water associations. And, as important, if not more so, Carl Fossette, the association's executive secretary, was employed as general manager for the new district.

Since 1960, the association has returned more to its former role as the center for information for water producers utilizing West Basin and the forum for the discussion of mutual problems. The initiative in planning new programs and negotiating settlements among potentially competitive public agencies has shifted to the agency with the power to carry out agreed policies. Representatives from the Replenishment District, the Flood Control District, Metropolitan, the Department of Water Resources and the Sanitation Districts regularly report to association members at quarterly meetings and are sensitive to any criticisms of their program voiced by the association. The association remains a potentially important political factor. The necessity of reporting four times a year to a group of water producers directly involved in West Basin affairs is itself a potent check on the unrestrained use of public powers held by the agencies created or helped by the association to perform certain ground water basin management functions. The association may not initiate plans for the operation of the conjunctive use system in the future, but the existence of the association will help to insure that the needs of the water producers who utilize the basin are taken into account.

CHAPTER V

THE IMPORTATION OF A SUPPLEMENTAL WATER SUPPLY

Investigation of Alternatives

The organization of the West Basin Water Association has a demonstration of the concern felt by many of the large water producers about the evidence of falling water tables and salt water intrusion in West Basin. While many members of the association were aware of the problems during the mid-1940's, few were certain about what should be done to solve them. Many non-member producers were either unaware of the problems or contested the validity of the evidence presented up to that time of a critical overdraft. Still others, who had remained outside the association, acknowledged the limited nature of the local supply, but felt that they possessed superior legal claims which would enable them to continue producing water equal to their future needs and to exclude others from continued access to the local ground water supply.

The Conkling Report

In order to expand the level of information about both the problems and alternative sources of supplemental water

that might help solve them, one of the first acts of the association was to retain Harold Conkling, a consulting engineer, to prepare a report outlining the availability, practicality and cost of eight potential sources of supplemental water.¹ Conkling's report was prepared and presented to the association in July, 1946. In his report, Conkling immediately eliminated six potential water sources as infeasible for West Basin. The six eliminated sources were water from the San Fernando Valley, water from the Whittier Narrows, water from the Owens Valley, water from undeveloped lower strata in West Basin, water from the Mojave River and water from the sea. Two sources given serious analysis and consideration were the use of reclaimed sewage and water from the Colorado River.

In the introduction to his report, Conkling listed the basic assumptions which underlay his analysis. Among the most important of these assumptions were the following:

1. That the cities of Torrance, Long Beach, and Los Angeles were members of the Metropolitan Water District and could meet their future demands for water from this supplemental source, but that the rest of West Basin would have to develop its own source of supplemental water independently.

¹Conkling had been Deputy State Engineer with the Division of Water Resources in California from 1921-1945 before establishing his own firm.

2. That "the entire area of the basin outside the boundary of the named cities [would] be incorporated into a district . . . which could distribute imported water and its costs most economically, equitably and efficiently."²
3. That it would be necessary to extract only 10,000 acre-feet per annum within the new district to supply peak loads in excess of the capacity of a surface distribution system, to maintain well and pumps, and to provide water for isolated entities.
4. That it would be safe to extract 10,000 acre-feet per year within the district.
5. That production of ground water in excess of the 10,000 acre-feet would be enjoined by the court until the water table rose to a safe level.
6. That reclaimed sewage water placed under ground would be owned by the new district and could be pumped out by users within the district in addition to their proportionate share of the 10,000 acre-feet of fresh water safe yield.

In his analysis of the comparative cost of importing Colorado River water and using reclaimed sewage water, Conkling designed two hypothetical systems with a maximum capacity of 80,000 acre-feet per year to allow for a 50

²Harold Conkling, Report to West Basin Water Association (Hermosa Beach, California: West Basin Water Association, 1946), p. v.

per cent increase in water demand. On the basis of these specifications, he estimated the average cost of importing 53,000 acre-feet of Colorado River water for the first thirty years would be \$35.00 an acre-foot. This included operating costs, taxes, interest and direct water payments. Additional water up to a total of 80,000 acre-feet would cost \$15.00 an acre-foot.³ In comparison, Conkling estimated that it would cost \$18.00 an acre-foot to deliver 53,000 acre-feet per year of purified sewage water and \$2.63 per acre-foot to deliver the additional 27,000 acre-feet to bring the system up to full capacity.

Even though the estimated cost of using reclaimed water to provide supplemental supplies was considerably less than the cost of Colorado River water, and Conkling felt that it was technically feasible to develop this source, he still recommended that a new water district be established to annex to Metropolitan "if a satisfactory agreement with Metropolitan District can be obtained."⁴ Conkling rejected the use of reclaimed sewage as a practical and immediate solution to the needs of West Basin for a supplemental supply for several reasons. First, until policies could be clarified with the City of Los Angeles, there was no assurance that a new West Basin district

³Actually, the water purchased from Metropolitan since 1948 has averaged around \$50.00 an acre-foot because the use of water from this source was quite low until after 1955.

⁴Conkling, op. cit., p. vii.

could connect to the sewer trunks crossing West Basin or that a firm supply would be available. Secondly, it was then impossible to tell if Los Angeles would charge for the use of this supply. Third, it might take a long time to clarify these matters and "West Basin necessities [were] immediate."⁵

In conclusion, Conkling pointed out that the development of reclaimed sewage appeared to be a community enterprise "just as the importation of Colorado River water is a community enterprise. The latter has been clarified and the fundamental rules have been made. The former has not been clarified and no rules have been made."⁶ Because the rules relating to the development of reclaimed sewage had not been made, Conkling felt that a new district would "not be free to proceed with the use of sewage because the matter [did] not depend upon the wishes of the district alone."⁷

However, Conkling did recommend that further investigation of the use of sewage water be encouraged after a new district had been formed and annexed to Metropolitan. He pointed out that the quantity of water demanded in West Basin in 1946 exceeded the amount of the area's future entitlement to Colorado River water based on the assessed valuation within the potential district. As a result, the

⁵Conkling, op. cit., p. vii.

⁶Loc. cit.

⁷Loc. cit.

West Basin area would need to explore still additional sources to supplement its supply from Metropolitan. Since West Basin was the "logical area for use of sewage water because the large outfalls cross it," Conkling felt the matter should be pursued further after access to Colorado River water was guaranteed.⁸

The Southwest Water Fact-Finding Committee Report

The Conkling report stressed the necessity of creating a new public enterprise to include all of West Basin not already a part of the Metropolitan Water District in order to gain access to Colorado River water. His recommendation has been seconded by a group of citizens appointed by Los Angeles County Supervisor Raymond V. Darby to investigate the same problems. In the spring of 1946, Darby had written to the chambers of commerce located in West Basin inviting interested members to attend a meeting to consider the "talk about Inglewood, Hawthorne, El Segundo, Manhattan Beach, Hermosa Beach and county territory joining the MWD."⁹ Darby wanted the group to discuss "every angle of the problem, the question of back payments, terms and conditions that might be satisfactory for our joining, if at all, and other questions or problems concerning this that might

⁸Conkling, op. cit., p. vii.

⁹Letter from Supervisor Raymond V. Darby to the Inglewood Chamber of Commerce, February 20, 1946.

arise.¹⁰ At the meeting Darby appointed twelve men to act as a fact-finding committee to investigate and report their findings to him.

After four months work, the Southwest Water Fact-Finding Committee recommended that "a water district under the available Municipal Water District Act of 1911 . . . be formed at once to coordinate the efforts of the various communities involved and to obtain a sufficient water supply for present needs and increasing demands."¹¹ The fact-finding committee also asserted that the serious threat to the water supply was "a common problem of all the West Basin cities and unincorporated territories. . ."¹² As a result, the committee urged that "the formation of a water district should necessarily include all of the territory which is and will be affected."¹³ The committee argued that this was "the only means by which the common water problem [could] be solved."¹⁴

¹⁰Letter from Supervisor Raymond V. Darby, loc. cit.

¹¹Letter from the Southwest Fact-Finding Committee to Supervisor Raymond V. Darby, June 7, 1946. "Southwest" refers to the southwestern portion of Los Angeles County which Darby represented on the Los Angeles County Board of Supervisors.

¹²Loc. cit.

¹³Loc. cit.

¹⁴Loc. cit.

The Choice of Colorado River Water
as a Supplemental Supply

Conditions of Access

The simultaneous presentation of reports by a consulting engineer and a group of citizens confirmed the beliefs of many large water producers about the need to create a municipal water district which could annex to Metropolitan. Metropolitan had been established in the first place as "a Southern California enterprise" to insure the generations become an adequate water supply for the region as a whole."¹⁵ The original membership in Metropolitan was somewhat less than expected and Metropolitan had often tried to encourage other areas to join.¹⁶ The expansion of its territorial boundaries and the increase of its water demand would help Metropolitan relieve the financial burden borne by the original members and firm its claim to Colorado River water. It appeared that both the local area and Metropolitan would benefit from the proposals made by Conkling and the fact-finding committee.

¹⁵MWD, Annual Report, 1938-39, p. 20.

¹⁶Typical of the statements made by Metropolitan in its annual reports about the possibility of other areas annexing to Metropolitan is this statement from the 1941 report, p. 5:

The thirteen cities which at this time constitute the District, undertook this project to insure their own future development and can bear the cost. It is believed however, that the common interests of Southern California will best be served if the benefits of the aqueduct are distributed to all communities in

While Metropolitan was interested in expanding its territory and sales, it was also in the position of a monopolist with control over the only practical source of supplemental water for the Southern California area. As a result, Metropolitan was able to define the conditions that an area would have to meet prior to Metropolitan's approval of a new annexation. These were among the "rules" to which Conkling referred. And, the strength of Metropolitan's bargaining position led Conkling to recommend annexation only "if a satisfactory agreement" could be negotiated with Metropolitan.

Among the conditions of entry established by Metropolitan was the formation of a municipal water district by a local area desiring to annex to Metropolitan. When the original Metropolitan Water District Act was written, it was thought that most of its member agencies would be cities.¹⁷ The original members were all cities and the first areas annexed were also cities. However, in 1938, this policy was changed to require areas to be of "sufficient size and water requirements to justify as economically feasible the delivery of aqueduct water. Preferably such areas should be so located as to control the entire production of water from

need of additional water. This can be accomplished by membership in the District and by sharing in the advantages and responsibilities of what is now a going concern, able to supply wholesale water to the coastal basin communities.

¹⁷See Calif. Stats. 1931, ch. 429.

underground water basins affected."¹⁸

In 1941, Metropolitan amended the organic law under which it was organized in order "to clarify the annexation provisions of the basic act, so as more readily to permit creation of other types of districts susceptible of annexation. . ."¹⁹ First, the amendment stipulated that the terms "municipal corporation," "municipality" or "city" referred to municipal water districts, municipal utility districts, public utility districts and county water districts as well as cities.²⁰ Secondly, the amendment clarified that wherever the terms "municipal corporation," "municipality" or "city" were used in the act, that the terms

¹⁸Julian Hinds, Summary Colorado River Plans and Policies, December 7, 1949 (mimeo), Appendix C, quoted in Vincent Ostrom, Water and Politics, p. 187. When the City of El Segundo indicated an interest in joining Metropolitan, the board of directors denied El Segundo's application and suggested that the City join other West Basin communities in forming a municipal water district to include the entire basin. W. P. Whitsell, Chairman of the Metropolitan board of directors, wrote:

This overlying area is a natural geographic unit with respect to the importation of water, for the reason that the various communities and districts involved now draw their water supplies from the same source and have a common need for supplemental water. The annexation to the Metropolitan Water District of only a portion of the area might result in the release of local waters to the un-annexed portions, thus giving them an unfair advantage over the annexing territory. This would be inequitable to the annexing area and to the District...

Quoted in the Gardena Valley News, July 11, 1946.

¹⁹MWD, Annual Report, 1940-41, p. 89.

²⁰Calif. Stats., 1941, ch. 25, sec. 1, p. 447.

referred to those agencies, "the corporate areas of which, as units, respectively, shall have been included in or annexed to such metropolitan water district," and that these terms did not refer to those municipalities which were included within the boundaries of "any overlying municipal corporation" which was a part of a metropolitan water district.²¹ These amendments had the effect of enabling overlay districts to join Metropolitan.

In addition, Metropolitan strengthened the provisions outlining its discretionary powers related to proposed annexations. Under the amended act, the governing body of a municipality or district could apply to the board of directors of a metropolitan water district for consent to annex. "The board of directors may grant or deny such application, and in granting the same may fix the terms and conditions upon which the corporate area of such municipality may be annexed. . . ." ²² The act goes on to state that It such terms and conditions may provide among other things for the levy . . . of special taxes upon taxable property within such municipality in addition to the taxes elsewhere . . . authorized . . . " ²³ A related amendment prohibited annexations to any water district included within a metropolitan water district without the prior consent of the board of directors of the Metropolitan Water District. The

²¹Calif. Stats., 1941, ch. 25, sec. 2, p. 448.

²²Ibid., p. 449.

²³Loc. cit.

board of directors was empowered to set special taxes for areas annexing to member districts different from that of the rest of the member agency, and in addition, to the regular taxes assessed to meet operating expenses. The effect of these amendments was to give Metropolitan the formal power to demand that an area desiring to annex, join with other areas utilizing a ground water basin to create an overlay district including all of the territory dependent upon the same source.

After 1941, Metropolitan used its new powers to establish special annexation levies for all new territory which joined the District. These levies, popularly referred to as "back taxes," were approximately equal to the taxes plus interest charges, that an annexing area would have paid had it been a part of Metropolitan since its formation. The gross amount of the levy was established first and the annexing area agreed to pay it in equal yearly amounts over a twenty or thirty year period. Metropolitan also attempted to prevent centers of strong opposition to Metropolitan from "holding out" and remaining outside Metropolitan while surrounding areas joined. Non-constituent "islands" could gain considerable benefits by not joining if all their neighbors did.

Metropolitan preferred the use of the Municipal Water District Act of 1911 by annexing areas because the law contained provisions which were well suited for use as a

re-wholesaling district within the structure of a metropolitan water district.²⁴ One of the primary benefits, from Metropolitan's point of view, was the control that those initiating the petition to create a new municipal water district held over the boundaries of the proposed district. This, in turn, enabled Metropolitan to exercise more control over the boundaries of the unit to be annexed.

Under the Municipal Water District Act of 1911 as amended in 1947, the people of any county or portion thereof, whether or not such portion contained unincorporated territory, could organize a municipal water district. The territory within the proposed district could consist of one or more parcels of land which did not need to be contiguous with each other. A petition describing the boundaries of a proposed district was to be filed with the county clerk of the county in which the proposed district was to be located after it was signed by 10 per cent of the qualified electors residing within the boundaries of the proposed district who voted for governor in the previous general election (including 10 per cent of the qualified electors in each city included in the proposed district). The county clerk after

²⁴In fact, the Municipal Water District Act of 1911 has come to be looked upon as Metropolitan's "property." It was originally sponsored by interests in the San Francisco Bay area. However, of the forty-nine municipal water districts in California at the present time, twenty-two are either member agencies of the Metropolitan Water District of Southern California or constituent districts of the San Diego County Water Authority, which is a constituent member of Metropolitan.

validating the petition, was to present it to the Board of Supervisors, who would give notice of an election to be held within ninety days to determine whether the proposed district should be incorporated. There was no provision for a hearing and no mention in the statute of criteria for the exclusion of any territory by the Board of Supervisors.²⁵

The Campaign for Popular Assent

After preliminary negotiations with Metropolitan and tentative approval of the annexation of a municipal water district to include the entire West Basin area, the problem racing proponents was mobilizing political support to win approval of the proposal by the citizens of the area. "One-hundred and fifty prominent citizens of the area" met in Inglewood on June, 1946, to discuss both the Conkling report and the Southwest Water Fact-Finding Committee report.²⁶ Strong opposition to the formation of a district was immediately registered by some of the inland communities including Inglewood and Hawthorne on the northeast, and Lawndale, Dominguez and Gardena on the southeast of the basin. The inland areas vigorously opposed inclusion in a proposed municipal water district because they did not consider themselves to be as threatened by the effects of salt

²⁵See Calif. Stats. 1941, ch. 26, sec. 2, pp. 454-55.

²⁶Carl Fossette, The Story of West Basin Water (mimeo; Hermosa Beach, 1950), p. 5.

water intrusion as the areas along the coast.

Mayor E. S. Dixon of Inglewood was particularly opposed to the inclusion of his city in the district. In a "letter to the editor" submitted to the Inglewood Daily News Dixon stressed the abundance of Inglewood's supply by stating:

I have for more than 18 months been accumulating and studying all available data regarding the water supply of our city. . . . I have consulted with geologists and other water authorities, and all of the data convinces me that there is sufficient underground water available to the City of Inglewood to supply all of its present and future needs.²⁷

In a speech before the members of the Southwest Inglewood Improvement Association, Mayor Dixon stressed the high tax burden to be assumed by residents of the new district. Dixon asserted that the "taxes for the proposed water district could amount to as high as 93 cents per \$100 of assessed valuation."²⁸ Dixon went on to claim that "authoritative reports showed that at least one-fourth of the area involved was in no need of water nor did it face a water shortage as claimed by the proponents of the district."²⁹ Dixon was particularly emphatic that Inglewood did not need a supplemental supply of water and should not have to "bear a major portion of the tax load for the benefit of a few."³⁰ Dixon claimed that Inglewood used "only four per cent of the water production of the so-called West Basin yet would be

²⁷Inglewood Daily News, January 7, 1947.

²⁸Quoted in Palos Verdes News, January 2, 1947.

²⁹Loc. cit.

³⁰Loc. cit.

forced to bear 24.2 per cent of the tax load if the measure [were] passed."³¹

C. E. Van Der Oef, a Hawthorne realtor, was equally disturbed by the prospect of his area being included in the new district. He told members of the Lawndale Business Men's Manufacturers Association that the proposed district would bring no benefit to Hawthorne since his city and the adjacent inland areas needed no supplementary water. "If a West Basin Water District is formed as a result of a favorable vote January 14, it will be formed under the Municipal Water Act of 1911 which is as vicious and unfair as the Mattoon Act. . . . [It] would help only the immediate beach cities. . . ." ³² W. D. Reynolds, president of the Dominguez Chamber of Commerce also opposed the inclusion of his area in the proposed district. He stated before the Lawndale Civic Association that the formation of a water district was unnecessary and would bring an increased tax burden of \$1.40 per \$100 of assessed valuation. He also stated that:

³¹Palos Verdes News, loc. cit.

³²Quoted in the Inglewood Daily News, January 4, 1947. The Mattoon Act was passed in 1925 to provide for the acquisition of land for the improvement of public highways and roads and to finance the general improvement of existing roads. Counties and municipalities were empowered to create improvement districts within their jurisdictions to raise the funds necessary to purchase new land and/or to improve existing roads. See Calif. Stats., 1925, ch. 419, p. 849.

The Dominguez area shows no sign of a water shortage; in fact, deep wells in that area show a higher recharge rate than formerly.... Hawthorne municipal reports show all its wells indicating a higher drawdown and increased recharge rate. Inglewood suffers from no water shortage. Then, why vote for a district under the 1911 municipal water district act which is vicious and undemocratic . . . and saddle three-quarters of an arbitrary area with 70%, of an increased tax load when no benefit will result since most of the area shows no water shortage. . . .³³

While many of the overt arguments made by those opposed to the creation of a municipal water district related to the supposed surplus of ground water supplies in the areas, many of those making statements of this kind felt that their supply would be adequate in the future because they had superior rights to ground water. The District Court of Appeals had just reversed the trial court's decision in the Raymond Basin case. Consequently, many of the cities and large domestic water producers felt that their rights to water would be considered superior to those of the industrial producers who were the newcomers. If the industrial producers were made to bear the full burden of adversity, the supply of ground water available for municipal water supply would be increased.

The Southwest Water Fact-Finding Committee undertook responsibility for directing the election campaign and assumed the expense of circulating petitions, legal advertising and the general campaign. The fact-finding committee

³³Quoted in the Hawthorne-Lennox Advertiser, January 9, 1947.

asked the West Basin Water Association to finance some of the expenses involved in an educational campaign based on the technical data accumulated by the association. The executive committee of the association did agree to use limited funds to publish some of the findings of the Ways and Means Committee and of the Conkling Report but refused to enter into the campaign as an active proponent.³⁴

Proponents in favor of the district stressed the inter-relationship of the entire region. Robert E. Austin wrote in an editorial that the people of the area should function as "a natural geographic team." He stated that the problems of West Basin should be solved "in the spirit of 'one for all and all for one.'"³⁵ Proponents also stressed the lack of a barrier against salt water intrusion. For example, F. N. Van Norman, of the fact-finding committee, declared that "there is no known barrier in the West Basin to prevent salt water encroachment."³⁶ Van Norman asserted that this "nullified the theory that the ultimate water problem of one West Basin city is different than any other in the area. On the contrary . . . the problem is one of mathematical progression for all cities."³⁷

³⁴West Basin Water Association, Executive Committee, Minutes, June 27, 1946.

³⁵Torrance Herald, July 25, 1946.

³⁶Los Angeles Times, July 26, 1946.

³⁷Loc. cit.

Election day was January 14, 1947. It rained that day for the first time in weeks. It has been reported that "one city opened all its fire hydrants to flush its water system on election day."³⁸ Voters who waded through the flooded streets voted against the proposed district by a ratio of four to three. The district carried with strong majorities in the beach communities; however, the strongly negative votes of the inland communities outweighed the favorable votes of the coastal regions. Voting results by cities and community areas were as follows:³⁹

<u>Area</u>	<u>Yes Votes</u>	<u>No Votes</u>
Inglewood	1,614	4,799
Hawthorne	235	1,244
Lawndale	131	373
Lennox	392	1,211
Dominguez	46	978
Gardena	404	1,181
Lomita	384	509
Hermosa Beach	1,414	342
Manhattan Beach	1,443	255
Palos Verdes	239	38
Redondo Beach	1,825	742
Other Unincorporated areas	1,169	379

The Campaign to Gain Metropolitan's Approval
of a Smaller District

Immediately after this election, the defeated proponents of the new district regrouped forces. The mayors of the

³⁸Fossette, op. cit., p. 7.

³⁹Inglewood Daily News, January 15, 1947.

have south bay cities, El Segundo, Manhattan Beach, Hermosa Beach and Palos Verdes Estates, started a concerted campaign to form a smaller district to exclude Inglewood, Hawthorne and Gardena. The mayors hoped to form a district which would include only those areas which had voted favorably for the first proposal. However, while this strategy would insure a victory at the polls, the mayors faced the task of convincing Metropolitan that the smaller district was an appropriate unit for annexation. The board of directors of Metropolitan initially opposed the idea of annexing a smaller district. The proposal was considered by several subcommittees of the board and by Metropolitan's engineering and legal staff. The Los Angeles directors proposed that Metropolitan contract with the West Basin area to sell water on a long term basis rather than approve an annexation of the smaller district.

Roy Selby, Mayor of El Segundo, made a personal visit to each of the fourteen cities which belonged to Metropolitan to enlist their aid in negotiations with the Board. It was later reported that "Selby was successful. every single Metropolitan director from member cities, except Los Angeles went on record in vehement support."⁴⁰ The reluctance on the part of the Los Angeles delegation resulted from a desire to see the beach cities annex to Los Angeles in order to gain additional water. Mayor Charles

⁴⁰Fossette, op. cit., p. 7.

Wortham of Redondo Beach eventually went directly to Los Angeles Mayor Fletcher Bowron to convince him to support publicly the south bay request for annexation to Metropolitan. After some additional delaying tactics, the Los Angeles members on Metropolitan's board of directors agreed to accept the district proposed by the mayors, if the territories of Lennox, Lawndale and Lomita, which had voted against the original district, were included in the reformulated district.

The Second Campaign for Popular Consent

The mayors of the five beach cities now turned their attention to the problem of gaining support in the areas added by Metropolitan which had opposed the first proposal to form a municipal water district. The mayors sent an envoy to Lomita to tell its community leaders that a new district was being formed by the "selfish" South Bay group and Lomita was going to be excluded. It has been reported that "two days later a defiant Lomita Committee attended a South Bay water meeting demanding to be included in the new district. 'Reluctantly' it was agreed to include Lomita."⁴¹ Now that they had gained this support, a meeting was held in Redondo Beach to which civic leaders from Lennox and Lawndale were invited. Representatives from these communities were informed that they were to be included in the

⁴¹Fossette, op. cit., p. 8.

proposed district regardless of their desires because of Metropolitan's demands. After conferring with water companies in these areas, leaders of the two communities agreed to support the proposal.⁴²

Election day was set for November 25, 1947, and another extensive campaign was initiated. The proposal to create a municipal water district carried at the polls this time by a ten to one margin. The proportion in favor of the district in El Segundo was fifty-three to one, and in all areas the district carried, as shown below:⁴³

<u>Area</u>	<u>Yes Votes</u>	<u>No Votes</u>
El Segundo	1,376	26
Manhattan Beach	2,461	72
Hermosa Beach	1,626	92
Redondo Beach	2,969	374
Palos Verdes Estates	290	10
Lomita	811	242
Lawndale	338	62
Howard	464	146
Wiseburn	741	295
Dominguez	16	0

The Establishment of a Municipal Water District

A second election was held immediately to select the board of directors of the new district. The men who were chosen, Robert E. Austin, Ralph W. Pritchard, R. T. Hutchins,

⁴²Fossette, loc. cit.

⁴³Daily Breeze, November 26, 1947.

W. C. Farquhar and August H. Riess, had all actively campaigned for the district and were members of either the Southwest Water Fact-Finding Committee or the West Basin Water Association. The first official act of the new board was to seek formal approval from Metropolitan for the initiation of annexation proceedings. Since approval had been given informally prior to the creation of the new district, Metropolitan immediately indicated its willingness for the new District to annex. The annexation proposal was successfully passed at an election held on June 8, 1948, and the district was officially annexed to Metropolitan on July 23, 1948. The first Colorado River water was delivered to the district during 1949.

The West Basin Municipal Water District, at the time of annexation to Metropolitan, extended over an area of sixty-three square miles with an estimated population of 142,500 people. The assessed valuation of the District was \$115 million, which was equal to 3 per cent of the total assessed valuation for Metropolitan as a whole.⁴⁴ The annexation levy established by Metropolitan was \$4 million to be paid in thirty annual installments beginning the fiscal year of 1949-50. A nine cent ad valorem tax on the taxable property within the District was sufficient to raise the first annual "back tax" payment.⁴⁵ On its part, Metropolitan agreed to

⁴⁴MWD, Annual Report, 1948-49, p. 4.

⁴⁵MWD, Annual Report, 1961-62, p. 153.

construct and finance a seven-mile West Basin feeder, including five service connections, at a cost exceeding \$1.6 million.⁴⁶

Expansion through Annexation

Even before the first drop of Colorado River water entered the West Basin area, at least one of the regions which had originally opposed the creation of the municipal water district asked to annex to the newly formed District. In fact, the City of Gardena asked to annex to the new District even before it, in turn, had annexed to Metropolitan. For fear that immediate annexation of Gardena to the new District would "further complicate the situation" Gardena was informed that it should wait until after proceedings to annex the West Basin Municipal Water District to Metropolitan were completed."⁴⁷ Gardena was officially annexed to the West Basin District on December 9, 1948.

By 1950, Mayor E. S. Dixon of Inglewood reversed his previous stand and urged his city to annex to the West Basin Municipal Water District. In an open letter to the citizens of Inglewood, Dixon frankly stated that the final judgment reached in the Raymond Basin case had changed his estimate of the legal position of Inglewood in relation to other

⁴⁶MWD, Annual Report, 1961-62, loc. cit.

⁴⁷Letter from Carl Fossette to Pat MacDonneil, Gardena Chamber of Commerce, January 7, 1948.

producers from the basin. Dixon observed that:

. . . I have been asked many times the reason why I now support Metropolitan Water District, in view of my opposition to it in 1947. . . . On October 24, 1945, a case was filed in the Superior Court of the State of California, entitled "California Water Service Company, et al., vs. City of Compton, et al." . . . This case was directed against every producer of water in the so-called "West Coast Basin." . . .

When this case was filed, your City Council employed a firm . . . to defend the City of Inglewood in this action. Our defense was based on the following quotation from the legal answer in this case by the above attorneys on behalf of the City of Inglewood: ". . . that this answering defendant owns the prior and paramount rights to take water from said West Coast Basin for domestic, irrigation, industrial and municipal uses, which right is superior to the rights of plaintiffs, and of each of them."

. . . [M]y decision to oppose the election . . . was based on the above legal advice.

Some time prior to the filing of the California Water Service Company suit, there had been pending in another section of Los Angeles County a case known as the "Raymond Basin Case." . . . This case continued in the courts for many years, finally reaching the Supreme Court . . . where a final decision was rendered against the defendants. The substantial and pertinent portion of the Supreme Court decision was to the effect that all water users from a common basin must be treated exactly alike...

I believe it would be apparent to anyone from the above that our decision to oppose the water issue in 1947 was based on a reasonable belief that we could defeat the suit designed to restrict our pumping, and that our reason for now supporting entrance to the Metropolitan Water District is based on as competent legal formation that we cannot hope to win this lawsuit.⁴⁸

The City of Inglewood annexed to the West Basin District on June 9, 1952. In rapid succession, both the Dominguez area and the City of Hawthorne also annexed. By October, 1953,

⁴⁸Quoted in Inglewood Daily News, September 26, 1956.

the West Basin Municipal Water District comprised substantially the same area as that which was proposed in the original election which failed to carry.

In 1954, two areas outside the territory of West Basin, Culver City and Malibu, petitioned Metropolitan to be accepted as member entities. Metropolitan would not consent to their annexation as individual member entities and insisted that these areas annex to the West Basin Municipal Water District. In addition, Metropolitan demanded that a series of small islands of non-Metropolitan property be included within the boundaries of the annexation unit. One of the areas so included was located in West Hollywood and served by the Los Angeles Department of Water and Power under a public utility obligation assumed when Los Angeles purchased a private water company serving the area before World War I. As a result, the residents in this "island" had access to an adequate water supply but had not paid taxes to Metropolitan, which supplied the water to Los Angeles for serving the area. The opposition in this territory to inclusion in the West Basin Municipal Water District was strong. While the vote in Culver City, Malibu and the rest of the county territory included in the annexation unit was five to one in favor of annexation, the vote in West Hollywood was five to one in opposition. Two suits were filed to prevent certification of the annexation election, asserting that the statutes authorizing such proceedings

were unconstitutional. The Superior Court dismissed the actions, however, and the annexation was certified by the Secretary of State.⁴⁹

As a result of this series of annexations, the West Basin Municipal Water District grew in size to an area of 167 square miles, serving a population of 622,000 people in 1962. Of this total area, approximately 103 square miles is located within West Basin, but the remainder is territory overlying other ground water basins or mountainous lands. The assessed valuation of the entire District exceeded \$1.3 billion in 1962. As shown in Table XI, annexation levies differed for each unit annexed to West Basin. As the years progressed, the total amount of "back taxes" plus interest increased and the amount of the annexation levy for each area was higher than it would have been if it had annexed to Metropolitan as part of the original District. As the assessed valuation in these areas has risen, the rate of taxation necessary to produce the fixed annual payment has decreased, as shown on Table XI.

⁴⁹ Mitchell v. West Basin Municipal Water District and the Metropolitan Water District; Montgomery v. West Basin Municipal Water District and the Metropolitan Water District. The plaintiff in the Montgomery case appealed from the judgment of the Superior Court but the District Court of Appeals granted a motion to dismiss the case on the grounds that the appeal was moot because the annexation had been completed. See MWD, Annual Report, 1954-55, PP. 119-120.

Table XI
Annexation Levies and Tax Rates for Subareas of the
West Basin Municipal Water District

Area	Total Annexation Levy	"Back Tax" Rate		1961-62 MWD Annual Tax Rate
		First Year	1961-62	
Original District	\$4,104,000	.09	.02	.15
Gardena Area	251,500	.11	.03	.15
Inglewood Area	7,164,000	.31	.15	.15
Dominguez Area	3,834,000	.26	.09	.15
Hawthorne Area	1,430,100	.23	.12	.15
Culver City- County area	23,092,800	.50	.26	.15
Total	\$39,876,400			

Source: Metropolitan Water District, Annual Report for 1961-62, p. 153.

The Function of the West Basin
Municipal Water District

The West Basin Municipal Water District was the first public agency established to attempt to solve some of the problems of water allocation in West Basin. The enterprise was created as an intermediate overlay agency which would enable ground water producers to purchase water imported from the Colorado River and to be represented on the governing board of the Metropolitan Water District. In 1948, when the West Basin District was incorporated, the general powers of municipal water districts included the normal corporate powers to have perpetual succession, to sue and be sued, to hold, use, enjoy and dispose of real and personal property of every kind and to enter into contracts with other agencies.⁵⁰

The wholesaling function of municipal water districts was outlined in the section which enabled a district:

. . . to sell water under the control of the district to municipalities, and to other public corporations and public agencies within the district, and to the inhabitants of such municipalities . . . and to persons, corporations and other private agencies with the distribution for use within said district without any preferences.⁵¹

Municipal water districts also had the power to exercise the right of eminent domain "to take any property necessary to

⁵⁰Calif. Stats., 1947, ch. 1422, sec. 12, p. 2982.

⁵¹Loc. cit.

supply the district or any portion thereof with water.

. . ."⁵² Municipal water districts were also empowered to borrow money, to issue bonds and to levy taxes. In the same year, the West Basin Municipal Water District was formed, two sections were added to the organic legislation enabling such a district "to restrict the use of district water during any emergency caused by drought, or other threatened or existing water shortage. . ."⁵³

In 1951, the Municipal Water District Act of 1911 was heavily amended, primarily to clarify statutory ambiguities about the relation of municipal water districts which were constituent members of a metropolitan water district. In addition to the extensive reformulation of sections dealing with organization, annexation, exclusion of territory, responsibility for bonding, etc., several new powers were authorized by legislation which were proposed by members of the West Basin Water Association. These amendments sought to change the character of the municipal water district from a re-wholesaling district only, to a district which could also undertake other ground water basin management functions.

One of the most important additions was an amendment authorizing a municipal water district:

⁵²Calif. Stats., 1947, ch. 1422, sec. 12, p. 2983.

⁵³Calif. Stats., 1948, ch. 15, sec. 1, p. 23.

to acquire, control, distribute, store, spread, sink, treat, purify, reclaim, recapture, and salvage any water, including sewage and storm water for the beneficial use or uses of the district or its habitants or the owners of rights to water therein."⁵⁴

Secondly, municipal water districts were specifically empowered to "join with one or more public agencies, private corporations or other persons for the purposes of carrying out any of the powers of such district. . . ." ⁵⁵ Contracts so negotiated could provide for contributions to be made by each signatory party and for the division and apportionment of the expenses of joint actions and benefits, services and products resulting from such actions. Thirdly, municipal water districts were given authority to initiate or intervene in the name of the district in "any action or proceeding involving or affecting the ownership or use of water or water rights within the district, used or useful for any purposes of the district, or common benefit to lands within the district or its inhabitants."⁵⁶ Since 1951, the municipal water district act has been amended numerous times by various groups interested in enabling a local public district to expand its range of functions. Among the new functions added have been recreation, sewage waste and storm water disposal and fire protection.⁵⁷

⁵⁴Calif. Stats., 1951, ch. 62, sec. 11, p. 191.

⁵⁵Loc. cit. ⁵⁶Ibid., p. 192.

⁵⁷See California, Water Code, sec. 71880, 71670, and 61680.

The West Basin Municipal Water District was fashioned primarily as an institutional facility for obtaining supplemental water. As a District created under the Municipal Water District Act of 1911, it was well suited to function as a re-wholesaler and a constituent member unit of the Metropolitan Water District of Southern California. The organic legislation, as amended in 1951 in response to the requests of the West Basin Water Association, would have also provided the legal structure for the early development of a ground water basin management program in West Basin. By the fall of 1953, all of West Basin was included within Metropolitan, either as a part of the West Basin Municipal Water District or as a separate member entity. The West Basin District could have exercised joint powers with the Cities of Los Angeles, Long Beach and Torrance to initiate a controlled production and replenishment program so long as all of the territory within its boundaries would be benefited by such actions.

As amended by the Legislature in response to Metropolitan's request, the organic legislation also gave Metropolitan considerable control over the boundaries of its constituent members, and Metropolitan used this power to gain its own objectives. By insisting that Malibu and Culver City annex to the West Basin Municipal Water District in 1954, Metropolitan was able to retain more control over the composition of its board of directors. If Malibu and

Culver City had joined Metropolitan as separate annexing units, they would have had separate representation on the Metropolitan board, which was already large and unwieldy. By insisting upon the inclusion of the West Hollywood territory as part of the Culver City-Malibu annexation unit, Metropolitan was able to force an area benefited by the availability of Colorado River water to pay its share of the costs. However, while Metropolitan achieved its goals, it effectively disabled the West Basin Municipal Water District from ever becoming more than a re-wholesaler of Metropolitan water and a satellite agency within Metropolitan.

CHAPTER VI

ADJUDICATION TO RATION THE LOCAL SUPPLY

Consideration of Litigation

While West Basin water producers were discussing the merits of various plans for importing a supplemental supply, they also considered alternative means for rationing the local supply. Prior to the formation of the Ways and Means Committee, California Water Service Company had considered initiating a basin-wide adjudication on its own and had retained an attorney and an engineer to do preliminary studies for this purpose. Kenneth Wright, the attorney retained by California Water Service Company, and one of the attorneys involved in the negotiation of a settlement in Raymond Basin, advised the firm "not to proceed as plaintiff without participation of other water producers in sharing plaintiff's Costs."¹ Wright estimated that "the plaintiff's legal costs of bringing adjudication of prescriptive rights to the point of reference to be approximately eight to ten thousand dollars with engineering fees to be added."² Wright

¹Statement by Wright at the April 24, 1945 meeting of Le Ways and Means Committee, Minutes, pp. 5-6.

²Loc. cit.

estimated the cost of a reference conducted by the Division of Water Resources, but paid for by the litigants, at approximately \$75,000 to \$100,000.³

Once the Ways and Means Committee was formed in 1945, California Water Service Company proposed that the committee recommend that the large water producers from the basin cooperate in initiating legal action similar to that involved in Pasadena V. Alhambra.⁴ At the first meeting of the committee, Kenneth Wright outlined the method used in the Raymond Basin litigation to achieve a production curtailment. Wright explained that Pasadena filed a suit only after the "failure of a long attempt to bring about unified friendly action . . ."⁵ Wright stated that the initiation of the suit had crystallized opinion and led parties into more active negotiation.

As Wright described the process, the principals and their attorneys attended a series of meetings during which they agreed to the appointment of the Division of Water Resources as Referee and formed a committee of seven members to devise a plan for final settlement. The working formulas developed by this committee were applied to the information provided in the Referee's report and a tentative judgment and an exchange agreement were drafted and subsequently

³Ways and Means Committee, Minutes, loc. cit.

⁴33 Cal. 2d 908 (1949).

⁵Ways and Means Committee, Minutes, March 13, 1945, p.2.

submitted to the court for consideration. Wright gave every member of the Ways and Means Committee a copy of the final judgment and exchange agreement approved by the trial court in the Raymond Basin case.

George B. Gleason, Senior Hydraulic Engineer for the Division of Water Resources, also made a presentation before the Ways and Means Committee emphasizing the Division's concern over the continued overdraft in West Basin. He estimated that the current annual rate of overdraft exceeded 40,00000 acre-feet. Gleason also discussed the Division's role as Referee in the Raymond Basin case and emphasized that a committee of engineers, representing the parties, studied and discussed with the Referee "each step" of the investigation and report. The chance of significant errors in the safe yield determination, Gleason noted, "was taken care of by providing that the court retain jurisdiction and that new estimates be made at five year intervals if the behavior of the water table . . . indicated that the overdraft had not been eliminated or that extractions had been reduced more than necessary.

The members of the committee itself seemed favorably disposed toward the idea of initiating a basin-wide adjudication which would proceed at the same time that action was being taken to secure a supplemental supply. At the first meeting, Louis Alexander, of Southern California Water

⁶Ways and Means Committee, Minutes, May 22, 1945, p. 2.

Company, commented that the committee was beginning to find some grounds of general agreement in regard to conclusions "that the Basin was over-drawn, that water from other source or sources would be necessary and that probably an adjudication would be advisable."⁷ Alexander noted that the more points to which the group reached agreement prior to going to court, "the easier and more rapid would litigation proceed and the solution be reached."⁸

By the time the Ways and Means Committee presented its report, most members were in strong agreement that litigation based upon the Raymond Basin adjudication was a necessary step to curtail the use of local ground water resources at the same time that efforts were made to gain a supplemental supply. In its report, the committee outlined in considerable detail the procedure which West Basin producers could follow in using the pattern of adjudication developed in Pasadena v. Alhambra. The committee described the proposed litigation as "an action to quiet title."⁹ Under a reference procedure, the committee suggested, the parties would have an opportunity to review the Referee's findings, to submit their objections, and to participate in the negotiation of a stipulated judgment based upon these findings. On the basis of the Referee's report and the

⁷Ways and Means Committee, Minutes, March 13, 1945, p. 2.

⁸Loc. cit.

⁹Ways and Means Committee, Report, p. 14.

stipulation presented to the court, the final judgment would prescribe the safe yield of the basin and the relative rights of respective parties to continue to take water from the basin. A separate exchange agreement could be negotiated to allow some flexibility in the allocation of ground water resources to those who were confronted with difficult problems in curtailing pumping from ground water supplies. The committee concluded by stressing the necessity for cooperation in this type of litigation:

From the foregoing, it will be at once apparent that by honest cooperation and sincere mutual effort the parties to the litigation can minimize the costs materially by stipulations and mutual agreements during the course of the reference, to the end that the Court, without consuming time in determining disputed issues, may respond to the stipulations and incorporate the agreements. This was found to be a most desirable feature in the Pasadena case, and expedited the ultimate determination immeasurably.¹⁰

Initiation of Litigation

Within a month of publication of the Report of the Ways and Means Committee, three appropriators, California Water Service Company, the City of Torrance and Palos Verdes Water company, acting as plaintiffs, initiated litigation which was designed to follow the procedures used in Pasadena V. Alhambra.¹¹ The plaintiffs petitioned the court to

¹⁰Ways and Means Committee, Report, p. 15.

¹¹California Water Service Corn, et al. v. City of Compton et al. Case No. 5066 in the Superior Court of California, in and for the County of Los Angeles. Judgment

determine the rights of all water producers in the basin to the underlying supply of ground water. The plaintiffs alleged that the annual supply of water to the basin was 30,000 acre-feet, that withdrawals from the basin exceeded the natural replenishment, and that damage was therefore caused to the basin by salt water intrusion. The court was asked to allocate the water supply and restrict total production from the basin to the annual safe yield.

Reference: Round One

The court appointed the Department of Public Works as Referee and ordered it to define the extent and boundaries of the basin and to report back on the physical facts involved.¹² After four years of study, the Referee

entered August 22, 1961. One of the members of the Ways and Means Committee commented in an interview that these three plaintiffs "had jumped the gun." It had been hoped to have several meetings involving most of the potential litigants to explain the nature of the case and get general agreement as to their objectives before filing the formal action. By going ahead before there was general agreement in the basin that the suit was necessary and beneficial, this member of the Ways and Means Committee felt that the process of litigation was delayed for several years. Individual companies felt it was their duty to defend their interests as against those of all the others, rather than seeking to gain a decision as soon as possible for their general good.

¹²While the Department of Public Works was appointed as Referee, it was the Division of Water Resources that performed the field investigations. In 1956, a general re-organization of State government resulted in the establishment of a separate Department of Water Resources. In 1956, the Legislature transferred to the State Water Rights Board the duty of serving as referee in investigations of the physical facts of a case where reference was made by a trial

recommended to the court that additional parties be included in the case so that a complete basin-wide investigation and adjudication could be undertaken. On December 5, 1949, the complaint was amended to include 340 additional parties.¹³ The bill of complaint was also amended at this time to allege that the rights and claims of each party were adverse to each and every other party.

The First Report of the Referee

The preliminary draft of the Report of the Referee was filed on February 15, 1952.¹⁴ The first part contained a finding of facts relating to the physical structure of the basin. This was the most extensive and detailed technical study of West Basin published to that date. The referee described West Basin as including territory west of the Newport-Inglewood fault and between the Ballona

Court. The State Water Rights Board contracted with the Department of Water Resources to continue to perform the field investigations in the West Basin case. While the formal designation of Referee changed through the years, the actual group performing the duties remained the same.

¹³Watermaster's Report, 1960-61, p. 4. This was an action that had significant effect on the costs of the litigation, as well as affecting the allocation of rights. See J. Herbert Snyder, "The California Court Reference Procedure: Economics and Law in the Allocation of Ground Water," Land Economics, 33 (November, 1959), 286-303.

¹⁴Report of Referee filed with the Superior Court on September 15, 1952, by the Department of Public Works. Herein referred to as Ref. Rept. I.

escarpment on the north and the Orange County line on the south. The average replenishment of fresh water to the basin from 1932 to the date of the filing of the amended complaint was found to be 24,400 acre-feet and the total annual water extractions from the basin were estimated to have averaged 60,600 acre-feet.¹⁵ Because of this annual overdraft, the Referee found that nearly 36,000 acre-feet of salt water entered the basin each year during the same period, threatening extensive harm to all the litigants.¹⁶ The Referee noted that the annual inflow across the Newport-Inglewood uplift averaged nearly 30,000 acre-feet during the years between 1945 and 1949, while salt water intrusion averaged about 50,000 acre-feet during those years.¹⁷ Another part of the report gave a detailed description of water production after 1932 for every party to the suit. the determination of water production became one of the most important portions of the report, since the allocation of rights to use ground water was eventually based on the quantity of water produced by each party during the five years prior to 1949.

In concluding its report, the Referee, on its own initiative, made several recommendations regarding the future management of the basin. These recommendations were

¹⁵ Ref. Rept. I, pp. vi-vii.

¹⁶ Ibid., p. 98.

