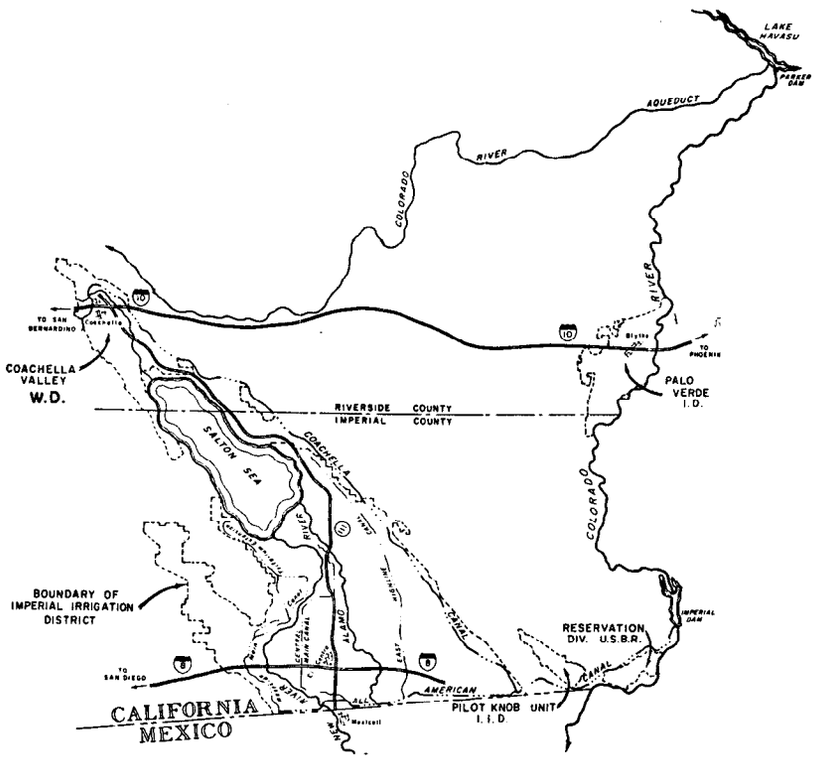
see: Order WR 84-12

IMPERIAL IRRIGATION DISTRICT

ALLEGED WASTE AND UNREASONABLE USE OF WATER

WATER RIGHTS DECISION

DECISION 1600



JUNE 1984

STATE WATER RESOURCES CONTROL BOARD

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STATE OF CALIFORNIA
STATE WATER RESOURCES CONTROL BOARD

In the Matter of ALLEGED WASTE AND UNREASONABLE USE OF WATER BY IMPERIAL IRRIGATION DISTRICT	)	DECISION 1600 County: Imperial

DECISION REGARDING MISUSE OF WATER
BY IMPERIAL IRRIGATION DISTRICT

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CITING THE RECORD

When citing evidence in the hearing record, the following convention has been adopted:

Information derived from the hearing transcript:

T,IV,22,01 - 24,15

- 24,15 — ending page and line number (may be omitted if a single line reference is cited)
- 22,01 — beginning page and line number
- IV — transcript volume number
- T — identifying abbreviation of the information source

Information derived from an exhibit:

BOARD,5,E4

- E4 — page number; table, graph, or figure number
- 5 — exhibit number
- BOARD — identifying abbreviation of the information source

Abbreviations of the information sources are:

Elmore	John Elmore
DWR	Department of Water Resources
IID	Imperial Irrigation District
CWA	California Waterfowl Association
CRB	Colorado River Board
EDF	Environmental Defense Fund
CVWD	Coachella Valley Water District
DFG	Department of Fish and Game
SSPO	Salton Sea Property Owners
USBR	U. S. Bureau of Reclamation
WCB	IID Water Conservation Advisory Board
T	Hearing Transcript
Board	State Water Resources Control Board

DECISION REGARDING MISUSE OF WATER[1]
BY IMPERIAL IRRIGATION DISTRICT

BY THE BOARD:

Mr. John Elmore (complainant) having filed a request for an investigation of the alleged waste and unreasonable use of water by the Imperial Irrigation District (IID or District); the Department of Water Resources (Department or DWR) having conducted an investigation, prepared a report and determined that a misuse of water was occurring; the District having failed to take steps to correct the problem to the satisfaction of the Department; the Department having referred the matter to the Board for hearing pursuant to California Administrative Code, Title 23, Section 4004; the Board having conducted six days of public hearing in El Centro, California; the complainant, the District, the Department of Water Resources and other interested parties having appeared and presented evidence; written closing statements and legal briefs having been submitted; the evidence, closing statements and legal briefs having been received and duly considered; the Board finds as follows:

2.0 SUBJECT OF DECISION

In response to a complaint alleging waste and unreasonable use of water by Imperial Irrigation District (District), a hearing before the State Water Resources Control Board was held on September 27, 28 and 29, 1983, and December 12, 13 and 14, 1983, in El Centro, California. The purpose of the hearing was to provide an opportunity for all

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[1] Article X, Section 2 of the California Constitution prohibits the waste, unreasonable use, unreasonble method of use or unreasonable method of diversion of water. All of these practices are included in the definition of "misuse of water" set forth in Title 23, Section 4000 of the California Administrative Code.

interested parties to present evidence to assist the Board in determining if the practices of the Imperial Irrigation District result in waste, unreasonable use, unreasonable method of use, or unreasonable method of diversion of water in violation of Article X, Section 2 of the California Constitution. Most of the evidence presented fell into three broad categories: extent of water losses and opportunities for conserving water within the Imperial Irrigation District; other beneficial uses and users for water that might be conserved within the IID; and the effect of IID water management practices on the Salton Sea and surrounding area. On the basis of the evidence presented, the arguments of the parties, and consideration of applicable law, the Board concludes that the provisions of Article X, Section 2 of the California Constitution require that the Imperial Irrigation District take several actions to improve its water conservation program, as specified in this decision.

3.0 BACKGROUND OF PROCEEDING

By letter dated July 17, 1980, Mr. John Elmore requested the Department of Water Resources to conduct an investigation of the alleged misuse of water by the Imperial Irrigation District. Mr. Elmore's letter identified five specific practices of the District or conditions within the District which allegedly resulted in a waste and unreasonable use of water. (See Section 4.0.) By letter dated July 18, 1980, Mr. Elmore requested that this Board conduct a hearing on the alleged misuse of water by the IID at the termination of the Department's investigation or the expiration of a reasonable time for such an investigation.

In response to Mr. Elmore's request, the Department of Water Resources conducted an investigation of water usage within IID. In December 1981, the Department submitted a Report of Investigation which found that although operations of IID were improving, water was being wasted that could be conserved for other beneficial uses. (DWR, 1, Foreword, p. iii; DWR, 10.) The DWR report identified a potential for conserving 438,000 acre-feet per annum (afa) through a combination of physical improvements and operational changes within IID. (DWR, 1, p. 56.) The Department notified the District of the findings of the report and requested that it submit a water conservation plan within six months.

The District initially agreed to prepare a water conservation plan, and later requested an extension of time to submit the plan. (IID, 10B; IID,10C.) By letter dated September 29, 1982, however, the District reviewed its water conservation efforts and advised the Department that the District considered its use of water to be reasonable and not to involve unnecessary waste. (IID, 10D.) The Department concluded that the IID letter was not responsive to the request to develop a water conservation plan and referred the matter to the Board pursuant to the provisions of California Administrative Code, Title 23, Sections 4000 et seq.

By letter to Board Chairwoman Carole Onorato dated May 3, 1983, Mr. Elmore's attorney renewed his request for a hearing or enforcement proceedings to eliminate the alleged misuse of water by the IID. Other letters supporting Mr. Elmore's request for a hearing were received from Francis E. and Elizabeth D. Griset; R. Raymond and Jean Campbell Griset; attorney Lowell F. Southerland on behalf of some 70

property owners in the vicinity of the Salton Sea; Citizens for a Better Environment; Harold Kelso Hunt, II; and the Environmental Defense Fund. (Board 1, Correspondence File.) In accordance with California Administrative Code, Title 23, Section 4004, the Board scheduled the matter for hearing.