¹⁷ Ibid., pp. 126 and 98.

based upon the following four basic assumptions discussed in the report prior to the list of recommendations:

1. That the most important criterion for determining the amount of water that could be withdrawn safely from West Basin was maintenance of water levels sufficiently above sea level to prevent further salt water intrusion.
2. That if salt water intrusion were eliminated as a source of replenishment, the volume of fresh water which could be withdrawn would be "limited to the inflow across the Newport-Inglewood uplift--which in turn is proportional to the water level differences across the uplift."¹⁸
3. That the difference between water levels in West and Central Basins might be eliminated and "conceivably reversed under the influence of decreased withdrawals unless a corresponding rise occurred east of the uplift."¹⁹
4. That because of the above, the Referee assumed it was unable to "specify a definite amount of water" which might be safely withdrawn or diverted annually from West Basin.²⁰

¹⁸Ref. Rept. I, p. 126.

¹⁹Loc. cit.

²⁰Loc cit.

Specifically, the Referee made the following recommendations:

- (1) That production of ground water from West Coast Basin be initially limited to a total of 30,000 acre-feet a year.
- (2) That 3,500 acre-feet per year of production be allocated to the smaller users and that the total production by all parties producing more than 100 acre-feet per year from the basin be initially limited to 26,500 acre-feet per year.
- (3) That any order that may be entered limiting production from the basin contain a provision allowing the parties a reasonable time after the date of such order within which to provide facilities for obtaining a supplemental water supply.
- (4) That the Court retain jurisdiction over regulation from the basin in order that the quantity of production by the parties, or regulations pertaining to the extraction of water may be modified as changes in conditions in the basin and in adjoining areas, or as data and information as to the effect of the regulation of pumping may require.
- (5) That a watermaster be appointed to administer any order that may be entered regulating production, and to maintain records of production, ground water levels, quality of water and other data that may be useful in determining the effect of regulation on the basin.²¹

From the perspective of most large water producers, the Referee's recommendations were drastic. Total production from the basin had increased from 60,000 acre-feet in 1945, when the suit was filed, to over 90,000 acre-feet in 1952. The competitive race to gain access to local supply appeared to have been accentuated by the litigation. The Referee was proposing a curtailment of pumping by more

²¹ Ref. Rept. I, p. 130.

than two-thirds. If the court accepted the Referee's recommendations, water costs would rise for all water producers. During 1952, treated Metropolitan water cost \$20.00 an acre-foot. Production costs for ground water averaged less than 10.00 an acre-foot. A production curtailment of two-thirds would result in an increase of at least \$600,000 per year in the cost of providing water to West Basin water users.

While many water producers objected to the Referee's recommendations, these recommendations were no more severe than the suggestions of the Ways and Means Committee and of the original litigants as outlined in their pleadings. The Referee had determined an estimated safe yield for the Basin and recommended that total production be limited to this amount. To insure that the determination of safe yield was not unrealistic, the Referee had suggested that the Court retain jurisdiction in order to evaluate the effect of the proposed curtailment on water levels within the Basin.

At the same time that the Referee presented its report, it also submitted to the court a final statement of \$171,536 as the total expenditure for the reference proceedings. This sum was \$70,000 in excess of the highest estimate made prior to the reference. The high cost of the reference is largely attributed to the number of parties involved and the difficulty in establishing water production histories for many small water producers, many of whom

were no longer functioning as water producers. The Referee concluded all parties in the apportionment of expense who had produced water during the period of analysis and who had evidenced an intent to continue pumping or resume pumping in the future."²² The Referee set \$50.00 as the minimum amount to be paid by each of 291 producing parties for the first twenty acre-feet per annum of average production during the period of study. Average production in excess of twenty acre-feet was assessed at a rate of \$2.72 per acre-foot. This method of allocating the cost placed the heaviest burden on the large water producer with a long history of high ground water production.

Objections to the Referee's Report

All parties were given an opportunity to file objections with the Referee concerning the preliminary report prior to its final submission to the court in September, 1952. Thirty-eight objections were filed. Of these, the objections filed by the Dominguez Water Corporation and related estate and land companies²³ were the strongest and most serious. These objections to the preliminary report indicated the type of arguments that would be raised later of the litigation became an open adversary proceeding. In

²²Ref. Rept. I, Exhibit 2, p. 2.

²³The Watson Land Company, Carson Estate Company, Del no Estate Company and Dominguez Estate Company.

essence, they were a preview of some of the major issues to be resolved in the West Basin case. The objections made by the Dominguez interests, and others who agreed with them on some points, were related to five principal points, including reference to (1) the period of analysis, (2) the area of investigation, (3) the limitation of total production to 30,000 acre-feet per year, (4) the stress on the danger of salt water intrusion, and (5) the legal character of the recommendations.

First, the Dominguez interests argued that the period of analysis should have covered a period of time extending back to 1910, instead of beginning with 1932. Other water producers, such as the City of Los Angeles and Moneta Mutual Water Company, with long histories of water use, joined the Dominguez interests in this objection. Second, the Dominguez interests argued that close interrelation between West and Central Basins required the inclusion of most of Central Basin in the scope of the study. Few of the other large water producers joined the Dominguez companies on this point, but Dow Chemical, the Gardena Syndicate, Inglewood Park and Cemetery, and Rancho Mutual Water Company, as well as some private individuals, joined in objecting to this limitation on the scope of the referee's investigation.

Third, the Dominguez companies questioned the adequacy of the methods used by the Referee to determine the underflow into the basin. They argued that there was insufficient

data to support the recommendation of such a severe cutback in production. Most major water producers in West Basin objected to this recommendation of the Referee. Among those objecting were California Water Service Company, General Chemical Company, General Petroleum Corporation, the City of Los Angeles, the Moneta Mutual Water Company, the Palos Verdes Water Company, the Richfield Oil Company, the Southern California Water Company, Standard Oil Company of California, the Texas Company, Tidewater Associated Oil Company and the City of Torrance.

Fourth, the Dominguez companies objected to the impression given throughout the report that there was imminent danger of salt water intrusion throughout the entire basin. They argued that intrusion occurred in only limited portions of the basin and that salt water intrusion would bring serious harm to the entire basin only in the distant future. Few water producers joined the Dominguez companies in their vigorous objection to the manner in which the Referee described the threat of salt water intrusion. The Moneta Mutual Water Company was the only other water company to object to this characterization of the problem.

Finally, the Dominguez interests objected to the recommendations regarding the management of West Basin which the Referee had included in its report as being beyond the purview of the order of reference and not within the jurisdiction of the Referee. They stated that the

recommendation had the effect of adjudicating issues that were still pending before the court and substituting administrative determinations for the judicial process. Since the decision affected property rights, the Dominguez companies felt that this was an unconstitutional deprivation of vested property rights without due process of law. The Moneta Mutual Water Company, Standard Oil, the Texas Company and Tidewater Associated Oil Company were among the other objectors who joined the Dominguez firms on this issue.²⁴

Negotiation: Round One

The Raymond Basin litigation had been described as an action which crystallized opinion and led parties into more active negotiation. The original plaintiffs in the West Basin case had hoped that the initiation of litigation would press West Basin water producers into more active negotiation leading toward an agreement to reduce the total production from the basin. However, seven years had passed without any signs of significant agreement among the major litigants. In fact, it was obvious from the nature of the objections to the report of the Referee that serious disagreements existed among the litigants and between the litigants and the Referee. During part of the seven year

²⁴West Basin Water Association, "Brief Synopsis of Objections Made to Draft Report of Referee" (mimeo; Hermosa Beach, 1952).

period, litigants and the Referee watched the District Court of Appeals reverse the trial court's judgment in Pasadena v. Alhambra.²⁵ For a while, it appeared that the model upon which their actions had been based would be disqualified for the as a legal method to allocate rights to pump from a ground water basin. In 1949, the California Supreme Court reversed the District Court of Appeals' decision and the plan used in the Raymond Basin case was reinstated as an acceptable legal formula for the allocation of ground water resources.²⁶

Serious negotiations were further postponed until "the facts were in" and litigants could begin to evaluate where they would stand under various allocation schemes that could be devised within the structure of ground water law in California. The report of the Referee constituted the facts which would be used by the court in making or legitimizing any final allocation of ground water rights to West Basin. The submission of the Referee's report should have signaled the beginning of serious negotiation.

Even after the Referee's report was filed, the principal parties still appeared hesitant to enter into serious negotiations leading toward a final settlement. On the other hand, few participants seriously considered the likelihood of a extended trial, and most were determined to prevent

²⁵Pasadena v. Alhambra, 180 Pac. 2d 699 (1947).

²⁶Pasadena v. Alhambra, 33 Cal. 2d 908 (1949).

the case from becoming a full adversary proceeding. The litigants were uncertain about which legal formula the court would choose if the parties failed to submit their own stipulated agreement outlining a satisfactory settlement. If the court decided to follow the allocation plan developed in Pasadena v. Alhambra, which the plaintiffs had asked the court to do in their original pleadings, then the court probably would curtail total production to 30,000 acre-feet. While all water producers would share the cost of this reduction, most water producers strongly objected to such a large reduction. If, on the other hand, the court referred to the doctrines established in Katz v. Walkingshaw to allocate rights within West Basin, certain water producers might receive full rights to continue to produce and others would be precluded from making any demands on the basin.²⁷ None of the producers were certain whether they would be among those who would be awarded rights or those who would be deprived of access to ground water supplies. Consequently, if the case were brought to an open trial, each Water producer faced the risk of severe losses and much higher costs of litigation.

In addition to the uncertainty created by the co-existence of diverse doctrines of ground water law, the difficulty of establishing reliable evidence about the events occurring in a ground water basin created additional

²⁷See discussion, Chapter III.

problems. The parties had been presented with a statement of facts about their ground water basin prepared by the Referee. Even though some of the litigants disagreed with it, the parties could negotiate within the framework of these findings without opening up new and difficult questions. However, if there were a contested trial, the court might re-examine the Referee's findings in light of adversary assertions about their validity. The court might consequently alter the findings of fact upon which it would base its decision. For example, the Referee asserted as a fact that there was a separable ground water basin called West Basin. As long as the litigants accepted this finding, they could continue to attempt to reach a settlement involving only West Basin. In the event the case were to proceed to an open trial, several parties objected to the boundaries used to designate West Basin and to the sufficiency of a proceedings to litigate interests in West Basin apart from Central Basin.²⁸ If the court agreed with this contention, the court might hold that rights in Central Basin needed to

²⁸In discussing the West Basin litigation before a legislative committee, Rex Goodcell of the City of Los Angeles commented that the attorney for the Dominguez interests (T. B. Cosgrove) had threatened to challenge the boundary designation. Goodcell commented: "In the West Basin matter, a very eminent attorney--Jerry Cosgrove--knew that he could upset the whole litigation on the boundary question alone. He finally went along with it because it was better for his clients to get what they could get." Assembly Interim Committee on Water, Hearings held in Long Beach, July 19, 1962, p. 78.

be adjudicated at the same time as those in West Basin. This would open up a whole new set of contentions and counter-contentions to be settled before a final judgment could be reached and a reduction in pumping could be effected.

The Association Intervenes

Because they feared the consequences of an open trial, the principal parties in the West Basin case were motivated to keep the matter out of court until they could reach an agreeable settlement. However, after seven years, the only area of general agreement appeared to be their hesitation to proceed to trial. Members of the executive committee of the West Basin Water Association watched the slow rate of progress and finally decided to intervene in the hopes of "assisting the parties . . . in arriving at a stipulated agreement which would lessen the time required for trial."²⁹ Members of the executive committee felt that water producers had the physical means to curtail production since Metropolitan water was available now to most large water producers.

Ben Haggott, as president of the association, called an executive committee meeting in December of 1952, to which he invited engineers associated with the major producers'

²⁹West Basin Water Association, Executive Committee, Minutes, October 16, 1952, p. 2.

involved in the case. He asked the attorneys and engineers present to form a committee which would attempt rapidly to reach a stipulated agreement through direct negotiation.

Haggott stated at the beginning of the meeting:

The purpose of this meeting is to approach a fair stipulated agreement between the parties as soon as possible. We have already spent too much money and lost too much time....

During this attempt to reach an agreement and stipulation, because we are people, there will be times when superficially it may appear that controversy rather than reason will prevail. However, hard practicality, public necessity, and the interests of each and every one of us demands that a solution be reached. Approaching an agreed solution we have the fortunate circumstance that, in so far as I can see, parties to the action are blessed with conscientious legal representatives who hold paramount the true interests of their clients and the true interests of public welfare.³⁰

Five attorneys and five engineers were appointed to serve as a legal settlement committee. Rex Goodcell of the City of Los Angeles was appointed as chairman.³¹ The members of

³⁰West Basin Water Association, Executive Committee, Minutes, December 18, 1952, p. 4.

³¹The members of the committee: Rex B. Goodcell, Jr., chairman, attorney for the City of Los Angeles; John E. McCall, attorney for Moneta Mutual Water Company and a number of small producers; Lauren M. Wright, attorney for Johns-Manville, Shell and Southern California Water Company; Kenneth K. Wright, attorney for California Water Service Company, Palos Verdes Water Company and the City of Torrance; T. B. Cosgrove, attorney for the Dominguez companies; Arvin B. Shaw, attorney for Inglewood; Donald M. Baker, engineer for the Dominguez Water Company; Edward R. Bowen, consulting engineer for Chanslor Canfield Midway Oil Company, General Petroleum, Richfield Oil, Shell Oil, and Union Oil Company; Raymond A. Hill, consulting engineer for Southern California Water Company; Samuel B. Morris, engineer for the City of Los Angeles; and W. C. Renshaw, engineer for the City of Inglewood.

Several members of the committee had functioned on a

this committee were appointed to serve in two capacities. First, they were to represent the interests of particular litigants. In addition, they were representatives of the water association responsible for achieving a timely curtailment of water production.

The dual role filled by members of the legal settlement committee affected the ensuing negotiations.³² Prior to this time, negotiations had occurred between attorneys whose sole responsibility was to reach the most favorable settlement for their clients. The safest strategy for each attorney to follow was to demand concessions for others and

similar committee in the Raymond Basin. Kenneth Wright had been chairman of the Attorneys and Engineers Committee in that litigation. Samuel Morse, Edward R. Bowen and Raymond Hill also served on the Raymond Basin committee.

³²One major accomplishment of the committee was to involve T. B. Cosgrove, the attorney for the Dominguez interests, in the problem of seeking a solution to the West Basin problem. Until that time, the Dominguez companies had fought every proposal made by the leaders of the West Basin Water Association. The Dominguez area was then in the process of annexing to the West Basin Municipal Water District, indicating an increased recognition by the Dominguez Water Corporation of impending water shortages. However, the position that the Dominguez companies had taken in regard to the priority of their rights over others involved in the case threatened the successful realization of an agreement for voluntary curtailment. Since the Dominguez Water Corporation was the largest single water producer in the basin, other producers would hardly agree to curtail production unless the Dominguez group also became a party to the voluntary curtailment agreement. Cosgrove came to play an active role on the committee. By the time an agreement had been drafted, he had changed his strategy to one of cooperation with other water producers. In fact, he was given credit for drafting the form of the interim agreement by one of his fellow members of the committee and commended for his outstanding contribution to the committee. Minutes, August 26, 1954, pp. 18-19.

concede little himself. Stalemate had been the cumulative result of this strategy. After the legal settlement committee began to function, negotiations shifted to a new level. No longer could each member of the committee assume that his client would retain full rights, while others would stand to lose. The committee started with the assumption that every participant would have his claims curtailed somewhat. Negotiations proceeded from this point.

Parameters of the Negotiation

The negotiation process within the legal settlement committee proceeded within relatively clear bargaining parameters. In physical terms, the committee needed to find some way to reduce production below 90,000 acre-feet, but more than 30,000 acre-feet. The upper limit was equivalent to the total production from West Basin in 1952, which most producers agreed was too great. The lower limit was the recommended curtailment made by the Referee, which most producers thought was too small. To re-enforce these bargaining limits, the committee was threatened on the one hand by the possibility of an injunction, and on the other by the possibility of an open trial.

To insure that the committee moved rapidly to gain agreement to reduce production below 90,000 acre-feet, the association secured the introduction of a bill in the State Legislature to authorize the granting of preliminary

injunctions in extended ground water basin litigation. The legislation, as passed, authorized the Department of Public Works, acting as referee, to apply "to the court for a preliminary injunction, restricting the pumping of water of the basin so as to avoid irreparable injury to, or destruction of, the waters of the basin."³³ The legislation authorized a court to issue an injunction "equitably restricting and apportioning the reduction in the pumping of water without requiring bond."³⁴ Ben Haggott, the president of the association, explained that the legislation was necessary "because . . . the Goodcell Committee might not be able to reach a recommendation as to voluntary curtailment of pumping within a reasonable time."³⁵ However, most association members agreed with Louis Alexander, who did not like "to see the rights of parties decided on the basis of injunction rather than on the basis of agreement."³⁶ But the threat of an injunction was there to prod the committee toward completing its negotiations.

The committee was aware that it could not gain agreement among the large water producers to the terms recommended

³³Calif. Stats., 1953, ch. 1690, sec. 2020, p. 3419. Now California Water Code, sec. 2020. Section applicable only to Santa Barbara, Ventura, Los Angeles, Orange and San Diego Counties.

³⁴Loc. cit.

³⁵West Basin Water Association, Minutes, May 28, 1953, p. 14.

³⁶West Basin Water Association, Executive Committee, Minutes, May 27, 1953, p. 3.

by the Referee. If the committee proposal did not allow production in excess of 30,000 acre-feet, most water producers would rather go to court and have the court make a final authoritative decision. Once in court, a producer might have a chance to establish a claim to a right which was superior to the claims of others. Since the pressure was for a rapid settlement, the committee soon decided to negotiate an interim agreement to curtail production voluntarily while some of the more difficult issues were resolved later.

The Physical Solution

The work of the legal settlement committee was divided between the engineers and the attorneys. Raymond A. Hill, representing the Southern California Water Company, became the chairman of the engineering subcommittee. The engineers were assigned the task of determining the kind of production curtailment which was physically possible without causing severe economic harm to any of the parties. Specifically, the engineers were faced with the following three questions:

1. How to devise a formula that would be satisfactory to all types of producers, especially to those who did not have access to Colorado River water?
2. How to provide for the peaking demand of some municipal utilities where the peak load exceeded average demand by as much as three or four times?
3. How to overcome problems of industrial producers

who found the more expensive Colorado River water of unsatisfactory quality for some industrial processes?

After a rapid survey of the individual needs of large water producers the engineers concluded that it would be physically possible to effect a 25 to 30 per cent reduction in pumping without serious economic harm to any water producer if a supplementary agreement for an exchange pool could be established similar to an agreement in the Raymond Basin agreement. Producers could meet their current and future levels of demand by using a combination of ground water and Metropolitan water, or by purchasing the right to pump additional ground water from other producers through an exchange pool.

Once it was established that it was possible to curtail production from 25 to 30 per cent, the engineers began to search for an acceptable formula that would result in the appropriate allocation of rights among producers. Since the West Basin case was modeled after the Raymond Basin case, most of the parties expected an agreement which would rely upon the mutual prescription doctrine development in the latter case. However, choice of the mutual prescription doctrine still left considerable room for negotiation. One of the most important open questions was the date to be used in determining the mutual prescriptive rights of all producers. Those who had initiated the suit in 1945 had

intended that the filing of litigation would stop the further accrual of prescriptive rights by any of the producers. However, 340 additional parties were included in the case in 1949 and the earliest date that could be used to determine the prescriptive rights of those parties was 1949. This left an open question whether 1945 or 1949 was the appropriate date to determine the prescriptive rights for the major parties included in the original filing.

The engineers compiled a list showing each party's presumed prescriptive right as of 1945 and 1949. Total prescriptive rights for producers pumping more than 100 acre-feet amounted to a total of 44,387 acre-feet for 1945 and 63,728 acre-feet for 1949.³⁷ Using 1949 as the year to determine prescriptive rights resulted in a total production figure half-way between the committee's bargaining limits. In an interim agreement, Raymond Hill suggested that it might be reasonable for everyone to agree to curtail production to the prescriptive rights which existed in 1949. Later, if in a final judgment, the court decided "to cut back production to 1945, the objection would not be so general."³⁸ Hill further reasoned that:

. . . with present usage in the amount of 90,000 acre-feet and . . . with the historical usage of 1949 amounting to about 63,000 acre-feet or one-half way back to where the Division wanted the curtailment to

³⁷West Basin Water Association, Legal Settlement Committee, Minutes, February 25, 1953, p. 3.

³⁸Loc. cit.

go, a cut back to 1949 might be more acceptable at the present time. . . [T]he parties would have enough water left under this arrangement to meet peak demands and it would afford a period in which to adjust to curtailment and . . . no one would be giving up any prescriptive rights already acquired.³⁹

Using the year 1949 to determine presumed prescriptive rights gave the committee a total production figure safely within their bargaining limits and a tenable legal formula for allocating this curtailment as among individual producers. While the choice of the year 1949 to determine prescriptive rights enabled the engineers to arrive at the desired physical solution, it made a significant difference in the relative rights of various classes of parties involved in the litigation. A comparison between prescriptive rights determined in 1945 and in 1949 is shown in Table XII. The delay of four years in the prescriptive period allowed the overlying industrial users as a group to increase their relative share of the water supply while the public and private utilities lost proportionately. But even though some groups gained proportionately and others lost, almost all producers would be able to produce more water if they agreed to curtail production to their presumed prescriptive rights in 1949 rather than to their presumed prescriptive rights in 1945.

³⁹West Basin Water Association, Legal Settlement Committee, Minutes, February 25, 1953, p. 4.

Table XII

Comparison Between 1945 and 1949 Prescriptive Rights^a
(Thirty-five Producers)

	1945	1949	Per Cent Increase
<u>Overlying Users</u>			
Industrial	16,134.7	25,876.0	60.27
Agricultural	1,211.0	1,211.0	34.43
<u>Appropriators</u>			
Public Agencies	11,177.3	14,375.2	28.61
Private Water Companies	16,980.1	20,889.1	23.02
Total	45,503.1	60,768.3	37.94

^aJennings, Engstrand and Henrikson, Report to City of Hawthorne on Status of Water Rights (La Mesa, 1963), Appendix B.

The Legal Formula

After the engineers submitted their report in June, 1953, the attorneys were assigned responsibility for drafting an agreement to accomplish the physical plan proposed by the engineers without affecting the legal status of any of the parties and without raising any irresolvable legal issues. At one point in their early discussion, one of the attorneys commented that there were some legal phases to the problems which he hoped "would never be necessary to

discuss."⁴⁰ The attorneys required a full year to draft an interim agreement which would accomplish the physical plan recommended by the engineers without disturbing the legal rights of the various parties.

On May 27, 1954, Goodcell presented the final draft of an interim agreement to the association. In the agreement, "Prescriptive Rights, 1949," were defined as "the highest continuous production of water by each user for beneficial use in any five-year period prior to October 1, 1949, as to which there was no cessation of use by it during any

⁴⁰West Basin Water Association, Legal Settlement Committee, Minutes, April 19, 1953, p. 4. The hope was to draft an interim agreement which would not raise any of the open legal issues. One of the issues they wished to avoid was an interpretation of section 1007 of the Civil Code, which precludes prescriptive rights running against a city or municipal corporation. One of the attorneys on the committee stated at an executive committee meeting that "section 1007 might be urged by some of the parties involved and would complicate the case somewhat because if this Section were to be applied, it would make it necessary for the Referee to compile basic data five years prior to 1935." Minutes, December 8, 1952, p. 3. Goodcell commented at the same meeting that the code section stated "that a city cannot be prescribed out of its water rights." He further stated that "while the law applicable to the West Basin case was relatively simple, it might nevertheless prove unpalatable to some agencies involved in the suit." Ibid., p. 2.

Louis Alexander stated the fear of many when he discussed this provision at an executive committee meeting during the spring of 1953 when he stated that "if this section of the Water Code [sic] were to be used as a basis for decision by the Court, there would be little water left for those not coming within that section of the Code which states that water rights of a city cannot be taken away." Minutes, May 27, 1953. Alexander went on to comment that he believed "Section 1007 would not be brought into effect if the committee of attorneys is successful in proposing a stipulated agreement. . . ." Loc. cit.

subsequent continuous five-year period prior to October 1, 1949."⁴¹ A clause which stated that the term "Prescriptive Rights, 1949" as used within the interim agreement was "an assumed right used as a basis only for the reduction in pumping of the waters of the Basin," immediately followed the definition.⁴² In addition, an entire section of the interim agreement was included to prevent the agreement from affecting the status of the legal rights of the signatories.⁴³

By signing the interim agreement, a water producer agreed not to pump, divert or withdraw during a year any more water than was listed in the agreement as his "Prescriptive Right, 1949." However, the agreement did provide that if the water needs of any signatory party were greater than the party's rights and his capacity to receive water from other sources, the party could pump in excess of his rights an amount not to exceed 10 per cent. Further withdrawals in excess of rights might be authorized by the

⁴¹ California Water Service Company v. City of Compton, Interim Agreement, p. 2.

⁴² Loc. cit.

⁴³ Section 9 provided that:

Among the parties to this Agreement, no taking of water from the West Coast Basin subsequent to the effective date hereof in an amount in excess of the right which any party may have acquired prior to the effective date hereof, shall constitute a taking adverse to any other party.

No party hereto shall acquire or obtain the right to plead the statute of limitations or an estoppel against

Watermaster in cases of emergency. A producer who withdrew water in excess of his right in one year was to reduce his pumping by an equivalent amount during the next year. Another element of flexibility in the allocation of water to users in the interim agreement was introduced by the exchange pool provisions which will be discussed in the next section.

The Interim Agreement

By November, 1954, agencies representing 82.5 per cent of the total "Prescriptive Rights, 1949," had signed the agreement and for the next seven years water production was regulated under the terms of the agreement. The attorneys petitioned the court to make the agreement an ex parte order and to appoint a watermaster. The court granted the petition on February 16, 1955, and appointed the Division of Water Resources as Watermaster effective March 1, 1955. No further signatures were secured to the interim agreement. The agreement remained in effect until October 1, 1961, when

other party hereto by reason of anything which any party hereto may do or refrain from doing subsequent to the effective date hereof and pursuant to this Agreement. . . .

Nothing which any party may do or refrain from doing hereunder shall constitute a forfeiture or abandonment by such party of any right which such party may have heretofore acquired. ..

The purpose of this section 9 is to maintain the status quo of the rights of the parties hereto as of the effective date of this Agreement.

the final judgment was entered by the Superior Court of Los Angeles County.

The Effect of the Interim Agreement
on Signatory Parties

The Physical Effects

During the first year of operation under the interim agreement, extractions of the forty-six parties signatory to the agreement were reduced 25 per cent to 53,684 acre-feet.⁴⁴ During the next seven years, ground water production of these parties averaged 53,000 acre-feet per year. The use of imported water increased greatly. During the first year, producers signatory to the agreement increased their purchase of Metropolitan water by 22,000 acre-feet. By 1961, producers signatory to the interim agreement brought a total of 150,000 acre-feet of imported water to West Basin, an increase of 90,000 acre-feet compared with the importation of water prior to 1955.

During the first year of operation, water levels rose from ten to fifteen feet in the southeastern portions of the West Basin. The remarkable recovery in this portion of the basin was attributed to the fact that the principal reduction in extractions occurred in that area. Seven years later, the ground water levels in the southeastern portion

⁴⁴Watermaster, Report for 1955-56, p. 1. The statistics in this section are derived from the Watermaster reports between 1955 and 1961.

had fallen slightly, but still ranged from five to ten feet higher than those prevailing in the area prior to the voluntary curtailment of production. Water levels in the remainder of the basin continued to drop but at a slower rate than prior to the agreement. During 1960-61, "there was an overall average decline in ground water levels within the basin of about 0.1 foot."⁴⁵ Salt water intrusion continued to move inland during the period. By 1961, approximately 8,000 acres were underlain by waters with a chloride ion concentration of 500 ppm or greater. This represented an increase of about 1,300 acres over 1955.

Curtailment of ground water production in West Basin also raised the water levels on the west side of the Newport-Inglewood fault relative to the east side and consequently reduced the quantity of water flowing across the fault zone. The problem of maintaining a fresh water inflow into West Basin was accentuated by the fact that water production in Central Basin increased greatly during the years when West Basin producers were curtailing production under the terms of the interim agreement. By the time the judgment was entered in 1961, water levels on the east side of the Newport-Inglewood fault were lower in some places than those on the west side. Consequently, water began to flow out of West Basin and into Central Basin.

⁴⁵Watermaster, Report for 1960-61, p. 2.

By curtailing production to 60,000 acre-feet under the interim agreement, West Basin producers were gambling that the harm to the basin from continued annual overdrafts would not be too severe. While operations continued under the interim agreement, water producers were also pursuing other opportunities to halt salt water intrusion. The possibility of constructing a barrier against the sea would enable ground water producers to continue to extract 60,000 acre-feet indefinitely. If they had curtailed production to a safe yield, the full cost of preventing salt water intrusion would fall directly on the water producer. If the institutional means to build a barrier could be found, water producers would share the costs of preventing salt water intrusion with the property owners of the area. An evaluation of whether they won their gamble with the sea cannot be made until salt water intrusion has actually been halted along the entire coastline.

The Economic Effects

During the seven years of operation under the interim agreement, total water use increased 27 per cent, while the use of imported water rose 60 per cent. The cost of curtailing ground water production and importing an ever larger volume of Colorado River water was borne by the signatory parties in proportion to their total demands. The total cost of imported water purchased by signatory parties as a

result of the interim agreement was approximately \$2,500,000.⁴⁶ Some water producers bore a disproportionately high share of this cost. For example, the City of Inglewood, during the first year of the interim agreement, was unable to buy Metropolitan water directly from the West Basin Municipal Water District, since the feeder line designed to transport Colorado River water to Inglewood had not yet been completed. Inglewood signed a pact with Los Angeles to gain emergency water, but Los Angeles charged \$32.44 an acre-foot in addition to a fixed monthly charge. Consequently, Inglewood paid nearly \$95,000 for imported water during the first year of the interim agreement.

The interim agreement had a considerable effect upon the creation of a market in water rights. Prior to the initiation of litigation, any one who wished to gain access to ground water had only to drill a well and begin to pump. Once litigation was in process, newcomers were placed on notice that they might not be able to gain permanent rights to ground water without establishing their claim in court.⁴⁷

⁴⁶Prior to the interim agreement, water producers pumped 45 per cent of the water used from local ground water sources. If ground water production had continued to constitute 45 per cent of the water used, the cost of providing water to meet the demands would have been \$2,500,000 less, taking into account the water rates provided by Metropolitan, as well as the cost of producing ground water.

⁴⁷However, several firms that did not have any "prescriptive Rights, 1949" purchased rights from others in order to gain access to ground water supplies.

Water producers named in the suit could still meet increased demands for water by producing a greater quantity. Once the interim agreement was signed, signatory parties could no longer increase ground water production without purchasing additional rights from another litigant willing to sell or lease his right. In essence, for the first time, ground water became scarce in a legal sense. While ground water was scarce in a physical sense prior to this time, water producers dealt with it like a free good because anyone could begin to produce. Equally important, these rights were now easily transferable and relatively exclusive. While the ground water rights of overlying landowners could not be transferred to another producer without transferring title to the land at the same time, the claims of individuals to "Prescriptive Rights, 1949," were considered to be perfectly transferable within the basin as to use, user and place of extraction. Many of the overlying land owners who had stopped water production were glad to find a market for the water rights they held. "Prescriptive Rights, 1949," sold under the interim agreement were not determinate since the final judgment might curtail production still further. A water right was actually a proportionate share of the basin's yield. The value of that share would depend upon the final decision in the litigation.

During the seven years of operation under the interim agreement, nine water producers who had signed the interim

agreement purchased a total of 4,500 acre-feet of "Prescriptive Rights, 1949." All but 323 acre-feet were purchased by water suppliers. These rights were purchased in twenty-six separate transactions. In some transactions, as many as ten or twelve small producers sold their water rights as a single unit. The grant deeds describing these transactions do not specify the value of the sale price. During the same period, local ground water rights in the Raymond Basin were valued at approximately \$200 per acre-foot for an adjudicated rights, and the price in West Basin was probably a similar amount.

The market for water rights was not as effective as it might have been, however. At the same time that 4,500 acre-feet of ground-water rights were purchased from some of the parties, nearly 200 parties abandoned or disclaimed 3,700 acre-feet of rights. Of this group, forty-three parties abandoned rights in excess of fifteen acre-feet and eighteen abandoned rights of fifty acre-feet or more. The Southern Pacific Railroad abandoned a right to 227 acre-feet and several overlying land owners abandoned rights to 100 acre-feet or more.

In addition to its effect on the development of a market for water rights, the interim agreement also offered an opportunity for signatory parties to develop a market-like structure within the exchange pool. It was assumed that water producers signatory to the agreement who had

access to a supplemental supply could meet half of their demands from imported sources and half from local ground water sources. Signatory parties were, therefore, required to offer to the exchange pool a quantity of water equal to the amount by which their "Prescriptive Rights, 1949, ' exceeded one half of their estimated total demands for the next year.⁴⁸ In addition, any party could make a voluntary offer. The party offering water for exchange set his own price, but the price was not to exceed the cost to the releasing party of purchasing water from others in equal monthly amounts through existing facilities.

The Watermaster was required to release water from the mandatory offers to the exchange pool starting with the lowest price asked and proceeding upward until the requests for water were fulfilled. Purchasers of exchange water paid a uniform price established by computing a weighted average for the water received. The revenues received by the Watermaster were then paid to the offering parties in an amount equal to the quantity of water released multiplied

⁴⁸A signatory party who owned "Prescriptive Rights, 1949," equal to 100 acre-feet, and who estimated his demands for the following year would be 150 acre-feet, would be required to offer the difference between one half of his total predicted demand ($150 + 2 = 75$) and his "Prescriptive Right, 1949" ($100 - 75 = 25$) or 25 acre-feet. If the same party estimated his demand at 50 acre-feet, he would be required to offer 75 acre-feet ($50 + 2 = 25$; $100 - 25 = 75$). And, if his estimated demand were 300 acre-feet, he would not be required to offer any water to the pool ($300 + 2 = 150$; $150 > 100$).

by their asking price. In other words, the buyers paid a uniform price, while the sellers received their asking price up to the quantity of water purchased.

During the first year under the interim agreement, a total of 3,335 acre-feet were placed in the exchange pool under mandatory offers. The price asked varied from \$17.00 to \$40.00. Water producers who needed to produce more ground water than their "Prescriptive Rights, 1949," purchased a total of 772 acre-feet from the pool at an average price of \$22.30 an acre-foot. This means that those who purchased exchange water paid more for this water than they would have paid for Metropolitan water, since they had to pay for their own production costs in addition to the cost of exchange water. The average price of the water offered for sale rose slightly during the next three years, and the amount of water purchased from the exchange pool diminished as producers found alternative and more economical methods of meeting their demands for water or left the field. In 1959-60, the price of water offered for exchange began to fall, but the amount of ground water purchased did not increase. The average price during that year was \$21.89 and 310 acre-feet of water were exchanged.⁴⁹

Prior to 1960, the mandatory offers with relatively low prices were made regularly by the same small group of

⁴⁹Watermaster, Report for 1959-60, p.25.

water producers.⁵⁰ Since their prices, which ranged from \$20.00 to \$25.00, were low relative to the others with prices up to \$60.00, the exchange water offered by this group was normally taken. Consequently, this group received a yearly income of \$500 to \$3,000, depending upon the amount of water released. In 1960-61, the United States Steel Corporation changed its strategy in relation to the exchange pool and induced a form of competition among those making mandatory offers to the pool by cutting prices. Prior to 1960, the price set by United States Steel had been in the \$25.00 to \$30.00 range and, consequently, the firm had never had its bids accepted and had never received income from the exchange pool. In 1960-61, United States Steel offered to release 1,279.5 acre-feet of water at \$19.00. This was the low offer for the year.

Potential buyers of exchange water during that year could not have known that the price of exchange water had fallen substantially, and the amount of exchange water requested was small--only 217 acre-feet. But, all of the water released from the pool was sold by the low 'bidder' and United States Steel received \$4,128.70 from the sale of exchange water. In effect, United States Steel had cornered the market and other water rights holders received no income for that year. Since the consequences of this price

⁵⁰The most frequent low offers were made by John Grant, Santa Fe Land Improvement Company, Tidewater Oil Company and Chanslor-Western Oil Company.

cutting strategy did not have an opportunity to manifest themselves in the operation of the exchange pool under the interim agreement, further developments of a water market in the exchange pool operating under the terms of the final judgment will be discussed below.

The Effect of the Interim Agreement
on Non-Signatory Parties

The two major non-signatory parties were California Water Service Company and the City of Hawthorne. These two firms refused to sign the interim agreement for different reasons and followed diverse strategies once the agreement went into effect. In 1945, California Water Service Company seriously considered initiating litigation on its own to halt the pumping race and to settle relative rights as of 1945. Because of the expense involved, California Water Service Company waited until others joined with it before filing the action. However, since the time of the filing, many decisions were made by other litigants and the Referee that were contrary to the original intentions or interests of California Water Service Company. While other producers continued to expand ground water production after 1945, California Water Service Company, believing its rights to be protected, began to use proportionately more imported water than others. The decision to base prescriptive rights on production during the five year period prior to 1949 gave a greater share of the basin to those who had increased

their production during that time. The prescriptive rights for California Water Service Company were the same in 1949 as they would have been in 1945. As a result, California Water Service Company suffered a greater proportionate loss to the large industrial pumpers than other public and private water suppliers.⁵¹

To make matters worse, the Referee had allocated the total cost of its services among producers on the basis of their average production from 1932 to 1950. This formula

⁵¹Ralph Elsmann of California Water Service Company had warned Ben Haggott of his company's dissatisfaction with the agreement during the summer of 1954. At that time he wrote:

In the hope that there may be no further misunderstanding of our position, we will briefly restate our principal objections to the agreement, as follows:

- 1) We feel the choice of 1949 rather than 1945 as the date for determining the proportionate rights of the parties is without legal or practical justification and works to the distinct disadvantage of certain parties, including California Water Service Company.
- 2) The use of the term "Prescriptive Rights, 1949" is unfortunate and misleading.
- 3) The treatment on Exhibit A of water taken by California Water Service Company from the land leased from Del Amno Estate Company is not justified by the findings of the Referee and credits to Del Amo Estate Company water which has always been taken by California Water Service Company under its own right.
- 4) No assurance has been obtained as to the amount of Metropolitan Water District water which will actually be available and can be utilized by parties if the proposed agreement goes into effect. We have not as yet decided if we will join in the agreement. We desire very much to effect some fair curtailment of pumping; however, we do feel that it is necessary to dispell any misunderstanding as to our position concerning the present proposal.

Letter from Ralph Elsmann to Ben Haggott of July 21, 1954.

placed the burden of paying for the investigation and report most heavily on established water producers with long histories of consistently heavy pumping. The industrial producers who increased production after 1945, and consequently were granted a greater proportionate share of the agreed yield of the basin, paid relatively less of the Referee's expenses when allocated according to average production over the eighteen-year period of record.⁵² The real effect of the company's refusal to sign the interim agreement was to shift the burden of the cost of Watermaster services back onto the companies which had gained proportionately higher rights under the agreement. No physical harm to the basin or other water producers resulted from their action, because California Water Service Company imposed a voluntary limitation on its own ground water production and did not pump any more water than would have been allocated to it under the interim agreement.

On the other hand, Hawthorne continued to increase its production as the years progressed. By 1959-60, Hawthorne was pumping more than 2,250 acre-feet in excess of its allocation under the interim agreement. During the period of the interim agreement, Hawthorne saved \$100,000 or more

⁵²For example, both General Petroleum and Union Oil Company were awarded "Prescriptive Rights, 1949," that exceeded the rights of California Water Service Company. Yet, California Water Service Company paid \$6,665 to the Referee while General Petroleum paid \$3,805 and Union Oil paid \$4,085. Ref. Rept. I, Exhibit 2.

by pumping at least 1,000 acre-feet of ground water more per year than its allocated pumping allotment under the interim agreement. As Hawthorne's production increased, the pumping trough beneath the city continued to drop. By 1960-61, water levels in the general area beneath Hawthorne averaged between thirty and forty feet below that of surrounding territory.⁵³

Other water producers suffered both physical and economic harm as a result of Hawthorne's strategy. The water producers located adjacent to the Hawthorne well fields were affected directly. The City of El Segundo and Standard Oil produced water from wells located to the west of Hawthorne near to the coast. Consequently, their field lay in the part of the salt water wedge that moved at an accelerated pace toward the pumping trough beneath Hawthorne. Standard Oil reduced its own water production severely in 1952 because it feared that salt water would soon engulf its wells lying between Hawthorne and the sea. Under the interim agreement, Standard Oil produced about two thirds of its "Prescriptive Rights, 1949."⁵⁴ El Segundo had curtailed its own production during some of the years between 1945 and 1955 for the same reason. The City of Inglewood, lying to the north of Hawthorne and inland, was not threatened by immediate salt water intrusion, as were El Segundo and

⁵³Watermaster, Report for 1960-61, plate 4.

⁵⁴ Ref. Rept. II, p. 146.

Standard Oil, but Inglewood's production costs were considerably increased as a result of the lowered water table. The economic costs of Hawthorne's actions were spread generally among all water producers who had signed the interim agreement and were paying higher costs for their water while Hawthorne continued to utilize the most inexpensive source of water from a base supply.

From Hawthorne's perspectives, at least from the perspectives of some of Hawthorne's leaders, the problem assumed entirely different proportions than it appeared to other water producers in West Basin. Instead of viewing the basin as something jointly owned by all water producers, Hawthorne viewed its needs to serve a municipality with water as superior to others, especially to the needs of industry. Since the interim agreement appeared to favor industrial producers, Hawthorne officials viewed the agreement as an attempt to take away water rights devoted to public use and give them to industrial concerns.⁵⁵ Hawthorne

⁵⁵In particular, some Hawthorne officials were suspicious of Standard Oil. Standard Oil encourages its employees to enter into active political life in the communities in which they live. As a result, several Standard Oil employees have held influential positions within their own cities, in the association and as members of the board of directors of the Municipal Water District and the Replenishment District. The mayor of El Segundo for many years was a Standard Oil employee. During the last years of the interim agreement, the mayor of Hawthorne, who was also a Standard Oil employee, attempted to change Hawthorne's strategy from one of hostility to one of cooperation with other water producers in the basin. His actions in support of the association and the interim agreement only confirmed the suspicions held by other council members that Standard

looked to the other cities for support of its position. However, the beach communities had already suffered severe losses from salt water intrusion. According to Hawthorne officials, these communities were willing to see any basis used to curtail the production from the basin and slow down intrusion. Hawthorne felt the beach cities were giving away their rights, which did not mean much since their wells were pumping salt water. Hawthorne officials were not successful in their attempt to convince Inglewood and Torrance, the other two inland cities, not to sign the interim agreement.

Reference: Round Two

The voluntary curtailment of pumping was a temporary method for dealing with the physical problem of slowing down the rate of salt water intrusion. Considerable time was required to reach this settlement, and time was becoming a more critical factor. Under the California Code of Civil Procedure placing a statutory time limit of five years for a case to proceed to trial, the court would be required to dismiss the West Basin case at the end of 1956 if the action had not been brought to trial.⁵⁶ The litigants began to

Oil was receiving preferential treatment.

⁵⁶Sec. 583 of the California Code of Civil Procedure provides that an action must be brought to trial within two years after the action is filed or the court may dismiss the case. The action must be brought to trial within five years after initiation or the court must dismiss the action. In Pasadena v. Alhambra the court held that the time spent by the Referee in preparing its report would be excluded

search for some method to protect their investment of time and money without having to proceed to trial without a final agreement.

It was decided that the litigants should go through the "formalities" of a trial during which the parties would ask the court for a second order of reference. By holding a formal trial the statutory requirement would be met, and in addition a second reference would give the litigants further time to negotiate a final settlement.⁵⁷ A year and one-half after the formal trial and the second order of reference, the litigants were again threatened with the

from the calculation of the five year time period for mandatory dismissal. 33 Cal. 2d 908. Since the order of reference was made nine months after filing, the litigants had four years and three months after the Referee's Report in which to reach a settlement or have the case dismissed.

⁵⁷The legal counsel retained by the association to find some method of saving the case from mandatory dismissal reported to the association on the significance of this trial and order of reference in the following statement made at the November 15, 1956, meeting of the association:

Out of an abundance of caution, the Committee for Settlement and I met with the presiding judge and judge Arnold Praeger, to whom this case has been assigned for trial, to obviate the usual one year delay on having a case set for trial in the Los Angeles County Superior Court. We accomplished this mission and November 13, 1956 . . . was reserved for the trial of this action . . . only 1 month from a mandatory dismissal of the entire action.

We then went through all of the formalities of trial setting, mailing a memorandum to all parties to the action, or to their attorney, having the case actually set and formally serving notice of trial on all parties. . . . In keeping with our caution because of the number of parties who might try and upset the applecart, we avoided the presiding judge's very kind offer to set the matter for trial on the Court's own

possibility of dismissal of their case when Judge Arnold Praeger, who had been hearing the case, disqualified himself. Praeger had discovered that he owned stock on one of the companies party to the suit. As a result of Praeger's disqualification, all of his actions and orders were void, including the second order of reference. The Judicial Council and the attorneys involved in the litigation began immediately to search for a qualified judge.⁵⁸ Judge George Francis of Alpine County was appointed. Goodcell, in reporting the appointment to the association, noted that "\$500,000 had been expended thus far by parties to the action and that consequently the committee had received the cooperation of all judges in attempting to solve the

motion because of a number of eases that emphasize the regularity of the trial in compliance with the Statute.

During the trial a second order of reference was obtained from the Court to the State Water Rights Board. The second reference trill allow for time to agree to stipulate and stop the effect of CCP 583 for certain but we believe that bringing the matter to trial as accomplished . . . we effectively killed this time limitation. . . . We should insure an additional safeguard by completing the stipulated agreement before the Referee's second report is filed.

Minutes, November 15, 1956, pp. 21-22.

⁵⁸Finding a qualified judge in a litigation like the West Basin case is a very difficult problem. Because of the interpretation given to Sec. 170 in the California Code of Civil Procedure, it is necessary to find a judge who does not own property in the county involved and is not a stockholder of any of the firms involved. In addition, for practical reasons it is necessary to find a judge who does not have a heavy case load and who is young enough to survive a long litigation.

problem.⁵⁹ Another attorney cited a different reason for the active cooperation of the Judicial Council. This attorney reasoned that Judge Praeger "had made orders for payment to the State of California of certain funds and that consequently everyone was interested in straightening the matter out so that the State would get its money."⁶⁰

A re-trial was held on Monday, July 28, 1958, which duplicated the previous trial held in November, 1956. The re-trial reaffirmed the rules and orders made by the previous judge and enabled the Referee to continue with the second reference procedure. A second report of the Referee was filed with the court on June 2, 1959.⁶¹ This report reaffirmed and amplified the technical data contained in the original report. In addition, production records for all parties and most non-parties were brought up to date through 1956. The most significant aspect of the second report was the change made by the Referee in its recommendations. The Referee reversed its own stand on the amount of curtailment necessary, and, in essence, ratified the basic elements of the interim agreement. The Referee recommended that:

⁵⁹West Basin Water Association, Minutes, May 22, 1958, p. 23.

⁶⁰Loc.cit.

⁶¹Report of Referee filed with the Superior Court on June 2, 1959, by the State Water Rights Board. Herein referred to as Ref. Rpt. II.

1. Ground water extractions be limited initially by court order to "Prescriptive Rights, 1949," as defined in the interim agreement;
2. The court should retain jurisdiction to implement necessary adjustments in the extractions of parties to the case;
3. The exchange pool established under the interim agreement be continued, and
4. Watermaster Service be continued and extended to cover all parties to the case.⁶²

Five objections to the draft of the Referee's report were filed. Most of these related to the description of the boundary contained in the report and three of the objections submitted their own boundary definitions to replace that of the Referee. The Dow Chemical Company objected to its inclusion in West Basin and contended that it produced water from an area to the north of West Basin.⁶³

Negotiation: Round Two

In 1956, preliminary to the formal court proceedings which anticipated a second round of negotiations, an attorney had been retained to represent the association on the legal settlement committee and to draft the necessary documents related to a final settlement. For 'the 'first

⁶²Ref Rpt. II, p. 190.

⁶³Ibid., Appendix C, pp. 16-18.

time, there was a major participant in the negotiation who was responsible only to the community of producers represented by the association and not to any of the litigants. Ralph Helm, acting as the counsel for the association, was requested by the executive committee of the association to work for "a stipulated judgment involving curtailment of pumping based on a percentage of the 1949 prescriptive rights."⁶⁴

At first there was considerable hope that a final agreement could be reached within a short time. During most of 1957 and 1958, as the Referee was preparing its second report, the legal settlement committee met each week and sometimes twice a week in order to prepare a final agreement. By the fall of 1958, Helm had completed the original draft of the proposed findings of fact and conclusions of law, as well as the proposed final judgment. The committee continued weekly meetings to perfect this draft and by November, 1958, one of the members predicted that their work would be completed in three to five meetings.⁶⁵

However, the final draft of the agreement was not presented to the association until February, 1960.⁶⁶ Many

⁶⁴West Basin Water Association, Executive Committee, Minutes, July 12, 1956, p. 3.

⁶⁵West Basin Water Association, Minutes, November 20, 1958, p. 14.

⁶⁶The prolongation of the negotiation increased the expense of arriving at a final judgment. The association paid \$18,000 in attorneys fees during this period. In addition, most of the large water producers paid additional fees.

problems had caused the long delay. On the technical side, many details had to be accumulated in the preparation of this draft. Every water right transaction which had occurred since the filing of the suit had to be traced and its effect on the allocation of rights determined. On the substantive side, most of the enterprises which had signed the interim agreement were willing to sign a final agreement similar to the interim agreement, but some were concerned that production still exceeded safe yield. Nevertheless, those who wished to continue the gamble with the sea outnumbered those who wanted to prevent salt water intrusion by an immediate curtailment of production to safe yield.

The major concern was caused by the lack of total agreement to the basic elements of the interim agreement, and the fear that the final settlement would be appealed. Water producers in West Basin had watched while the stipulated agreement negotiated in the Raymond Basin was challenged by the one large, non-signatory producer. West Basin litigants wished to avoid the additional costs involved in a prolonged appeal. Since the interim agreement afforded partial physical protection, many of the litigants felt that they had time to work out an agreement that was entirely satisfactory for all parties. Some of the issues at controversy with California Water Service Company were settled in the early period of the second round of negotiation. California Water Service Company claimed 800 acre-

feet of the 898 acre-feet listed as part of the "Prescriptive Rights, 1949," for Del Arno Estate Company.⁶⁷ Prior to 1958, Del Amo Estate Company transferred 777 acre-feet of these rights to California Water Service Company. In addition, California Water Service Company was assured that the formula used to apportion the costs of the reference would be modified to apportion the costs more equitably.

Early in the negotiations, envoys were sent to the City of Hawthorne to urge city officials to reconsider their previous stance in regard to the interim agreement.⁶⁸ In 1958, the association appointed the Mayor of Hawthorne to the executive committee in the hopes that he would be able to change the attitudes of other city officials. However, the attempts to find a satisfactory settlement with Hawthorne were unsuccessful. Hawthorne officials never agreed to the basic principle that ground water production should be curtailed in order to reduce the costs of salt water intrusion.

A final draft of a proposed "Agreement and Stipulation

⁶⁷Ref. Rpt. I, p. 68.

⁶⁸In September of 1957, for example, officials from the City of Torrance, Inglewood and El Segundo met with representatives of the City of Hawthorne "in an effort to persuade the City of Hawthorne to become a party of the Interim Agreement and petition to curtail pumping." The Inglewood official reporting on the meeting stated that "Hawthorne City officials had indicated that they would take the matter under consideration but that press releases implied that there was small likelihood that the City would become a party to the Agreement." West Basin Water Association, Executive Committee, Minutes. July 12, 1957, p. 4.

for judgment" was presented to the association in February, 1960. The final draft was very similar to the interim agreement. By signing the final agreement a producer agreed that the amount of his adjudicated right listed in the agreement was his total right to water from the basin and that his right was of the same "legal force and effect and without priority with reference" to the rights of the other producers.⁶⁹ Each signatory party also agreed to limit his future production to the amount of his adjudicated right, subject to additional pro rata reductions "if such a reduction is required to preserve said Basin as a common source of water supply."⁷⁰ In order to add flexibility to the operation of the proposed judgment, the agreement established that each right holder who did not extract his full adjudicated right during the course of one water year would be permitted to carry over an amount not to exceed 10 per cent of his adjudicated right to the next water year. In addition, a right holder would be permitted to extract 10 per cent in excess of his adjudicated right during one year to meet possible emergencies. If the Watermaster approved, extractions could be increased still further in an emergency. Over-extractions during one year were to be compensated for by an equivalent reduction in pumping during

⁶⁹California Water Service v. City of Compton, Final Judgment, Exhibit B., sec. 4.

⁷⁰Loc. cit.

the next year. A signatory party to the agreement could specifically exempt himself from the operation of the exchange pool provisions of the final agreement. The provisions themselves were almost identical with the exchange pool provisions of the interim agreement. The Department of Water Resources was again named as Watermaster to administer the judgment and the exchange pool.

The largest water producer from the basin, the Dominguez Water Corporation, gave the final agreement its full support by bringing signed copies of the agreement to the first association meeting to be held after the agreement was sent to all litigants. The Dominguez Water Corporation was joined in this gesture by the City of El Segundo and Chanslor-Canfield Midway Oil Company.⁷¹ Three months later, twenty parties representing 32.5 per cent of the total adjudicated rights had signed the agreement.⁷² It was reported at that time that it was only necessary to gain eight more signatures in order to take the agreement to court.⁷³ The signing process was somewhat disrupted during the summer of 1960 when an amendment to the agreement was sent to all

⁷¹West Basin Water Association, Minutes, February 25, 1960, p. 8.

⁷²West Basin Water Association, Minutes, May 26, 1960, p. 15.

⁷³It is clear that the legal settlement committee expected to gain a majority of signatures within a few months. Several places in the draft, the year "1960" was inserted as the time of the final trial.

parties to change the boundary description to conform to a revised boundary description used by the Referee in a supplemental report. By February, 1961, thirty parties representing 65 per cent of the rights had signed. Only the cities of Hawthorne and Los Angeles, Standard Oil and Texaco Oil had not signed among the large producers. By early summer of 1961, producers holding 82 per cent of the adjudicated rights in the basin had signed both the agreement and the amendment to the agreement. It appeared to the committee that no further signatures could be gained.

Final Judgment and Appeal

On July 21, 1961, after sixteen years of litigation, a short trial of no more than a few hours was held before Judge George Francis in the Superior Court of Los Angeles County. The Dow Chemical Company was the only water producer present at the trial with an outstanding issue at controversy. Dow asserted rights to seven acre-feet of water as an overlying landowner in territory which was asserted to be in a separate and independent basin. If Dow had been allowed to challenge the proposed Judgment, questions related to the rights of overlying owners and the adequacy of the definition of basin boundaries would have been raised. The legal settlement committee was particularly anxious to avoid having these issues raised. Consequently, the attorney representing the signatory parties

moved to amend the proposed Judgment to include Dow Chemical Company as possessing a right to seven acre-feet of water per year. No other objections were made at this trial. Hawthorne did not send a legal representative to the trial to present its objections to the stipulated agreement.

A representative of the State Water Rights Board attended the trial and spoke to the court about the financial problems involved in the reference. The original formula used to apportion the expense of the reference, discussed above, had created "somewhat of a snarl." Since there were a number of very small water users who had refused to pay the \$50.00 minimum charge, the court recommended that persons pumping twenty-five acre-feet or less be released from any financial obligation for the reference.⁷⁴ In addition, the formula was changed so that the allocation of expenses involved in the reference was based on "Prescriptive Rights, 1949," rather than on average annual extraction over the full period of record.⁷⁵ As a result, refunds were made to some small producers and to those who were not granted adjudicated rights, but who had already made some payments to the Referee. Other readjustments were made in the charges assessed against the large water

⁷⁴See Reporters Transcript of Proceedings, July 21, 1961, p. 16.

⁷⁵California Water Service Company v. Hawthorne, p. 905.

producers. This change in the formula used to allocate the cost of the reference meant that those who had gained continuing rights to produce ground water as a result of the litigation shared responsibility for the costs of the reference in proportion to the amount of their benefit.

The findings of fact and conclusions of law, and the proposed judgment presented to the court were accepted by the court substantially in the same form as they had been prepared by the legal settlement committee. The judgment was entered on August 22, 1961. As of October 1, 1961, all entities included as parties in the case were "perpetually enjoined and restrained from pumping or otherwise extracting from the Basin any water in excess of said party's Adjudicated Rights. . . ." ⁷⁶ A total of ninety-nine parties were decreed to have adjudicated rights totaling 64,065 acre-feet. ⁷⁷ The ninety-nine parties adjudged to have rights, as well as five parties without rights but with active wells, were placed under Watermaster Service.

The Hawthorne Appeal

At the association meeting following the trial court's decision, a city councilman from the City of Hawthorne rose

⁷⁶Final Judgment, sec. 5.

⁷⁷Because many producers had abandoned, disclaimed or lost rights, the total adjudicated rights were considerably less than the total "Prescriptive Rights, 1949." The first determination of rights totaled 67,788.8, while the second totaled 64,064.09 rights.

to congratulate the group on their "victory, ." but warned them that his City planned to fight the decision "through every court in the land." The City of Hawthorne backed up its threat to appeal by retaining a firm of highly respected attorneys specializing in water law to represent its interests.⁷⁸ The legal settlement committee had been unsuccessful in its attempt to avoid the Hawthorne appeal. At first the association assumed the financial responsibility for supporting the judgment against the Hawthorne appeal. However, in 1962, the Replenishment District undertook financial responsibility for defending the judgment, while the association maintained direct relations with the attorneys.

Hawthorne argued that the following errors had been committed by the trial court and required a reversal of its judgment determining rights to produce ground water in West Basin:

1. The trial court did not consider Hawthorne's substantive rights under section 1007 of the Civil Code;
2. The trial court "erroneously used 1949, the time of filing of the amended complaint as the base year

⁷⁸In addition, Edward Sidebotham and Sons appealed from the decisions on a procedural question relating to the lack of adequate notice about the death of its attorney. The Sidebotham appeal did not raise significant issues but it was essential for the major litigants to defend their settlement against the appeal. Since the Sidebotham appeal did not raise any points of significance for this study, it will not be discussed further.

in computing the prescriptive rights of the parties, instead of 1945, the time of the filing of the original complaint,"⁷⁹ and

3. The trial court failed to distinguish between overlying and prescriptive rights of the parties.

In the first instance, Hawthorne asserted that the trial court had failed to apply section 1007 of the Civil Code in making its determination. Hawthorne reasoned that its share of the total yield would have been 5 per cent if the court had given effect to the prohibition against private individuals and firms gaining prescriptive rights against municipal corporations. Hawthorne asked the court to allocate 5 per cent, or 3,170 acre-feet, of the total adjudicated rights to Hawthorne even though it had not produced this quantity of water until 1954. On this contention, the court held that Hawthorne could only claim the amount of water it had produced and placed to beneficial use before 1949.

The court further reasoned that Hawthorne had not lost any prescriptive rights to private individuals since "all of the prescriptive users have continued to pump water."⁸⁰ The only invasion was a partial one involving a "possible interference with respect to appellant's right to continue to pump at some future date."⁸¹ The court took into account

⁷⁹California Water Service Company v. City of Hawthorne, 224 A.C.A. 885, 898.

⁸⁰Loc. cit.

⁸¹Loc. cit.

the creation of the Replenishment District and the development of new sources that might "eliminate the threat of future curtailment."⁸² After refusing to accept Hawthorne's first contention, the court further argued that Hawthorne should be precluded on equitable grounds from invoking section 1007 of the Civil Code. Since Hawthorne had notice of all proceedings, but had not raised any of these arguments at the trial, Hawthorne was stopped from raising these issues on appeal.

Hawthorne's second contention was that the trial court should have computed the prescriptive rights of the original parties as of 1945, the date of the filing of the original complaint. The court held that there was no merit in the contention because the complaint was also amended "to enlarge the scope of the proceedings to include the adverse claims of all parties against each other, thus creating new causes of action."⁸³ Since the final judgment was an inter se adjudication of the rights of all parties among themselves, the District Court of Appeals held that 1949 was the appropriate date to determine prescriptive rights.

The third contention was a general complaint against allowing individuals to transfer water rights and change the place of extraction and type of use. Hawthorne asked

⁸²California Water Service Comra v. City of Hawthorne, loc. cit.

⁸³Ibid., p. 901.

the court to prevent transfers in the future, but did not ask for a redetermination of its rights based on this claim. The District Court of Appeals concluded that the trial court "properly concluded that there was no necessity for distinguishing between the overlying users and appropriators."⁸⁴ In addition, the court approved the solution adopted by the trial court as being in accord with Article XIV of the State Constitution which expresses the rule of reasonable and beneficial use of water:

This rule dictates that when the supply of water is limited, as in the overdrawn basin here in question, the public interest requires that there be the greatest number of beneficial users which the supply can yield. It has also been held that under the constitutional provision, the trial court has the duty of working out a physical solution if possible and if none is suggested by the parties to work one out independently of the parties. Here, because of Hawthorne's failure to appear, the solution as to its rights had to be worked out independently. As in *City of Pasadena v. City of Alhambra*, "it seems probably that the solution adopted by the trial court will promote the best interests of the public, because a pro tanto reduction of the amount of water devoted to each present use would normally be less disruptive than total elimination of some of the uses."⁸⁵

Since the California Supreme Court has refused to review the decision made by the District Court of Appeals, the California Water Service case is finally closed, eighteen years after it was opened. The questions raised by Hawthorne were entered too late to have a definitive

⁸⁴ California Water Service Company v. City of Hawthorne, loc. cit.

⁸⁵ Loc. cit.

effect on the structure of California ground water law, but the court has established that Hawthorne does not have any rights to produce water from West Basin other than those entered in the original judgment in the California Water Service case. The event that most of the major parties had tried to prevent for many years, an appeal, occurred and was weathered by the litigants.

While the final judgment allocated rights to produce ground water among the water producers named in the suit, it did not limit the entry of new water producers into the field. The litigants were exposed to the actions of those who were not a party to the suit. Enterprises, not named in the original suit could enter and begin to produce ground water unless further legal action were taken. To prevent others from gaining a prescriptive right to West Basin ground water adverse to their interests, the seven largest ground water producers involved in the California Water Service case initiated a second action in 1956, against the sixty-three active West Basin water producers not named in the original suit.⁸⁶ While a judgment has not been entered in this case, only twelve of the original defendants remain as active producers and the total production for this group has been reduced from over 3,000 acre-feet prior

⁸⁶ Dominguez Water Corporation v. American Plant Growers Association, Case No. 68965 in the Superior Court of the State of California in and for the County of Los Angeles.

to the filing of the second action to approximately 300 feet in 1963. A stipulation for final agreement has been drafted and signed by almost all of the parties involved.

Unless access to ground water supplies can be rigorously controlled, this prolonged and expensive litigation will be meaningless. In light of the action in this case against the new pumpers, it appears that the parties to the California Water Service case are prepared to take diligent action in preventing the entrance of new ground water pumpers who assert claims to the water supply as overlying owners. New producers can enter the field by purchasing ground water rights from a party to the California Water Service case. In this way, the possibility of devoting water rights to new and valuable uses is not precluded, but the total volume of demands on the basin will continue to be limited. If they are successful in settling the second case on the basis of the current negotiated settlement, then, the West Basin litigation will have accomplished one of its primary purposes, that of the control over access to ground water supplies.

The Effect of the Final Judgment

During the first year after the effective date of the judgments the parties included within the jurisdiction of the court extracted 58,624 acre-feet or 5,418 acre-feet less than their adjudicated rights and 1,676 acre-feet less than

their production in the year prior to the judgment.⁸⁷ During this year, the parties imported 165,918 acre-feet of water, an increase of 4 per cent over the previous year. Ground water production during the second year increased approximately 50 acre-feet, but the importation of water from other sources increased 2 per cent to 168,436 acre-feet.

The Physical Effects

The final judgment has had a beneficial physical effect on the basin since the ground water levels have risen from one to two feet throughout most of the basin during the two years since the judgment. However, water levels are still below sea level throughout the basin. During the first year after the judgment, salt water intrusion along the west coast proceeded about 0.1 mile inland, underlying an area of about 8,000 acres. In the first Watermaster's report to follow the judgment, it was noted that over a long period of time salt water had invaded the Gaspur aquifers for a distance of two miles inland along San Pedro Bay, but had not entered the Silverado Aquifer, the main water-bearing aquifer in the area. During 1962-63, there appeared to be little change in the extent of salt water intrusion within the basin. It would appear that the immediate threat of intensive salt water intrusion has been

⁸⁷The statistics in this discussion on the effect of the final judgment are based on information contained in Watermaster, Report for 1961-62 and 1962-63.

abated. The final judgment cannot be considered the only causal factor affecting salt water intrusion, since the construction of the barrier, spreading in Central Basin and adjudication in Central Basin would also affect the extent of salt water intrusion.

The effect of the final judgment on the amount of fresh water inflow across the Newport-Inglewood fault is more difficult to assess. While some recent studies have estimated sub-surface fresh water inflow into West Basin at 10,000 acre-feet per year, many water engineers have commented informally that water is flowing out of West Basin into Central Basin. This was confirmed in part by Jack Coe, of the Department of Water Resources, in a presentation before the West Basin Water Association in February, 1963. Coe analyzed the flow across the Newport-Inglewood uplift in each of four different sections and presented his conclusions as follows:

<u>Area</u>	<u>Direction of Flow Across Uplift</u>
Inglewood	No Movement
North of Gardena	Into West Basin
South of Gardena	Into Central Basin
Dominguez Gap	No movement in one portion and into Central Basin in another portion. ⁸⁸

⁸⁸West Basin Water Association, Minutes, February 28, 1963, p. 14.

The Economic Effects

The costs of the judgment fell most heavily on the City of Hawthorne, which was forced for the first time to purchase most of its water from Metropolitan and to limit its total production from the basin to its adjudicated rights to 1,880 acre-feet. The ground water production of many small water producers who had not signed the interim agreement was also curtailed for the first time. Signatory parties to the interim agreement continued to produce the same quantity of ground water as before. Increases in demand were met by purchasing Metropolitan water.

Price competition among those offering water to the exchange pool has been intensified under the judgment. As shown in Table XIII, the price of exchange water has fallen. In 1961-62, Santa Fe Land Improvement Company set the low price of \$14.00 an acre-foot.⁸⁹ The next highest price of \$15.00 was set by four producers. Since their combined offer exceeded the requests, the sale of water was apportioned among the four. In 1962-63, John Grant set the low price of \$11.00 and the highest priced water released was apportioned among the four parties that had offered to release their rights at a price of \$14.00.⁹⁰

⁸⁹Exchange water priced below \$15.00 was less expensive for most producers than Metropolitan water priced at \$25.00 during 1961-62, unless their production costs exceeded the average of \$10.00 per acre-foot for the area.

⁹⁰Under the interim agreement, John Grant regularly set his price around \$20.00 and was usually among the small

Table XIII

Partial Listing of the Water Offered and Released in the
West Basin Exchange Pool Under the Final Judgment

Mandatory Offers	<u>Amount Offered</u> (acre- feet)	Price	<u>Water Released</u> (acre- feet)	Revenue
1961.-62				
Santa Fe Land Im- provement	39.5	\$14.00	39.5	\$ 553.00
Chanslor-Western Oil	88.0	15.00	26.2	393.00
William Rosecrans	91.3	15.00	27.1	406.50
H. S. Scott	9.5	15.00	2.8	42.00
U. S. Steel	1,167.0	15.00	346.7	5,200.50
John Grant	59.0	15.00	0	0
Total		15.00	442.3	\$6,595.00
1962-63				
John Grant	58.1	\$11.00	58.1	\$ 639.10
Frank Ballman	7.0	12.00	7.0	84.00
William Rosecrans	91.3	12.00	91.3	1,095.60
Santa Fe Land Im- provement	39.5	13.50	39.5	533.25
Chanslor-Western Oil	88.0	14.000	18.4	257.60
Felipe Gonzales	25.8	14.00	5.4	75.60
Robinson & Associates	3.1	14.000	0.7	9.80
U. S. Steel	1,177.0	14.00	246.9	3,456.60
Kahlert, <u>et al.</u>	18.9	17.00	0	0
Total			467.3	\$6,151.55

The amount of exchange water requested doubled between the last year of the interim agreement (when price cutting began) and the first year of the judgment. Activity within the exchange pool should increase even further. Since the time of the judgment, eighteen producers who were not originally a part of the exchange pool have filed with the Watermaster and the court a notice of their intention to be bound by these provisions. As a result, fifty parties can now enter the exchange pool either as buyers or sellers. Another stimulus to the growth of the exchange pool is the number of recommendations made by the Watermaster to parties who have over-extracted that they should purchase exchange water to make up for over-extraction.⁹¹ In addition, several parties without adjudicated rights have been able to continue ground water production by purchasing exchange water to meet their expected demands.

So far the exchange pool has provided a facility for those who have limited or no use for their water rights to rent these rights-to other water producers for use as a base supply. Many of the purchasers of exchange water do

group of parties to have their water released. However, for two years in a row, Grant's price was too high to be included among those who gained revenue from the release of their water. By dropping his price to \$11.00, Grant was obviously attempting to insure that he would be one of the parties who received some income from the exchange pool during 1962-63.

⁹¹Parties with overextractions during 1962-63 have pledged the purchase of approximately 250 acre-feet of exchange water in 1963-64.

not purchase any imported water. The exchange pool has enabled the relatively inefficient water producer, who cannot afford Metropolitan water, to survive. The low price of water offered to the pool is evidence that the adjudicated rights to the basin exceed the need for seasonal peaking. Ground water exchanged at the margin is water devoted to the provision of a base supply. If the adjudicated rights of the basin were substantially reduced in the future, the exchange pool could become an extremely important mechanism to enable those who own ground water rights in excess of their need for peaking to offer these rights to those who need access to ground water to meet their peak demands. If this were to happen, exchangers would have to be allowed to set their price at more than the marginal cost of Metropolitan Water. Depending upon the supply and demand, the price of water exchanged to be devoted to peaking would range between the marginal cost of the alternate supply and the cost of renting seasonal storage for one year.

The market for water rights has not been as active since the judgment as the exchange pool. The major purchaser of ground water rights, Sparkletts Drinking Water Corporation, has purchased a total of sixty-two acre-feet of rights in eight different transactions since the judgment. The largest single transfer of rights since the judgment, 916 acre-feet, occurred in June of 1963, when the

final order of condemnation was entered in favor of the Torrance Municipal Water District in its action to acquire the water distribution system and water rights of the Moneta Mutual Water Company. In addition to the above listed transfers, five more sales were completed for relatively small rights.⁹² Because of the failure of one of its wells, the Dominguez Water Corporation is leasing the right to pump 750 acre-feet of water per year to the Richfield Oil Company which had been supplied with this quantity of water by Dominguez prior to the well failure. Since the judgment, parties have abandoned only twenty-two acre-feet of adjudicated rights.

The fact that there has not been an active market for water rights is additional evidence that the current volume of adjudicated rights exceeds the volume of peak demands in the basin. If the total adjudicated rights were reduced at some future date one could expect the market for water rights to become very active and the price of a water right to range between the capitalized value of the marginal cost of an alternative supply and the cost of constructing seasonal storage.

The California Water Service case has been an important step in the development of a conjunctive use system in West

⁹²The grant deed describing on sale of 7.2 acre-feet of rights listed the total price of the sale as \$200, but there is some question as to whether this represents the typical price paid for water rights in West Basin.

Basin. By defining who owned a share in the natural yield of the basin, the case delimited those who would benefit from regulatory actions to manage the basin and, therefore, the group which should bear the major burden of paying for such regulation. By turning a competitive race for water resources into a cooperative arrangement for apportioning the benefits and the costs of a production curtailment, the litigation was an important beginning in the evolution of a conjunctive use system. As a result of the initiation of a second related suit, it would also appear that the litigants have gained control over the access to ground water supplies in West Basin. This is another important step in the development of a conjunctive use system.

The West Basin litigation was prolonged and costly. It has frequently been stated that the total costs of litigation were approximately \$5 million. If this is an accurate estimate of the costs, it seems a high price for the actual progress made. For while the litigants have been able to define who owned a share of the basin and to prevent non-owners from beginning to pump water, they were not able to solve the long-run problem of balancing the demands on the basin with the supply and the resulting threat of salt water intrusion. The quantity of production has been curtailed, but it still exceeds the average annual supply. The litigants were able to negotiate their own settlement to avoid a court order to reduce their ground water

production to 30,000 acre-feet per year. As individual producers they were unwilling to assume the full costs of a production curtailment. Because of the legal structure of California water law, and because of the hesitation of the trial court to take an active role in water litigation, they were allowed to evade the issue of defining a safe yield and bearing the costs of a production curtailment.

It was apparent by the early 1950's to many water producers that litigation was not going to solve the problem of overdraft and salt water intrusion. As a result, they began to search for other alternatives for dealing with these problems. If the water producers of West Basin were unwilling to reduce the demand and stop salt water intrusion, they could alternatively attempt to increase the supply and stop intrusion in this manner. This search for alternative ways of solving the problem of salt water intrusion is the subject of the next chapter on "The Creation of a Barrier Against the Sea."

CHAPTER VII

THE CREATION OF A BARRIER AGAINST THE SEA

Many of the proponents of litigation as a means to curtail ground water production to safe yield and reduce salt water intrusion were convinced by the early 1950's that they could not gain their objectives through litigation alone. Too many water producers indicated an unwillingness to agree to a curtailment which would bring water production within the limit of safe yield. Consequently, the search began for other techniques to halt intrusion. Fresh water stored in the aquifers had been the natural barrier against the sea. Once this water was removed, some artificial means of creating a barrier was needed. The United States Geologic Service and the Los Angeles County Flood Control District, in their cooperative study of 1951, recommended the creation of an artificial fresh water barrier by injecting water into wells along the coast or by creating a fresh water mound under a series of coastal spreading grounds.¹ The Division of Water Resources included the creation of a fresh water barrier as a possible means to halt salt water intrusion

¹United States Geologic Survey, Geology, Hydrology and Chemical Character of the Ground Waters in the Torrance-Santa Monica Area (Washington: 1948).

in a study performed in 1950.² For the next four years, West Basin entrepreneurs were faced with the task of establishing the technical feasibility of a fresh water barrier against the sea and trying to find institutional means to place such a barrier into operation.

Association members discussed the possibility of testing various methods to create an artificial barrier with both the State Division of Water Resources and the Los Angeles County Flood Control District. Division officials indicated that they felt an obligation to the court as Referee to suggest methods for solving the problem of overdraft and salt water intrusion, but they did not have sufficient funds to conduct investigations in the area. Division officials suggested that the association seek a state legislative appropriation of \$100,000 for the Division of Water Resources to finance an experimental study. The Flood Control District also lacked financial capability to undertake a major experiment with the concept of a fresh water barrier and its officials urged the association to appeal to the State Legislature for funds to support its experimental program.

The Flood Control District did begin a limited study of artificial recharge by utilizing an abandoned well owned by Manhattan Beach for some months. Approximately 1.5 cubic

²California Division of Water Resources, Sea Water Intrusion in Ground Water Basins Bordering the California Coast and Inland Bays (Sacramento: 1950).

feet of water per second was forced into the test well to ascertain whether the fresh water would form an inverted cone-shaped barrier and block the westward movement of the ocean into the basin at that point. The results of this experiment were promising. The Flood Control District was able to demonstrate that fresh water injected through a well would "displace and squeeze out the invading sea water" and that there was "virtually no mixing of sea water with the artificially introduced fresh water."³

While the Flood Control District performed the small scale injection well tests, it also constructed a small spreading basin east of Redondo Beach which could hold two acre-feet of water. The site was covered with fine, porous, dune sand believed to reach down to the Silverado aquifer, the main water-bearing aquifer in the area. Dominguez Water Corporation furnished about four acre-feet of water per day for this experiment.⁴ Another test plot was operated near Imperial Boulevard in El Segundo. The experiments utilizing spreading basins established that this method of building a barrier was not as effective as the use of injection wells. Water spread in these locations percolated into the major aquifers, but at an insufficient

³"Fresh Water Dikes to Halt Salt Water Contamination in California Ground Water Basins," Information Sheet published by West Basin Water Association, March, 1951.

⁴Inglewood Citizen, July 6, 1950.

volume to establish an effective barrier.

Financing a Prototype Experiment

Limited experimental data supported the theory that a fresh water mound created by injection wells could be utilized to seal off the sea; however, prior to a full-scale installation of such an expensive type of barrier, it was necessary to test the method further by constructing a prototype project. Experimentation with a prototype would determine whether a series of wells, similar to the well used in Manhattan Beach, could prevent salt water from intruding under or through the fresh water cones created by each injection well. Spacing of wells, amount of water to be used, type of wells to be constructed, health and safety precautions and over-all costs were among the other items of information to be settled by such an experiment.

Formation of Plans

In December of 1950, O. A. Gierlich, of Manhattan Beach, wrote his fellow members of the association to state that he felt the association should sponsor an immediate large-scale testing program as a preliminary step toward the installation of an artificial barrier along the eleven-mile exposed, western coastline. Gierlich suggested that the association ask the State Legislature for an outright grant of \$200,000 to \$250,000 as an emergency measure. He

asserted that the loss of the "fresh water underground reservoir in West Basin would be an economic disaster which could not be considered purely local, but would be of state-wide interest."⁵

Shortly thereafter, members of the executive committee of the association met with Paul Baumann of the Flood Control District, Charles Chapel, the Assemblyman from the Forty-sixth District, and interested members of the association. Most members agreed with the idea of asking for State funds. Brennan Thomas of Long Beach asserted that the situation in West Basin had all the elements of an emergency and would justify a grant of State funds. Thomas wanted the association to ask for "enough money to do the Job" by sponsoring what he called a "one shot bill." Thomas did not believe that "it was wise to plan on continued support from the State, but . . . the State had given money for less important projects, and . . . the State would assist in saving the Basin."⁶ Those who agreed with Gierlich and Thomas on strategy disagreed on the possible costs of such an experiment. For example, Louis Alexander estimated that \$800,000 would be needed for construction and \$650,000 a year to purchase water. Robert Austin, on the other hand, estimated that \$250,000 would be sufficient to cover the

⁵Letter from O. A. Gurlich to the Directors of West Basin Water Association, December 7, 1950.

⁶West Basin Water Association, Executive Committee, Minutes, December 20, 1950, p. 3.

cost of construction and water for the first years.⁷

Disagreements over the number of wells to be constructed, the cost of transporting water to the barrier, and the type of water to be used caused variation in estimates. The Flood Control District wanted to build twenty new wells spaced one-half mile apart along the eleven-mile coast. Gierlich and others thought some abandoned wells could be used. Alexander included the cost of building a pipeline that could carry at least forty second-feet of water. Most of the members present at the meeting assumed that the barrier would use reclaimed water from Hyperion to inject in the recharged wells. Colorado River water cost more than \$20.00 an acre-foot at the time and several members commented that the use of this source of water would be too expensive. However, others doubted the availability of Hyperion water and made their estimates based on the use of Metropolitan water.

Allan Harris of Johns-Manville overtly disagreed with the idea of asking for State funds. He pointed out that "every one in the Basin was still pumping to full capacity, and at the same time . . . planned to obtain and spend money to replenish the Basin and . . . this was not a logical program."⁸ Another member, Clyde Woodworth, agreed with

⁷West Basin Water Association, Executive Committee, Minutes, December 20, 1950, p. 5.

⁸Ibid., p. 8.

Harris, pointing out that "if the agencies along the coast would cease pumping, wherever possible, it would assist materially in creating the required dike and would reduce the amount of replenishment water required."⁹

Legislative Strategy

Invoking the aid of a superior political agency involves the risk that support may be granted with unexpected contingencies which may represent costs to the originators of the move. The association wanted to gain State funds while retaining local control over the use of the funds. Most association members wanted the Flood Control District to perform the prototype experiments. The extensive work previously performed by the Flood Control District indicated that "the techniques and skill necessary to carry on the work of building a fresh-water, ground water barrier [were] available within the Flood Control District and that, therefore, the Flood Control District [was] the logical body to carry on the actual work."¹⁰ Association members felt that if the Flood Control District performed the prototype experiment, their views and interests would be taken into account in the plans and undertakings of the District.

⁹West Basin Water Association, Executive Committee, Minutes, December 20, 1950, p. 8.

¹⁰"A Report to the Executive Committee of the West Basin Water Association from the Committee on Waste Water Reclamation and Water Spreading," February 9, 1951, p. 3.

Even though the association wanted the Flood Control District to construct the series of injection wells, the Legislature could not appropriate State funds directly for a local district. The legislation would have to appropriate money for a State agency to be used in a specific manner. The logical choice was the Division of Water Resources. However, the association was not enthusiastic about the possibility of involving the Division, since Division officials had refused to help with the small-scale studies, while the Flood Control District expended \$75,000 of its general funds on these projects.¹¹ Association members sought to protect "their" money by drafting legislation which required the Department of Public Works, Division of Water Resources, to cooperate with the Flood Control District and other West Basin agencies.

The skeleton bill, drafted in the executive committee and introduced simultaneously in the Assembly and Senate proposed to appropriate a blank sum "to be available for expenditure by the Department of Public Works, Division of Water Resources, acting through the State Engineer."¹² The draft authorized the Department of Public Works "to

¹¹Letter from Carl Fossette to California State Board of Water Resources, February 1, 1951, p. 2.

¹²Draft of bill submitted to Hon. Jack Tenney enclosed in a letter from Fossette to Tenney, January 4, 1951. The bill was later amended and the figure \$900,000 inserted as the amount of the requested appropriation.

cooperate and contract with the Los Angeles County Flood Control District, the West Basin Water District and any other public or private corporation or agency with respect to the project."¹³ The original draft did not describe the project as an experiment. As written, the money was to be used to provide "suitable facilities, including water injection wells, water spreading grounds, pipe lines and equipment necessary to introduce water into the water-bearing aquifers in West Coast Basin."¹⁴ The use of State funds was justified as an emergency measure following the suggestion made by Gierlich and Thomas.¹⁵ Only a brief statement was included about possible statewide benefits which could result from the observation of the operations by others. A vague allusion was made to the effect that "such information should be available to affected areas and the public or other agencies concerned at the earliest possible time."¹⁶

While the West Basin entrepreneurs might have felt a closer working relationship with the Flood Control District, the State Legislature was more apt to rely on the judgment

¹³Draft of bill, loc. cit.

¹⁴Loc. cit.

¹⁵"This act is an urgency measure necessary for immediate preservation of the public peace, health or safety within the meaning of Article 14, of the Constitution and shall go into effect immediately." Loc. cit.

¹⁶Loc. cit.

of a state agency rather than that of a local district. This gave the Division of Water Resources more power in the Legislature than the Flood Control District. Realizing this, the association solicited aid and endorsement from the State Engineer, the Division of Water Resources and the State Water Resources Board. Endorsement was given in principle by all three, but the Division secured the introduction of an alternate bill in the same legislative session.¹⁷ This bill would have appropriated a sum of \$10,000,000 to be available for expenditure by the Division of Water Resources "for emergency assistance to local agencies in creating and maintaining fresh water barriers to restrain the intrusion of sea water . . . into ground water basins of this State."¹⁸ While the alternate bill authorized the Division "to cooperate and contract with public bodies or private corporations . . . ," expenditures from this appropriation were to be made subject to a list of conditions and limitations, including:

1. An official finding by the Division that emergency conditions existed in a basin.
2. Submission of an application for the use of funds to the Division accompanied by detailed plans of the project.

¹⁷Assembly Bill 2712, 1951 California Legislative Session.

¹⁸Draft of Assembly Bill no. 2712, 1951 California Legislative Session.

3. Determination by the Division that the proposed project was necessary and feasible.

4. Approval by the Division of all expenditures made by the Appropriation.¹⁹

The alternate bill did not mention West Basin or the Flood Control District in any way. The effect of the bill, if it had passed, would have been to give the Division of Water Resources power to select the projects it wanted to sponsor. Water producers in West Basin would have to compete with producers in coastal areas throughout the state who would want to have such a project located in their basins. Besides the possibility of losing the funds to others, West Basin would also bear the risk of losing a large portion of the funds to the Division for administrative expense.

The introduction of the alternate bill resulted in a change of strategy on the part of West Basin producers. They began to stress the experimental nature of this project and the benefits other areas would gain from the experience of operating an experiment in West Basin. Association members used the adverse condition of the basin as an asset for the purpose of gaining State support. The Division of Water Resources had reported to the State Water Pollution Control Board in December, 1950, that West Basin was in the worst condition of all the basins in the State in regard to

¹⁹Draft of Assembly Bill no. 2712, loc. cit.

salt water intrusion.²⁰ Because of this, advocates from West Basin were able to assert that West Basin was "the logical area in which to expend such funds as may be necessary to prove conclusively that salt water intrusion can be stopped. . . ." ²¹

Legislative Implementation

A compromise was negotiated between representatives of the association, the Flood Control District and the Division of Water Resources. The two bills were combined. The compromise bill was unanimously approved by both houses of the legislature and signed into law in July, 1951. The legislation appropriated \$750,000 to the "State Water Resources Board for investigational work and design criteria for correction or prevention of damage to underground waters of the State by sea water intrusion in the West Coast Basin of Los Angeles County and other critical areas."²² The Legislation also authorized the Board "to cooperate and contract with the Los Angeles County Flood Control District, the West Basin Municipal Water District and any other public or private corporation or agency to the purpose of this act."²³

²⁰Discussed in "A Report t the Executive Committee of the West Basin Water Association from the Committee on Waste Water Reclamation and Water Spreading," February 9, 1951, p. 2.

²¹Ibid., p. 3.

²²Calif. Stats., 1951, ch. 1500, sec. 1, pp. 3483-84.

²³Ibid., p. 3484.

The act stressed the statewide problem of salt water intrusion and the need for experimental studies to find ways and means of stopping contamination of the State's ground water assets.

Designing Institutional Arrangements for
a Permanent Barrier

The appropriation of \$750,000 would provide the necessary money to construct a prototype barrier, but no institutional arrangements were available to operate a barrier once the experiment was concluded. Therefore, during the same legislative session in which the appropriation of State funds was gained, association members were concerned with the problem of creating new institutional arrangements for the construction and maintenance of a long-range barrier program. They hoped to gain approval for legislation that would enable them to organize or reorganize a public enterprise with the appropriate powers and boundaries to build a barrier as soon as the prototype model had established the physical feasibility of constructing a barrier.

Consideration of Alternative Institutional
Arrangements

In 1951, none of the local public agencies concerned with water resource development in West Basin had the appropriate range of powers or boundaries to undertake the barrier program. The first possibility, the West Basin

Municipal Water District, did not include all of West Basin and did not possess the power to reclaim and conserve water. The second possibility, the Los Angeles County Flood Control District, included substantial territory located outside West Basin and the District could not use its general revenue to purchase water for reclamation. While provisions enabling the creation of special zones of benefit to finance water conservation activities of benefit to a local area had been added to the organic legislation during the previous year, the usefulness of these provisions had been weakened through amendments introduced at the suggestion of the City of Los Angeles and the Metropolitan Water District. The zone provisions as passed by the Legislature included a clause that cities and municipal water districts had to give their express consent to inclusion within a zone. Any city could exclude its territory from a proposed zone of benefit by refusing to pass a resolution approving inclusion by its own governing body. The fiscal capabilities of the zone provision were also inadequate. The zone ad valorem tax was limited to \$.02 per \$100 of assessed valuation.

The Metropolitan Water District was a third possibility. Metropolitan had surplus capacity in its aqueduct and was interested in finding a guaranteed market for some of its water. However, there were no zone provisions in the Metropolitan Water District Act and the district lacked the appropriate powers. A fourth possibility was the creation

of an entirely new district specifically to undertake the barrier project after the experimental stage was completed.

Association members faced the task of drafting appropriate legislation to enable any of the possible districts to undertake the desired program. Two alternatives, reliance on Metropolitan and the creation of a new enterprise, were tentatively discarded. Metropolitan was eager to enter the field, but the association was hesitant to give it further power over local water resources. The establishment of a new district seemed too large and risky an undertaking when they might be able to accomplish the same goals by modifying the Los Angeles County Flood Control District Act and the Municipal Water District Act of 1911. This was the course they chose.

Legislative strategy and Implementation

Several bills were introduced by legislators representing territory within West Basin during the 1951 session to modify the Los Angeles County Flood Control District Act and the Municipal Water District Act of 1911. Legislation as passed reflected the association's intention to modify the zone of benefit provisions within the Flood Control District Act to enable the Flood Control District to purchase imported or reclaimed water for conservation with the revenue provided by special zones of benefit. The County Board of Supervisors was authorized to establish

zones "for the purpose of financing the acquisition of imported or reclaimed water, or both, which acquisition the board had determined will be of special benefit to the area within any such zone."²⁴ This provision would enable entrepreneurs to move toward the creation of two zones: one in West Basin to support the barrier, and the other in Central Basin to spread water in the Montebello forebay. The zone tax was increased from \$.02 to \$.05 per \$100 of assessed valuation, more than doubling potential revenue.

Under this legislation, the Flood Control District was also authorized to expend general revenue to finance conservation activities within a zone of benefit so long as the expenditure did not exceed the general Flood Control District taxes collected within the zone. Since the general Flood Control District tax authorization was \$.15 per \$100 of assessed valuation, this provision plus the zone provision gave the Flood Control District the potential authority to levy \$.15 per \$100 of assessed valuation to be devoted to the construction and maintenance of a barrier and \$.05 per \$100 of assessed valuation to purchase water for the barriers.

The legislation as passed also reflected the objections the City of Los Angeles and Long Beach made to the original bills drafted by the association. Both cities had objected to the use of funds derived from a tax on real property to

²⁴Calif. Stats., 1951, ch. 97, se. 1, p.2592.

finance replenishment activities. Los Angeles and Long Beach argued that territory within their boundaries possessed a higher assessed valuation in proportion to the amount of ground water used than other regions. Los Angeles pumped from 1,000 to 3,000 acre-feet per year from West Basin, while importing over 35,000 acre-feet to serve this area. Long Beach no longer extracted ground water from West Basin and imported all the water used to supply that portion of Long Beach located in West Basin. These cities requested that a clause be added to the zone provision which would give them a chance to exclude territory within their boundaries from a zone of benefit. Several meetings were held, attended by representatives of all interests and amendments to the original legislation were drafted and agreed to by all.

Under the amended provisions, written notices were to be sent to all cities and public districts within a proposed zone thirty days prior to a hearing. Property owners, cities and public districts could then submit written protests. If property owners representing 10 per cent of the assessed valuation of the taxable real property within the proposed zone filed written protests, the proceedings were to be abandoned. Likewise, if protests adopted by a majority vote of the governing bodies of cities or of other public districts formed for the purposes of supplying water in which there was taxable real property having an

assessed valuation of at least 60 per cent of the value of all taxable real property in the proposed zone, the proceedings were to be abandoned. At the hearing itself, property owners, cities and public districts would be allowed to submit further written or oral protests against the establishment of the proposed zone or the inclusion therein of particular territory. The Board of Supervisors was instructed to consider the amount of water that a region imported for use in determining whether a zone devoted to conserving ground water would be of particular benefit to the territory included.²⁵

Long Beach, in particular, also objected to the idea of permanent zones. Long Beach officials felt that the establishment of a zone in Central Basin might lull pumpers in that basin into inactivity regarding their water supply problems. Most Central Basin producers still utilized ground water as a base supply. Long Beach, as a member of Metropolitan, was using large quantities of more expensive imported water while watching its neighbors continue to draw down Central Basin water levels. The legislation was amended to make the zones a temporary source of funds for

²⁵The final wording of this provision was: "In determining the properties which will be specially benefited by inclusion in the proposed zone, the board shall consider the availability to such properties, other than as a result of said work so proposed to be done by the district, of imported or reclaimed water and the present and contemplated use of such water thereon." Calif. Stats. 1951, ch. 911, sec. 2, p. 2592.

conservation activities. Zones were to terminate automatically after five years but might be terminated prior to that. A new zone could be established immediately to succeed the previous one, but cities having an assessed valuation of at least 35 per cent of the assessed value of the taxable real property within the proposed zone could block the formation of a new zone by passing resolutions of protest within their governing bodies.