4.0 ALLEGATIONS OF JOHN ELMORE

By letter dated June 17, 1980, John Elmore requested the Department of Water Resources to investigate the alleged misuse of water by Imperial Irrigation District resulting from allegedly wasteful management and marketing practices. (DWR, 1, Appendix A.) Mr. Elmore is a farmer with acreage adjacent to the Salton Sea which he has had to protect with dikes due to the rising level of the Salton Sea. His letter alleges that the rise in the level of the Salton Sea has been caused by the following policies and practices within the Imperial Irrigation District:

a. Maintaining canals in overly full conditions causes frequent spills at the terminal end of the canals.

b. The absence of reservoirs for regulation of canal flows causes the unnecessary delivery of excess amounts of water. This results in canal spills and runoff into the Salton Sea.

c. Excess water is delivered to farmers' headgates resulting in excess tailwater.

d. There is an absence of tailwater recovery systems within the IID. Tailwater recovery systems would allow use of runoff for productive purposes.

e. Farmers are required to order water in 24-hour delivery intervals and the delivery cannot reasonably be terminated after sufficient water is received. Excess water from the deliveries drains unused into the Salton Sea.

The allegations of Mr. Elmore's complaint and other aspects of Imperial Irrigation District operations are addressed in Section 10. below.

5.0 DESCRIPTION OF IMPERIAL IRRIGATION DISTRICT

5.1 Geographic Description

The Imperial Irrigation District is located in Imperial County between the southern end of the Salton Sea and the Mexican border. The New and Alamo Rivers traverse the valley from Mexico to the Salton Sea which is a natural sump. The IID encompasses 1,062,290 acres, of which about 460,000 acres are irrigated each year. The main crops grown in the Imperial Valley are alfalfa, wheat, cotton, sugar beets and lettuce. There are approximately 16,000 acres devoted to urban land use with a population of about 95,000 concentrated mainly in the towns of El Centro, Brawley and Calexico.

The soils within the IID vary from the Imperial Clays with a low permeability to highly permeable sandy soils. There is a high degree of unpredictable stratification of the soils within the District. This makes it difficult to apply water evenly and to obtain the necessary penetration for effectively leaching salts from the soil. Land leveling has helped in attaining water penetration of the soils with low permeability. Extensive tile drain installation has been

required to keep the soil from becoming water logged and to attain the leaching needed because of salts in the soil and irrigation water.

The average annual rainfall in the area is approximately 2.8 inches. (DWR, 1, p. 5.) From 1976 through 1981 rainfall measured at three gaging stations around the Salton Sea averaged about 4.5 inches per year due to several large tropical storms. (Board 1, 1982 Hess Geotechnical Corp. report, Volume 1.) Complete records of rainfall measurements in the Imperial Valley are shown in Board Exhibit 5.

5.2 Irrigation Delivery and Drainage System

All irrigation, municipal, industrial and domestic water used within the Imperial Valley is supplied by the IID from the Colorado River. The delivery system which begins at the Imperial Dam includes about 1,760 miles of conveyance and distribution facilities.

When the IID places an order for water with the U. S. Department of Interior, Bureau of Reclamation (Bureau or USBR), the request is made six to ten days prior to the time the water is to be delivered to the farmers' headgates. Water which is to be diverted into the All-American Canal at Imperial Dam must be released from Hoover Dam approximately 305 miles upstream. The water passes through U. S. Bureau of Reclamation facilities at Lake Mojave and Lake Havasu on the Colorado River before flowing downstream to Imperial Dam. Water which is diverted into the All-American Canal is distributed to the East Highline, Central Main and Westside Main Canals which are the three major canals that supply water to the smaller canals throughout the valley. The water is regulated by approximately 500 control gates and

5,500 farmer headgates. This entire delivery system operates through gravity flow.

The IID also operates and maintains approximately 1,450 miles of drainage canals to collect irrigation return flows. These canals drain into the New and Alamo Rivers which in turn drain into the Salton Sea. During the period 1965 to 1980, IID diversions from the Colorado River averaged 2,855,000 afa. (IID, 16, Attachment 3.) Of this amount, an average of 1,036,446 afa entered the Salton Sea as irrigation return flow from IID. IID return flow constituted about 71 percent of all inflow to the Salton Sea during the years mentioned. (Elmore, 3, Table 3.)