As discussed in Chapter V, the Municipal Water District Act of 1911 was amended at this time as well to enable Districts created under this law "to acquire, control, distribute, store, spread, sink, treat, purify, reclaim, recapture, and salvage any water, including sewage and storm waters, for the beneficial use or uses of the district or its inhabitants or the owners or rights to water therein."²⁶ This legislation was originally drafted by Kenneth Wright, attorney for West Basin Municipal Water District, who felt that the District could take over the function of purchasing reclaimed or imported water for the Flood Control District if a zone of benefit could not be created or was terminated. Wright felt that the West Basin Municipal Water District would retain ownership of the water it purchased for reclamation. He also assumed that the West Basin litigation would soon be settled. Consequently, the lack of congruence between basin boundaries and the District's boundaries

²⁶Calif. Stats., 1951, ch. 62, sec. 11, p. 189.

would not be a problem. Wright argued that producers "outside the District would have no right to take water from the basin in excess of the allotment awarded by the court under the adjudication proceeding. . . ." ²⁷ Wright continued his line of argumentation by stating that "the West Basin Municipal Water District would own all water thus added to the basin supply and would withdraw such water as needed or authorize such withdrawal by agencies within the District." ²⁸ The amendments to the Municipal Water District Act of 1911 were designed to give the producers of West Basin an alternative institutional arrangement if the zone of benefit within the Flood Control District was not successful.

The 1951 legislative session was a notable success for West Basin entrepreneurs. Not only had they gained a lump-sum appropriation from the State to support a prototype barrier experiment, they also had gained the institutional facilities which they thought would enable them to undertake a permanent barrier program. However, for all their legislative success, West Basin entrepreneurs were unable to move beyond paper plans for many years to come. The prototype experiment took much longer than expected and provided less information than was needed to plan for a complete

²⁷West Basin Water Association, Executive Committee, Minutes, September 1, 1950, p. 5.

²⁸Loc. cit.

barrier program. When the results later became available, serious questions were raised about the adequacy of the institutional facilities which had been authorized, but these were unforeseen developments at the end of the legislative session of 1951. The energies of all were immediately turned to the problem of beginning the prototype experiment as soon as possible.

The Prototype Experiment

Competition for the State Funds

Once the appropriation for \$750,000 was approved, other areas of the state saw opportunities to gain a portion of these funds to finance similar projects in their regions. Paul Baumann of the Flood Control District warned the association late in July of 1951 that "an attempt would be made to secure a portion of the funds by representatives of Ventura County, San Diego County and Santa Clara County."²⁹ The association might have to compete with others to gain the funds for which it has lobbied in the first place. Baumann mentioned that members of the State Water Resources Board were "under the impression that the money appropriated was to be distributed throughout the State."³⁰

²⁹West Basin Water Association, Executive Committee, Minutes, July 30, 1951, pp. 1-2.

³⁰Ibid., p. 2.

To insure that their interest in the State appropriation was protected, the association dispatched Ben Haggott and Paul Baumann to Sacramento to meet with the State Water Resources Board and present their case. Since preliminary studies had already been performed in the West Basin area, Haggott was able to discuss an experimental program that could be initiated immediately. Haggott again used the dire condition of West Basin as an asset by stressing that a successful experiment in West Basin would prove that salt water intrusion could be stopped in all other less contaminated basins of the State. Baumann was asked whether he thought the Board was legally required to spend all the appropriated funds in West Basin. Baumann declined to answer as to the legal responsibilities of the Board, but asserted that the Board certainly had a moral responsibility to follow the Legislature's intention.³¹ Haggott and Baumann were successful and the Board allocated the funds to the Division of Water Resources for use in West Basin.

Designing the Experiment

Representatives of the Division of Water Resources and the Flood Control District were invited to a special meeting of the executive committee of the West Basin Water Association on August 22, 1951, to discuss the nature of the

³¹Interview with Ben Haggott, May 15, 1962, and Paul Bauman, July 10, 1963.

experimental work to be performed. It was clear that representatives of the Division and of the Flood Control District had different perspectives about the work to be done. Max Bookman of the Division mentioned the preliminary work that would have to be done to make a report on the previous investigations of sea water intrusion to the State Water Resources Board. Harvey Banks, also of the Division, implied that the preliminary phases of the experiment might take about two years, but that some data would be available for study before the end of that time. On the other hand, Paul Baumann stated that he believed "time was most essential . . . and that while there was room for laboratory work, . . . there would be more benefit from field experiments because it was impossible to duplicate field conditions in a laboratory."³²

Perspectives about the nature of the experiment itself had to be settled. West Basin water producers and the Flood Control District had asked for the funds to test out the idea of forming an interface between fresh water and sea water to control salt water intrusion. The Division of Water Resources was interested in testing out the idea of diluting ocean water until it was potable. The Flood Control District was in the stronger position since it had performed successful small scale experiments which had

³²West Basin Water Association, Executive Committee, Minutes, August 22, 1951, p. 4.

provided some verification of the feasibility of building a barrier. The Division's position was weakened still further by the fact that an attempt to dilute the quantity of salt water already in the basin would have been very costly. The concept of building a barrier was retained.

Another area of disagreement between the Division and the Flood Control District was over the question of the type of water to be used in the barrier. Harvey Banks felt that half of the wells should use Metropolitan water and half should use reclaimed effluent obtained from the Hyperion Treatment Plant. The Flood Control District felt that effluent should be used for spreading programs but not for the injection wells. Baumann commented that "there might be considerable criticism and perhaps grave results in experimenting with effluent placed directly in the wells, and . . . the District would have nothing to do with injecting water other than of the highest quality."³³ The position held by the Flood Control District predominated and it was decided that "for the first experiment, water of unquestionable quality should be used, and thereafter, if it was desirable, experimenting with water of varying quality could be accomplished."³⁴

³³West Basin Water-Association, Executive Committee, Minutes, August 22, 1951, p. 4.

³⁴Loc. cit.

On October 1, 1951, an agreement was signed by the State Water Resources Board and the Los Angeles County Flood Control District which was a compromise between State domination of the project, on the one hand, and local control on the other. Under the contract, all funds devoted to field work were to be spent in West Basin, and only \$35,000 was lost to various laboratory studies. The State, however, asserted more than a passing interest in the project and how it was administered. Control of funds was retained by the State and funds were distributed in response to specific requests supplemented with detailed justifications. The first allotment to the Flood Control District was for \$450,000 for installation and one year's operation of the field experiment. Eventually, a total of \$642,000 was paid to the Flood Control District for the project. The Division of Water Resources spent \$63,000 to finance its supervision of the reporting function. The State also retained ownership of all the facilities constructed with State funds.

Construction of Injection Wells

The Los Angeles County Flood Control District began construction in January, 1952, of nine twelve-inch cased or gravel packed wells and approximately fifty observation wells varying in size from two to eight inches in diameter. The injection wells were spaced approximately 500 feet apart, parallel to the coast and about 2,000 feet inland.

The choice of the site for the project was based on the following factors:

1. Sea water had intruded into the main aquifer underlying the area,
2. The Atchison, Topeka and Santa Fe Railway Company, which had a single track line approximately paralleling the coast line at a suitable distance inland, provided free right of way for project facilities,
3. A source of suitable injection water was available in the vicinity, namely, filtered and softened Colorado River water through facility of the Metropolitan Water District of Southern California,
4. The underlying Silverado water-bearing zone is a confined pressure aquifer suitable for the desired experiments utilizing injection wells,
5. Existing piezometric surface and the Silverado water-bearing zone are comparatively close to ground surface in the area,
6. Local interests were desirous of reclaiming as much of the aquifer underlying the test site as possible.³⁴

Results of the Experiment

As the operational phase of the experiment was initiated, it was apparent to all observers that the project was a success. A fresh water pressure mound was created along a .9 mile stretch of the coastline preventing additional salt water from intruding into the basin along this front. Only a small portion of the injected fresh water was lost to the sea. The barrier functioned to replenish the basin as well as to hold back the sea. However, as

³⁴Department of Water Resources, Sea Water Intrusion in California, Appendix B (Sacramento, 1956), pp. 60-61.

more and more data were received from the experiment, West Basin entrepreneurs realized that the dimensions of their problem had changed. The assumptions upon which their early suggestions regarding a barrier were based were being disproved. In 1951, those who recommended a barrier project had assumed that:

1. A series of wells spaced about one-half mile apart could create and maintain a fresh water pressure ridge to prevent further salt water intrusion.
2. Some of the abandoned wells along the coast could be used to inject water as part of the barrier.
3. A relatively cheap supply of water was available in the form of reclaimed sewage effluent from the Hyperion Treatment Plant in El Segundo.
4. A decision would be reached relatively soon in the West Basin litigation so that all pumping from the basin would be severely curtailed.
5. A large appropriation from the State would enable the Flood Control District to build a prototype model in a short period of time that could be expanded without too much additional expense to constitute a barrier all along the coast from Playa Del Rey to Palos Verdes.

Each of these assumptions had failed to stand by the spring of 1953 when the early successful results of the

barrier test were being evaluated. Instead of spacing the wells one-half mile apart, the wells were spaced 500 feet apart. The closer spacing required less water to maintain a pressure mound, but this meant that the West Coast barrier would require 120 injection wells or more. None of the abandoned wells along the coast could be developed as injection wells. In fact, the Flood Control District had considerable difficulty with some of the wells especially drilled for the barrier. New design requirements were being established for the construction of injection wells. Not only were there more wells required than predicted, but the cost of each well would be higher than expected.

Technical and political problems still prevented the immediate use of the potential Hyperion supply. Section 4458 of the Health and Safety Code specifically prohibited the injection of reclaimed sewage water into a ground water basin. If this source of supply could be proved safe for injection, association members expected to be able to change this provision through simple legislative enactment. The Flood Control District was now willing to experiment with this source of water and the Department of Public Works of the City of Los Angeles gave the Flood Control District permission to use five second feet of Hyperion effluent at no cost for two years. However, even if the District could prove the efficacy, economy and safety of this supply, the problems of convincing the City of Los Angeles to sell

Hyperion water for use by others still remained. While Hyperion effluent had been granted for experimental purposes, Los Angeles officials had remained aloof and unresponsive to West Basin requests to make a definite commitment regarding the future use of this supply. Because of these technical and political uncertainties, no decisions could be made about the source of water to supply the full barrier until further experiments using Hyperion water had been completed and agreements were negotiated with the City of Los Angeles. There was general agreement that Metropolitan water was too expensive to use as the sole source of water for the entire barrier.

The fourth assumption, that the West Basin case would be rapidly resolved, had also failed to stand by the spring of 1953. The legal settlement committee had just been organized and was beginning to draw up a preliminary agreement to curtail pumping. Few expected a successful conclusion to the litigation for several years. The volume of pumping was increasing each year and many individuals questioned the advisability of injecting fresh water along the coast only to have it pumped out immediately a short distance inland.³⁵

³⁵August Riess, Treasurer of the West Basin Municipal Water District, suggested that his district "should not be placed in the position of asking for a 5 cent levy to be used in placing water under ground if that was to be immediately pumped out again." Executive Committee, Minutes, March 16, 1953, p. 6.

West Basin producers had hoped that the State appropriation would be sufficient to enable the Flood Control District to construct most of the future barrier and to gather enough data to be able to complete the barrier immediately after the experimental phase was completed. However, by the end of 1953, the prototype barrier extended for slightly less than a mile and the Flood Control District indicated that further information was needed before a full barrier could be undertaken.

The State had allotted \$642,000 of the total appropriation for use by the Flood Control District and these funds would be exhausted by December, 1953. If the barrier were discontinued when the funds were expended, the physical benefit resulting from nine months of injecting water would soon be dissipated. Association members, officials of the Flood Control district and the State Division of Water Resources, were anxious to keep the project going until they could decide what future steps should be taken.

The Attempt to Establish a Permanent
Barrier Program

Consideration of Alternatives

Since their plans to create a conservation zone within the Flood Control District were based on assumptions currently being disproved, association members needed to

consider a new set of alternative courses of action before they asked the County Board of Supervisors to establish a zone of benefit. Early in the spring of 1953 representatives of the association, the Flood Control District, Metropolitan, West Basin Municipal Water District, and the State Division of Water Resources met to discuss their respective views regarding the formation of a conservation zone within the Flood Control District. None of the representatives at the meeting were entirely satisfied with the prospect of creating a conservation zone as the sole alternative open to them.³⁶

Louis Alexander from the Southern California Water Company set the tone of the meeting. He urged the group to begin the formal steps leading toward the formation of a zone within West Basin immediately, but to recognize that still other arrangements would be necessary in the long run. Alexander emphasized the temporary nature of water conservation zones which could only be established for a five-year period. Such a short duration would not encourage the Flood Control District to make major capital expenditures for facilities needed in conjunction with the maintenance of the barrier. The Flood Control District needed assurance that water could be provided to it for a long period of time before it would invest a substantial

³⁶West Basin Water Association, Executive Committee, Minutes, March 16, 1953, pp. 1-11.

amount from its general funds in West Basin.

Alexander argued that it would be desirable to relate the payment for water to an assessment on pumping so that those who used the basin would be the ones who would pay for the barrier. Alexander referred to the Orange County plan being considered in the legislature as an ideal plan.³⁷ Alexander recommended that the association attempt to amend the Metropolitan Water District Act to permit formation of zones within Metropolitan which could levy an assessment on pumping to be used to purchase water for the barrier. Warren Butler from Metropolitan told the group of difficulties Central Basin producers had encountered when they attempted to form Zone I under the new provisions of the Flood Control Act. The Los Angeles City Council had opposed the inclusion of any Los Angeles City territory within Zone I. The zone had been formed after a divided three-to-two vote in the County Board of Supervisors. No tax had been levied nor replenishment work undertaken because of the boundary dispute. The City of Los Angeles was also expected to oppose inclusion of any of its territory in a West Basin water conservation zone.

Butler also opposed, in principle, the use of ad valorem taxes to provide funds for this type of project. He felt that an assessment on pumping was the fairest method

³⁷Senate Bill 91, 1953 California Legislative Session. Amended the Orange County Water District Act, Calif. Stats., 1953, ch. 420, p. 876.

of paying for a barrier since "under this system those who used the water would pay for it."³⁸ However, he recommended the formation of a conservation zone in West Basin, since this was the only administrative means available at this time for raising money to pay for the initial phases of an extended barrier project.

As a result of these discussions, it was decided to proceed with the formation of a zone of benefit within the Flood Control District, recognizing that this was not a permanent solution, and to begin to search for new institutional arrangements after the zone was created. It would take more than a year to complete the formal steps leading to the creation of a zone of benefit. The Flood Control District would be required to present a detailed report to the County Board of Supervisors before any action could be taken. While the West Basin Municipal Water District began this process in the spring of 1953 by requesting the Board of Supervisors to create such a zone, the immediate problem of financing the limited barrier project after December, 1953, when the State funds would be exhausted, had assumed emergency proportions.

³⁸West Basin Water Association, Executive Committee, Minutes, March 16, 1953, p. 11.

Emergency Funding

Association members considered gaining new funds from the State Legislature or from the State Water Resources Board. Preliminary discussions with various officials in Sacramento discouraged further exploration of this source.³⁹ After consultations with the County Board of Supervisors and the Flood Control District, the association was able to solve part of the problem. Flood Control District officials indicated that \$70,000 could be allocated from general funds to pay for the operation and maintenance of the barrier, operated at a minimum level from January until the time a zone could be created. However, the Flood Control District was precluded by law from financing an experimental study. The project would have to be considered as a conservation measure and the water would have to be provided to the Flood Control District free of charge. The problem facing the association was considerably reduced, but now they needed to find enough money to purchase water for the barrier for another six months.

After exploring the West Basin Municipal Water District's capability to purchase water for a conservation measure of this type, and receiving a negative answer, association members decided to assume responsibility for purchasing the necessary water themselves by passing a

³⁹West Basin Water Association, Executive Committee, Minutes, August 27, 1953, pp. 9-10.

special assessment within the association. The special assessment raised over \$20,000. In addition, funds were solicited from agencies which were not members of the association and approximately \$14,000 was collected from twenty firms. In addition, the Los Angeles Department of Water and Power agreed to supply seventy-five acre-feet of water for the barrier and the West Basin Municipal Water District donated 200 acre-feet for the barrier. The funds and donated water were sufficient to maintain the barrier operations at a minimum level until a zone could be formed in July, 1954.

Formation of Zone II

The Los Angeles County Flood Control District presented its report and recommendations to the Los Angeles County Board of Supervisors in December, 1953. In this report, the District reviewed the nature of the problem of salt water intrusion and efforts which had already been made to solve this problem in West Basin. The report also outlined the limitations of the Los Angeles County Flood Control District Act for dealing with this type of problem on a long-run basis. H. E. Hedger, as chief engineer for the Flood Control District, estimated the costs of constructing and operating the barrier under six alternative plans of operation. Hedger estimated that it would require a capital outlay of \$4,830,000 to construct a complete barrier along

eleven-mile reach. The annual operating cost of a full . . . barrier was estimated at \$501,000, while the water costs would vary from \$312,000 per year for purified Hyperion effluent to \$1,040,000 per year for Metropolitan water. However, Hedger felt that "the five-year life limitations and other limitations as set forth in the zone act would preclude the justification of the capital expenditure necessary and unless extension of the time limit was assured, no permanent benefit would result to the basin."⁴⁰

Consequently, Hedger recommended that "consideration given the formation of a zone for the West Basin should be limited at this time to financing . . . the continued use of the existing facilities for maintaining a barrier against sea water intrusion pending a more permanent means of financing. . . ." ⁴¹ This would not require additional capital outlay and would involve annual operating costs of \$108,000 and annual water costs of \$84,000. Zone revenues would be more than sufficient to finance this limited operation.

In addition, Hedger recommended that his District should be authorized to use zone funds to initiate "an investigation to determine an economical and suitable water

⁴⁰Los Angeles County Flood Control District, "Report on the Advisability of Establishing Water Conservation Zone II of the Los Angeles County Flood Control District" (Los Angeles, December 16, 1953), p. 4.

⁴¹Ibid., p. 8.

supply for such a barrier."⁴² This study would require six months time and cost approximately \$75,000. As a means of financing the eleven-mile barrier, Hedger suggested that "consideration should be given to the derivation of revenues from the area concerned, such as a tax levied by the West Basin Municipal Water District and other municipalities of this [area] for the purpose of providing a supply of water for a sufficient duration to justify the necessary capital investment."⁴³

The County Board of Supervisors approved the recommendations made by the Flood Control District with one exception. The District had recommended that the boundaries of the proposed conservation zone enclose all of West Basin including portions of the City of Los Angeles. Los Angeles protested the inclusion of property within its boundaries on the grounds that these regions would not be "specially benefited" as required by the zone provisions of the Los Angeles County Flood Control District Act. The County Counsel's office ruled that these provisions meant that areas which imported a "predominate" proportion of their water supply would not be "specially benefited."⁴⁴ Since

⁴²Los Angeles County Flood Control District, "Report on . . . Water Conservation Zone II . . .," loc. cit.

⁴³Loc. cit.

⁴⁴As reported by Paul Baumann in West Basin Water Association, Minutes, February 24, 1954, p. 7.

Los Angeles imported at least 85 per cent of its water supply to the West Basin area, the territory within the City of Los Angeles was excluded by the County Supervisors. This exclusion reduced the assessed valuation of the zone by \$113,000,000. The exclusion did not affect immediate plans, as the revenue from the smaller zone would still be sufficient to finance the limited operation of the barrier. Zone II of the Los Angeles County Flood Control District was formally established on July 1, 1954.

While West Basin public entrepreneurs had not solved the problem of salt water intrusion, they had at least proven the physical feasibility of preventing intrusion through the creation of a fresh water barrier against the sea. And, in addition, they had been successful in improving the institutional arrangements to operate and maintain a limited fresh water barrier along a one-mile stretch of the coastline. At the same time, West Basin entrepreneurs had met a series of disappointments. The State appropriation for which they had worked did not prove sufficient to build a major portion of the barrier as hoped. The institutional facilities that they had established in 1951 proved inadequate when they were needed in 1954. The costs of the barrier program were far larger than anticipated and it was uncertain whether they could find an economic source of water. However, West Basin entrepreneurs had also learned that they were functioning in a relatively

competitive public enterprise system that involved a number of exposures whenever they initiated political actions without taking into account the interests of other public agencies. This was an important lesson which they could apply in subsequent years when they attempted to design and create an appropriate management system to develop a conjunctive use system in West and Central Basins.

CHAPTER VIII

DESIGNING AND CREATING AN APPROPRIATE MANAGEMENT SYSTEM

After Zone II was established as a zone of benefit within the Los Angeles County Flood Control District in order to provide a temporary institutional arrangement to operate the one-mile fresh water barrier against the sea, individuals in West Basin could turn their attention to the task of creating a more permanent institutional arrangement. West Basin producers could also begin to think about the type of ground water basin management program that they would like to undertake in the long run. So far their actions had been responses to emergency problems and related specifically to finding solutions for these problems. The results of these actions were beginning to affect the operation of the basin and it appeared that West Basin could be conserved for future use as part of a conjunctive use system. Now they needed to create a new public enterprise with the appropriate boundaries and powers which could have primary responsibility for devising a ground water basin management plan to be placed into operation by a group of agencies working together.

By mid-1954, after three and one-half years of

frustrating events in the attempt to create a barrier, association members had learned several lessons from their experiences. First, they learned that when others financed projects, the financing agency retained control over the way the funds were to be used and the local area lost control of the project. If West Basin water producers wanted to continue local control over the use and allocation of their resources, they would have to finance their own projects. Second, they learned that considerable risk was involved when formal political action was initiated unless potentially affected parties were taken into account early in the planning and were satisfied with the proposed action. Therefore, if the West Basin producers wanted to change the institutional structure related to ground water resources in California, they would have to mobilize wide political support among those directly involved in West Basin affairs (such as the City of Los Angeles, the Metropolitan Water District, the Flood Control District, and the Division of Water Resources) as well as those in other areas which might be affected by such legislation (such as water producers and users in Orange and Riverside Counties and agencies which function in the state as a whole through the Irrigation Districts Association).

The Water Replenishment District Act

In applying these lessons to the problems of creating a permanent institutional arrangement to construct the extended barrier and to manage the basin in the long-run, West Basin producers discontinued their previous practice of drafting proposed legislation within the association and then submitting it to the legislature for the approval of other groups. Instead, Ben Haggott, as president of the association, suggested to W. S. Rosecrans, the president of the Conservation Association of Southern California, that there was a need for representatives from all segments of the California water industry to meet and discuss potential legislation that might solve some of the critical ground water problems facing many California ground water basins. Rosecrans invited representatives of forty-five different agencies to meet in September of 1954 "to draft equitable and effective ground water legislation for introduction at the 1955 Legislature. . . ." ¹ From this large group, a study committee of twelve members, referred to as the Committee of Twelve, was formed to draft legislation that might solve similar water resource allocation problems faced by many areas in the state. Ben Haggott was appointed as chairman of the group and Louis Alexander was appointed as a representative of the Central Basin Water Association.

¹Letter from W. S. Rosecrans to the Central Basin Water Association, July 30, 1954.

Warren Butler from the Metropolitan Water District and Rex Goodcell from the Department of Water and Power of the City of Los Angeles were also intimately familiar with the West Basin problems.²

After several meetings of this group, it appeared that the northern part of the state was not interested in new legislation and would oppose any proposed legislation applicable generally to the entire state. In addition, members of the Orange County water industry had recently arrived at a satisfactory local settlement of some of their problems and opposed any new legislation which would include

²The other members were Paul Bailey, Orange County Water District; Ranson W. Chase, Water and Power Committee, Los Angeles Chamber of Commerce; J. J. Deuel, California Farm Bureau Federation; Robert Durbrow, Irrigation Districts Association of California; James K. Krieger, a water law attorney from Riverside County; A. C. Reynolds, California Mutual Water Company Association; Ralph H. Taylor, Agricultural Council of California; G. I. Wilde, United Water Conservation District. Charles C. Cooper, Metropolitan Water District, attended some of the early meetings.

The success of the strategy of involving a wide group of interests related to water in order to gain their approval of legislation prior to going to the Legislature can be seen in this statement by one of the members of the Committee of Twelve:

The Committee of Twelve was made up of engineers, attorneys and representatives of irrigation districts, water districts, farm bureaus, cities, private utilities and the State of California itself. Into that group came a variety of viewpoints and a diversity of problems which was most beneficial. Instead of recommending solutions for particular areas or groups, the ideas of this committee were bound to be cross-sectional in their scope.

James K. Krieger, "Progress in Ground Water Replenishment" (mimeo; April 15, 1955), p. 2.

their territory. Haggott felt that these problems could be surmounted if the application of new legislation was "limited to areas in southern California and where supplemental supply is available (areas now within or possible of annexation to M.W.D.)."³ Haggott also recommended that new laws should be framed so that they "became operative at local option in a way to exclude Orange County."⁴

Discussion of proposed legislation centered on two types of political change. The first related to legislation designed to expedite future ground water adjudications. The Referee in the West Basin case took seven years to prepare the first report largely as a result of the dearth of information concerning the historical water production patterns of the litigants. To correct this situation in the future, the committee drafted legislation to require all those who produced at least twenty-five acre-feet of ground water per year to file notices of their extraction for each year with the appropriate state agency. As discussed in Chapter II, this legislation was subsequently passed and made a significant difference in the behavior of ground water producers by making a record available on water production. The legislation could not expedite the West Basin case, but it would provide some of the necessary information

³Ben Haggott, "Statement of Issues and Proposals on Under-ground Water Legislation," (mimeo; Los Angeles, October 11, 1954).

⁴Loc. cit.

for a relatively rapid basin-wide adjudication in Central Basin at a later time.

The second area of proposed legislation was the design of a new general law district which could undertake broad replenishment responsibilities financed primarily by an assessment on the ground water production of pumpers within the boundaries of a district created by the initiative of people in a local area. After extended discussion and negotiation, the committee succeeded in drafting a Water Replenishment District Act during the early spring of 1955, which was subsequently enacted by the Legislature, signed by the Governor and incorporated into the state Water Code.

The new legislation enabled local areas in the counties of Santa Barbara, Ventura, Los Angeles, San Diego, Riverside, San Bernardino and Orange to organize a public district to replenish the local ground water supplies of an area. The area within the Orange County Water District was specifically excluded from the operation of this statute.

The formation of a replenishment district differs somewhat from that of many other public water service agencies in California. The process is initiated by the circulation of a petition within the proposed district which may include both incorporated and unincorporated land and be located in more than one county. The proponents of a new district are required to gain the signatures of at

least 10 per cent of the registered voters residing within the boundaries of the proposed district. Persons seeking to organize such a district are required to include in the petition a statement limiting the annual property tax rate that can be imposed by the district. In no case can the proposed property tax limitation exceed a rate of \$.20 for each \$100 of assessed valuation. This provision was included to gain the support of water producers in other areas interested in the possibility of creating replenishment districts but opposed to the idea of a severance tax.⁵

The completed petition is to be filed with the appropriate county clerk (or county clerks in cases involving areas in more than one county) who is responsible for verifying its sufficiency. The petition is then filed with the Department of Water Resources which is held responsible for determining what property should be included or excluded from a district based upon a determination that the people within the proposed area will benefit directly or indirectly from the replenishment program. This provision was intended to remove the control over the determination of new water district boundaries previously held by the County Board of

⁵In a report to the West Basin Water Association, Louis Alexander stated that "the original concept for the bill was that an assessment on pumping only would be provided and . . . no ad valorem tax would be permitted. . . [T]he farm element in the State had insisted upon an ad valorem tax rate provision and . . . the present bill represents a compromise between the two points of view." West Basin Water Association, Minutes, April 12, 1955, p. 8.

Supervisors and reduce the influence of the City of Los Angeles and the Metropolitan Water District on the areas to be included or excluded from water service districts created in Los Angeles County.

A replenishment district is governed by a five-man board of directors elected every four years in alternating terms from divisions of the district which contain approximately equal population. Once created, a replenishment district may do any act "necessary to replenish the ground water of said district."⁶ Specifically, replenishment districts are empowered for the purposes of replenishing ground water supplies, to buy, sell and exchange water. A district may "distribute water to persons in exchange for ceasing or reducing ground water extractions."⁷ In addition, a replenishment district may "spread, sink and inject water into the underground," and "store, transport, recapture, reclaim, purify, treat or otherwise manage and control water for the beneficial use of persons or property within the district."⁸ Replenishment districts are authorized to build the necessary works to achieve their objectives.

This list of powers, in addition to the corporate powers to have perpetual succession, to sue and be sued, to take, lease, use, convey and dispose of real property, and to construct and operate waterworks necessary to

⁶ California Water Code, sec. 60220.

⁷Ibid., sec. 60221.

⁸Loc. cit.

replenish the underground water basin, gives an agency created under this act extensive legal authority to institute controls over both the inflow and outflow of water within a district. A district can initiate and assume the costs of local actions "begun to prevent interference with water or water rights used or useful to lands within said district. . . ."⁹

The organic legislation includes a unique provision that was intended "to avoid duplication of similar operations by existing agencies and replenishment districts."¹⁰ In the event that "an existing agency has facilities available and adequate to accomplish any part of the purposes of a district . . . the district shall investigate and determine the cost of contracting for the accomplishment of such purposes through such existing agency."¹¹ The replenishment district is expected to contract with an existing agency if its board of directors makes a finding that such a contract "is more economical and for the best interests of the area to be benefited."¹² However, the authority to make such a determination rests with the board of the replenishment district and such a district may undertake the works itself instead of committing itself to an inter-agency contract.¹³

⁹California Water Code, sec. 60230.

¹⁰Ibid., sec. 60231. ¹¹Loc. cit. ¹²Loc. cit.

¹³Krieger explained this provision in the following

As a result of this provision, a replenishment district could be organized primarily as a management and financing district to provide funds for the operations performed by other agencies. Under the circumstances where a replenishment district may exercise a substantial quantity of its authority through contracts with other agencies, the fiscal powers of the district become very important. These powers give a replenishment district its capabilities in relation to the agencies with which it contracts. This situation makes the financial provisions of the act of particular importance. A water replenishment district has three methods for obtaining revenue: a replenishment assessment, an ad valorem tax, and the capacity to set water rates for the sale or exchange of water for replenishment purposes.

The first method of obtaining revenue is the replenishment assessment to be paid by each ground water producer located within the district on the amount of water withdrawn from the ground water supplies within the district. Prior to determining the annual rate of the replenishment assessment to be levied, a district is required to make an

way:

Certain existing public agencies believed that they had the facilities to accomplish replenishment. Some of these agencies had the facilities to replenishment ground water basins, but no means of raising funds to purchase the water to do the replenishing. They felt that they should be permitted to do the job, and that no new public corporation should usurp their functions.

Krieger, op. cit., p. 6.

extensive engineering survey and report on the ground water supplies of the district. Among the findings to be made in the report is whether there was an overdraft during the preceding water year, the estimated overdraft for the current year and an estimate of the overdraft that will occur in the ensuing year. Then, the district is required to determine the quantity, source and cost of water which could be purchased to replenish the overdraft.¹⁴ After completing these findings, the district is required to estimate the rate of the replenishment assessment that will be required to produce sufficient revenue to purchase replenishment water. These findings of the physical operation of the basin and about the availability and price of replenishment water are reviewed at a public hearing prior to a final order setting the replenishment assessment rate for the ensuing year.

The final order establishing the replenishment assessment on each acre-foot of ground water to be produced within the district during the ensuing year is effective within ninety days and must be paid in quarterly installments by all water producers within the district.¹⁵ The district is empowered to charge a 1 per cent per month interest charge on delinquent payments. If a ground water producer fails to report his production, the district may impose a

¹⁴California Water Code, sec. 60300.

¹⁵Ibid., sec. 60325.

penalty charge not to exceed 10 per cent of the replenishment assessment which the water producer is subsequently determined to owe the district. If a water producer refused to register a well or pay his assessment, the district is authorized to ask the court to issue an injunction restraining the water producer from operating his production facility.¹⁶

The Replenishment District Act contains an additional provision related to the replenishment assessment which was one of the most controversial issues discussed by the Committee of Twelve. Once a basin-wide adjudication has been completed and the safe yield of the basin determined, the act specifically excludes each producer's share of the safe yield of a basin from the replenishment assessment. Specifically the act states:

In the event of an adjudication of all or substantially all of the rights to extract ground water and a determination of the natural safe yield of the ground water supplies within the district, and a determination of the amount or extent to which the rights to extract ground water so adjudicated may be exercised without exceeding the natural safe yield of such ground water supplies, the board of such district shall recognize such judicial determination by exempting from replenishment assessments the amount of water pumped by each person whose rights have been so adjudicated which does not exceed his proportionate share of the natural safe yield of the ground water supplies of the district, as so adjudicated from time to time by the court having jurisdiction over such adjudication proceeding.¹⁷

¹⁶California Water Code, sec. 60337.

¹⁷The legislation also provides that all water production facilities must have water-measuring devices attached

The section as originally proposed excluded all water right holders from paying assessments on their total rights. Members of the Committee of Twelve who objected to the original proposal argued that it established "two classes" of water producers and released the privileged class from bearing its full financial burden for a replenishment program of benefit to them. Charles C. Cooper, the assistant general counsel for the Metropolitan Water District, argued that the limitation of an assessment to the amount of production in excess of a producer's legal right to extract water "would render the scheme impractical and unworkable as a revenue measure."⁸¹ Cooper was joined in his view by Warren Butler, who compared the problem of replenishing depleted ground water basin supplies with the problem of financing a new school for a recently developed subdivision. "Schools are, of course, a public enterprise in which all share the cost equally in each community. Why shouldn't water supply be also the responsibility of the whole community in the same equal manner."¹⁹ Butler concluded that the application of the "principle of sharing our financial responsibilities in providing for community needs makes it possible to

"capable of measuring the accumulated amount of ground water produced therefrom." California Water Code, sec. 60350.

¹⁸Charles C. Cooper, "Statement of Issues and Proposals on Underground Water Legislation" (mimeo; October 13, 1954), p. 1.

¹⁹Warren Butler, "Statement of Issues and Proposals on Under-Ground Water Legislation" (mimeo; October 11, 1954), p. 1.

simplify the problems of our extremely complex society down to the point where we can endure them."²⁰

The final provision was a compromise whereby the right holder was allowed "free pumping" for that portion of his right that represented his share of the safe yield of a basin rather than for his entire right. This compromise was discussed by one member of the group when he wrote:

Another genuine compromise was reached with respect to who would pay a pumping tax. . . . Certain groups believe that the charge should be based upon the number of acre-feet each person pumps regardless of any water rights he may claim to have. On the other hand, those people from rural areas where water rights are long established believe with equal sincerity that pumpers should be excused from paying A tax on the amount of water which is theirs by court decree. Consequently, the bill provides that if and when there is an adjudication of water rights within a replenishment district, the board of directors of that district must exempt from a pumping charge that portion of any pumper's adjudicated rights in and to the safe yield of the basin.²¹

The second method by which a water replenishment district may raise revenue is the use of an ad valorem tax. As noted above, all water replenishment districts are precluded from levying an ad valorem tax in excess of \$.20 per \$100 of assessed valuation. Each replenishment district can establish a lower limit in the initial petition circulated in the formation process. The ad valorem tax is to be used primarily to pay for the administrative operations of the

²⁰Butler, loc. cit.

²¹Krieger, op. cit., p. 3.

district or to pay for the principal and interest on any bonded indebtedness.²² The third revenue producing power of water replenishment districts is the authority to fix a rate for the sale or exchange of water for replenishment purposes. It was assumed that if an agency chose to exercise its power "to distribute water to persons in exchange for ceasing or reducing ground water extractions," that the agency would need to be able to set an appropriate charge for the water so delivered.

The replenishment district designed by the Committee of Twelve would enable an area like West Basin to create a management enterprise to negotiate long range plans with the Flood Control District, Metropolitan and others for the joint operation of the basin as part of a conjunctive use system. The replenishment district could provide the funds and contract with others to perform various aspects of a management program. However, if other agencies did not perform satisfactorily, the replenishment district had sufficient powers to perform its own services. The legislation as finally drafted was different from that which West Basin producers would have written specifically for their own purposes. However, by taking into account the needs of other areas and existing water service agencies, West Basin was able to gain rapid approval of the final draft once

²²California Water Code, sec. 60251.

submitted to the Legislature.²³ Since the Committee of Twelve's goal was to present a unified front to the Legislature once agreement was reached, West Basin interests continued to be protected. Formal approval by the association was as essential for the success of the Committee's proposal as was the approval of other groups of water producers.²⁴ As a result, West Basin had an informal veto over any proposal which was not satisfactory to it.

Constituting a Management System for West Basin

The passage of the Water Replenishment District Act provided the legal authority for members of the West Basin

²³There were actually very few amendments offered while the bill was being considered by the Legislature. Amendments added to the bill after original submission included provisions that "mineral rights separately assessed shall be exempt from property tax, that the petition for formation of the replenishment district be signed by 10 per cent of the registered voters rather than by 10 per cent of those voting at the last election, that the replenishment district must pay for relocation of utilities, roads, railroad., etc., in event of condemnation, that a 6 months waiting period must expire before circulating a new petition if one has failed, and that Orange County Water District be specifically excluded from the Act." Report by R. R. Thornburn to the association, Minutes, May 26, 1955, pp. 14-15.

²⁴Haggott called a special meeting of the board of directors on April 12, 1955, to consider the draft of the Replenishment District Act and the Recordation Act. He wanted formal approval by the association before he acted to approve the final draft within the Committee of Twelve. At the special meeting, both Haggott and Alexander were asked many questions and subjected to some criticism for not having accomplished all that the association wanted, but the association members voted unanimously to support the drafts. Minutes, April 12, 1955, p. 11.

Water Association to proceed with the organization of a new public enterprise to undertake a more comprehensive basin management program. The effort to negotiate at the informal level and gain wide political support prior to an overt political action which involved exposure to the influence or veto power of others had been successful. The capacity of the Legislature to alter or refuse to pass legislation submitted to it by a local area always poses an element of exposure for those proposing new legislation. The Legislature may adopt provisions at variance with the objectives of those proposing the creation of a new public instrumentality. The association had minimized this risk by involving others in the design of the proposal who might oppose the creation of new institutional arrangements to manage and replenish ground water basins.

The process of organizing a replenishment district involved still other exposures, some of which were built into the process by the Committee of Twelve to insure that certain interests were taken into account when replenishment districts were formed. The first major exposure in the formation process was the requirement that the Department of Water Resources had the responsibility to "determine whether or not other lands should be included within the proposed district, or whether some lands which are included should be excluded, and whether the proposed district, as modified by inclusion or exclusions, will be of benefit

generally to all persons or property which rely directly or indirectly upon the use of or right to use the ground water supplies within such proposed district."²⁵ As noted above, this provision removed the power to determine what territory should be included within a proposed replenishment district from the Los Angeles County Board of Supervisors and reduced the influence of the City of Los Angeles and the Metropolitan Water District to affect the designation of boundaries. However, the proponents of a new district were still exposed to the claims of any public jurisdiction that some of the territory within the proposed boundaries should not be included, or that the district as a whole would not be of benefit to the area and should not be created.

The second exposure was the need to gain public approval through an election to authorize the creation of the district. West Basin producers remembered the first attempt to create the West Basin Municipal Water District. In that case the open and aggressive opposition of civic leaders in certain communities led to a failure at the polls. If public agencies opposed a proposed replenishment district and were not successful in removing territory within their boundaries during the proceedings before the Department of Water Resources, public officials from these jurisdictions could go to the voters and urge a negative vote against a

²⁵California Water Code, sec 60097.

proposed replenishment district. This would greatly increase the cost of a replenishment district campaign and add to the risk of another failure at the polls.

In addition to being exposed to the demands of other public jurisdictions that the new enterprise be created in conformance with their interests, West Basin producers were faced with a series of technical and economic questions to be resolved. Some of these concerned the type of water to be used in the barrier, the responsibility of different agencies for the construction of various facilities, the possibility of creating a large replenishment district to include Central Basin, the limitation to be placed on the ad valorem tax, and the amount of revenue to be gained from a replenishment assessment. These variables were all inter-related. A change in any one variable affected all the others. Consequently, West Basin entrepreneurs were faced with the problem of juggling a number of critical factors for organizing a district until they arrived at a satisfactory settlement for all involved.

The process of negotiating a settlement on all of these essential factors represents the vital phase of developing an understanding which in effect would serve as a constitution for the organization of the mixed public enterprise system which would be responsible for the management of the West Basin water industry. While this was conducted in the context of decisions being taken for the organization

of the West and Central Basin Water Replenishment District, the formulations in this "constitution" involved a settlement for the coordination of the activity of all of the principal water agencies. The process of negotiating this basic settlement took nearly three years. Once this settlement was reached, the organization of the Central and West Basin Water Replenishment District was accomplished in very short order.

Negotiating the "Constitutional" Settlement

Most of the early negotiation leading toward the constitution of a new management enterprise occurred within the West Basin Water Association's ad hoc committee on boundaries of the proposed replenishment district. This committee was subsequently fused with a similar committee within the Central Basin Water Association. Official members of this committee were from the associations, but representatives from the Flood Control District, the Metropolitan Water District and the State Department of Water Resources attended meetings frequently and were directly involved in the negotiations.

The source of water for use in the fresh water barrier proved to be one of the most important variables to be discussed during the first year and one-half of these negotiations. The Flood Control District had used treated Metropolitan water as its prototype model, but considered this

source too expensive for use in a full-fledged barrier program. In addition, the Colorado River aqueduct would not be expanded to full capacity until 1960, and Metropolitan could not meet the requirements of the extended barrier and still satisfy domestic demands until the aqueduct expansion program was completed. As a result, West Basin producers and Flood Control District engineers expected to be able to use sewage effluent produced at the Los Angeles City Hyperion Treatment Plant. However, there appeared to be serious technical problems involved in the attempt to use Hyperion water. The effluent produced by the Hyperion Treatment Plant during 1955 and 1956 needed additional treatment prior to its injection directly into the basin.

Several methods for additional treatment had been considered. Flood Control District engineers favored a plan to spread Hyperion effluent on nearby land owned by the Los Angeles International Airport. After the effluent had percolated through twenty feet of soil, the Flood Control District planned to recapture it for use in the barrier. An informal agreement had previously been negotiated with airport officials "to create a cooperative project designed to satisfy the drainage requirements of the area as well as the spreading needs for reclaiming the effluent."²⁶ In the fall of 1955, it appeared that only a limited amount of

²⁶Report by Paul Baumann to West Basin Water Association, Executive Committee, Minutes, August 18, 1955, p. 4.

land would be available, but the Flood Control District engineers began to survey the area and draw plans for eventual operation of a subsequent reclamation project. However, all efforts to develop this land for a joint use project were dropped in February, 1956, when airport officials indicated that "there would be no airport land available for such purposes."²⁷

Within a few days, the chairman of the West Basin Water Association's committee on "boundaries," R. R. Thorburn, reported to the association that his committee had realized that "the replenishment program in West Basin had been predicated upon the use of Hyperion effluent and . . . while use of such effluent had been discussed for a number of years, there was nothing to indicate that this water would be available or that it could be satisfactorily reclaimed and used in the Basin."²⁸ The association had written the Flood Control District asking whether it would be possible to use Hyperion water if the airport land was not available for use as an additional reclamation program. Thorburn concluded that the "Flood Control District's reply . . . made it necessary to re-evaluate the problems of replenishment and to face the actual facts with respect to

²⁷Report by R. R. Thorburn, West Basin Water Association, Executive Committee, Minutes, February 15, 1956, p. 4.

²⁸West Basin Water Association, Minutes, February 23, 1956, pp. 18-19.

difficulties in using Hyperion effluent."²⁹

The committee on boundaries "started over again" by beginning to gather data on the cost of bringing raw Metropolitan water to the basin for use in the barrier once the Colorado River aqueduct had been expanded to full capacity in 1960.³⁰ The Committee did not want "to eliminate possible use of reclaimed sewage effluent but to work on a program which seemed to offer a more immediate solution."³¹ Members of both associations were appointed "to approach the Metropolitan Water District . . . to see whether a firm commitment of a sufficient quantity of water could be obtained . . . and to request a certain amount of engineering and cost estimates which would be needed."³²

Once West Basin producers realized that they would probably have to use untreated Metropolitan water for the barrier, they began more intensive talks with their Central Basin neighbors concerning the creation of one large district to include both basins. When the two associations had

²⁹West Basin Water Association, Minutes, February 23, 1956, pp. 18-19.

³⁰While the committee began to consider the use of Colorado River Water, the Flood Control District continued its tests of Hyperion effluent. At the May 24, 1956, meeting of the association, Paul Baumann reported that the District was constructing an infection well near the Hyperion Plant and working with the Regional Water Pollution Control Board and with Hyperion engineers to set quality standards for injection.

³¹Report by Allan Harris, West Basin Water Association, Minutes, March 22, 1956, p. 6.

³²Ibid., pp. 6-7.

first started these negotiations, the differences between the two basins were quite apparent. An outline of these differences was presented by the chairman of the committee to a West Basin association meeting in November, 1955, as follows:³³

	<u>West Basin</u>	<u>Central Basin</u>
Approximate Area	130 sq. miles	250 sq. miles
Population in 1955	580,000	1,500,000
Approximate Assessed Valuation	\$600,000	\$1,500,000,000.
Annual Overdraft	60,000 acre-feet	110,000 acre-feet
Method of Replenishment	Injection Wells	Spreading Grounds
Status of Water Rights	Interim Agreement and Controlled Pumping	No Adjudication and Increasing Demands

At the same meeting, Thorburn also outlined the reasons for and reasons against forming a district to include both basins:

Reasons for forming a district including both basins:

1. The purpose would be the same in both basins, to wit: Replenishment of the ground water supply.
2. Greater financial resources would be available, hence the rate of tax and amount of pumping assessment could be lower.
3. A large district would have greater political strength and would be more effective in dealing with the Upper San Gabriel Valley District and various state bodies.
4. The Long Beach Harbor area offers a potential route for intrusion of sea water into West Basin and would probably be included. It is doubtful

³³West Basin Water Association, Minutes, November 17, 1955, pp. 9-10.

if any of Long Beach could be included in a district comprising only the West Basin.

5. Under flow of ground water across the fault from Central to West Basin would probably be greater under the replenishment program of a larger district.
6. Administration costs would be less in a larger district.

Reasons against forming a district including both basins:

1. The injection form of replenishment is unique and necessary to West Basin. Central Basin would control that program in the West Basin if a large district is formed and might not want to continue the well injection method along the coast.
2. Pumping is curtailed in West Basin and not in Central Basin.
3. The degree of ultimate curtailment might not be the same in both basins.
4. Control of the local tax rate and amount of pump assessment would be relinquished by West Basin.
5. A local district could initiate proceedings to insure natural replenishment from Central Basin.
6. Extensive recharge of Central Basin might contribute free water to West Basin.³⁴

West Basin water producers were aware that the manner in which an organization was formally constituted would significantly affect its actions thereafter. While there were obvious advantages related to the close hydrologic inter-relationship between the two areas, there were also grave risks that Central Basin might dominate the new enterprise to the disadvantage of the West Basin producers. West

³⁴West Basin Water Association, Minutes, November 17, 1955, pp. 9-10.

Basin association members wanted to be able to assure that their future interests would be taken into account before they supported the idea of one district to include both basins. The fears and hopes of the West Basin producers were summarized in a letter written by the chairman of the committee on boundaries to his committee during the fall of 1955, when he wrote:

In the event a water replenishment district to include both Basins is decided upon, it appears desirable that a statement of policy morally binding on the new district board of directors should be adopted. The policy should provide assurance of an effective salt water barrier program for West Basin, a curtailment of pumping in Central Basin to insure continued ground water flow into West Basin, and an arrangement of the five divisions of the new district so that territory of both Basins would be included in each such division to prevent West Basin versus Central Basin representation on the board of directors.³⁵

West Basin producers have always faced a strategic disadvantage in bargaining with their upstream neighbors in Central Basin and the Upper San Gabriel Valley. Since West Basin producers are on the end of the pipe line, other producers could eliminate their supply of local ground water by increasing the withdrawals higher in the system. There is no physical way to prevent this. The critical question for West Basin producers has been the determination of the most appropriate set of economic, legal and political strategies to prevent increased upstream withdrawals. After their costly experience with litigation, most West

³⁵Letter from R. R Thorburn to the Replenishment District Boundary Committee, October 27, 1955, p. 2.

Basin producers hesitated to enter into prolonged adjudication concerning the respective rights of Central Basin producers and West Basin producers to the joint supply. The possibility of creating a management enterprise to include both basins offered the opportunity to negotiate a rationing agreement within the framework of a common public enterprise. However, as the chairman of the West Basin committee recognized, it also involved the risk of losing their independence if Central Basin interests were to gain a pre-dominate position in the institutional structure of the new enterprise.

Once it had been decided to use untreated Colorado River water in the barrier, both basins were consequently dependent upon the same source of water for their replenishment needs. This seemed to be the critical factor that swayed many West Basin producers toward approving the idea of a joint district. By forming a larger district, both areas would gain considerable bargaining strength in relationship to Metropolitan. And, once Metropolitan was the major supplier of replenishment water for both basins, the interests of the West Basin producers were more adequately protected since they could count upon Metropolitan to bring pressure upon a future replenishment district to build the barrier as expected and purchase the water made available by Metropolitan for this purpose. By committing themselves to the use of Metropolitan water, West Basin producers

gained a powerful ally in case the future replenishment district were dominated by Central Basin and not interested in continuing the barrier project.

In November, 1956, the West Basin committee on boundaries officially reported its conclusion that "the interests of the West Basin would be best served by formation of a joint water replenishment district to include the areas of both Central and West Basins. . . ." ³⁶ "The idea of forming one replenishment district to include both West and Central Basin," one member commented, "was favored because of the emphasis on the use of raw water rather than on the use of reclaimed sewage effluent." ³⁷

During the fall of 1956, the focus of negotiations shifted to an internal committee of the Metropolitan Water District on water spreading and pipelines chaired by W. C. Farquhar, a West Basin Municipal Water District representative on Metropolitan's board of directors. Farquhar initiated a series of meetings of his committee with Flood Control engineers to see whether Metropolitan could provide the water needed for replenishment purposes in both basins. As a result of these preliminary consultations, Farquhar's committee asked the general manager and chief engineer of the Metropolitan Water District to prepare a plan that

³⁶West Basin Water Association, Minutes, November 15, 1956, p. 13.

³⁷West Basin Water Association, Executive Committee, Minutes, November 15, 1956, p. 3.

would enable Metropolitan to supply water for the future barriers along the west coast between Ballona escarpment and Palos Verdes, in the Dominguez Gap and the Alamitos Gap, as well as for increased spreading at Whittier narrows.

After five months of study and planning, Robert Diemer, Metropolitan's general manager and chief engineer, presented a comprehensive plan to meet the needs of several areas for replenishment water. Diemer proposed that the lower Metropolitan feeder "crossing Central Basin from Orange County be used as a raw water line with laterals extending southward and branching to the Los Alamitos areas on the east and the Dominguez and West Coast areas on the west."³⁸ This plan required the construction of approximately thirty-six miles of new pipelines including a replacement for the treated water distribution line into Orange County and the construction of several laterals to transport raw water from the lower feeder to the replenishment facilities. In total, Diemer's plan would cost Metropolitan \$21 million, of which \$10 million would be used to build the laterals to supply raw water for the West Coast barrier.

In April, 1957, the Metropolitan Board of Directors adopted a general policy statement approving Diemer's proposal. The statement declared that the lower feeder "as

³⁸West Basin Water Association, Minutes, February 29, 1957, p. 17.

a matter of policy . . . shall be used for transporting untreated water rather than treated water. . ."³⁹ In addition, the directors declared their willingness to build the pipe lines described by their general manager "on the condition that within the next four years there shall be organized a water replenishment district or districts in the Central and West Basins."⁴⁰ The directors added the further proviso that the new replenishment district or districts would execute a contract with Metropolitan "for the purchase of untreated Colorado River Aqueduct water for the replenishment of the local underground basins to the full amount of the revenues made available by charges on pumped water."⁴¹

While association members were talking with Metropolitan officials to gain definite assurance of a supply of water, they were also meeting with Flood Control officials in the hopes of gaining a more definite plan of operation for the new barrier. The proponents of a replenishment district needed specific facts to present in their proposal and the association was dependent upon the Flood Control District to drill numerous test wells and analyze the geologic formations along the whole coast, to determine the quantity of replenishment water needed, to perform right of way studies

³⁹Policy statement adopted by the Board of Directors of the Metropolitan Water District of Southern California at its meeting on April 16, 1957.

⁴⁰Loc. cit. ⁴¹Loc. cit. Emphasis added.

and to plan the design of the required facilities and structures. However, the Flood Control District maintained that it could not perform the necessary studies in the time period desired by the association because of the problem of staff limitation. To help the Flood Control District gain a larger permanent staff to undertake these studies, the two associations passed resolutions asking the Los Angeles County Board of Supervisors to authorize the Flood Control District to expand its barrier research program. The Flood Control District reported to the Board of Supervisors that it needed authority to establish twenty new positions to undertake a three and one-half year investigational program at a cost of \$850,000. In the spring of 1957, the Board of Supervisors approved the plan submitted to them by the district with the recommendation of the association, and the Flood Control District was authorized to expend \$550,000 from Zone I and II funds and \$300,000 from general funds for this purpose.

By the spring of 1957, it appeared that the two associations had settled most of the important questions relating to the creation of a replenishment district to include both basins which would purchase water from Metropolitan to be injected and spread by the Flood Control District. The associations turned to the problem of determining the exact boundary of the proposed district. Louis Alexander, a member of both associations, met several times with Harvey

Banks and Max Bookman of the Department of Water Resources to determine their views on the likely boundaries to be included in a new replenishment district. Once the formal formation process was initiated, the Department would have to make a formal ruling on this question, and the associations wanted to involve the Department in the consideration of preliminary boundaries at an early date. The Department was authorized to assist areas planning to establish a replenishment district in the task of determining the appropriate boundaries based upon the area to be benefited from the proposed program.

The West Basin boundary had been designated by the Referee in the prolonged West Basin litigation. While many enterprises disagreed with the eastern boundary of the Referee's designation, all were willing to accept the northern boundary defined by the Referee as the northern boundary of the West Basin portion of the district. The difficult question to resolve related to the northern boundary for Central Basin, as this had never been determined authoritatively. The question of area to be included related to the question of what territory in the broad area known as Central Basin would be benefited by the spreading program at the Whittier narrows. The preliminary boundary description for the new district drawn by Department of Water Resources officials included the entire area designated by the Referee as a part of West Basin, all of

the Central Basin Municipal Water District, the entire City of Long Beach and a considerable portion of the City of Los Angeles.

Once the Department had assisted in preparing this tentative boundary description, association members were anxious to gain general approval. The City of Long Beach approved its inclusion in the proposed district so long as a considerable portion of the City of Los Angeles was also included. But when Louis Alexander and Carl Fossette subsequently met with representatives of the City of Los Angeles in July, 1957, they found that these representatives voiced strong opposition to the inclusion of any Los Angeles City territory in the proposed district. Their opposition was based upon the City's lack of benefit, since nearly all of its water derived from sources outside West Basin. After an unsuccessful meeting, Alexander and Fossette left "a map of the coastal plain with the Department representatives with a request that they indicate a suitable north boundary on the map for the proposed new district."⁴²

In response, William S. Peterson, general manager and chief engineer of Los Angeles' Department of Water and Power, wrote a letter addressed to both associations, transmitting a copy of the map left at the first meeting and

⁴²West Basin Water Association, Joint Executive Committee, Minutes, August 21, 1957, p. 4.

stating that "because of the geographical situation of land outside the City of Los Angeles it was believed that two separate water replenishment districts should be formed, one bordering the City of Los Angeles on the east and the other situated generally west of the City."⁴³ On August 2, 1957, the Department of Water and Power wrote to the Water and Power Committee of the Los Angeles City Council and to the Metropolitan Water District expressing opposition "to the inclusion of any Los Angeles City territory in a water replenishment district . . . [and] to the possibility of the Los Angeles City tax payers participating in the cost of constructing lateral pipelines to Central and West Basin for delivery of unsoftened water. . ."⁴⁴ The Department of Water and Power indicated that it would not object to the construction of "untreated water lines provided treated water would be supplied to the City when required . . ." at specified locations.⁴⁵ The City of Los Angeles, was, therefore, objecting both to its inclusion within the proposed replenishment district and to the decision made by the Metropolitan board of directors to finance the construction of laterals to be used to transport untreated Colorado River water for the barriers.

After fortifying themselves with additional reports by

⁴³West Basin Water Association, Joint Executive Committee, Minutes, August 21, 1957, p. 2.

⁴⁴Ibid., p. 3.

⁴⁵Loc. cit. Emphasis added.

the Flood Control District, the Department of Water Resources and some of their own members, the two associations began a serious round of negotiations with the City of Los Angeles in January, 1958. The association had determined that it was essential to gain the support and cooperation of the City of Los Angeles before attempting to form a replenishment district. The City was just as determined to oppose any proposal to create a replenishment district which would levy a property tax on residents of the City of Los Angeles and undertake an expensive replenishment program while water producers continued to withdraw more water from the area than the safe yield. The associations appointed a "water replenishment sub-committee" to meet regularly with representatives of the Department of Water and Power until a satisfactory settlement could be reached at the informal level.

Among the fundamental issues at controversy was the plan of the replenishment district proponents to eliminate the two zones of benefit within the Flood Control District and to utilize the taxing power of the Replenishment District to finance the construction of the barrier. The City of Los Angeles had opposed its inclusion in the zones of benefit on the grounds that it was inappropriate to tax the high property values within the City of Los Angeles to gain funds to build a barrier which was of marginal benefit to Los Angeles City taxpayers. Los Angeles won its fight to

be excluded from the zones of benefit. Having won that round, the City felt it had enough power to gain the exclusion of its territory from a replenishment district that proposed to undertake the same actions as the zones of benefit. The proponents of the new district argued that the use of an ad valorem tax was justified as a proper charge against land which had benefited from the economic development fostered by the excessive withdrawal of ground water reserves. The use of the revenue producing powers of the Flood Control District zones of benefit had always been considered a temporary measure, since the zones could be terminated easily. The capability of the replenishment district to use an ad valorem tax levied on all the land included within the proposed district would enable the district to collect enough capital to construct the barriers immediately.

Since Los Angeles had used a much higher proportion of imported water and had made a very small demand upon ground water in Central and West Basins, City officials did not feel that Los Angeles property owners should pay for the replenishment of the accumulated overdraft. Los Angeles was willing to contribute to a replenishment program which was financed by an assessment on the volume of water produced by each entity. In this way, Los Angeles City representatives argued, Los Angeles would bear an appropriate burden of the replenishment program, but would not pay a

proportionately high share of the cost of replacing the overdraft caused by others.

As a compromise the group agreed to continue the two zones of benefit within the Flood Control District which contained little Los Angeles City territory. The funds received from the \$.05 ad valorem tax levied in these zones would then be devoted in theory to the replenishment of the accumulated overdraft, All water purchased by the replenishment district would be financed by an assessment on the volume of ground water production within the district. The district would be prohibited from using money raised from an ad valorem tax to purchase water, but the district could levy a one-half cent ad valorem tax to cover district administrative costs and the expense of litigation.

Los Angeles City representatives also objected to the idea of replenishing the basins while producers were still withdrawing water in excess of safe yield. Los Angeles representatives felt the cost of the replenishment program was too high to justify the continued use of the basins to meet base demands. Their first proposal to alter this situation was that a legal action be initiated to test the validity of the "in lieu filing section" of the Water Code. As discussed in Chapter III, supra, sections 1005.1 and 1005.2 of the Water Code were written to protect users of imported water from losing water rights when they substituted imported water for local ground water. However,

ground water producers doubted that these provisions actually protected their rights and had continued with their excessive drafts even when imported water was available. If the courts would validate these sections in a contested litigation, ground water producers within the proposed replenishment district might be more willing to use a larger quantity of imported water, but the subcommittee was unable to find anyone to bear the financial burden for such a legal action.

As an alternative, a Los Angeles official suggested that the proposed district "shall levy an assessment on pumping sufficient to insure a reduction of pumping . . . [and] greater use of imported water."⁴⁷ The Los Angeles representatives did not receive a definite guarantee that the replenishment assessment would boost the cost of ground water to equal the cost of imported water. However, the preliminary estimates of the amount of a replenishment assessment that would be necessary to purchase the required quantity of water for the barrier and spreading program reassured them that the replenishment assessment would increase the cost of ground water so that it approximated the cost of imported water. In addition, it was agreed that the new district would be responsible for initiating a basin-wide adjudication in Central Basin immediately upon forma-

⁴⁷West Basin Water Association, Water Replenishment Subcommittee, Minutes, January 30, 1958, p. 2.

formation in order to reduce pumping in Central Basin. By July, 1958, the associations and the City of Los Angeles had come to an essential agreement satisfactory to all.

The negotiated settlement by the association and the City of Los Angeles, as well as with the Flood Control District, Metropolitan and the Department of Water Resources, was formalized in a seven-page "Proposal" made by the subcommittee on July 30, and presented to the two associations for approval in August, 1958. The proposal set forth the essential factors for constituting the new enterprise. The statement proposed that a replenishment district to include the area originally recommended by the State Department of Water Resources be formed to (a) repel salt water intrusion; (b) recharge the ground water basins; and (c) reduce the pumping therein to safe limits.⁴⁸ To accomplish these purposes the proposal stated that "the district will have responsibility for financing the purchase of water used in halting the intrusion of sea water and in replenishing the ground water supply."⁴⁹ To insure that significant replenishment could be accomplished, it was also proposed that "the district will be responsible for bringing an action to adjudicate water rights within its area and curtail pumping to safe limits."⁵⁰

⁴⁸West Basin Water Association and Central Basin Water Association, "Proposal Submitted by the Joint Committee on Water Replenishment District" (mimeo; July 30, 1958), p. 1.

⁴⁹Ibid., p. 3.

⁵⁰Loc. cit.

The proposal clarified the future relationship of the replenishment district to each of the existing agencies which might consider the replenishment district as a potential competitor. It then outlined the amount of water that would be purchased from Metropolitan and spread or injected by the Flood Control District. After mentioning the funds to be raised by an ad valorem tax in the zones of benefit within the Flood Control District, the proposal stated that "the Water Replenishment District would have no authority to purchase replenishment water with ad valorem tax derived funds, and the petition for the formation of the district will clearly set forth this limitation on its taxing power."⁵¹ The proposal estimated that a levy of \$6.00 per acre-foot would be necessary to raise the necessary funds to purchase 165,000 acre-feet of water from Metropolitan-- an amount equal to the current average annual overdraft. In order to stress the non-competitiveness of the proposed district with others interested in providing aspects of the replenishment program, the concluding sentence of the proposal stated that the replenishment district would be an administrative agency operated by a five-member board of directors with a minimum staff."⁵²

⁵¹West Basin Water Association and Central Basin Water Association, "Proposal Submitted by the Joint Committee on Water Replenishment District," p. 6.

⁵²Ibid., p. 7.

The proposal written by the subcommittee appointed by the two associations to negotiate with the City of Los Angeles became in effect a constitution for a multiple-agency management program to operate a coordinated program designed to make effective use of the opportunities for development of a conjunctive use of the various surface and ground water supplies available to water producers in West and Central Basins. The proposal was included as an essential attachment to the formal petitions presented to the Los Angeles County Board of Supervisors and the State Department of Water Resources and in this way has formal recognition as a type of "constitutional" document.

Establishing the Key Management Enterprise

Once the "constitution" for this mixed public enterprise system had been adopted by a negotiated agreement of all parties concerned, the organization of the Replenishment District to complete the organic structure for the operation of a ground water management program became a relatively simple formality. The first step in the formal process was the circulation of a petition among the voters in the 420 square mile area of the proposed new district. The area to be included was divided into five sections with a chairman appointed for each section responsible for organizing the task of securing a total of 150,000 signatures on the formation petition. Each of the five chairmen recruited

community chairmen and hundreds of volunteer workers to circulate petitions. This proved to be a monumental undertaking.⁵³ The association had hoped to file the petition with the Los Angeles County Board of Supervisors in March, 1959, in order to have the necessary time to enable the Department of Water Resources to hold its hearings and make a determination of the adequacy of the boundaries and have the election during the fall of 1959. However, the task of gaining signatures proved to be much more difficult and an additional three months were required, while professional help was employed.⁵⁴

Because of the previous informal negotiations with other agencies involved in the process of forming a

⁵³The public relations representative employed to help in this process characterized the extent of the task; he stated at the November 20, 1958, meeting of the West Basin Association:

It is the arithmetic of the problem which reveals the magnitude of the task... The number of signatures needed is equal to the total number of registered voters in 21 out of 58 counties in the State of California. The number of signatures needed is equal to 86% of all the registered voters in our neighboring San Bernardino County. The number of signatures needed is greater than the total population--men, women and children--in the City of San Jose, California's seventh city in size of population.

Minutes, p. 17.

⁵⁴The two associations expended a total of \$30,000 in connection with the circulation of the petition to form the Central and West Basin Water Replenishment District, of which the Central Basin association paid 60 per cent and the West Basin association paid 40 per cent. Approximately \$12,000 was spent to hire petition circulators when it became apparent that voluntary workers could not gain the full quota at an early enough date.

replenishment district, the delay in the time required to gain necessary signatures on the formation petition was more than made up by the rapidity with which the Board of Supervisors and the Department of Water Resources processed the petition. The proponents of the district filed the petition with the Board of Supervisors on June 9, 1959. The Board of Supervisors transmitted the petition within two days to the Department of Water Resources. The Department, anticipating this event, issued an order dated June 11, as soon as the petition was received, to set the hearing on the boundaries of the new district for July 6, 1958. At the hearing the Department presented a technical report on the proposed replenishment district which was based upon data compiled by the Department over a long period of time.⁵⁵

The hearing was attended primarily by proponents of the new district from the two associations and from all of the major public agencies which would be involved in the future replenishment program. The testimony presented by the various representatives of public agencies stressed the prior planning that had preceded the adoption of the proposal for a replenishment district and the cooperative nature of the program to be undertaken. The proponents submitted a total of forty-two resolutions or written

⁵⁵California, Department of Water Resources, Rpt. on Pro. Replen. Dist.

letters of endorsement of the proposed district submitted by the Los Angeles County Board of Supervisors, nineteen cities, fourteen chambers of commerce, two water districts, one improvement association and one realty board.⁵⁶

Several small landowners appeared to ask that their property be excluded from the proposed district, but the few who opposed the inclusion of their land were not well informed and did not present an effective case. Eleven days later, the Department made a formal determination that the boundaries as proposed were sufficient.

On July 28, 1959, the County Board of Supervisors adopted an order dividing the proposed districts into five divisions, equalizing the population in each area as much as possible. At the same time, the Board set Tuesday, November 17, 1959, as the date of a special election to vote on the Replenishment District and to elect the first directors of the district if the proposition were adopted. With one exception, the men who had previously served as chairmen of the five divisions created to circulate petitions were sponsored by the two associations as candidates for the positions of directors of the proposed district. To the associations' surprise, on the last day to file nominating petitions, the names of five individuals were filed as an opposition slate to the candidates sponsored by

⁵⁶Hearing held before the Department of Water Resources in the Matter of the Formation of the Central and West Basin Water Replenishment District on July 6, 1959, p. 108. Typed transcript.

the associations. The executive secretary of the associations reported to a joint executive committee meeting that it appeared that the candidates were sponsored by the Democratic Party and that, insofar as he could recall, "the filings on partisan basis represented the first time a local water issue had been made a partisan issue."⁵⁷

Association members engaged in a feverish campaign to inform the voter about the need to create a replenishment district. Pamphlets circulated within the area stressed the future role of the district as an administrative agency to function in cooperation with the Flood Control District and Metropolitan to replenish the two ground water basins. The campaign pamphlets stressed that the proposed district would not levy a property tax for the purpose of purchasing replenishment water and that the "average homeowner" would pay only twenty-five cents a year ad valorem tax to cover the administrative expenses of the district. There was no serious opposition to the formation of the district, but the association feared that voters might vote against the district because they did not understand the reasons for its creation. There was also the sense that voters might resent still another election dealing with water problems and react adversely to the continued existence of the problem in spite of a prior record of favorable votes on

⁵⁷West Basin Water Associations, Joint Executive Committee, Minutes, September 24, 1959, p. 2.

water problems.⁵⁸

The voters came out with substantial support for the new district and officially authorized the creation of the Central and West Basin Water Replenishment' District by a vote of four to one.⁵⁹ However, two of the candidates sponsored by the association for a position as district director did not win election. In Division 1, representing Inglewood, William P. Malloy defeated E. L. LyIrnn. In

⁵⁸The association employed a public relations firm to help manage the campaign and the representative of this firm stressed this problem in a talk before the association on November 20, 1958. Minutes, p. 17.

Added to the general problem is our own special "Cry Wolf" problem.

November 25, 1947, an election was held to form the West Basin Municipal Water District. It was the second go-around and of course highlighted salt water intrusion and lowered water levels.

June 8, 1948, the annexation to Metropolitan was approved and again the threat to the underground supply was emphasized in the campaign.

December 2, 1952, an election campaign to form the Central Basin District was successfully concluded which dramatized the water shortage.

September 21, 1954, another campaign was brought to a victorious culmination for annexation of Central Basin to Metropolitan. Here the public was advised to insure a supply of water or face the threat of water rationing.

June 5, 1956, Proposition W [water bonds to enable Metropolitan to expand its aqueduct facilities) was overwhelmingly endorsed by the voters of both Districts, who were again reassured that their vote would help solve the water problem.

Now we return to the voters with a new water supply problem.

⁵⁹Los Angeles Times, November 18, 1959.

Division 4, embracing Bell, Huntington Park, South Gate and adjacent cities, Russell L. Hardy defeated Leland Weaver. The other three races were won by the association-sponsored candidates: Charles D. Barker in Division 2, representing the beach communities from San Pedro north to El Segundo; Lloyd C. Leedom in Division 3, representing the Long Beach area; and D. W. Ferguson in Division 5, representing Artesia, Norwalk, Whittier and several other areas.

As a result of five years of intensive planning and negotiation, it appeared that public entrepreneurs in West and Central Basin had been able to design and create a management system with the appropriate boundaries and range of powers to undertake an extensive ground water basin management program. The Central and West Basin Water Replenishment District would function as the key management enterprise in shaping the program for the mixed public and private enterprise system with responsibility for the operation of an agreed upon program. The difficult task of constituting the management system was completed. Now they faced the risks and opportunities of evolving a specific program and placing it into operation. And, at the same time, they would be testing the capabilities of a decentralized political decision-making system to operate an efficient ground water basin management program in conjunction with a highly developed water industry having access to several alternative sources of water supply.

CHAPTER IX

THE ORGANIZATION OF A GROUND WATER BASIN

MANAGEMENT PROGRAM

For more than twenty years the supply of ground water available to West Basin has been considerably less than the demands for its use. During much of this time individuals have attempted to take a variety of actions which would achieve a better balance between supply and demand or alleviate some of the harm resulting from overdevelopment of this resource. The creation of the Central and West Basin Water Replenishment District brought into existence a new public enterprise which included all of West Basin and the closely related and neighboring Central Basin. The new agency possessed a range of powers that offered the opportunity for finding a long run balance between supply and demand and achieving an optimal allocation of scarce resources. During the last three years, the Replenishment District has undertaken a number of actions or worked closely with others to coordinate their actions so as to achieve a program for conjunctive use of the ground water resources with surface water supply systems. While developing a ground water basin management program, the public and

private agencies involved have by their actions continued to build a decentralized political superstructure responsible for the management of a complex water supply system.

The first part of this chapter will be devoted to a discussion of the ground water basin management program which has developed since the Replenishment District was formed. The critical problem facing the Replenishment District has been the necessity to balance supply and demand for ground water and to halt salt water intrusion. Discussion of the program will be focused first on the management of supply and secondly on the management of demand. The third section of this chapter will contain a brief overview of the nature of the political decision-making system that has been responsible for developing the ground water basin management program. The adequacy of a decentralized political decision-making system will be evaluated for its capacity to reach satisfactory decisions through negotiation among the various public agencies and to coordinate their actions relating to ground water basin management. A third criterion for evaluating the adequacy of the local decision-making system, that of its capacity to arrive at solutions which are economically efficient without ignoring basic questions of equity, will be the subject of much more detailed analysis in the concluding chapter to follow.

The Management of Supply

The Attempt to Gain a Guaranteed Local Supply

Because of the physical structure of the San Gabriel River system, a public district encompassing Central and West Basins does not have control over the inflow of local surface and ground water. The average quantity of local inflow is significantly affected by the level of ground water extractions made by producers in the San Gabriel Valley. Fear that the local supply to Central and West Basins would diminish if San Gabriel producers did not curtail ground water production and begin to use imported water to supplement local supplies motivated Central Basin producers to meet with the upper basin producers as early as January, 1955. While the Committee of Twelve was still drafting the Water Replenishment District Act, Central Basin producers asked the San Gabriel producers (1) to form a private water association similar to the ones in West and Central Basins, (2) to join Metropolitan, and (3) to begin to restrict their demands on the joint ground water supply. The San Gabriel producers were warned that they were exposed to litigation if the outflow from the San Gabriel Valley continued to decline and they refused to take corrective actions.¹

¹San Gabriel Valley Water Association, Minutes, May 9, 1962, p. 1.

The upper basin producers formed the Upper San Gabriel Valley Water Association and employed Carl Fossette as their executive secretary.² The association began preliminary negotiations with Metropolitan concerning the terms and conditions for access to Colorado River water. However, in 1958, leaders in the cities of Alhambra, Monterey Park, Azusa and Sierra Madre opposed the proposal to join Metropolitan, withdrew from the association, and formed, as a defensive move, their own municipal water district, the San Gabriel Valley Municipal Water District. As long as these four "'rebel" cities were included within the territory of a municipal water district, they could not be included against their will in another district organized under the same organic law. By organizing a public district in this fashion, the four cities were able to strengthen their position as "hold outs." The remaining members of the Upper San Gabriel Valley Water Association, with the exception of West Covina, formed the Upper San

²Fossette describes the formation of this association in the following manner:

We then held a number of "What shall we do?" meetings and it was decided to form this Association to assist in acquiring more water, when needed. The Association was organized on January 16, 1956, and more "What shall we do? meetings were then held. It was then decided to attempt the formation of a municipal water district that would be acceptable for annexation to the Metropolitan Water District as one possible means of getting more water, when needed.

San Gabriel Valley Water Association, Minutes, May 9, 1962, p. 2.

Gabriel Valley Municipal Water District in December, 1959.³

As soon as it appeared that a guarantee of a long-run, fresh ground water supply to the lower basin could not be negotiated at the informal level, the City of Long Beach decided to initiate litigation to determine the relative rights of the upper basin users to the joint water supply system. The action was filed by the City of Long Beach on May 12, 1959, with the Central Basin Municipal Water District and the City of Compton as co-complainants.⁴ The Long Beach v. San Gabriel litigation, while initiated shortly before the formation of the Replenishment District, has become an essential element of the Replenishment District's program to manage the supply. Since 1960, the Replenishment District's attorney and general manager have been active participants in most of the negotiation between the parties in this case. The Long Beach v. San Gabriel action was intended to be modeled after the litigation initiated by the Orange County Water District in 1951 against four

³The San Gabriel Valley is actually split into four different groups: (1) the Upper San Gabriel Valley Municipal Water District, which has annexed to Metropolitan; (2) the San Gabriel Valley Municipal Water District, which has contracted directly with the State for supplemental water after 1972; (3) Pasadena and several other cities, which were already members of Metropolitan; and (4) West Covina, which has stayed out of all districts.

⁴City of Long Beach v. San Gabriel Water Company, Case No. 722,647, in the Superior Court of the State of California in and for the County of Los Angeles.

cities, Riverside, San Bernardino, Colton and Redlands, which produced water upstream from Orange County.⁵ In June, 1957, the trial court in this case had established the total rights of the four defendant cities and enjoined them from producing more than their rights. Brennan Thomas, the general manager of the Long Beach Water Department, pointed out the similar geological structure of the two areas when he discussed the initiation of this litigation at a West Basin association meeting. Thomas stated that "the West Basin was in the same relative position as the Orange County Water District, that Riverside represented the same position as the Central Basin area, and that the upper San Gabriel Valley area occupied a position similar to that of the San Bernardino area."⁶

The process of selecting defendants in this case differed considerably from the procedure used in the West Basin case. In the latter, an effort was made to include all persons who owned wells that had produced water from the basin. In order to save time and expense, the plaintiffs in Long Beach v. San Gabriel named only twenty-five of the largest water producers from a group of about 100 known producers. Three of the four "hold out cities" were cited as defendants so as to force them to bear a

⁵Orange County Water District v. City of Riverside, 188 Cal. app. 2d 566 (1961).

⁶West Basin Water Association, Minutes, November 20, 1958, p. 12.

proportionate share of the increased cost of providing water in the area. They had been able to avoid annexation to Metropolitan by creating their own municipal water district, but they had no defense against inclusion in this suit. The fourth rebel city, Sierra Madre, was not included since its rights had been adjudicated in the Raymond Basin case. The plaintiffs wished to avoid raising questions about the relation of the Raymond Basin to the rest of the San Gabriel River system. The plaintiffs also attempted to exclude mutual water companies from this case to avoid the legal issue of the rights of overlying owners.⁷ The ten large rock companies in the San Gabriel Valley which produced ground water for use in their gravel pits were excluded since most of the water they used re-entered the joint ground water supplies.

In July, 1960, a negotiating committee was organized composed of five representatives from each of the two areas. It was decided during the early meetings of the committee "to discuss the principles of settlement first and to discuss the price tag regarding water rights at a later date."⁸ Consequently, the negotiating committee agreed "to order a joint engineering reconnaissance survey

⁷However, by error, two mutual water companies were included.

⁸Central Basin Water Association, Minutes, November 2, 1961, p. 15.

to be undertaken by engineers representing both plaintiffs and defendants."⁹ The plaintiffs and defendants each employed a separate engineering firm. They then coordinated their efforts to produce a joint compilation of physical data related to the San Gabriel Valley and the Central Basin. This engineering survey was to be used for the purposes of negotiation and "not for introduction in the court case."¹⁰ The engineers recommended the inclusion of additional parties, but were successful in convincing the plaintiffs to add only three new parties, making twenty-eight the total number of defendants.

After fifteen negotiating sessions spread over a period of one year, the committee agreed to a "Statement of Principles for a Settlement Agreement." In this statement, dated September 26, 1961, the members of the negotiating committee affirmed "their mutual desire to settle the present pending litigation over the water rights of the San Gabriel River..."¹¹ As the first contracting principle agreed upon, the San Gabriel Valley litigants

⁹Central Basin Water Association, Minutes, November 2, 1961, p. 15.

¹⁰Loc. cit. The problem in any complex ground water litigation like Long Beach v. San Gabriel is to establish a set of facts that can be generally agreed upon so that negotiation is based upon a single set of assumptions about physical events.

¹¹Central Basin Water Association, Minutes, November 2, 1961, p. 16.

guaranteed the Central Basin litigants "an average annual supply of usable water equal to the average annual water supply . . . which was obtained from the San Gabriel River system . . . by the Lower Area over the base period 1934-35 through 1958-59. . ." ¹² This water supply was divided into four categories: (1) subsurface flow through Whittier Narrows; (2) rising water through Whittier Narrows; (3) exported and transported water from the San Gabriel Valley for use in Central Basin; and (4) usable storm water. The supply of water to be guaranteed by the San Gabriel Valley producers in any individual year was to be computed by applying a ten-year moving average of indexes of rainfall for the valley to the average annual water supply to the lower basin during the base period. In years when the natural supply fell below the guaranteed amount, the San Gabriel producers agreed to deliver sufficient water to the Central Basin producers 'to make up the deficiency from sources other than the natural supply, provided that the delivery shall be made at rates of flow comparable to that received historically and at such rates that there shall be no waste of delivered water or loss of storm run-off which has historically been conserved by ground water spreading operations in the Lower Area." ¹³

¹²Central Basin Water Association, Minutes, November 2, 1961, p. 17.

¹³Loc. cit.

The negotiations following the signing of the general agreement have been devoted to the task of filling in the specific figures in the general formula. At an early stage the litigants agreed that the average historical supply to Central Basin was 100,000 acre-feet. When the San Gabriel producers seemed hesitant to guarantee the full 100,000 acre-feet, one of the representatives for the Central Basin producers offered to subtract an arbitrary figure of 5,000 acre-feet from this historical average. As a result, the negotiators have settled on 95,000 acre-feet as the average annual guaranteed supply. The guaranteed supply will vary each year around this figure, depending upon the quantity of rainfall during the period.

One major area of negotiation has revolved around the question of how much reclaimed water Central Basin producers would allow as a part of the guaranteed supply. Central Basin producers have indicated that they would not take all of their supply in this form but would not object to the construction of reclamation plants high in the valley. The effluent from these plants could then be spread on the valley floor to enter the joint supply. The litigants expect that the Upper San Gabriel Valley Municipal Water District will deliver to the lower area in any deficit year the difference between the guaranteed supply and the natural supply. It is intended that the municipal water district will be reimbursed by means of a pumping assessment levied

on the twenty-eight defendants in proportion to the amount of water they produce.¹⁴

The orientation of most of the participants in the negotiation process has been to arrive at a satisfactory physical solution without raising too many legal issues. They anticipate that a final stipulated agreement can be presented to the court in the near future so as to place this plan into operation. It is anticipated that a water-master will be appointed to supervise the operation of the agreement and that the court will retain jurisdiction in order to modify the agreement from time to time in light of experience and the accumulation of more precise data. If the negotiations are successful in arriving at a stipulated agreement along the lines discussed above, the average annual local supply to Central and West Basins will become a firm and dependable quantity. The Replenishment District will be able to include approximately 100,000 acre-feet of ground water on the supply side of its equation. This amount of water will be provided to the Central and West Basin area without cost prior to capture, but it is the most

¹⁴This is a short run solution and is not a particularly equitable apportionment of the costs. The upper basin producers may have to adjudicate rights as among themselves to determine the relative share of this cost to be borne by each producer in the long run. They may also have to curtail their own production in order to guarantee a firm supply to the lower area. It may be necessary to form a separate replenishment district in the San Gabriel Valley or to annex to the Central and West Basin Water Replenishment District.

valuable water available to local water producers, since it can be extracted for use during times of peak demands.

The Acceleration of the Spreading Program

In addition to the attempt to gain a guaranteed annual fresh water supply from the San Gabriel Valley, the Replenishment District has attempted to increase the local supply through an accelerated spreading program at the Montebello forebay. Prior to the creation of the Replenishment District, it was hoped that the new management entity could spread enough water each year to offset the annual overdraft. In addition, Flood Control District Zone I funds were to be used to purchase additional water for spreading on the assumption that such water would replace the accumulated overdraft. However, by 1960, Bookman pointed out that this proposed program was physically infeasible due to the limited transmissibility of the aquifers surrounding the forebay.¹⁵ Bookman recommended that the Replenishment District attempt to spread as much water as the forebay could absorb and transmit while Colorado River water was available, even though they could not balance the basin in this way.

Since 1960, the Replenishment District and the Flood Control District have spread quantities of water each year which have varied from 93,000 to 209,300 acre-feet, as

¹⁵CWBWRD, Basin Management Study pp. 36-39.

shown in Table XIV. After four years of experience, Bookman now states that it appears necessary to spread at least 120,000 acre-feet of water in the Montebello forebay during the ensuing years [1964-64] in order to maintain water levels.¹⁶ During 1961-62, the quantity spread at the forebay more than balanced the estimated annual overdraft and some water was placed into storage. However, since then,

Table XIV

Quantity of Water Purchased for Spreading
and Estimated Overdrafts
1960-64

Water Year	Amount of Water Purchased for Spreading			Estimated Annual Overdraft	Replen- ishment Assess- ment
	Zone I	Replenishment District	Total		
1960-61	80,800	67,000	147,800	238,800	\$3.19
1961-62	39,500	169,800	209,300	141,600	\$5.75
1962-63	4,800	88,200	93,000	149,000	\$6.63
1963-64	--	124,000	124,000	175,600	\$6.58

Source: CWBWRD, Annual Report, for 1961-64.

the quantity of water spread at the forebay has been less than the estimated annual overdraft. As a result, the accumulated overdraft has grown even with the intensive effort to accelerate the barrier program. One of the

¹⁶CWBWRD, Annual Report for 1962, p. 52.

factors leading to the continued increase in the accumulated overdraft has been the lack of rainfall in the area and the consequent reduction in the quantity of local water supply available for use each year. If the precipitation and runoff had approximated the long-term annual mean for the area, the spreading activities of the Replenishment District would have balanced the annual overdraft and some water would have been added to storage. Another equally important factor leading to the continued unbalance of the basins has been the large drafts made on ground water supplies, particularly in Central Basin.

The Acceleration of the Barrier Program

Once it appeared that the spreading program was not an effective method for eliminating the accumulated overdraft, the proposed barrier programs took on an even more important role in the evolution of the basin management program. Once constructed the West Coast barrier would place 50,000 acre-feet of water underground and the Alamitos Gap barrier would inject 20,000 acre-feet per year. The Dominguez Gap barrier would probably inject between 10,000 and 12,000 acre-feet per year. A large portion of the injected water would be added to storage. The replenishment from the barriers, when combined with the water spread at the forebay, would more than balance the annual overdraft in both basins, as well as prevent further salt water intrusion.

By 1960, estimates of the costs of the barrier program were subject to significant upward revision. The Flood Control District had found that the aquifers underlying Redondo Beach were considerably deeper than anticipated, leading to an increase in both construction costs and the volume of water needed to maintain a fresh water mound. Cost estimates rose to more than \$6 million to construct the remainder of the West Coast barrier, \$3 million to construct the Alamitos Gap barrier and \$2.5 million to construct the Dominguez Gap barrier.¹⁷ In addition, Metropolitan partially reversed its decisions made in 1957 to provide raw Colorado River water for the barriers. Metropolitan still planned to construct the special feeders to serve the barriers as agreed, but a treatment plant was planned for construction on the low feeder, so the water conveyed to the barriers would be filtered. Filtered Colorado River water for replenishment purposes would cost \$20.00 per acre-foot or about \$5.00 more per acre-foot than untreated water sold for replenishment. Since Metropolitan was expending \$9.2 million on the feeder to supply the West Coast barrier and would have to invest, in addition, \$5.5 million on the feeder to supply the Alamitos and Dominguez.

¹⁷Since the Alamitos Gap barrier is to be located half in Los Angeles County and half in Orange County, it is assumed that the Orange County Water District would split the capital cost with the Los Angeles County Flood Control District and would pay for the operation and maintenance of the facilities located in Orange County thereafter.

Gap barriers, the Replenishment District was more or less obligated to purchase water from Metropolitan as long as it was available for replenishment purposes. The Replenishment District had the fiscal capability to purchase the more expensive water and did not seem to question the advisability of constructing the barriers in light of the change in the cost of the water supply. Filtered Colorado River water sold for replenishment purposes would be priced about \$10.00 less than the filtered and softened water sold for direct use, and after the costs of production would thus be approximately equal to the cost of surface delivery for Metropolitan water.

Financing the capital cost of nearly \$11 million to construct the three barriers attracted much greater attention. The Flood Control District had already established a barrier construction fund for the West Coast barrier and \$1.5 million had been allocated to this fund from Flood Control District tax revenue by the summer of 1960. In addition, Zone II of the Flood Control District would produce approximately \$800,000 during 1960-61 which could be devoted to construction. Additional revenue would be made available each year.¹⁸ If the Flood Control District were

¹⁸The Flood Control District planned to devote \$500,000 a year from general funds toward construction of the barriers until these projects were completed. Zone II funds could also be allocated for construction if the Replenishment District purchased water for the barrier.

to finance the West Coast barrier, construction could not be completed until 1965. Construction could begin on the Alamitos Gap and Dominguez Gap projects after 1965 as Flood Control District funds became available.

This form of financing seemed far too slow to the board of directors of the Replenishment District, the Metropolitan Water District and the water producers in the area. Metropolitan Water District officials were concerned that the West Basin feeder, constructed at such a high cost, would remain idle for four years or more. It had been justified on the basis of the immediate need for a large volume of water to supply the barrier. The Replenishment District wanted to see the barrier constructed while Metropolitan water was still available in sufficient quantities to meet the barrier requirements. The ground water producers had gambled with the sea by not curtailing ground water extractions to safe yield and they were afraid the ocean might win before the barriers were constructed.

During the late spring of 1960, members of the West Basin Water Association began to discuss the possibility of obtaining state funds to build the barriers. This represented a change in strategy from their reliance on local funding and local control. Their last attempt to gain state funds had been in 1951, when they asked for help in building the prototype barrier. This had been a frustrating experience in several ways and many association members did not

want to risk losing control over their own project by going to the state. But the barriers were conceived of as emergency measures and it was hoped that the state would allocate funds without asserting control over the use of these funds. In the summer of 1960, Louis Alexander and Carl Fossette began discussions with Department of Water Resource officials about the possibility of including "an item of \$11,000,000 in the State Budget for construction of facilities needed for the barrier project."¹⁹ After receiving some encouragement, association members met with the appropriate legislators and suggested the introduction of a bill to enable the State through the Department of Water Resources "to pay a portion of the capital costs of projects to be constructed in co-operation with local agencies for the purpose of replenishment, recharge or restoration of critically overdrawn or depleted ground water basins."²⁰ Both Carl Fossette and William Stokes, manager of the Inglewood Water Department, appeared before a Senate committee in support of this legislation.

However, before its passage, the "Porter-Dolwig Ground Water Basin Protection Law" was extensively amended to give the Department of Water Resources extensive authority over the projects constructed under this legislation. As a

¹⁹West Basin Water Association, Joint Executive Committee, Minutes, July 18, 1960, p. 3.

²⁰Legislative Session, 1961, SB 1440 as introduced April 20, 1961.

Department of Water Resources engineer explained to a Central Basin Water Association meeting, . . . the bill authorizes the Department of Water Resources to initiate investigations, studies, plans, and design criteria for construction of any project deemed by the Department to be practical, economically feasible, and urgently needed to correct critical conditions of overdraft. . . ." ²¹ The Department engineer went on to state that the legislation authorized his Department, upon the receipt of plans and design criteria "to review, evaluate, and revise such plans and design criteria to insure that construction of such projects will accomplish the purposes of the act." ²² Even though they were successful in gaining legislative approval for the allocation of State funds to projects like their barrier. projects, producers in West and Central Basins decided not to risk State control over their local project. They feared that the Department of Water Resources would want to review the projects all over again and impose its own standards of performance. They were convinced that the projects were necessary and did not want the State to revise their plans of operation.

As a result, reliance upon the Flood Control District for funding the project over a longer period than desired

²¹Central Basin Water Association, Minutes, August 3, 1961, p. 10; emphasis added.

²²Loc. cit.; emphasis added.

has been accepted. After a year of delay, while the attempt to gain State funds was in process, the Replenishment District began more intensive discussion with the Flood Control District about the exact plan for constructing and operating the barriers. But progress toward the completion of the barriers had not been as rapid as many water agencies hoped. By the end of 1963, only twelve injection wells were operating, the same number as in 1960.²³ Construction was started on several new wells during 1963, but the supply of the basin would not be affected until the wells were put into operation during 1964. A revised construction schedule was presented in the 1964 Annual Survey Report on Ground Water Replenishment issued by the Replenishment District in March, 1964.²⁴ Under the new schedule, the completion date for the West Coast barrier has been delayed until 1966, while the completion date for the Alamitos Gap barrier has been rushed ahead to 1965. Since the Alamitos Gap is located on the boundary between Los Angeles and Orange County, the final completion of this barrier is dependent upon coopera-

²³The Flood Control District has been subjected to considerable private criticism for what has been considered bureaucratic delay. In one interview, the manager of a municipal water department was quite vehement in criticizing the Flood Control District for hiring permanent employees to undertake most of the engineering and design projects. Others interviewed stated that the decision-making process within the Flood Control District took far too long because of the number of levels through which a single proposal was passed.

²⁴CWBWRD, Annual Report for 1964, p. 18.

cooperative arrangements between the Los Angeles County Flood Control District and the Orange County Water District. The Orange County Water District has tentatively committed itself to the construction of facilities within Orange County and, with this assurance, the Flood Control District has gone ahead with plans related to the facilities on the Los Angeles side. The Flood Control District has announced its intention to complete the Dominguez Gap barrier in 1967.

The Development of New Sources of Replenishment Water

Soon after its establishment, the Replenishment District began negotiations with the Los Angeles County Sanitation Districts and with the City of Los Angeles concerning the development of new sources of water for replenishment. As the demands for water from the Metropolitan Water District increase in the future, the Replenishment District will be faced with a diminishing supply of water for replenishment purposes. The County Sanitation Districts have been interested in reclaiming sewage water flowing through their system for a number of years. In 1958, the Sanitation Districts, in cooperation with the Flood Control District, issued a report recommending the construction of a pilot reclamation plant at the Whittier narrows to produce

water suitable for spreading at the forebay.²⁵ Once the Replenishment District had been created, it could guarantee a market for the water produced at such a plant. Serious negotiations for the purchase of reclaimed waste water were initiated early in 1960. On February 1, 1961, a four-party joint exercise of powers agreement was signed by Los Angeles County, the Sanitation Districts, the Flood Control District and the Replenishment District. Under this agreement, the County contracted to provide \$1.7 million in funds, interest free, to finance the construction of a demonstration plant at Whittier narrows. The Sanitation Districts agreed to construct, maintain and operate a plant having a capacity for reclaiming approximately ten million gallons per day of sewage effluent from the sewerage lines crossing the narrows. The Sanitation Districts agreed that the quality of the water delivered by it for spreading would meet all of the water quality requirements established by State regulatory agencies. The Flood Control District agreed to accept delivery of approximately ten million gallons of reclaimed sewage effluent per day and to spread this water in its own works located below the narrows. The Replenishment District agreed to pay a price equal to the rate charged by Metropolitan for untreated water used for replenishment

²⁵Los Angeles County Sanitation Districts, Report Upon the Reclamation of Water from Sewage and Industrial Wastes in Los Angeles County, California (Los Angeles, 1958).

purposes to the Sanitation Districts for all reclaimed water delivered and spread. The price of untreated Metropolitan water sold for replenishment and reclaimed water produced at the Whittier Narrows Plant was \$15.25 per acre-foot, as of July 1, 1964. Of the money paid to the Sanitation Districts by the Replenishment District, \$6.00 per acre-foot was to reimburse the County for its loan in an estimated period of thirty years. The Sanitation Districts agreed to absorb \$1.00 an acre-foot to equal their savings in treatment costs at their final treatment and disposal plant. While the actual supply thus developed was relatively small when compared with the quantity of raw Colorado River water available during the early 1960's, the availability of a small quantity of water from this source gave the Replenishment District a chance to test the appropriateness of reclaimed water for replenishment purposes before the Metropolitan supply was exhausted. If the first operation of the plant and spreading activities proved successful, the Whittier Narrows Plant could be expanded at a later date when the Metropolitan supply had begun to diminish. In addition, operation under the four-party agreement for a few years would give the participating agencies an opportunity to test out the rules they had established for running this type of enterprise.

The first year of operations at the Whittier Narrows Plant was very successful. The expected daily volume of

ten million gallons was increased to twelve million gallons. The quality requirements for an acceptable effluent from the Whittier Narrows Plant were established by the Regional Water Pollution Control Board prior to its initial operation. The plant went into operation in July, 1962, and during August was producing water of sufficient quality for release to the Flood Control District. Since then, the plant has been able to maintain quality standards in every respect except the elimination of detergent as measured by the presence of alkyl benzene sulfonate (ABS). The Regional Water Pollution Control Board No. 4 originally set a limit of 2.0 ppm for ABS in the effluent from the plant. However, the effluent produced at the Whittier Narrows Plant during the first months of operation contained between 3.5 and 4.0 ppm of ABS. Consequently, the Regional Water Pollution Control Board changed its original requirement to 3.7 ppm provided that the reclaimed water was diluted by an equal proportion of Colorado River water or surface run-off prior to spreading.

The Replenishment District purchased a limited quantity of treated Colorado River water during the first months of operation when untreated water was not available for dilution. The Replenishment District's board of directors expressed its dissatisfaction with this development and passed a resolution stating that the board did not consider itself liable to buy expensive water for blending with the

reclaimed water. A meeting with legal counsel for the Sanitation Districts was requested.²⁶ However, during the winter of 1962, untreated water was available at all times to use in diluting the reclaimed water, and by the spring of 1963 the Sanitation Districts had introduced a new method of foam stripping which reduced the quantity of ABS in the reclaimed water to less than 2 ppm. In April, 1963, the requirement for an equal dilution of reclaimed water with other water was removed and the Regional Water Pollution Control Board required only that water sampled at the spreading grounds had to contain no more than 2 ppm of ABS. The new foam fractionation treatment increased the cost of reclaiming water by approximately \$1.75 per acre-foot, but the price paid by the Replenishment District remained at the original contract price.

On the basis of the first year's operation of the Whittier Narrows Plant, County Sanitation District engineers have prepared an extensive report on the possibilities for expanding the plant and for constructing other reclamation plants throughout their system.²⁷ The Whittier Narrows Plant was designed for modular expansion of the basic plant unit. Consequently, an expansion to a production capacity of twenty-four million gallons daily could be accomplished

²⁶West Basin Water Association, Minutes, August 23, 1962, p. 10.

²⁷Los Angeles County Sanitation Districts, A Plan for Water Reuse (Los Angeles, 1963).

by duplicating the production plant without the construction of an additional control building. The Sanitation Districts he also prepared tentative plans for a second addition which will enlarge the facility to a capacity of fifty million gallons daily. Ultimately, the plant could be expanded to produce 100 million gallons daily or about 100,000 acre-feet per year. This quantity of water would be approximately sufficient to meet the long-term requirements of a full-scale replenishment program.

The Sanitation Districts' proposal is based upon a detailed study of the effect of the reclamation facility on reducing the costs of maintaining the remainder of the Sanitation Districts' facilities. When the original plant was constructed, the continuous operation of the plant could not be assured. Emergencies might require the plant to be bypassed and all effluent to be discharged through the sewer outfalls to the ocean.²⁸ Consequently, capacity to handle twelve million gallons daily has been reserved in sewer lines below the reclamation plant for emergency use at all times. As urbanization of the area intensifies, the Sanitation Districts are faced with the need to expand the capacity of all their facilities. This would usually

²⁸The Whittier Narrows Plant was constructed in the Whittier Narrows Flood Control dam site. While the plant was constructed to be operating during most floods, certain unusual flows would necessitate the discontinuance of plant operation for a period of two to three weeks. Other emergencies would be caused by power failures and similar unexpected events.

entail the construction of new trunk sewers, treatment plants and outfall sewers. However, if an emergency treatment and diversion facility, capable of operating throughout any emergency, were added to the reclamation plant, then the flow could be removed from the system at all times. The emergency reserve in the present system would be available to meet growth requirements.

The Sanitation Districts have estimated that it would cost \$240,000 to construct an emergency diversion and treatment facility at the Whittier Narrows Plant to handle twenty-four million gallons daily of flow. This capital cost amortized over fifty years at 4 per cent interest, plus the annual cost of maintaining standby preferred service power connections, is estimated to average \$.96 per acre-foot of water produced at an expanded facility. The capital value of the facilities between the Whittier Narrows Plant and the ocean, needed to convey twenty-four million gallons daily, is estimated to be worth about \$5.75 per acre-foot. Consequently, investment in these facilities would produce a net capacity savings creditable to the Whittier Narrows Plant of \$4.80 per acre-foot. If the emergency facilities were constructed, the cost of water produced at the present facility would be \$11.00 an acre-foot, while the cost of water produced at an expanded plant would fall to \$10.00 an acre-foot.²⁹

²⁹See discussion in A Plan for Re-use, pp. 36-41.

The Sanitation Districts' report proposes that the four part agreement be renegotiated to enable the Sanitation Districts to expand the plant capacity at Whittier Narrows to twenty-four million gallons daily and to construct the proposed emergency facilities. While the report does not state the price at which the Districts are willing to sell their effluent, it does suggest that the price of reclaimed water could be lowered as soon as the expansion of the plant and the construction of diversion facilities were completed. The Sanitation Districts now appear to be ready to go into effective competition with the Metropolitan Water District by offering a source of water for replenishment at a price less than the replenishment water provided by Metropolitan.

The Replenishment District has been hesitant to enter immediately into a second formal contract with the Sanitation Districts. Most of the members of the Replenishment District board of directors feel a moral obligation to continue to purchase as much replenishment water from Metropolitan as possible since Metropolitan invested considerable capital in building facilities to provide replenishment water to the district. If the Replenishment District were to begin to purchase large quantities of reclaimed water for spreading at the forebay, this would represent a substantial loss in income to Metropolitan. Some of the technical problems related to the removal of ABS and the

detection of viruses have also made members of the board move cautiously toward further commitments to expand this supply soon. However, it would appear that the Replenishment District plans to rely upon this source of supply in the future as the Metropolitan supply for replenishment diminishes.

In addition to the expansion of the Whittier Narrows Plant, the Sanitation Districts have also proposed the construction of an Alamitos Water Reclamation Plant with a capacity of fifteen million gallons daily to supply the Alamitos Gap barrier after the Colorado River water supply for this barrier has diminished. The proposed location of this plant is a park owned by the City of Long Beach at the confluence of the San Gabriel River and Coyote Creek close to the line of proposed injection wells. The estimated cost of water produced at this facility, after credit has been given for capacity savings in downstream facilities, is approximately \$14.00 an acre-foot. In addition, the Flood Control District will need to construct a small regulating reservoir to equalize the flow and a pumping plant to increase the water pressure for injection. The annual cost of the amortized capital investment plus the annual operation and maintenance costs to the Flood Control District would add approximately \$6.50 an acre-foot to the cost of this water. The price of treated water sold for replenishment has been rising and is expected to continue

to increase. As of July 1, 1964, the Replenishment District was paying \$24.25 for treated water used in the West Basin barrier. The possibility of a lower price for reclaimed water and the guarantee of a long term supply should be very attractive to the Replenishment District in a few years. However, it appears that the Replenishment District is committed to the use of Metropolitan water in the Alamitos Gap barrier until demands for the direct use of Colorado River water in the area reduce its availability for replenishment.

The Replenishment District has also attempted to develop a long-run source of supply for the West Coast barrier from the reclaimed sewage effluent produced by the Hyperion Treatment Plant of the City of Los Angeles. In the years since the West Coast barrier was first contemplated, reclaimed sewage effluent from the Hyperion Treatment Plant has often been considered as a potential source for the West Coast barrier. When the use of this water was tested during the mid-1950's, the effluent produced by the Hyperion Plant was not of a high enough quality for direct use in the barrier. By the early 1960's, however, the Hyperion Treatment Plant had modified its treatment process so as to produce 100 million gallons daily of high quality effluent. In the spring of 1961, the Flood Control District began a series of tests to determine which form of additional treatment was the most efficient and

economical to prepare Hyperion effluent for injection. The tests continued for more than two years. District engineers established that an automatically back-washed rapid sand filter could produce water of sufficiently high quality for injection.

The solution of the technical problems involved in using Hyperion water has not led to the solution of the political problems. Both the Replenishment District and the association have frequently asked the City of Los Angeles for a commitment regarding the future availability of this supply. So far, the City has successfully evaded making a commitment in response to this question. The Mayor of Los Angeles, on October 4, 1961, appointed an advisory committee "to help determine City policy and the proper measures to be undertaken concerning the utilization of sewage effluent as a reclaimable water source."³⁰ The Mayor asked the committee to explore the following four questions:

1. Is the City of Los Angeles to engage in water reclamation projects to relieve a potential water shortage?
2. If not (because of no potential shortage based on Department of Water and Power figures that water resources are adequate until 1975) is the City willing to furnish reclaimable sewage to other cities?
3. If so, what form should this take in the matter of contracts, so that the City does not jeopardize

³⁰Letter from Mayor Yorty to the City Council, October 4, 1961, quoted in West Basin Water Association, Minutes, November 15, 1962, pp. 13-14.

later use of this potential water supply by the City of Los Angeles?

4. What legal restrictions and official regulations must be modified to reflect sanitary engineering progress and to allow water reclamation while adequately safeguarding public health?³¹

Since the creation of the committee, few meetings have been held and the City has not yet announced a formal policy regarding the possibility of selling Hyperion water. However, many of the men involved in the management of West Basin argue that when Metropolitan water is no longer available, the City of Los Angeles will be forced either by the pressure of public opinion or possibly by court action to sell Hyperion water rather than wasting this high quality effluent in the sea.

The Management of Demand

The Establishment of a Pro-Rata Rationing

The Long Beach v. San Gabriel case, the acceleration of the spreading and barrier programs and the development of new sources of replenishment water are all actions which affect the supply of water to Central and West Basins. Very soon after its establishment, the Replenishment District also began to contemplate actions which would regulate the demands made upon these ground water basins. The

³¹Cited in West Basin Water Association, Minutes, November 15, 1962, p. 14.

West Basin interim agreement, negotiated in 1955, followed by the final judgment in 1961 had accomplished a reduction in the demands made upon the West Basin for water supply and a pro-rata rationing of an agreed upon volume of ground water each year. However, the demands made upon ground water supplies in Central Basin had continued to increase every year. By November, 1960, it was estimated that the large water agencies in Central Basin produced 83 per cent of their water from local sources and acquired only 17 per cent from an imported source. At the same time, enterprises in West Basin were importing 70 per cent of their water and pumping only 30 per cent of their total supply from the basin.³² Metropolitan water had been available for direct use in Central Basin since 1955. However, due to the legal structure of ground water rights, most producers continued to pump as large a volume of ground water as they could put to use in order to establish as large a claim to water rights as possible. Central Basin producers used only 3 per cent of the capacity in their connections to the Metropolitan system in January, 1960, and only 14 per cent in July, 1960.³³ Ample capacity in the individual connections to Metropolitan lines allowed most producers to peak off the Metropolitan feeders while using ground water for their base supply. It was estimated that an additional supply of

³²CWBWRD, Basin Management Study, p. 88.

³³Ibid., pp. 84 and 86.

33,350 acre-feet of treated Colorado River water could have been delivered for direct use during 1960-61. After improvements in the Metropolitan distribution system were completed, it was estimated that Metropolitan could deliver an additional 117,360 acre-feet for direct use during 1962-63 beyond the anticipated deliveries to the area for direct use and for spreading activities.

Since it was obvious to the members of the Replenishment District board of directors that water producers in Central Basin would not reduce their draft on ground water supplies until litigation has established their relative rights, the board began to discuss the problem of initiating a basin-wide adjudication in Central Basin to achieve a pro-rata rationing of ground water resources.³⁴ The West Basin litigation has been very time consuming and costly. And, even after eighteen years, the litigation has not accomplished its original objectives. Some Central Basin producers thought part of the time involved in the West Basin case was caused because litigation was initiated before many water producers thought it was necessary. The water producers who opposed the idea of adjudication proceeded to fight for superior rights instead of attempting to reach a satisfactory solution for all. The length of

³⁴Initiation of litigation was also a part of the settlement made with the City of Los Angeles, which opposed the movement toward expensive replenishment activities while ground water producers continued to aggravate the problem.

West Basin litigation was also attributed to the length of time the State Division of Water Resources took to prepare its first report as Referee. In an attempt to avoid some of the costs involved in the West Basin litigation, formal initiation of litigation in Central Basin was delayed until general agreement could be reached among major water producers concerning the need for litigation to reduce future pumping from the basin. In fact, by the time the action was filed, not only were most water producers in favor of a basin-wide adjudication, they had already agreed to the general outline of an interim agreement which would enable them to share a production curtailment proportionately. The Replenishment District also avoided the use of the Department of Water Resources as Referee by employing the consulting engineer, Max Bookman, to do preliminary surveys and to verify the production records of all of the litigants involved in the case. The Replenishment District worked closely with the Central Basin Water Association. The association proceeded at the informal level with individual producers while the Replenishment District assumed responsibility for formal actions.

In November, 1960, Bookman concluded a study on basin management for the Replenishment District in which he recommended that litigation be initiated in Central Basin to curtail ground water production and to increase the use of imported supplies. After considerable discussion about

the report within the Central Basin Water Association, the president of this association appointed a committee on ground water adjudication in February, 1961, to meet with Bookman, Fossette and Martin E. Whelan, the attorney employed by the Replenishment District to handle the litigation. The committee was assigned the task of finding a satisfactory settlement to achieve a production curtailment in Central Basin. By the fall of 1961 this committee had agreed upon a program to reduce production in Central Basin by 25 per cent and Bookman prepared a report entitled "Control and Reduction of Pumping of Ground Water in Central Basin" to summarize their plans. This report was printed and circulated to all ground water producers operating in Central Basin.

On October 31, 1961, a series of three meetings were held at the association office attended by approximately 100 representatives of pumpers in the area for the purpose of discussing the proposed curtailment through litigation. General approval was given to the plan to reduce pumping through an interim agreement modeled after the interim agreement used in the West Basin case. On November 2, 1961, the Central Basin Water Association met and unanimously approved a resolution that requested the Replenishment District to initiate litigation immediately based upon the principles enunciated in Bookman's report. During the next several months Whelan, as the Replenishment District

attorney, met with the attorneys for all major water producers in the basin to gain their general approval of the complaint to be filed. At the same time, Bookman gathered data from tiater producers concerning their past production and claims to rights and the association committee met regularly with Whelan, Boolankman and Fossette to draft an interim agreement.

The case was formally initiated on January 2, 1962.³⁵ Seven hundred parties were named based on the records that the Replenishment District had accumulated since its formation.³⁶ Bookman and his staff began an intensified effort to verify the production records submitted by producers named in the suit. By May, 1962, enough tentative information was known about the production records of most producers to print a draft of the interim agreement for submission to the association and the ground water producers

³⁵Central and West Basin Water Replenishment District v. Charles E. Adams, et al., Case No. 7,656 in the Superior Court of the State of California in and for the County of Los Angeles. Whelan chose this date as it was "the closest possible date for such filing at the end of the calendar year." It was hoped that filing at the end of a calendar year might make it easier to determine the prescriptive rights on a yearly basis. Central Basin Water Association, Minutes, February 1, 1962, p. 6.

³⁶The Replenishment District did not rely on the in lieu filings since they found that water producers had in many cases exaggerated their production. Filings with the Replenishment District carried the responsibility of paying a tax on the quantity of production recorded and seemed to represent a more realistic record of actual production.

of Central Basin.³⁷ During the late spring and summer Bookman continued to meet with producers to verify their production records while Whelan met with their attorneys to gain signatures to the agreement. By early fall, Whelan thought that enough signatures had been promised that they could request a formal hearing. After the hearing was set for September 28, 1962, some water producers, who had informally indicated they would sign, were not available for signature. However, as a result of an intensive campaign to sign up producers, the Replenishment District presented the court with an interim agreement signed by producers holding 79 per cent of the assumed relative rights in the basin.

The court ordered the interim agreement to go into effect on October 1, 1962, and appointed the Department of Water Resources as Watermaster to administer the provisions of the agreement. Nine months after the formal initiation of litigation, a production curtailment had been drafted and signed by litigants producing approximately 80 per cent of the ground water from Central Basin.

³⁷Prior to the final submission of the interim agreement drafted by Whelan based upon the recommendations of the association committee, a group of ten water law attorneys experienced in the West Basin case was asked for their opinion of the proposed interim agreement for Central Basin. After two meetings the group indicated general approval of the interim agreement and suggested a few minor changes which were incorporated into the final draft.

While the Central Basin interim agreement was modeled after the interim agreement negotiated in West Basin, there were some important differences. One important difference was the method of determining relative rights of the parties. The relative rights of Central Basin pumpers took into account imported water use credit under an agreed upon interpretation of section 1005.1 and 1005.2 of the Water Code. Ground water producers were given credit for the amount of imported water used in any year after 1951 which exceeded the amount of imported water used in 1951. While this did not affect many producers, a few of the larger importers did increase their relative rights as a result of this interpretation of the code section.³⁸ On the other hand, one of the largest importers of water to the basin, the City of Los Angeles, received no credit at all for imported water use. Los Angeles had imported an unusually large quantity of water in 1951 and has never again imported as much water to Central Basin. Assumed relative rights including imported water use credit were estimated through to 1961. Signatories to the agreement were required to reduce production to 80 per cent of their assumed relative rights after October 31, 1962. The interim

³⁸In some cases it made a significant difference. For example, the assumed prescriptive rights based on ground water production of Los Angeles County Waterworks District No. 1 is 22 acre-feet, but the assumed relative right is 746 acre-feet. As a result, the agreed pumping allocation for this party is 597 acre-feet.

agreement listed the assumed prescriptive rights, 1961, based on ground water production; the assumed relative rights based on both ground water production and imported water use credit; and the agreed pumping allocation, which was 80 per cent of the assumed relative right for each signatory party.

The second major difference between the interim agreement in Central Basin as compared with the interim agreement in West Basin was the structure of the exchange agreement. The water supply for the exchange pool in Central Basin is provided by all signatory parties who have a connection to the Metropolitan distribution system. These parties, referred to as exchangers, are required to offer either (a) 20 per cent of their agreed pumping allocation or (b) an amount equal to the imported water available to the party in excess of the needs of the party. The inability to reduce pumping by 20 per cent of the agreed pumping allocation, if the (b) option is taken, must be substantiated in writing to the Watermaster. Parties who do not have a connection to the Metropolitan system or who are unable to take from this system an amount of water that when added to their agreed pumping allocation will meet their estimated needs for a particular year are referred to as exchangees and are eligible to purchase water from the exchange pool. The exchange agreement thereby enables the relatively marginal producer who cannot afford

Metropolitan water to continue to produce his full supply from the basin. The equitable solution which enables those with long standing claims to ground water to continue to use ground water for base demands is not necessarily an efficient solution.

Exchangees are required to file a request to purchase with the Watermaster prior to the tenth of November of each year, estimating the amount of ground water needed, substantiated with data concerning system design and water requirements. The Watermaster then makes a tentative allocation of the total approved requests among the exchangers using as the basis of the proration, the proportion of each exchanger's agreed pumping allocation to the total agreed pumping allocation of all exchangers. The price paid by exchangees and received by exchangers is determined by the Watermaster according to the following formula:³⁹

The price as of the beginning of the water year charged by Central Basin Municipal Water District for filtered and softened Metropolitan water shall have added to it the sum of \$2.00; and, there shall be subtracted from the foregoing total the sum of \$10.00 (representing an assumed and agreed cost of pumping water in the Central Basin) and any then current rate or rates of taxes or assessments levied on the pumping of ground waters in the Central Basin by the Central and West Basin Water Replenishment District or any other governmental agency.

³⁹Interim Agreement, Sec. D 8.

Example:

(1) Cost of water from C.B.M.W.D. (assumed)	\$28.00	
(2) plus		<u>2.00</u>
		30.00
Less:		
(a)	\$10.00	
(b) Plus replenishment or		
pump assessment	<u>6.63</u>	<u>16.63</u>
Cost of Exchange Pool Water		\$13.37

The Central Basin exchange agreement contains a built-in guarantee that as the cost of Metropolitan water rises, the cost of exchange water will also rise. The structure of the Central Basin exchange pool eliminates the possibility of the development of competition among exchangers to sell their water to exchangees. As a result, the exchange pool will not function to motivate individuals with relatively low valued uses for ground water to sell exchange water to those with relatively higher valued uses for ground water. Individual parties can enter into separately negotiated lease agreements or sell their rights. This leaves an element of flexibility in the allocation of water to various users and uses in the Central Basin.

The Central Basin exchange agreement, similar to the West Basin exchange agreement, is primarily designed for those who wish to purchase ground water for use as their base supply rather than for those who wish to purchase additional ground water to be used at times of peak demands.

The third major difference is the addition of a provision to enable a party to pump his relative prescriptive

right for 1961 every fifth year. The relative prescriptive right for 1961 does not include credit for imported water use. This provision was designed to enable the parties to protect their claims to ground water rights developed prior to the signing of the interim agreement in case the litigants are unsuccessful in reaching a final agreement and the question of relative rights is determined by the court on the basis of past production records. The effect of this provision is to increase the amount of ground water that can be produced under the agreement.

Several additional differences in the two agreements result from the procedures used to arrive at the agreement in Central Basin. Signatory parties are allowed to request a redetermination of the production histories upon which their relative rights are based. This gives a signatory party the right to challenge the validation procedure used by Bookman and the opportunity (and risk) of a new determination made by the Watermaster. Non-signatory parties may become parties to the interim agreement by submitting their claim to water rights to the Watermaster for review and certification. Signatory parties may withdraw from the interim agreement by written notice in the event the action has not been submitted to the trial court for a final determination within five years from the effective date of the agreement.

The interim agreement in Central Basin appears to be a

document primarily designed to find an agreeable way to allocate ground water rights in Central Basin and to gain at least a small reduction in the total production from the basin. It is apparent that those who were responsible for negotiating the agreement in the Replenishment District and in the Central Basin Water Association wanted to gain a production curtailment as soon as possible and were not interested in clarifying and defining the legal issues involved. Since the interim agreement has gone into effect, Whelan has met regularly with the attorneys representing the major litigants in an attempt to gain a stipulation to submit to the court for final determination. However, this has not been as easy a task as the negotiation of the interim agreement. Producers, who were willing to sign an interim agreement which protected their diverse claims to rights while accomplishing a relatively small production curtailment of benefit to all, have been far more cautious about signing a final stipulation which will define their rights over a long period of time. Other producers who refused to sign the interim agreement are demanding that their interests be taken into account in the final settlement.

One major controversy involves the interpretation of sections 1005.1 and 1005.2 of the Water Code to be used in the final agreement. Under the interpretation used in the interim agreement, the City of Long Beach received

substantial credit for imported water use, while the City of Los Angeles received no credit at all. Consequently, Los Angeles did not sign the interim agreement. Whelan has suggested another interpretation for the section which would improve the position of Los Angeles but reduces the assumed rights of Long Beach. Until the negotiators can find a legally tenable formula which will provide a satisfactory physical solution for both of these major water producers, a final agreement is impossible. Since the Central Basin litigants have sought to find a satisfactory physical solution, the negotiators recognize their legal vulnerability and their need for unanimous agreement to the final stipulation. The Replenishment District and the Central Basin Water Association were able to draw upon the West Basin experience and avoid some of the costs involved in reaching an interim agreement there. However, not all the costs of reaching a satisfactory solution to conflicting demands for the use of scarce resources can be avoided. Difficult problems are involved and they cannot be ignored in the attempt to reach an agreement.

It is quite clear that the Replenishment District does not intend to ask the court for a safe yield determination in Central Basin. This issue was carefully avoided in the final West Basin judgment. Water producers in both basins strongly resist any move to reduce production to a safe yield or even to allow the court to define safe yields for

the basins. However, once ground water rights have been adjudicated in both basins, the Replenishment District will face the difficult problem of interpreting the provision in its organic legislation requiring the district to levy replenishment assessments on only that portion of ground water production which exceeds the basins' safe yield. In January, 1963, the Replenishment District directors and general manager requested Max Bookman to analyze the overall effects of exempting each producer's share of the safe yield from the replenishment assessment. Bookman concluded that it would be easiest and fairest to assess all ground water production rather than to exempt each producer's share of the safe yield.⁴⁰

An attempt was made to eliminate this provision from the Water Replenishment District Act, but other interested areas in the state objected. A compromise bill was passed in 1963, which delayed the effect of the provision for three years after the completion of final adjudication.⁴¹ The legislation also added a provision to the effect that a replenishment district board of directors could determine by resolution whether a particular adjudication "will invoke the provisions of this section as of the beginning

⁴⁰Letter from Max Bookman to Carl Fossette, January 19, 1963.

⁴¹California Stats., 1963, ch. 253, sec. 3, p. 1015.

of the third fiscal year."⁴² This determination is subject to review de nova at any time by a court of competent jurisdiction upon appeal by a water producer within the district.

The limited ground water production curtailment resulting from the interim agreement has had a marked effect on the ground water basin. Water levels rose from ten to twenty feet in some locations. Signatory parties to the agreement produced 168,906 acre-feet of ground water during 1962-63, which represented a 21 per cent decrease when compared with the 214,151 acre-feet extracted by these parties during the previous year.⁴³ The use of imported water increased by approximately 44,000 acre-feet during 1962-63.⁴⁴ While the recovery in water levels resulting from the interim agreement has been an important aspect of the ground water basin management program, the management of demand through litigation has not assumed the same proportion in the total program as the management of supply through replenishment. The ground water production curtailment of 45,000 acre-feet was only one half of the 98,000 acre-feet spread during the same period at the Montebello

⁴²California Stats., 1963, loc. cit.

⁴³However, the 45,000 acre-feet production curtailment under the interim agreement was not as much as the original plan submitted by the association committee had scheduled. Fossette stated before the Assembly Interim Committee on Water on November 29, 1961, in Anaheim, that the original plan "will reduce pumping by 25 % or about 70,000 acre-feet a year." Hearings, p. 133.

⁴⁴Watermaster, Central Basin, Report for 1962-63, p. 3.

forebay.⁴⁵ When the barriers are in operation, the reduction in demand will be an even smaller element in the overall management program than the increase in supply.

Since its establishment, the Replenishment District through negotiation with other public and private agencies has been developing a plan of operation for West and Central Basins which will protect the basins from salt water intrusion and bring the supply of ground water available to the basins into balance with the legal demands that can be made upon it. The present program anticipates that the average supply of ground water to the area, once the barriers are completed, will be:

Long-run average natural fresh water supply	142,000 acre-feet
Spreading of untreated Colorado River water and reclaimed sewage effluent	120,000 acre-feet
Water injected through the barriers	75,000 acre-feet
Total average annual supply	<u>337,000 acre-feet</u>

Through the litigation in West and Central Basins, the demands that can be made upon this supply will be limited to:⁴⁶

West Basin	59,000
Central Basin	<u>221,000</u>
	280,000

Since the average demands for ground water will be less

⁴⁵Watermaster, Central Basin, Report for 1962-63, pp. 14, 16.

⁴⁶CWBWRD, Annual Report for 1964, pp. 31, 59, 52, 53.

than the average supply, approximately 57,000 acre-feet per year will be devoted to an elimination of the accumulated overdraft.

The Evolution of a Decentralized Political
Decision-Making System

At the same time that the Replenishment District and other public and private agencies have been developing a ground water basin management plan, by their actions and decision they have also been establishing a decision-making system responsible for managing these basins. These institutional arrangements are as much a product of the work of public entrepreneurs as the barriers, the spreading program and the interim agreement in Central Basin. Prior to the establishment of the Replenishment District, decisions regarding the movement toward ground water basin management were taken primarily within the context of the West and Central Basin Water Associations with the active participation of the various public agencies involved. Since the creation of the Replenishment District, certain decisions are taken within the context of the Replenishment District itself, others are taken as a result of negotiations between the Replenishment District and the two private water associations and still others are taken in general negotiation with a group of other public agencies interested in ground water basin management.

With regard to decision taken within the Replenishment District itself, the most significant development is the substitution of majority rule for unanimous consent. Once a public agency is created, individuals cannot "opt out" when they are in the minority. It is assumed that everyone will be in the majority sometimes and in the minority sometimes, and as a result the individual is precluded from opting out of most public decisions. Of course, it is possible to "opt out" of a decision by a local public agency by moving to another community, but one cannot "resign" his membership from a local public agency without moving out of the area. By creating a public agency, the public entrepreneurs of West and Central Basins established an organization which could lower the costs of decision making at the risk of increasing the number of decisions that were unsatisfactory to a minority group which would have to abide by the decision.

Because there are vital issues at stake the Replenishment District has not always exercised its authority to take decisions under a majority rule, but has chosen to work closely with the associations and their informal rules of unanimous consent. This was especially apparent in the way the Replenishment District pursued the Central Basin litigation. The Replenishment District asked the Central Basin Water Association to be responsible for negotiating the actual agreement used as the basis of the interim agreement

with the help of the Replenishment District's general manager, attorney and engineer. Since litigation of this type is much more costly if a contest develops, the Replenishment District attempted to hold down the costs by achieving unanimous consent within the association before initiating formal action. This strategy proved successful in regard to the rapid negotiation of the interim agreement, but water producers were able to gain a smaller production curtailment than was originally recommended. If the Replenishment District wishes to achieve a substantial ground water production curtailment in the future, it may have to use its own decision rules to accomplish this action and risk the costs of litigation.

In regard to the decisions reached through negotiation with other public agencies, the decision-making system strongly resembles the structure of bilateral monopoly bargaining, or, at times, that of an oligopolistic market. Each of the participants is fundamentally independent from the others, but each is reliant upon the negotiation of satisfactory exchanges to further its survival values and to achieve some of its basic objectives. The Replenishment District has attempted to achieve a major portion of the management program and to coordinate the activities of other public agencies by functioning primarily as a large-scale purchaser of public goods and services. Other agencies have goods and services which they wish to sell or exchange.

Usually a common ground has existed for a satisfactory settlement between the agencies.

In those areas where the Replenishment District is the only purchaser, it can exercise the power of the monopsonist and exact a bargain which is weighted in its favor. When another agency is the only supplier, it can exercise the powers of a monopolist and can negotiate a final settlement which is highly favorable to its basic interests. When the Replenishment District functions as a monopsonist facing a monopolist, there is room for the arrangement of a satisfactory bargain for both parties which may or may not impose costs on others or for prolonged and heated negotiation leading to stalemate. All of the risks and uncertainties of bilateral monopoly bargaining exist. Whenever competition is introduced on one side, the power of the agency on the other side is increased as it attempts to gain the most favorable bargain from the competitors.

The Metropolitan Water District of Southern California has functioned as the only major wholesaler of imported water in the Southern California area until recent times. While Metropolitan has had monopoly powers, it has been exposed to the claims of Arizona for a larger share of the Colorado River and the consequent threat that Metropolitan's share would be decreased. Metropolitan officials have felt the need to establish a history of extensive use in order to substantiate their claims to the Colorado River. In

addition, Metropolitan has not been able to turn the Colorado River aqueduct venture into a successful financial enterprise. The demand for water has not been sufficient to enable Metropolitan to operate its aqueduct at its most efficient scale. In an attempt to increase the demand for its product, Metropolitan has followed the strategy of lowering the price of Colorado River water sold to public agencies which use the water for replenishment purposes. When the founders of the Replenishment District approached Metropolitan to determine whether it would provide a source of water for the barriers, Metropolitan's board of directors made a commitment to construct feeders to convey untreated Colorado River water to the barriers. While the future Replenishment District was not the only purchaser, the promise of large volume future sales led Metropolitan to invest \$15 million to construct the feeders. However, once the commitment was made to use Metropolitan water in the barriers, Metropolitan was able to exact a higher price by placing a treatment plant on the lower feeder which provided filtered water to the barrier. Metropolitan has recently suggested that the water carried in these lines may eventually be softened as well as filtered. The price of Metropolitan water delivered to the barriers may, thus, rise still further.

However, a competitor has entered the field and may be able to reduce the control that Metropolitan exercises over

the price of water used for replenishment purposes. The Los Angeles County Sanitation Districts want to expand the Whittier Narrows Plant and to construct a reclamation plant to supply the Alamitos Gap barrier. It appears that the price of reclaimed water produced at these plants will be less than the price of Metropolitan water. The possibility of an alternative supply at a lower price will give the Replenishment District more power in its future negotiations with the Metropolitan Water District.

The Replenishment District has almost a monopsonist's position in relation to the Sanitation Districts and is capable of exacting a low price. The Sanitation Districts have been searching for other buyers for their water, but have not succeeded so far. Some of the parks in the area have indicated an interest in purchasing reclaimed water, but the size of their future purchases are not sufficient to build facilities for supplying these demands alone. Consequently, the agreement of the Replenishment District to purchase a large volume of the future production is an essential factor before the Sanitation Districts can gain funds to construct additional reclamation facilities.

The Flood Control District was created in 1915 primarily in response to the need for major public works to prevent the recurrence of severe floods in the Los Angeles and San Gabriel River basins. This type of "durable goods" public agency frequently is in a very exposed position.

Once it has completed the durable public works for which it was originally created, it may find itself "out of business" unless new goals and new projects can be found. In more recent years, the Flood Control District has placed more emphasis on its secondary function, water conservation, in an attempt to maintain its survival as a large scale public enterprise in Los Angeles County. Consequently, the Flood Control District has been interested in selling its services as an engineering design and operating firm in the business of water conservation. Through its own revenue producing power, the Flood Control District can undertake some water conservation projects, but could not construct the barriers or operate the spreading grounds using imported water. The barrier project, in particular, is very attractive to the Flood Control District, since it involves a large scale design and construction project in the immediate future as well as long term maintenance and operation of the project.

While the Replenishment District does not purchase the services of the Flood Control District directly, there is an exchange relation between the two districts which is similar to a market exchange. The Replenishment District can purchase water for conservation, something which the Flood Control District is precluded from doing. As a result, the Replenishment District exchanges a water supply for the services of conserving the supply in the ground

water basin. The Replenishment District's control over the water supply gives it some power to specify how that water will be used. At the same time, there is no other agency which can build the barriers and run the spreading works for the Replenishment District unless the Replenishment District decided to "go into the business" itself. Consequently, the negotiation between the Replenishment District and the Flood Control District also has a strong resemblance to a bilateral monopoly bargaining situation. Each can, at times, exact a little higher price from the other than the other hoped. The Flood Control District, by insisting upon the use of its own staff to do most of the planning and design of the West Coast barrier, has delayed the construction of this barrier and increased its costs. At the same time, the Replenishment District has convinced the Flood Control District to contract for the engineering plans and design for the Alamitos Gap barrier and this barrier will be constructed ahead of the Flood Control District's original schedule. Since these agencies both want to see the barriers completed and the spreading program continued, their equal power and lack of competition have not precluded the possibility of agreement. However, if, in the future, these two agencies do not share the same objectives, their equal power and the lack of competition might lead to stalemate or to the development of new institutional arrangements to replace their present cooperative arrangements.

The relation of the Replenishment District to the Watermaster Service of the State Department of Water Resources resembles a market exchange to a limited extent. The Watermaster performs an essential service for the Replenishment District, that of monitoring the extractions of ground water producers within the West and Central Basins. One half of the cost of the Watermaster Service is paid for by the local water producers. If the producers felt that the Watermaster service was not adequate or too expensive, they would act through the Replenishment District to try to improve the service or reduce the cost. The Replenishment District and the Watermaster Service have entered into cooperative agreements to reduce duplications in their functions. For example, production records are submitted by water producers in the area to the Replenishment District which machine processes the data and make them available to the Watermaster.

Other than the Watermaster, the Department of Water Resources is viewed by the Replenishment District as a potential competitor for the control and management of the local ground water basin. The Department is undertaking the construction of a major aqueduct to bring water from Northern California to Southern California. An inherent part of the State's plan of operation is the use of the ground water basins for terminal storage in conjunction with its aqueduct system. While State officials have

frequently noted that the basins will remain under local control, State officials have also made it apparent that if local areas do not undertake efficient management programs on their own, the State will initiate its own program. The interest of the State in West and Central Basins has been evidenced by the creation of a special study group of engineers, hydrologists, geologists and economists to prepare a model management plan for the four ground water basins of the Los Angeles County coastal plain (Hollywood, Santa Monica, West and Central Basins). The early technical studies of this group were incorporated into the plans made by the Replenishment District. However, the State is also making an economic analysis of alternative management plans for these ground water basins. If the State recommends a management plan which is significantly different from the plan evolved in the local area, the Replenishment District will be faced with some difficult decisions. If the Replenishment District's board of directors, the general manager and the engineer agree that it is a better plan than they have been able to evolve so far, they can use the threat of an eventual State "take over" to move local water producers closer to a more optimal plan proposed by the State. However, if the local agencies do not think the State plan is better than their own, they may be faced with a difficult challenge for effective control over the local ground water basins.

The decentralized political decision-making system of West and Central Basins is a distinct creation of the public entrepreneurs who have been involved in the task of building institutional facilities to enable the local area to control its own resources. The adequacy of this decentralized decision-making system can be evaluated in terms of three criteria: (1) the capacity to regulate the physical events to be controlled; (2) the capacity to reach satisfactory solutions through negotiations and to coordinate the efforts of formally independent public and private agencies; and (3) the capacity to reach efficient solutions that involve an equitable apportionment of the benefits and the costs.

The capacity of the decentralized political decision-making system in West and Central Basins to control the relevant physical events is rather high. The technical expertise available in the various public and private agencies involved has meant that the know-how to achieve regulation is present. The problem until recent times has been the need to create some enterprise whose boundaries were coterminous with the boundaries of the relevant physical world. The creation of the Central and West Basin Water Replenishment District added to the system a key agency whose boundaries were coterminous with two out of three of the interrelated ground water basins along the San Gabriel River system. Significant control can be accomplished by treating these two basins as a linked system.

The San Gabriel Valley, the third basin, has been linked to a certain extent by litigation. At least the outflow from that basin will be regulated in the future and water producers in Central and West Basins can be assured of a firm and predictable average inflow of ground water. Individuals in the area recognize that it would be helpful to include the San Gabriel Valley in the Replenishment District or to form a separate replenishment district in the San Gabriel Valley to coordinate activities with the lower area. Gradual progress toward this goal is apparent.

In addition to the relevance of the boundaries of the decision-making system to the physical world to be regulated, the decentralized system evolved in West and Central Basins offers a variety of scales of enterprise that can be utilized to solve various physical problems. The Replenishment District's scale of operation is not very large when compared to that of the Los Angeles County Flood Control District or the Metropolitan Water District. However, by functioning as a purchaser of goods and services, the Replenishment District gains the advantage of the large scale of other public agencies when dealing with such problems as importing Colorado River water, building waste water reclamation plants and constructing the barriers. The decentralized decision-making system offers the

possibility of increasing or decreasing the scale of enterprise in relation to the events to be regulated.

The decentralized political decision-making system has also been capable of reaching satisfactory solutions through negotiation and of coordinating the efforts of formally independent public and private agencies. Since all of the public agencies which have participated in the negotiations leading toward the development of a ground water basin management plan are formally independent, an agency would not participate in any action considered unsatisfactory to its essential values. While one agency may be able to use its bargaining power more effectively in some decisions, other agencies have to be satisfied with the final arrangements, or they could exercise a veto power. However, the question of whether a satisfactory solution is also an optimal solution remains to be considered. The concluding analysis in Chapter X will examine that issue further.

SECTION IV

CONCLUSION

CHAPTER X

AN EVALUATION OF THE WEST BASIN EXPERIENCE IN PUBLIC ENTREPRENEURSHIP

The West Basin experience in public entrepreneurship has involved a whole series of developments since 1945 including: (1) the organization of a private association to provide a forum for the discussion of joint problems; (2) the formation of a municipal water district to furnish an alternate supply of surface water; (3) the initiation of a limited form of pro rata rationing of ground water supplies; (4) the determination that a fresh water barrier to prevent salt water intrusion was physically feasible and (5) the creation of temporary institutional arrangements to operate a partial barrier against the sea. The experience has culminated in the development of a ground water basin management program and the evolution of a decentralized decision-making system composed of several public enterprises which have acted conjunctively to place the management program into operation. In the previous chapter, the adequacy of the decentralized decision-making system was evaluated in terms of its capacity to regulate the physical events to be controlled and to reach satisfactory solutions

to the problem of coordinating the efforts of diverse and independent public agencies. In this chapter, the question of whether the program developed by this management system represents an optimal use and allocation of resources will be considered. The second portion of this chapter will be devoted to an analysis of the way in which institutional arrangements affect individual conduct leading toward optimal and non-optimal behavior. The last section will deal with the problems faced by the public entrepreneur in devising institutional arrangements to provide public goods and services.

Optimal Use of Ground Water Supplies in a
Conjunctive Use System

The development of an optimal program for the conjunctive use of ground and surface water supply systems is a difficult and complex problem. In an optimal system, it is assumed that resources are devoted to their most valuable uses. Optimal development also implies that for a given outlay of funds, that the highest return is achieved, or for a given set of benefits, that the least expenditure is made.

The primary benefit attributed to the ground water basin management program that has been developed for West and Central Basin is usually the protection of the storage

capacity of these basins from salt water intrusion.¹ If the water producers of West and Central Basins were utilizing their ground water rights principally to meet peaking requirements, the flow of benefits attributed to the program would appear to be quite realistic. However, since a large portion of the ground water extracted from West and Central Basins is utilized as a base supply, serious questions are raised concerning the actual benefits and costs realized by the management program. In order to deal with these questions, it will be necessary to discuss (1) the economic value of ground water rights devoted to diverse functions, (2) a hypothetical optimal use pattern for ground and surface water supplies, (3) the actual use patterns in West and Central Basins, (4) the benefits and costs of the barrier program, (5) the benefits and costs of the spreading program and (6) an alternate management program for a more optimal use of the ground and surface supplies for West and Central Basins.

¹See in particular, the Los Angeles County Flood Control District, Report on Required Facilities for Replenishing and Protecting Ground Water Reserves in the Central and West Coast Ground Water Basins, Part I and II (Los Angeles, 1961). Hereinafter cited as LACFCD, Report on Required Facilities, Part I or II.

The Economic Value of Ground Water Rights

The economic value of a ground water right is dependent upon the use to which it is devoted. When a ground water right is utilized to meet a constant rate of demand its economic value is equivalent to the capitalized value of the marginal cost of purchasing the same quantity of water once a year from a surface supply for an indefinite period into the future. The marginal cost of water purchased from an alternate source in the West and Central Basins is the price charged by the Metropolitan Water District for treated and softened water delivered for direct use. At the present time, this price is approximately \$30.00 per acre-foot. At an interest rate of 6 per cent, the capitalized value of a water right for one acre-foot per year devoted to the provision of base supplies would be \$500.00.

However, when ground water rights are utilized to meet peak seasonal demands in excess of the base supply of a system, the economic value of the seasonal storage component of a ground water right is equivalent to the cost of constructing surface storage to replace the seasonal storage provided by the basin. Since a ground water right enables a water producer to extract a defined quantity of water each year, it can be considered equivalent in theory and function to a defined volume of storage constructed for seasonal peaking purposes. The construction of surface storage facilities in the urbanized West and Central Basins

is very expensive. In its benefit cost analysis of the West Coast barrier, the Los Angeles County Flood Control District estimated that the cost of surface storage facilities in the area averaged approximately \$16,000 for each acre-foot of capacity.² Using the Flood Control District's estimate, the seasonal storage component of a ground water right devoted to this use in West and Central Basins would be worth as much as \$16,000 for a right to extract one acre-foot during the period of peak summer demand.

As discussed in a later section, water producers in this area would require surface storage approximately equivalent to 8 to 16 per cent of their total annual demands if they did not have access to ground water supplies to meet their peaking requirements. This would mean that a ground water producer dependent upon a uniform surface supply with an annual demand for 500 acre-feet, for example, might require seasonal storage for 40 to 80 acre-feet. At a cost of \$16,000 an acre-foot, the water supplier would have to spend \$1,280,000 to build adequate surface storage facilities in this area with 80 acre-feet of capacity. This hypothetical water producer would presumably be willing to pay up to \$1,280,000, or \$16,000 an acre-foot, for the potential storage component involved in the right to extract an equivalent 80 acre-feet from ground

²LACFCD, Report on Required Facilities, Part I, p. 98.

water supplies to meet this same seasonal demand. In addition, he would be willing to pay the capitalized value of the marginal cost of providing the 80 acre-feet of water as such from any source during off-peak periods of demand.

The economic value of ground water rights used for storage to meet daily peaking needs is somewhere between the value of ground water rights used for seasonal storage and the value of ground water rights used for base supply. In addition to this need for storage to meet peak demands during the hot summer season, a water supplier needs to provide about 35 per cent of his maximum daily demands for storage within his system in order to meet daily peaking requirements.³ In an optimal conjunctive use system, the storage necessary to meet daily peaking requirements cannot be entirely replaced by the use of ground water supplies. Some surface storage is necessary in order to make efficient use of the imported water transmission system and to provide adequate pressure for fire flow protection at all times. However, the right to produce ground water can be substituted for some of the storage needed to supply daily peaking requirements. It is assumed that storage constructed to provide daily peaking needs is filled and emptied 365 times a year. Therefore, the right to extract 365 acre-feet per year would be equivalent to one acre-foot

³Interview with Louis Alexander, July 2, 1963.

of storage capacity provided for daily peaking needs. Assuming a cost of \$16,000 to construct one acre-foot of storage, a water supplier would be willing to pay approximately \$44.00 an acre-foot for the potential storage component involved in the right to produce ground water to be used to meet daily peaking needs. In addition, a water supplier would be willing to pay the capitalized value of the marginal cost of obtaining alternate supplies for the right to obtain the flow of one acre-foot each year for an indefinite period into the future.

An Optimal Use Pattern for Surface and Ground Water Supplies

Because of the extreme difference in the value of ground water rights used for seasonal peaking requirements and ground water rights used to meet base supply needs in West and Central Basins, it is assumed that an optimal conjunctive use system for these areas would devote ground water supplies primarily to their highest valued use or for seasonal peaking purposes. If the average yield of the ground water basins is sufficient, some rights may also be used to meet daily peaking needs. Use of ground water supplies to meet base demands is justified in an optimal plan only to the extent that the natural yield exceeds seasonal and daily peaking requirements or to the extent that the marginal cost of replenishment is less than the marginal

cost of using surface supplies to meet base demands. This latter occurs only when there is a source of replenishment water priced low enough that the cost of this water, plus the cost of artificial replenishment, plus the cost of pumping this water out of the basin is less than the cost of purchasing a surface water supply for direct use.

Figure 4 is a schematic representation of the way a hypothetical water supplier would meet his daily winter and summer demands for water from imported supplies, from his surface storage, and from ground water sources in an optimal conjunctive use system for West and Central Basin. Figure 5 is a schematic representation of the same water supplier's annual demand for imported and ground water supplies. If an optimal conjunctive use system has been developed in West and Central Basin, one would expect that the actual patterns of use for ground and imported water would resemble the pattern of use shown in Figure 6.

The Actual Use Patterns in West and Central Basins

As shown in Chart 1, the actual patterns of monthly demands for ground and imported water in West Basin differed significantly during 1962-63 from the hypothetical optimal pattern. While the actual use of ground water is much less than the use of imported supplies, it is apparent that a large portion of the demand is extracted at a uniform rate.

Figure 4

Method of Supplying Winter and Summer Daily Demands in an Optimal Conjunctive Use System

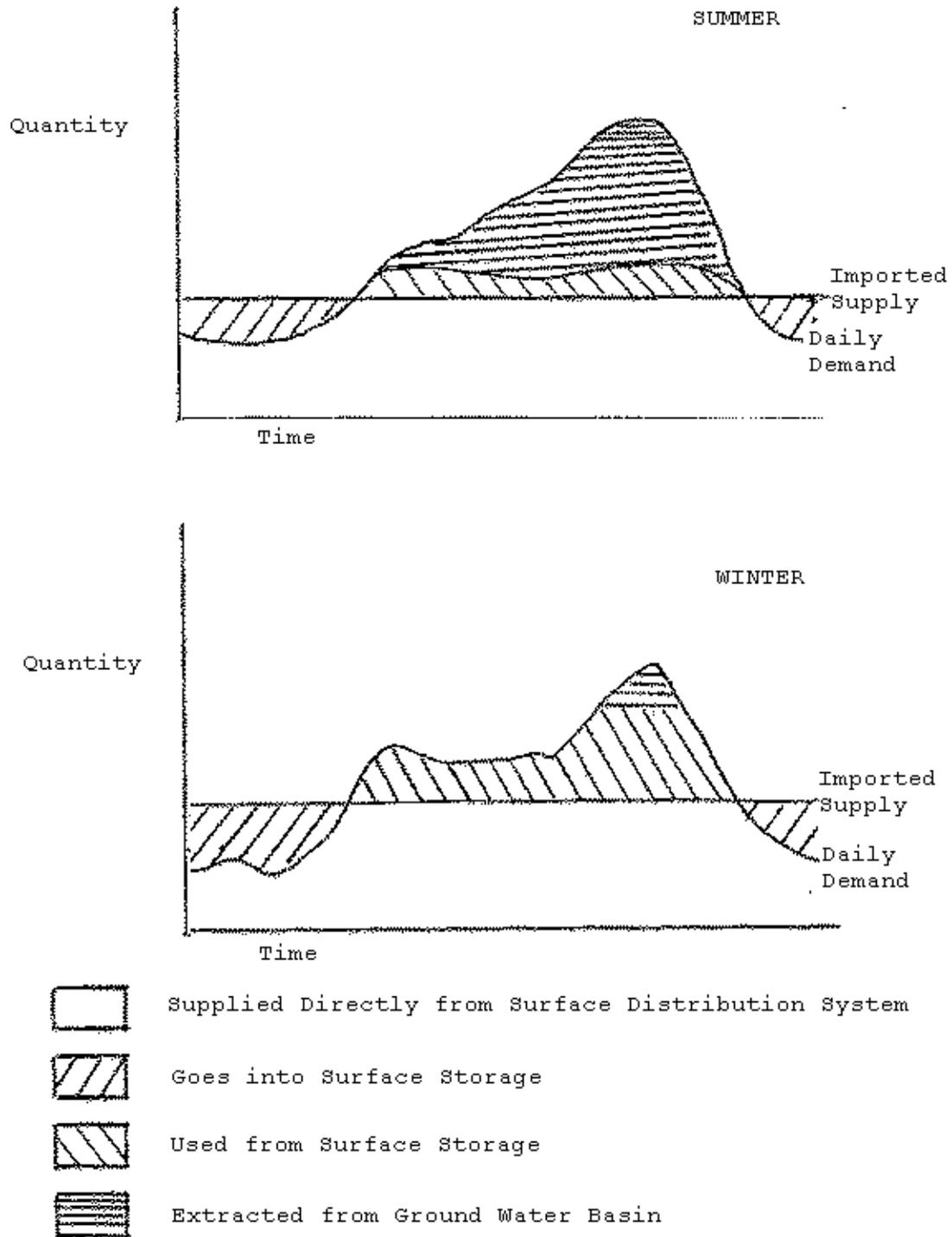


Figure 5

Annual Demand Pattern for Hypothetical Water Supplier in a
Conjunctive Use System

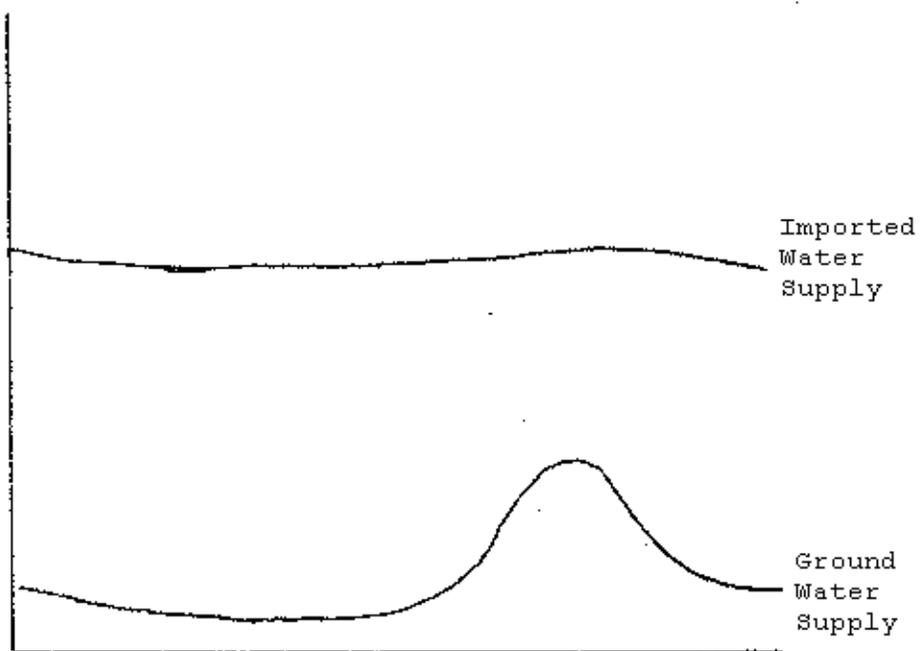
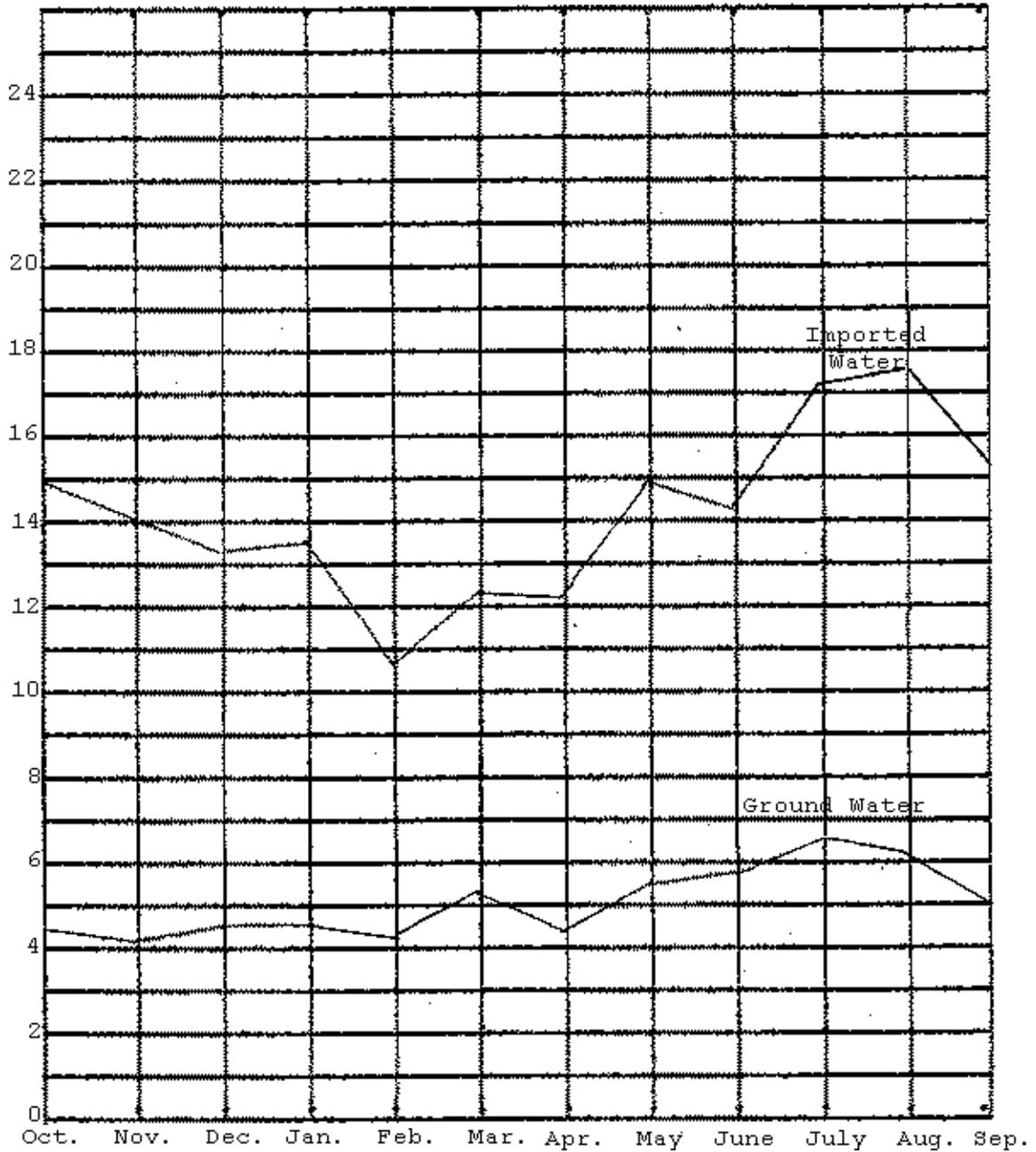


Chart 1

Monthly Demands for Imported and Ground Water Supplies
 in West Basin during 1962-63
 thousands
 of
 acre-feet

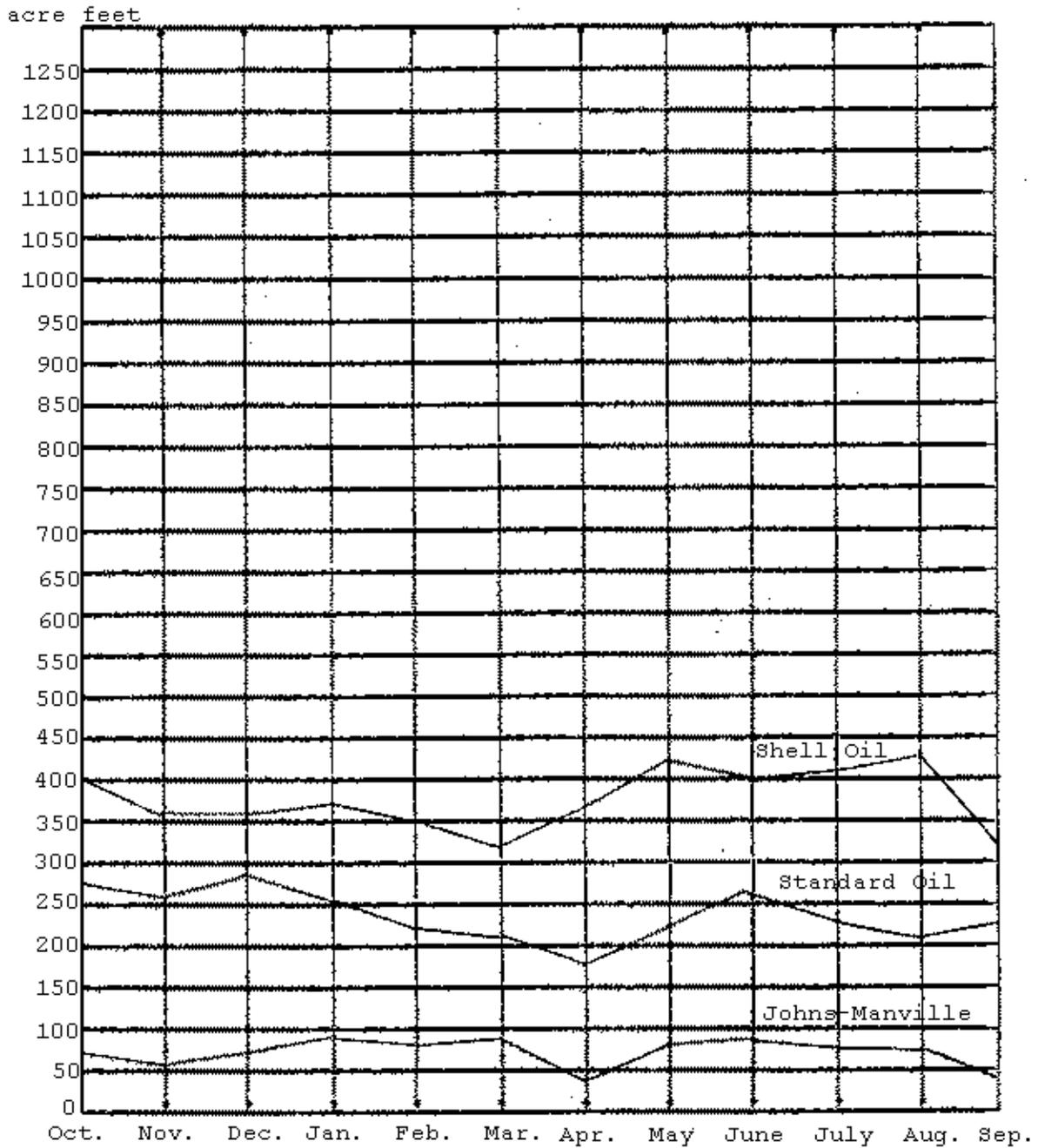


Source: Watermaster, West Basin, Report for 1962-63, plate 8.

There is more variation in the quantity of imported water used during the year than there is in the quantity of ground water extracted. Since the Metropolitan distribution lines were designed at a capacity which was 130 per cent of the predicted average long term demand for imported water in the area, and the actual demand for imported water has never approached expectations, water producers are physically able to use the surface distribution system to provide their peaking requirements. The pattern of monthly demands for imported and ground water supplies can be explained more fully by reference to Tables IV, V, and VI in Chapter I and Charts 2, 3, and 4 to follow.

In 1962-63, industrial producers in West Basin produced 41 per cent of the total yield of the basin. As shown in Chart 2, three of the firms included in this group extracted their ground water at a relatively uniform rate with small variations to meet changes in production processes. Petroleum and industrial producers have frequently justified their large production of ground water to meet a constant demand on the basis of the quality differential between ground water and Colorado River water. However, as the amount of Colorado River water spread and injected into Central and West Basin increases, the quality differential between the two sources will diminish and any special economic value for these industrial producers will be eliminated.

Monthly Demands for Ground Water:
 Shell Oil, Standard Oil and Johns Manville
 (1962-63)



Source: Watermaster, Report for 1962-63, pp. b-12, b-15, b-8.

Chart 3

Monthly Demands for Ground Water: Southern California Water Company, Dominguez Water Company, California Water Service, Palos Verdes Water Company (1962-63)

acre feet

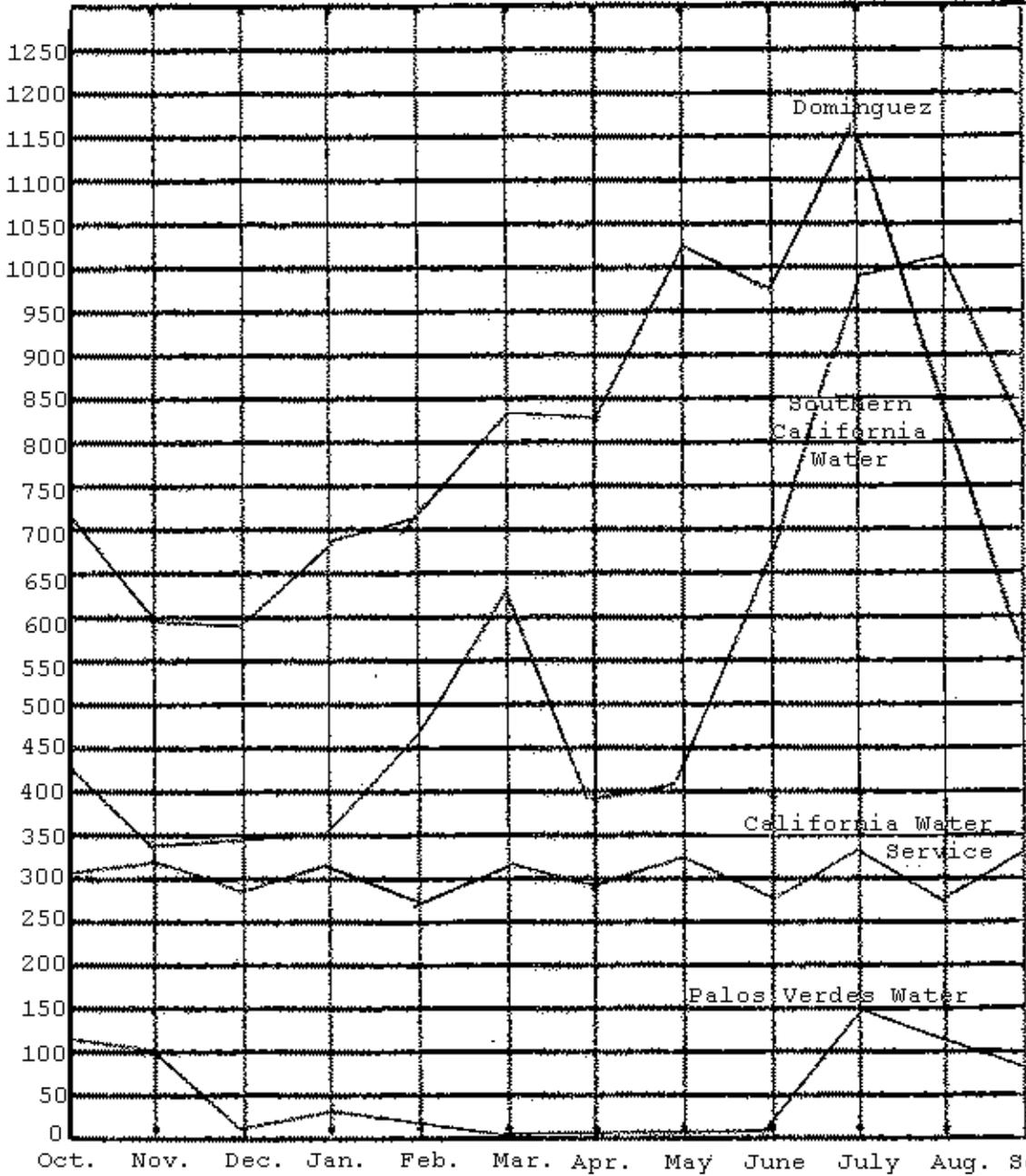
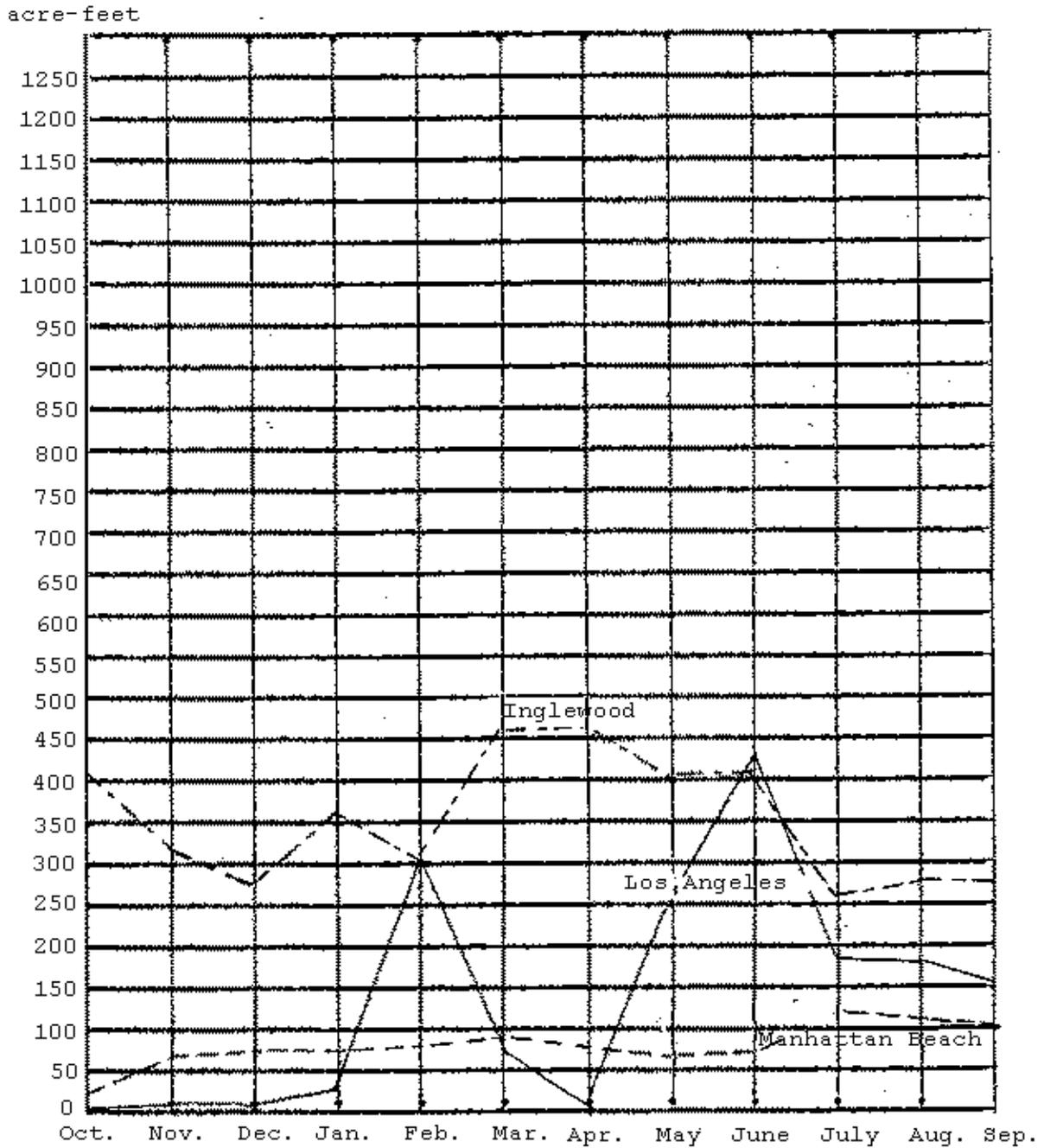


Chart 4

Monthly Demands for Ground Water:
 Cities of Inglewood, Los Angeles and Manhattan Beach
 (1962-63)



Source: Watermaster, Report for 1962-63, pp. b-8, b-9, b-10.

Chart 3 shows the monthly demands for four private water companies for ground water during 1962-63. The Palos Verdes Water Company, which imported 93 per cent of its water supply during the year, utilized its ground water rights primarily for seasonal peaking. California Water Service Company, which imported 74 per cent of its annual supply appears to have extracted ground water at a relatively uniform rate. It can be assumed that some of this ground water was devoted to daily peaking, but it would appear that California Water Service Company met its summer peak demands by increasing its use of the imported supply. Southern California Water Company, which imported 73 per cent of its water supply withdrew a large portion of its annual ground water rights during the summer months of heavy demand, but also used a considerable volume of its ground water rights to meet base demands. Dominguez Water Company, the largest water producer in the basin, imported 71 per cent of its supply. While the Dominguez Water Company did utilize a large portion of its ground water rights to meet summer demands, it would appear that it also used at least 450 acre-feet of ground water per month to supply its average demand.

Chart 4 shows the monthly demand for ground water of three municipalities during 1962-63. The City of Los Angeles which imported 96 per cent of its water supply used in West Basin exhibits a pronounced seasonal peaking

pattern in its demands made upon ground water supplies. Manhattan Beach, which imported 77 per cent of its total supply appears to have used ground water supplies to meet only a small portion of its summer peak demands. The rest was met by increases in the amount of imported water used. Inglewood which imported 62 per cent of its water supply did not use ground water to meet seasonal peaking requirements. In fact, ground water production during July, August and September was lower than during any other month of the year.

In comparing the use of ground water supplies for seasonal peaking purposes and the percentage of imported water used there is a strong correlation between the use of the basin for seasonal peaking and the relation of a supplier's ground water right to his total demand. Water suppliers whose ground water rights are less than 10 per cent of their total demand appear to reserve their use of ground water primarily for seasonal peaking. Producers whose ground water rights are between 10 and 30 per cent of their total demand appear to use a significant portion of their ground water rights to meet seasonal peaking, but have sufficient ground water rights to meet daily peaking requirements and some base demands. When ground water rights approach 40 per cent or more of a supplier's total demand, it would appear that a large volume of ground water is devoted to use as a base supply.

Central Basin producers are much more dependent upon ground water resources for use as a base supply than West Basin producers. Water suppliers, who signed the Central Basin interim agreement and reduced their ground water production during 1962-63 by 20 per cent, extracted 67 per cent of their total supply from ground water sources after the production curtailment. This group includes almost all of the large water suppliers in the area. It is assumed that the large industrial producers and the numerous non-industrial overlying producers withdrew an even higher percentage of their total supply from ground water sources. As shown on Chart 5, Central Basin producers utilized Colorado River water at a relatively uniform rate and met seasonal peaking requirements from their ground water supplies. However, it would appear that at least 10,000 acre-feet per month, or 120,000 acre-feet per year, of ground water supplies were used as a base supply.

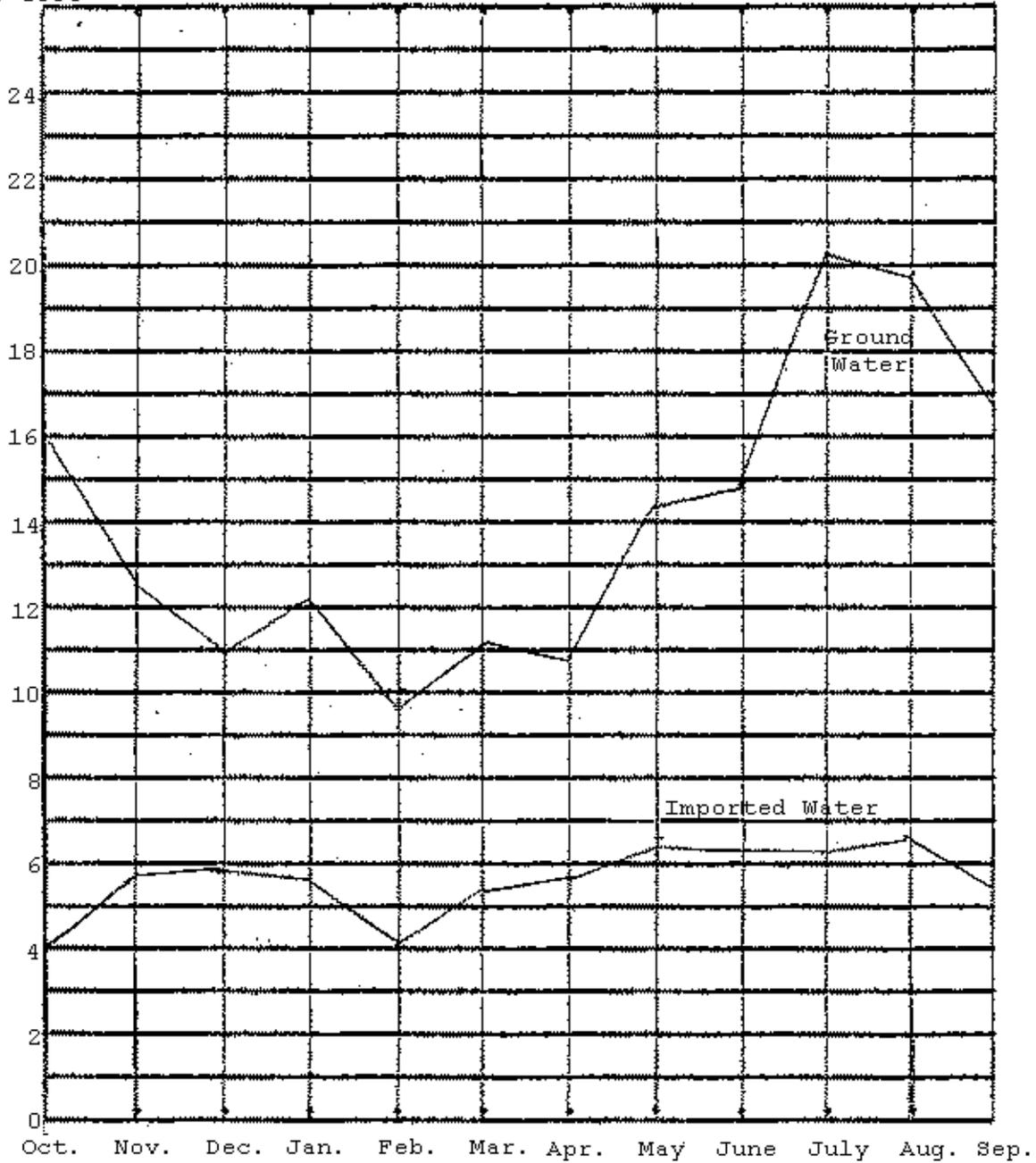
The Benefits and Costs of the Barrier Program

The water producers of West and Central Basins, the taxpayers in the area, and the taxpayers located throughout the Metropolitan Water District have already made considerable investments in the water supply systems of West and Central Basins and are making an even greater investment in the immediate future to construct three fresh water barriers against the sea. Evidence of extensive allocation of ground

Chart 5

Monthly Demands for Imported and Ground Water Supplies
in Central Basin During 1962-63

thousands
of
acre-feet



Source: Watermaster, Central Basin, Report for 1962-63, plate 4.

water resources to their least valuable use, the provision of a base supply, raises questions about the benefits to be derived from investment in the barrier program. In discussing the benefits derived from the proposed barrier program, one needs to be cautious in defining the benefits that actually flow from the construction of the barriers. Construction of the three barriers will halt salt water intrusion at the present time and protect the future utility of the ground water basins for use in conjunction with a surface supply system. However, rising ground water levels resulting from substantial curtailment of ground water production would also prevent salt water intrusion in the long run.

The proposal to curtail production to a safe yield has been made numerous times in the past. At the turn of the century, Mendenhall suggested that ground water production in West Basin remain at 10,000 acre-feet per year, his estimate of the safe yield. In 1946, Harold Conkling recommended that ground water producers curtail production to 10,000 acre-feet, less than the safe yield estimates for that time. Conkling argued for the full use of a new surface water distribution system while water producers allowed the water levels in their basin to reach sea level. Conkling estimated that ground water production of 10,000 acre-feet per year would be sufficient to meet all peaking requirements. The idea of using a production curtailment

as a means of halting salt water intrusion has been included in every summary of the methods available for preventing salt water intrusion made by the Flood Control District and the State Department of Water Resources.

While the costs of a barrier program have been carefully enumerated, the costs of a production curtailment have not received the same attention. For example, the Flood Control District, in analyzing the Alamitos Gap barrier made the following assertion:

If the pumping in the Central Basin were reduced to the degree necessary to restore a seaward gradient through Alamitos Gap, the economic loss to the water supply agencies, and the cost of substitute facilities required, would greatly exceed the cost of constructing and operating a fresh-water barrier.⁴

Max Bookman, in a brief discussion of the possibility of a ground water production curtailment has made an equally unsupported assertion that it would cost approximately a billion dollars to replace the storage facilities provided by the basin if a production curtailment were effected.⁵ Both of these statements are based on the assumption that most of the water being extracted from West and Central Basin is being used to meet peak demands. The evidence presented above indicates that a very large percentage of the water extracted from these basins is devoted to use as a base supply. If water producers do not have to build

⁴LACFCD, Report on Required Facilities, Part II, p. 21.

⁵Letter to Carl Fossette, January 15, 1963.

additional surface distribution lines or additional storage facilities in order to reduce ground water production, then the cost of a production curtailment is only the cost of obtaining an equivalent volume of water from an alternate source as a base supply.

Since the estimated average annual yield of fresh water to West and Central Basin is approximately 142,000 acre-feet, the reduction of total ground water extractions to 130,000 acre-feet should be sufficient to bring the basins into balance and to prevent further intrusion of the sea. If such a curtailment were effected, water producers would need to purchase approximately 150,000 acre-feet of water from Metropolitan at a cost of approximately \$30.00 an acre-foot or a total cost of \$4,500,000. Assuming that ground water producers can obtain an additional 150,000 acre-feet of water from the Metropolitan system without additional investment in major surface facilities and that seasonal peaking requirements for the area do not exceed 130,000 acre-feet a year at the present time, the cost of providing this base supply of water is an appropriate measure of the benefits to flow from the barrier project.

As shown in Table XV, the total cost of constructing the three barriers in Los Angeles County is approximately \$26,000,000. This estimate of the capital costs includes past expenditures for construction and engineering studies related to the construction of the West Coast barrier and

Table XV

Capital Investment in the Barriers

	Past Ex- penditures	Current & Future Expenditures	Total
<u>West Coast Barrier</u>			
State Grant to build original 1-mill barrier	\$641,600		
LACFCD construc- tion of addi- tional facilities	178,400		
Engineering investigations and tests	510,000		
West Coast barrier investigation and design	840,000		
Construction costs of extended barrier		\$5,690,000	\$7,860,000
Alamitos Gap Barrier Construction costs in Los Angeles County		1,875,000	1,875,000
Dominguez Gap Barrier Construction Costs			2,000,000
<u>Distribution Facilities</u>			
West Coast Feeder	9,200,000		
South Coast Feeder		5,500,000	
			<u>14,700,000</u>
GRAND TOTAL			\$26,435,000

the cost of the feeders constructed by Metropolitan to convey water to the barriers.⁶ Approximately one-half of the total capital expenditure involved in the construction of the barriers will be borne by the taxpayers of the Metropolitan Water District as part of their annual ad valorem taxes. Of the other half, \$641,600 were provided by the State as a grant to finance the construction of the first mile of the West Coast barrier and the remainder, or approximately \$11 million, has been or will be provided by the property owners located within the boundaries of Zones I and II of the Los Angeles County Flood Control District.

Within the context of this study, only a crude approximation of the annual costs associated with the barriers can be gained as shown in Table XVI. The Flood Control District has estimated the operation and maintenance costs and water costs for all three barriers. The Flood Control District has also estimated the annual interest and depreciation costs for a major portion of the West Coast Barrier. Following their basic assumptions regarding an interest

⁶This estimate is very similar to the estimate made by Finley B. Laverty, as assistant chief engineer of the Los Angeles County Flood Control District in testimony in Hearings held before the Assembly Interim Committee on Water held in Anaheim on November 29, 1961. Laverty reported that the cost of the three barriers "to be some 25 million dollars including the supply lines to the barrier [and] the recharge wells. . . ." My estimate differs from Laverty's in that I included the State grant and capital investments made by the Flood Control District in the past as well as present and planned investments.

Table XVI

Annual Cost of Maintaining Barriers and Producing
150,000 Acre-Feet of Ground Water

West Coast Barrier

Operation and Maintenance ^a	300,000	
Cost of Water ^a	1,500,000	
LACFCD Estimate of Average Annual Interest at 4% and depreciation on \$5,471,000 of barrier capital expenditures ^b	303,000	
Rough Estimate of Interest and Depreciation on Remaining Costs of West Coast Barrier ^c	<u>212,720</u>	
		\$2,315,720

Alamitos Gap Barrier

Operation and Maintenance (LA County Share) ^a	156,525	
Cost of Water (LA County Share) ^a	266,000	
Rough Estimate of Annual Interest at 4% and Depreciation on LA County Share of Capital Expenditure ^c	<u>143,545</u>	
		566,070

^aDerived from information provided by Clinton Milne, Flood Control District on October 1, 1964.

^bLACFCD, Report on Required Facilities, Part I, p. 99.

^cOwn estimate.

Table XVI - (Continued)

Annual Cost of Maintaining Barriers and Producing
150,000 Acre-Feet of Ground Water

Dominguez Gap Barrier

Operation and Maintenance ^a	130,000	
Cost of Water ^a	315,000	
Rough Estimate of Annual Interest at 4% and De- preciation on Capital Expenditure ^c	<u>157, 500</u>	
		602,500

Distribution Facilities for
Barriers

Rough Estimate of Annual Interest at 4% and De- preciation over a Fifty Year Period	<u>882,000</u>	<u>882,000</u>
Annual Cost of Barriers		\$4,365,990
Annual Cost of Pumping 150,000 Acre-Feet of Ground Water		<u>1,500,000</u>
Total Annual Cost of Program		\$5,865,990

^aDerived from information provided by Clinton Milne,
Flood Control District on October 1, 1964.

^bLACFCD, Report on Required Facilities, Part I, p. 99.

^cOwn estimate

rate of 4 per cent, depreciation of pipelines over a 50 year period and depreciation of other facilities over a 20 year period, a rough estimate was made of the annual interest and depreciation costs for the remainder of the West Coast barrier capital costs and all of the capital costs involved in the Alamitos Gap and Dominguez Gap barriers. The cost of producing ground water was estimated at \$10.00 an acre-foot, the amount used by the Replenishment District in estimating the production costs within the area. The interest rate and period of depreciation were conservatively estimated in all cases and the resulting total annual costs of approximately \$5.8 million can be considered as a low estimate. Since the benefits to be derived from this investment were estimated at \$4.5 million per year, it would appear that the annual cost of the program may be approximately \$1.3 million more each year than the annual benefits.

This rough approximation of the benefits and costs of the barrier program was based upon two assumptions. The first was that there is sufficient capacity within the Metropolitan distribution system to enable water producers located in West and Central Basin to purchase an additional 150,000 acre-feet of Metropolitan water annually. The second was that the total ground water production of 130,000 acre-feet would be sufficient to meet the requirements for seasonal peaking in the area. While these

assumptions cannot be definitively established, there is considerable evidence to confirm their validity.

The Surface Capacity in the Metropolitan Distribution System

In 1962-63, the total quantity of water supplied in the West and Central Basin area was 535,650 acre-feet. Of this quantity approximately 283,000 acre-feet were extracted from ground water supplies and approximately 252,650 acre-feet were imported. Of the imported water approximately 200,000 acre-feet were purchased from the Metropolitan Water District and the rest came from the San Gabriel Valley and from the Los Angeles aqueduct.⁷ While it is not possible to determine exactly how much Colorado River water was available in addition to the quantity actually used, it is possible to gain a rough estimate from current information.

In 1960, Max Bookman, in close cooperation with Metropolitan officials-attempted to determine how much Metropolitan water would be available in 1962-63 in excess of their predicted demands. Based on these figures, Bookman estimated that there would be 117,366 acre-feet available for direct use in the Replenishment District in excess of the anticipated demand for direct use. The actual deliveries of Metropolitan water for direct use and

⁷CWBWRD, Annual Report for 1964, p. 28 and p. 31.

for the West Coast barrier were approximately 10,000 acre-feet less than anticipated.⁸ Bookman's estimate was also based upon an anticipated spreading program which would have utilized 229,100 acre-feet of untreated Colorado River water for spreading at the Montebello forebay. Water for spreading is transported in Metropolitan's middle feeder which can also deliver treated Colorado River water to the Garvey reservoir to be available for direct use. The feeder can operate intermittently for each purpose, but the amount of treated water it can convey during any period is always less than the amount of untreated water it can convey. Bookman's estimated spreading program for 1962-63 would have utilized the middle feeder to such an extent that only 40,000 acre-feet of treated water would have been available for direct use in West and Central Basin. However, during 1962-63 only 81,000 acre-feet of untreated water were actually spread at the Montebello forebay and it would have been possible to delivery approximately 128,000 to the Garvey Reservoir for direct use. Consequently, approximately 88,000 additional acre-feet of treated water could hare been available during 1962-63. By adding these net changes to the original Bookman estimate, it would appear that during 1962-63, it would have been possible to deliver up to 215,155 acre-feet in addi-

⁸CIBWRD, Management Study, p.72, and CWWRD, Annual Report for 1964, p. 28.

tion to the actual deliveries made to the Central and West Basin areas.

The Need for Ground Water Rights
to Meet Seasonal Peak Demands

While it is not possible within the context of this study to make a detailed analysis of the need for ground water rights to meet peak summer demands in West and Central Basin, it is possible to make some rough estimates from some of the facts known about the water supply system. In the first place, the total annual demands for water are known for both West and Central Basin, and for most of the producers within each basin as shown on Table XVII. The Los Angeles County Flood Control District, in its benefit-cost analysis justifying the construction of the West Coast barrier estimated the need for seasonal storage by determining the average monthly demand for water. The Flood Control District assumed that storage facilities with a capacity equal to the average monthly supply would be sufficient to meet peak demands in an area like the West Basin. From this formula, one would assume that water producers in a conjunctive use system need to produce a volume of ground water at least equivalent to one-twelfth of their annual demand to provide enough ground water to meet seasonal peak demands.

However, a formula for determining the need for surface storage is predicated on the assumption that during

Table XVII
 Estimated Peaking Requirements for West and Central Basing
 (1962-63)

Producers	Total Water Demand ¹	Estimated Peaking 1/12 th of Annual Demand	Requirements 1/6 th of Annual Demand
<u>West Basin</u>			
Industrial	49,300	---	---
Non-Industrial	3,845	319	638
Municipalities	122,645	10,179	20,358
County Districts	3,467	289	576
Private Water Companies	<u>75,824</u>	<u>6,293</u>	<u>12,586</u>
Total West Basin	255,090	17,079	34,158

¹Watermaster, West and Central Basins, Reports for 1962-63.

²Adjusted for exportation to West Basin.

³Estimated.

⁴Since Industrial Producers extract primarily at a constant rate, they have little or no need for seasonal peaking facilities.

Table XVII
 Estimated Peaking Requirements for West and Central Basing
 (1962-63)

Producers	Total Water Demand ¹	Estimated Peaking 1/12 th of Annual Demand	Requirements 1/6 th of Annual Demand
<u>Central Basin</u>			
Signatories to the Interim Agreement			
Municipalities	90,106 ²	7,479	14,958
County District	19,149	1,589	3,178
Private Water Companies	99,018 ²	8,218	16,436
Others	8,650	718	1,436
Non-Signatories	<u>64,000³</u>	<u>5,312</u>	<u>10,624</u>
Total Central Basin	280,923	23,316	46,632

¹Watermaster, West and Central Basins, Reports for 1962-63.

²Adjusted for exportation to West Basin.

³Estimated.

⁴Since Industrial Producers extract primarily at a constant rate, they have little or no need for seasonal peaking facilities.

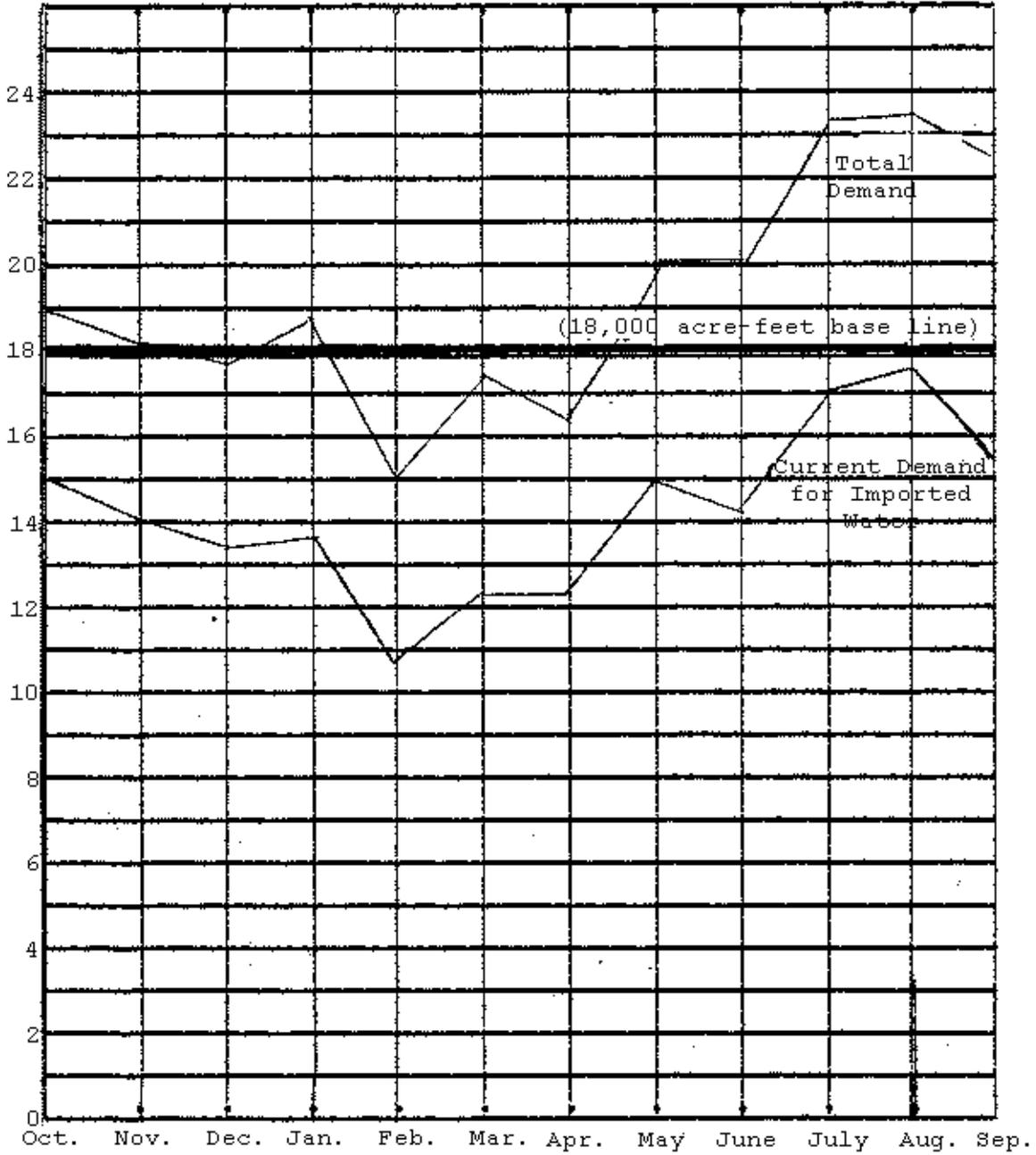
the off peak months, producers will purchase surface water to fill their surface storage reservoirs. In a conjunctive use system utilizing a pressure aquifer to meet peak demands, water entering ground water storage usually comes from a different source. As a result, the actual use of a base supply may be less, and the need for ground water to meet peak seasonal demands may be as much as twice as high as the quantity of water that would be placed into surface seasonal storage. Consequently, the need for ground water to meet peak seasonal demands has also been estimated at one-sixth of the annual water demand. In a conjunctive use system in which some surface storage is provided, the actual need for ground water to meet seasonal peak demands may be between one-twelfth and one-sixth of the total water supplies. The estimated peaking requirements for water suppliers in West Basin and Central Basin based upon their annual demand during 1962-63 is shown in Table XVII. It is assumed that since the industrial producers in West Basin extract ground water primarily at a uniform rate that they have little or no need for peaking storage. The peaking requirements for other producers were estimated using the Flood Control District formula of one-twelfth of the annual demands as the lower estimate and one-sixth of the annual demands has been used as the higher estimate. Using these approximations, water producers in West and Central Basins would have needed to produce between 40,500

and 81,000 acre-feet of ground water during the summer months to meet their peak demands during 1962-63. While annual demands for water varies from year to year, a ground water production curtailment of 150,000 acre-feet would enable suppliers to extract 130,000 acre-feet of water which is considerably above these estimates.

Examination of the actual monthly demands in West and Central Basins for 1962-63 confirms that the need for ground water to meet seasonal peaking demands would have fallen within the parameters estimated in Table XVII during that year. Chart 6 shows that the total monthly demands for water in West Basin for 1962-63. If West Basin water producers had imported 18,000 acre-feet of water per month, their total need for ground water to meet seasonal peaking demands would have been 20,750 acre-feet. Chart 7 shows the total monthly demands for water producers signatory to the interim agreement in Central Basin during 1962-63. If these producers had used a constant base supply of imported water equal to 16,000 acre-feet per month, their total need for ground water to meet seasonal peaking demands would have been 46,500 acre-feet. As stated above, a production curtailment of 150,000 acre-feet for both basins would have permitted the production of 130,000 acre-feet of ground water during the year. This would enable ground water producers in both basins to produce more than enough ground water to meet seasonal peaking requirements.

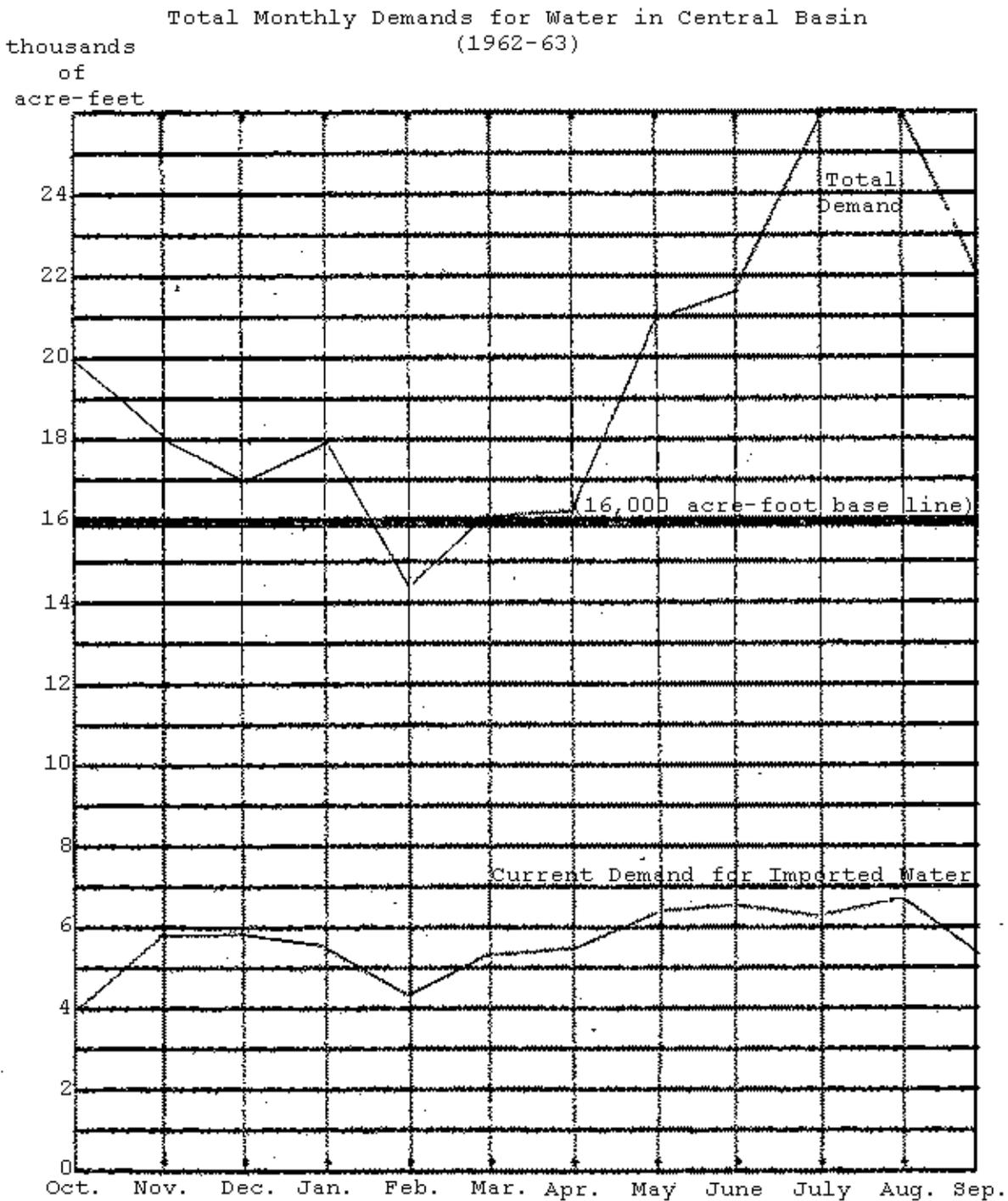
Chart 6

Total Monthly Demands for Water in West Basin
(1962-63)



Source: Watermaster, Central Basin, Report for 1962-63, plate 8.

Chart 7



Source: Watermaster, Central Basin, Report for 1962-63, plate 4.

Benefits and Costs of the Spreading Program

While it would appear that the annual benefits to be derived from the barrier program are less than the cost of constructing and operating the program, the benefits to be derived from the spreading program at the Montebello forebay appear to exceed the costs. The spreading facilities were built by the Flood Control District as part of their regular program to offset the loss of natural percolation resulting from lining the river channels crossing the plain. The Flood Control District estimates that the operation and maintenance costs involved in spreading imported water average about \$1.25 an acre-foot. Since the Metropolitan Water District sells untreated Colorado River water for replenishment at approximately one-half of the price of softened and filtered water, "replenished ground water" is still less expensive than softened and filtered Colorado River water after it has been pumped out of the ground. The Flood Control District estimated that the total cost of "replenished ground water" pumped to a head of 200 feet above ground surface was \$23.40 an acre-foot in 1963 while softened and filtered Colorado River water was \$30.00 an acre-foot.⁹

The spreading program will provide still greater benefits in the future with the expansion of the Whittier

⁹LACFCD, Report on Required Facilities, Part I, p. 44.

Narrows Reclamation Plant and the possibility of obtaining 100,000 acre-feet per year from this source at a price considerably less than the estimated price of alternative supplies of imported water. If the Sanitation District can provide 100,000 acre-feet of reclaimed water at a price of \$10.00 to \$15.00 an acre-foot, the differential between "replenished ground water" and the surface supply will be approximately \$20.00 an acre-foot. The Flood Control District has also proposed that pumping patterns be altered within Central Basin in order to increase the amount of water which could be spread at the forebay each year. Specifically, the Flood Control District recommended that approximately 40,000 acre-feet per year of ground water be pumped from the forebay for relay to water users in the pressure area. Because of the limited transmissibility of the aquifers, it is faster to convey this water to the pressure zone via surface lines than it is to allow the water to move underground and be pumped from the pressure areas. If institutional means can be found for establishing such a relay system, the Flood Control District would be able to spread an additional 50,000 acre-feet per year at the forebay.

An Alternative Program for the Conjunctive Use of
West and Central Basins

For the purposes of analysis the barrier program and the spreading program have been discussed separately above. In the analysis of the barrier program, an arbitrary ground water production curtailment of 150,000 acre-feet was chosen as an alternate method for balancing the basins and halting salt water intrusion. However, since the total cost of "replenished ground water" is less than the cost of purchasing treated water for direct use, it is possible that a combined program of spreading and ground water production curtailment could be conducted which would prevent salt water intrusion while allowing producers to extract more than 130,000 acre-feet of water per year. In fact, it would be possible to achieve the same goals of the current ground water basin management program at a total annual cost which is \$2.5 million less than the cost of the proposed program as a whole.

As summarized in Chapter IX, the ground water basin management program being placed into operation in West and Central Basins will involve the injection of approximately 75,000 acre-feet of water along the coast and the spreading of approximately 120,000 acre-feet of water at the forebay. Assuming a fresh water average annual yield of 142,000 acre-feet and ground water production of 280,000 acre-feet per year, the proposed management program will place

approximately 57,000 acre-feet of water per year into ground water storage to offset past overdrafts. The variable cost of operating the proposed conjunctive use system to provide water supplies equal to the current level of demand will be approximately \$16 million a year as outlined below and shown on Table XVIII.

As shown on Table XVI, the annual cost of the barrier projects is approximately \$4.3 million. The Flood Control District estimates that the operation and maintenance costs involved in spreading imported water average about \$1.25 per acre-foot.¹⁰ Since Metropolitan's price for untreated Colorado River water is \$15.25 an acre-foot, the average cost for spreading imported water has been estimated at \$16.50 an acre-foot. The costs of extracting ground water have been estimated at \$10.00 an acre-foot in the West and Central Basin area. Assuming the current level of demand for water of 530,000 acre-feet in West and Central Basins, approximately 250,000 acre-feet of water is required from Metropolitan at \$30.00 an acre-foot or a total annual cost of \$7,500,000. Based upon the current assessed valuation and tax rates for the West Basin Municipal Water District, the Central Basin Municipal Water District, the City of Long Beach and the City of Torrance, the water supply system in West and Central Basins also has fixed annual

¹⁰LACFCD, Report on Required Facilities, Part I, loc. cit.

Table XVIII

The Annual Cost of the Conjunctive Use System Being Placed
into Operation in West and Central Basins

Variable Costs:

Annual Cost of the Barrier Projects	\$ 4,365,990
Annual Cost of Spreading 120,000 acre-feet of water at \$16.50 per acre-foot	1, 980,000
Annual Cost of Pumping 280,000 acre-feet of Ground Water at \$10.00 per acre-foot	2,800,000
Annual Cost of Purchasing 250,000 acre-feet of Metropolitan Water at \$30.00 per acre-foot	<u>7,500,000</u>
Total Variable Costs	\$16,645,990

Fixed Costs:

Metropolitan Tax Levies on WBMWD, CBrMWD, City of Torrance and City of Long Beach at 1962-63 rates	<u>10,115,495</u>
Total Costs of Program	\$26,761,485
Average Variable Cost of Water per acre-foot	\$ 31.10
Average Total Cost of Water per acre-foot	\$ 50.00

Table XIX

The Annual Cost of An Alternative Conjunctive Use System

Variable Costs

Annual Cost of Spreading 95,000 acre-feet of water at \$16.50 per acre-foot	\$ 1,577,500
Annual Cost of Pumping 180,000 acre-feet of Ground Water at \$10.00 per acre-foot	1,800,000
Annual Cost of Purchasing 350,000 acre-feet of Metropolitan Water at \$30.00 an acre-foot	<u>10,500,000</u>
Total Variable Costs	13,957,500

Fixed Costs

Metropolitan Tax Levies on WBMWD, CBMWD, City of Torrance and City of Long Beach at 1962-63 Rates	<u>10,421,760</u>
Total Costs of Alternate Program	\$24,072,995
Average Variable Cost of Water per acre-foot	\$24.45
Average Total Cost of Water per acre-foot	\$45.50

costs in excess of \$10 million. The average variable cost of water provided under this management plan is approximately \$31.10 an acre-foot, while the average total cost of water is \$50.00.

The same objectives of balancing the basin, of halting salt water intrusion, and of placing 57,000 acre-feet of water per year into ground water storage could be accomplished by an alternate plan at a total variable cost of \$14 million per year, which is \$2.5 million less per year than the proposed plan. The alternate plan would have involved a ground water production curtailment of 100,000 acre-feet. Consequently, ground water extractions would equal 180,000 acre-feet at a total annual cost of \$1.8 million. In order to balance the basins and place 57,000 acre-feet of water into storage, it would be necessary to spread 95,000 acre-feet of water at an annual cost of \$1,577,500 acre-feet. Under this alternate plan of operation it would also be necessary to purchase 350,000 acre-feet of imported water at a total cost of \$10.5 million. The average variable cost of water provided under this plan of operation would be \$24.20 an acre-foot as compared with \$31.10 an acre-foot under the plan currently being placed into operation by the Replenishment District.

The planning period of this analysis is limited since current demand levels and current prices are used. However, the constraints of this analysis are the same as

those used in the analyses performed by the Flood Control District and the Replenishment District. A determination that the ground water basin management plan being placed into operation at the present time is not an optimal economic allocation of resources for the present, does not imply that a similar plan might not be an optimal allocation of resources at some future time under changed conditions. A management plan involving the construction of fresh water barriers may become an optimal allocation of resources when the barriers utilize reclaimed water priced at approximately one-half the price of the alternate surface supply available for direct use.

It is not the intention of this chapter to suggest a management plan to be adopted in West and Central Basin, but rather to point out the existence of other plans that could have been adopted to produce the same benefits at less cost. The determination that alternative plans for the conjunctive use of ground and surface systems exist which could have saved West and Central Basin approximately \$2.5 million a year leads to the question of why public entrepreneurs would chose a more costly program to accomplish their goals. In order to recommend changes in the institutional structure which would lead to more optimal conduct, it is necessary to understand the institutional arrangements that led to the choice of a non-optimal plan.

Institutional Arrangements and the Structure of
Incentives for Non-Optimal Conduct

Instead of asserting that public entrepreneurs are irrational when they undertake non-optimal programs, the social scientist has the task of considering whether the institutional arrangements provide a structure of incentives and deterrents which enable individuals acting within this structure to realize individual objectives consistent with social values. In order to analyze the structure of incentives and deterrents, it is helpful to consider how individuals acting within the structure have viewed their opportunities and risks. This has been one of the purposes of the case study presented in this dissertation. This section will be a short recapitulation of the actions taken by various individuals and agencies within the structure of institutional arrangements so that the reasons for the development of a program that has non-optimal aspects can be made more explicit. The following section will discuss the question of how to modify the institutional arrangements so that it might be possible to develop more efficient solutions within this kind of a decentralized decision-making system.

As discussed in Chapter II, the market is an efficient mechanism for the allocation of many scarce resources, but may not lead to an optimal allocation of all resources. The market may not be effective when there is a significant

divergence between private and social costs or private and social benefits. During the early development of ground water resources in West Basin, water producers had little awareness of the social costs of their actions. However, by 1945 many of the large water producers were aware that the competitive over-development of ground water resources had created some very serious social costs that were not taken into account in the private calculations of individual producers. In 1945, water producers were almost totally dependent upon the ground water basin for their water supply as well as for the distribution of supply and for the provision of seasonal storage. The use of the ground water basin for all three purposes kept the cost of water very low. Any change to a surface supply would require a considerable investment. Decisions about investment in a new and expensive surface water supply system involved questions of both equity and efficiency. The established water producers argued that equity required that their vested property rights be honored and that the newcomers should bear the full cost of building a new system to meet new needs. Those who were primarily interested in developing an efficient conjunctive use system recommended that all water users share the cost of constructing a new system to be used by all and that the use of the ground water basin be reserved for its most valuable function, that of providing water to meet seasonal peaking

demands.

As decisions have been made, considerations of equity have seemed to prevail over those of efficiency. The decision to construct a surface supply system was finally made in 1949. At that time the original West Basin Municipal Water District annexed to the Metropolitan Water District. As a condition of entry, the new district agreed to pay a "back tax" assessment of \$4 million over a period of 30 years. The annexation levy represented the local area's minimum investment in its new surface distribution system. In addition, Metropolitan could levy additional taxes to supplement its income derived from the sale of water. As other areas annexed to the West Basin Municipal Water District, the tax payers in annexing units were committed to a large initial investment payable during a 30 year period plus additional taxes to offset the operating deficit of the Metropolitan system. The total annexation levy for the entire West Basin Municipal Water District grew to \$40 million. The fixed costs of this investment were to be paid by the taxpayers within the District in the form of ad valorem taxes levied by the Metropolitan Water District. The decision to place the responsibility for this financial burden on the property owner was justified by those who made the decision on the assumption that the land value had increased as a result of the assurance of a firm water supply. In effect, the public district

assumed that a positive externality had been created of benefit to the taxpayer which was as large or larger than the tax burden.

While assessing land owners for the capital investment needed to construct a new surface distribution system may have had elements of equity, it did not lead to efficient decisions by those who had operating responsibility for determining the mix of water to be used in the area. The individual water producer did not have to take the fixed costs of the surface distribution system into account when he made decisions regarding the quantity of Metropolitan water to be purchased and the quantity of ground water he would extract. The price of Metropolitan water varied from \$18.00 to \$24.00 per acre-foot prior to 1955 while the cost of pumping an acre-foot of ground water varied around \$10.00 an acre-foot. Individual producers were motivated to use the lower cost ground water to supply their base demands and to use the higher cost Metropolitan water only when necessary to meet peak requirements.¹¹ This inefficient utilization of the capacity provided in the Metropolitan system resulted in a very high average cost for the quantity of Metropolitan water actually used. The average cost of Metropolitan water used in West Basin, including the

¹¹See Michael Brewer, Economics of Public Water Pricing (University of California: Grannini Foundation of Agricultural Economics, 1961), p. 11.

annual tax payment, was \$224.00 in 1950, \$94.50 in 1952 and \$80.00 in 1954. Water producers received a tax subsidy of \$204.00 per acre-foot in 1950, of \$74.40 in 1952 and of \$60.00 in 1954. The individual decisions made by ground water producers in West Basin led not only to the inefficient use of the surface supply system provided by the taxpayer's investment; these decisions also led to a continued intrusion of salt water into the basin at a high social cost to all.

Because the water producers in the area were concerned about the effect of salt water intrusion, even though they were unable to agree to curtail their own ground water production so as to prevent further intrusion, they began to search for other ways to prevent the infiltration of the sea. In 1951, they went to the State to ask for funds to build a prototype barrier. The \$642,000 invested by the State was used to build a one-mile barrier along the coast to protect the water supplies in this area against further danger. By gaining access to State funds, the producers in the area did not have to take the cost of constructing the first link in the West Coast barrier into account in their calculations of the cost of ground water production. Pumping costs were still the only explicit costs ground water producers took into account.

The creation of Zone II within the Flood Control District in 1954 established an institutional device for

the continued operation of the one-mile barrier. However, the costs of the limited barrier program were borne entirely by taxpayers in the area benefited. Between 1954 and the establishment of the Replenishment District, the taxpayers of the area invested over \$1.9 million in additional engineering studies, construction of project facilities and the purchase of water for use in the barrier. Only 25,000 acre-feet of water were injected into the barrier at an average unit cost of \$80.00 an acre-foot not including the cost of constructing the original barrier. Ground water producers still did not have to take into account the social costs involved in their private actions.

The negotiation of the interim agreement in 1955, which became a final stipulated judgment in 1961, carried decisions a step closer toward efficiency. Individual water producers were required to make a pro rata reduction in pumping by approximately 25 per cent of their use of ground water supplies for 1954. The rationing of ground water supplies forced most water producers to rely upon imported supplies to meet their increased demands. Adjudication also had the consequence of establishing water rights to explicit quantities for individual proprietors and created the opportunity for a limited market to permit the sale of water rights or the temporary rental of water rights under a water exchange agreement. The exchange pool has provided an incipient market, but its potential has

been limited with its use by non-optimal producers to continue to derive a base supply from local ground water sources. The use of a pro rata rationing system led to a gradual decrease in the average cost per acre-foot of Metropolitan water used within the West Basin Municipal Water District. In 1956, the average cost of Metropolitan water, including the tax payments made within the district was \$82.00 per acre-foot. In 1958, the cost was \$80.00 an acre-foot and in 1960, it was \$71.50 an acre-foot. Water producers received a tax subsidy of \$62.00 an acre-foot in 1956, of \$58.00 in 1958 and of \$46.50 in 1960.

While West Basin producers were beginning to develop a more efficient conjunctive use system, Central Basin producers continued to rely primarily on ground water supplies. Within Central Basin only the cities of Los Angeles, Long Beach and Compton had access to surface supplies prior to 1952. In 1952, the Central Basin Municipal Water District was formed and annexed to the Metropolitan Water District. At the time of annexation, the new district assumed a total financial obligation of \$76 million to be paid over a 30 year period. Again, the burden of paying for the fixed costs of the surface supply system was passed on to property owners. Consequently, Central Basin water producers were not required to take these fixed costs into account in their private calculations concerning the appropriate mix of water supplies to be used. In

addition, Central Basin producers were not willing to reduce pumping in an area where ground water rights were not defined.

The Central Basin area organized the first zone of benefit within the Flood Control District in 1952, but did not begin to spread water at the Montebello forebay until 1954. Between 1954 and the formation of the Replenishment District, the taxpayers of Central Basin spent \$4.8 million to operate the spreading grounds and purchase imported water from Metropolitan. This investment increased the replenishment of Central Basin by a total of 401,200 acre-feet. The marginal cost of this water to the area, including the cost of spreading, averaged \$12.00 an acre-foot. It would have cost the area approximately twice as much to purchase the same quantity of water for direct use. Since the purchase of water for spreading increased the volume of water carried in the Metropolitan system, this investment also lowered the average cost of Metropolitan water to the area. However, Central Basin water producers still did not have to take into account the cost of providing the replenished ground water that they were extracting for use as a base supply.

Once the Replenishment District began to levy replenishment assessments in 1960, ground water producers in both basins were forced for the first time to take into account some of the costs involved in maintaining the

conjunctive use system that was being developed. The private costs of producing ground water were increased by a replenishment assessment of \$3.19 in 1960-61, \$5.75 in 1961-62, \$6.63 in 1962-63, and \$6.58 in 1963-64. The replenishment assessment for 1964-65 will be \$7.36. However, the replenishment assessment covers only a small portion of the social costs of the current water supply system, and private producers are still not motivated to take the full range of costs involved into the calculation of their individual actions.

Examination of the various costs that individual ground water producers will have to take into account when the barriers are constructed will illustrate why water producers are motivated to undertake a barrier program which requires greater aggregate costs than it will return in aggregate benefits. Assuming 1963-64 Metropolitan prices and anticipated production levels, ground water producers will have to pay a replenishment assessment of approximately \$12.00 an acre-foot to enable the Replenishment District to purchase 75,000 acre-feet of filtered Metropolitan water for the barriers and 120,000 acre-feet of untreated Metropolitan water and reclaimed sewage water for spreading at the Montebello forebay. Individual water producers will consider the relative cost of \$30.00 an acre-foot for filtered and softened Colorado River water and approximately \$22.00 an acre-foot for ground water (replenishment

assessment plus cost of production) when planning the mix of water to be utilized. Since each water producing agency is interested in keeping production costs as low as possible, it is a reasonable strategy for individual agencies to use as much ground water as legally possible and as little imported water as needed. As long as replenishment water is available at a price less than water purchased for direct use, and the water producer is responsible for paying only the water costs of a replenishment program, water producers will be motivated to act politically in a way that will lead to over investment in replenishment activities.

The actions of the various public agencies also appear rational when examined from their perspective within the structure of institutional arrangements. The Flood Control District, for example, is in the position of a durable public goods enterprise in search of new projects in order to survive as an organization. The barriers are especially attractive projects to the Flood Control District as they involve major construction activity for several years as well as a long-term commitment to the operation and maintenance of a continuing project.

The Flood Control District is at the same time rather insulated from public criticism, question and control. The Los Angeles County Board of Supervisors acts as the ex officio board of directors of the Flood Control District.

Consequently, there are no elected officials that stand or fall on the accomplishments, costs or failures of the Flood Control District. Secondly, Flood Control District taxes are relatively hidden in general county taxes. The average taxpayer within the zones of benefit is not aware that he has been paying a \$.05 ad valorem zone of benefit tax and a \$.15 ad valorem general district tax devoted to barrier construction.

The willingness of the Metropolitan Water District to use its general tax revenue to construct special feeder lines to supply water to the barriers is also understandable when viewed from Metropolitan's perspective. Metropolitan has attempted for years to encourage the full use of the Colorado River aqueduct. It has been the hope that a history of extensive use would enable Metropolitan to strengthen its legal claim to water from the Colorado River. The barrier projects were attractive to Metropolitan since they promised to put considerable volumes of water into immediate use while the demand for direct use of Metropolitan water was still less than the capacity of the aqueduct.

While Metropolitan has been exposed to the claims of Arizona litigants and to adverse court decisions, the District has been relatively insulated from direct public control. Metropolitan's board of directors is appointed by the various member agencies which comprise the district. While some of the Metropolitan directors are also directors

of local municipal water districts, and have to stand for election in the local area, these dual directors can usually separate their local elective post from the larger appointed one. West Basin Municipal Water District directors, for example, sometimes boast in election campaigns that the local district does not levy a property tax. West Basin Municipal Water District directors do not refer to the Metropolitan Water District annual tax of approximately \$.16 or more or to the annexation levy for "back taxes" which varies within the West Basin district from \$.02 to \$.26. Metropolitan taxes remain fairly obscure in the average taxpayers bill. And, even if a taxpayer is aware of how much he is paying for the capital investment in the Metropolitan system, he rarely recognizes that the local director on Metropolitan's board is exposed to popular elections or local political control.

The Sanitation Districts are governed by a group of boards. The County Board of Supervisors act as an ex officio board for the Sanitation Districts located entirely in unincorporated territory. When a Sanitation District includes one or more incorporated cities, the governing boards of the cities appoint members to sit on the governing board of the district. All of the governing boards of the Sanitation Districts meet together periodically to discuss matters of interest to the entire system before individual meetings are held for each individual board.

This has proved to be a very effective method for organizing the management of the Sanitation Districts so that they operate on a large scale while taking local interests into account. However, these agencies have little exposure to direct public scrutiny and control.

The Replenishment District is the public agency most exposed to political action since all five members of the governing board are required to face an election every four years. Election campaigns are directly related to the activities of the Replenishment District. However, Replenishment District directors are able to describe the accomplishments of their District while stressing that it levies only a 2 mill ad valorem tax for administrative purposes. No references are made to the taxes paid to finance the barrier program through the taxing zones of the Flood Control District. The fact that water users pay through the replenishment assessment for all water artificially placed into the basins is also stressed during election campaigns. Consequently, while the Replenishment District is the most exposed to public scrutiny and criticism, the full costs of its program are not reflected in its own operations and are therefore hidden from casual surveillance.

The costs of the ground water basin management program developed in West and Central Basin have been and will be borne in a general sense by the benefited public, but the

incidence of costs do not require the producers who make the operating decisions about the conjunctive use of different sources of water supply to take the full costs of their actions into account. The costs of the conjunctive use system are not directly related to one agency nor to the individual programs of action which together comprise the over-all water supply system. As a result, it is possible for individuals and agencies within this institutional structure to be motivated to make inefficient decisions. It may be equitable to place a portion of the cost of a water supply system on property owners since they receive positive benefits from the investment in a secure long-run water supply system. However, when the property owner's share of the direct costs is very large, the water producer is not required to take account of these tax charges and is not led to make efficient use of scarce and valuable resources. There is no incentive for the large water user to take account of what is paid in taxes in the conduct of his particular enterprise because these costs do not vary directly in relation to his conduct. His conduct is not affected because his units of use are not related to his units of tax load. If water users bear only a portion of the costs of water supply, they are only sensitive to that portion of the costs which are reflected in the price of water when they decide how much water to use and from what combination of sources.

Heavy reliance upon property taxes to finance water supplies may involve further inequities since taxpaying may be quite disjunctive from water using. The owners of a series of parking lots, for example, may pay high taxes for prime land, but use little water, while some small business or industrial plants may require large volumes of water and pay relatively small taxes. Those who are large taxpayers, but small water users cannot directly take account of water costs in the conduct of their affairs, but must attempt to affect decisions indirectly through representation before public bodies. When the public agencies who make decisions about investing public funds are relatively insensitive to and insulated from public participation or scrutiny, then those who pay a large share of the costs may not be seriously taken into account.

Institutional Arrangements to Facilitate
More Optimal Conduct

While this study is coming to a conclusion, the range of experience in public entrepreneurship in West and Central Basins is not. The public entrepreneurs in this area who have solved many complex problems are faced with the necessity of solving still more. As part of a decentralized decision-making system, they are precluded from directly imposing what they consider to be an optimal solution to problems on others. If the decentralized

aspect of the system is going to survive, public entrepreneurs are faced with the task of creating still different institutional facilities that will change the structure of incentives and deterrents so that individuals pursuing private purposes will also take proper account of public values. Efficiency need not be the predominant value in a public enterprise system. But, when efficiency is sacrificed to other goals, the costs of any such decision needs to be made explicit and taken into account. In a relatively competitive public enterprise system, such as exists in Southern California, the need for achieving solutions which are considered both relatively equitable and relatively efficient is essential for any particular system to survive.

There would appear to be three major techniques that West and Central Basin public entrepreneurs might use in an attempt to create an equitable structure in which individuals would be motivated to make more efficient decisions. The first would be an attempt to use economic measures which would provide the same structure of incentives and deterrents that once can secure in a workable market. If taxation of property in the zones of benefit within the Flood Control District were terminated and the replenishment assessment were increased to provide enough revenue to cover the full costs of operating replenishment activities, water producers would be led to recognize the full

costs of their activities. As long as ground water producers do not have to take the full costs of a replenishment program into account, they will continue to devote their ground water rights to their least valuable use as a base supply. However, if the cost of producing water, including the replenishment tax, were higher than the cost of the imported water supply, ground water producers would be led to use ground water primarily for seasonal and daily peaking purposes.

A second technique would combine legal action to make an equitable apportionment of the safe yield among current users and to permit water producers who can make a higher use to purchase water rights from those who can not make as highly valued use of their water rights. In 1945, when the West Basin litigation was initiated, the plaintiffs asked the court to determine the safe yield of the basin and to make an equitable apportionment of this yield. The structure of the current litigation in Central Basin is very similar. The Replenishment District would be in an effective position to ask the court, in the public interest, to determine the safe yield for both basins and the relative share of each water producer to that safe yield. As long as the agreed rights within these basins exceed the actual yield, individuals are asserting claims to property, a part of which is non-existent. If a safe yield determination were made, the claims of each individual to

ground water supplies would represent his share of the average natural yield of the basin.

A ground water production curtailment to the safe yield would still leave enough water to meet most seasonal and daily peaking requirements within the area. The rights initially allocated to proprietors on the basis of an adjudication, however, would not be assigned to the proprietors who could make the most efficient use of the ground water supplies for future use. As long as proprietors are assigned explicitly defined shares of the basin's safe yield, the proprietors making the more efficient use of ground water supplies for peaking purposes should be able to offer a sufficiently attractive price to secure willing sellers from among the proprietors making a lower valued use. Since the difference in value is so great, there is ample room for beneficial trading.

A third technique would mix political and economic actions. Under its organic legislation, the Replenishment District has the power to:

. . . fix the terms and conditions of any contract under which producers may agree voluntarily to use replenishment water from a nontributary source in lieu of ground water, and to such end a district may become a party to such contract and pay from district funds such portion of the cost of such replenishment waters as will encourage the purchase and use of such water in lieu of pumping so long as the persons or property within the district are directly or indirectly benefited by the resulting replenishment.¹¹

¹¹California, Water Code, sec. 60230.

Under this provision, the Replenishment District can contract to pay a water producer to purchase water from an alternative source if it is in the public interest. This section enables the Replenishment District to "rent" ground water rights so as to preclude their use. In the spring of 1963, Max Bookman, in a report to the Replenishment District suggested the District as a whole would benefit by encouraging producers located near to the barrier project to reduce their production of ground water. Bookman considered "that a reduction of pumping in that location would be beneficial to the barrier project and would result in less injection water being required for the barrier operation. . . ." ¹² Bookman recommended that the Replenishment District pay pumpers located immediately inland from the barrier at the rate of \$10 per acre-foot to curtail ground water production and substitute imported water. ¹³

This provision could also function as a legal foundation for renting the rights of those who use ground water as a base supply. The Replenishment District could pay as much as \$20.00 an acre-foot to rent 150,000 acre-feet of water rights each year at a total cost of \$3 million and

¹²West Basin Water Association, Minutes, February 27, 1964, pp. 19-20.

¹³Bookman also suggested that the exchange pool provided in the final judgment "be amended to establish a first priority for exchange water offered by producers affected by water quality problems adjacent to the barrier." Ibid., p. 20.

still expend approximately \$1.3 million less per year than the total annual cost of the barrier program. As an alternative, the Replenishment District might purchase ground water rights now devoted to use as a base supply so that the basin would be used primarily for seasonal storage. The purchase and "retirement" of a large volume of rights devoted to use as a base supply would protect the basin against salt water intrusion in the long run. If the need for seasonal storage increased in the future, the Replenishment District could sell water or rent rights for use to meet seasonal peak demands at a price sufficient to cover the cost of providing replenished ground water. Purchasing water rights in order to protect a natural reservoir, is quite analogous to the purchase of land in order to create a surface reservoir.

Each of the above techniques for achieving a more optimal conjunctive use of the surface and ground water resources in West and Central Basins has advantages and disadvantages, costs and benefits. It is not the intention of this study to argue for the adoption of any one measure, but rather to point out these possibilities. Other techniques not mentioned probably exist. Certainly, combinations of the above might also lead toward more optimal conduct. Statewide legislation might be needed to implement these approaches but new legislation has been necessary in the past and will be necessary again as

individuals attempt to solve problems.

Failure to move toward a more optimal conjunctive use system exposes the local area to political action from the other agencies also interested in the development of an effective conjunctive use system. Considerable risk exists if public entrepreneurs begin to conduct public enterprises by assessing tax payers larger quantities than the benefits they receive. The greater the share of costs placed upon the taxpayer, the greater the political risk of a "taxpayers' revolt" against the current water management system. A taxpayers' revolt could result in a takeover raid on the local district in an attempt to change the distribution of costs within the local area. Or, a taxpayers' revolt could lead to an attempt to change the basic rules for the management of local ground water supplies and a search for a higher level of government to take over the function of developing a more efficient conjunctive use system.

Some of the Problems of Public Entrepreneurship

Every society faces the task of finding appropriate institutional means for providing the goods or beneficial consequences desired by members of that society and avoiding the harms or adverse consequences resulting from competition among individuals for the limited quantities of valued events. This task may be accomplished in a variety of different ways involving some combinations of

individual effort and initiative on the one hand and centralized direction and control on the other. In our society, we often speak of the "private enterprise" system because of the number of goods and services which are provided as a result of the enterprise of individuals in privately organizing appropriate production units. However, many of the goods desired in our society cannot be effectively provided by the activities of private individuals acting within the scope of relationships which are legally authorized for private persons to undertake. In some cases, substantial injury may be caused for third parties if the provision of these goods is left to private arrangements. In other cases, private individuals would not be motivated to enter the field without access to special powers to enable them to capture benefits which would otherwise be available to all without payment. As a result, the provision of some goods and services requires the exercise of special powers and special rules of conduct which characterize public organizations.

While we do not speak as often of our public enterprise system, an important aspect of our society is the existence of a public enterprise system providing certain public goods and services or quasi-public goods and services. Such a public enterprise system functions in close association with private enterprises. Where the legal structure permits, individuals who are directly concerned

with the prevention of social harms or the provision of social goods can seek local public solutions to common problems rather than relying upon some external public agency to impose a solution upon them. Those who organize community undertakings in an attempt to solve problems associated with the provision of public goods and services may or may not be able to reach optimal solutions to these problems. However, if those who are attempting to solve their own common public problems are forced to bear the costs as well as receive the benefits from the solution which they chose, there is a greater likelihood that the solution chosen will, in the long run, represent a more efficient solution than those solutions which would be chosen by an external agency which does not directly pay the costs involved.

The public entrepreneur functions within a political system which defines the rules of conduct which he must follow in his attempt to provide public goods and services. The political system defines the conditions for organizing and operating public enterprises, the extent of competition among participants, the nature of the special powers which may be exercised and the special burdens imposed upon those who exercise public responsibilities. The political system maintains special institutional facilities with its own rules for changing the basic rules of conduct if satisfactory results cannot be secured under existing arrange-

ments.

In the design of any public enterprise, public entrepreneurs must attempt to solve a series of problems including: (1) the problem of constituting an enterprise which can assert effective control over the relevant set of events to be regulated, (2) the problem of gaining consent and support among those directly and indirectly affected, and (3) the problem of financing the undertaking and insuring that there is an appropriate fit between the incidence of benefits and the incidence of costs.

The public entrepreneurs in West and Central Basins have attempted to deal with all of these variables in the course of undertaking a public ground water basin management program. The relevant set of physical events with which they have been working includes a complex set of interrelated ground water basins lying along the Los Angeles and San Gabriel River systems. Ideally, an appropriate management unit would include all of the San Fernando Valley, the San Gabriel Valley, Hollywood Basin, Santa Monica Basin, West Basin and Central Basin. The possibility of achieving this ideal management system was precluded very early by the exclusive legal authority given to the City of Los Angeles over the San Fernando Valley and the flow of the Los Angeles River by virtue of its pueblo rights. The public entrepreneurs of West and Central Basins are in the process of gaining effective physical

control over the remaining basins along the San Gabriel River system through a variety of institutional arrangements. They have demonstrated that it is not necessary to establish one agency with exclusive jurisdiction over an entire physical system in order to achieve effective control. The design and creation of the Central and West Basin Water Replenishment District has given them extensive control over the linked West and Central Basins, but the control and operation of these basins is shared with a group of related public enterprises of varying sizes and scales of operation. The Long Beach v. San Gabriel litigation should enable them to gain control over the physical input into this system without the necessity of extending the boundaries of the Replenishment District to include the San Gabriel Valley. The relative insignificance of the Hollywood and Santa Monica Basins for water resource development has reduced the need to extend control over these basins.

The decentralized management system that has evolved in West and Central Basins is a relatively unusual institutional arrangement for gaining consent and support among those directly affected by the development of a conjunctive use water supply system. The overlapping positions held by the executive secretary of the three related water associations and municipal water districts, who is also general manager of the Replenishment District, insures that the

interests of each of the major basins are taken into account in all decisions affecting the others. The existence of many other individuals holding overlapping memberships in these different organizations reinforces the tendency toward decisions that take all areas into account through a rich network of communication among the various associations, agencies and interests involved.

The informal and frequent negotiations among the Replenishment District, the local water users' associations, the Flood Control District, the Metropolitan Water District, the Sanitation District and other interested public and private agencies insures that they will search out relatively satisfactory arrangements to their common management problems. Decisions have usually been negotiated by these formally independent public agencies under an informal rule of unanimous consent. Since no agency is required to agree to a plan that is adverse to its essential interests, the results of these negotiations can be considered as satisfactory for the participating agencies and the interests which they represent.

Conflict among these formally independent agencies might lead to a temporary stalemate at some future time if their interests are not as closely aligned as they are at the present time. However, these agencies exist in a political environment with other institutional facilities which can be invoked to resolve conflicts between public

agencies. The State Legislature has frequently been used in the past to change the institutional structure and resolve conflicts. The Legislature has created new capabilities within existing agencies, prohibited certain behavior, and authorized the establishment of new enterprises to perform functions which existing agencies were unable to undertake through the exercise of their joint powers. Certain types of conflict can be brought before the courts if necessary. The Replenishment District, for example, moved toward the use of the courts to protect their interests when the water produced by the Sanitation Districts could not be spread without dilution because of the presence of too much ABS. The Replenishment District felt that the Sanitation District should be responsible for producing an effluent of sufficient quality for spreading and objected to the necessity of purchasing expensive treated Colorado River water to dilute the Sanitation District's effluent to meet spreading requirements. This conflict was resolved by the participants when the Sanitation Districts were able to modify their production process to improve their product sufficiently to more than meet these standards.

While public agencies have been able to gain consent and support among those directly affected and to coordinate the actions that they will jointly undertake, there is still some question whether all of the broader community

interests have been adequately taken into account at the same time. The public agencies involved in this decentralized political decision making system are somewhat insulated from general public control and scrutiny. The major water producers in the area have been well represented in the decisions being taken by the various agencies comprising the ground water basin management system in the West and Central Basins. However, the unwillingness of the water producers to curtail ground water pumping to a level which would assure optimal use of the ground water supplies in a conjunctive use system has led to decisions by the public agencies involved to invest in the construction of excess facilities and to assign a substantial portion of the cost for such facilities to property owners paying ad valorem property taxes. The assessment of costs to taxpayers rather than water users would seem to indicate that taxpayer interests are not as well represented as water producer and water user interests. This assumption is confirmed in part by the institutional arrangements which tend to insulate the governing boards of several of the public agencies involved from full exposure to public control through elections in which local water policies are at issue. The government of the Replenishment District is exposed to public scrutiny and control, but so far representatives of water producers have been able to retain a majority position on this body. So long as the general

community interests are not as well represented in the decentralized decision-making system as the water producers, there is a possibility that the decisions reached by the decentralized decision-making system may tend to approximate collusive agreements to further the interests of the water producer and the survival values of the public agencies at the cost of maintaining higher tax rates than would be required for a more optimal plan of operation.

The problem of financing public enterprises and the relationship between the incidence of benefits and the incidence of costs is a critical problem to be solved in any public enterprise system. Most goods provided by public agencies are provided in such a manner precisely because of external effects and commonality problems which make it difficult to control the allocation of benefits and assign appropriate burdens for the costs of providing such services.

The West Basin experience indicates that a ground water basin management program can be established through public entrepreneurship to assure local control over the use of ground water resources. The management program assures an appropriate level of physical control to prevent future impairments by salt water intrusion even though an optimal management program in economic terms has not yet been attained. The fact that the decentralized ground water management system in the West and Central Basin

areas has searched out a solution and developed an alternative source of water supply for replenishment purposes by the reclamation of waste water, which is significantly lower in cost than alternative supplies being provided by the large-scale water production agencies, indicates that their performance is more economic than alternative programs of the large-scale water production agencies. In this sense, public entrepreneurship in ground water basin management in West and Central Basins is an important long-term force contributing toward the more efficient use of water resources in Southern California. Much has been done, but more remains to be done in the development of a coordinated ground water management system through local public entrepreneurship if ground water supplies are to be efficiently used as a part of a conjunctive use program drawing optimally upon the alternative surface and ground water supplies.

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