5.3 Hydroelectric Power Generation

The IID has constructed and operates hydroelectric power plants at Drops 1 through 5 along the All-American Canal. The flow capacities for these power plants are as follows:

Drop #1	5,350 cfs
Drop #2	6,000 cfs
Drop #3	6,000 cfs
Drop #4	6,000 cfs
Drop #5	3,000 cfs

(T, IV, 67,18 - 68,03; attachment to letter dated October 13, 1983 from R. L. Knox to Raymond Walsh of the SWRCB.) From 1960 to 1982 there has been an increase in the generation of power from 69.5 to 81.4 Kilowatt hours per acre-foot. The revenue from this power has increased in the same period from $1.096 to $4.649 per af. (IID, 16, Attach. 25.) At present day costs, 100,000 af of water would generate $464,900 in revenue for the IID. IID submitted evidence indicating

that all the water diverted through the All-American Canal passes through the power plants and is used to generate electricity. (IID, 6, p. 4.)

6.0 PARTICIPANTS AT HEARING

The following parties made evidentiary presentations at the hearing: Mr. John Elmore, Department of Water Resources, Imperial Irrigation District, California Waterfowl Association, Colorado River Board, Environmental Defense Fund, Coachella Valley Water District, Department of Fish and Game, Salton Sea Property Owners,[2] U. S. Bureau of Reclamation, and the Imperial Irrigation District Water Conservation Advisory Board.

In addition to parties making evidentiary presentations, the following persons made non-evidentiary policy statements at the time of the hearing: Dr. Wiley Horne, representing Metropolitan Water District (MWD); Mr. William DuBois; Mr. Robert Adams; Mr. Ross Deter, representing the California Energy Commission; Mr. Bob Goodson, representing Southern California Edison; Mr. James M. Bucher; Mr. Luis Legaspi, representing the Imperial County Board of Supervisors;

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[2] The plaintiffs in two separate lawsuits against IID participated in this proceeding through their attorney, Lowell F. Southerland, and were referred to as the "Salton Sea Property Owners". The lawsuits in which said parties are plaintiffs are Salton Bay Marina, Inc., et al. v. Imperial Irrigation District (Imperial County Superior Court No. 48157) and Anderson, et al. v. Imperial Irrigation District and Coachella Valley Water District (Imperial County Superior Court No. 57249). Appeals in both cases are pending.

Mr. Jack Strobel; Mr. Ron Ackert, representing the Salton Sea Fish and Wildlife Club; Ms. Margaret Matsui, representing the Vantuna Research Group of Occidental College; Mr. Cliff Hurley; Mr. Charles Westmoreland; and Mr. Lloyd Heger.

7.0 WATER RIGHTS

The right of Imperial Irrigation District to divert and use water from the Colorado River is not at issue in this proceeding except insofar as that right is limited by the State Constitutional prohibition of waste and unreasonable use or method of use of water. (California Constitution, Article X, Section 2.) As discussed in Section 8.0, however, an important aspect of determining the reasonableness of the District's present water usage is to examine the alternative uses which may be made of water saved through conservation. The Colorado River is an interstate watercourse which has been subject to considerable water rights litigation. Consequently, the evaluation of alternative uses necessarily involves review of the legal framework governing the allocation of Colorado River water among competing users.

7.1 Boulder Canyon Project Act

The Boulder Canyon Project Act was enacted on December 21, 1928. (43 U.S.C. §§617 et seq.) The purposes of the Act are flood control, improvement of navigation, regulation of flows, storage and delivery of stored waters for reclamation and other beneficial uses exclusively within the United States, and for the generation of electric energy. The Act authorizes construction of Hoover Dam and Power Plant and

construction of the All-American Canal serving the Imperial and Coachella Valleys.

Section 5 of the Boulder Canyon Project Act authorizes the Secretary of the Interior (Secretary) to enter into water delivery contracts with users in the lower basin states. The section also provides that no person can have the use of stored Colorado River water without a contract with the Secretary. (43 U.S.C. §617d.) Before entering into any agreements with water users in California, the Secretary requested the State to agree on a listing of relative priorities of rights among the major users of Colorado River water. The result of this request was the "California Seven-Party Agreement" of August 18, 1931.

7.2 California Seven-Party Agreement

The parties to this agreement agreed that their respective claims to Colorado River water should be accorded the following priorities:

TABLE 1

WATER ALLOTMENT -- CALIFORNIA SEVEN-PARTY AGREEMENT

Priority	Description	Acre-feet Annually
1	Palo Verde Irrigation District gross area of 104,500 acres	3,850,000
2	Yuma Project (Reservation Division) not exceeding a gross area of 25,000 acres	
3(a)	Imperial Irrigation District and lands in Imperial and Coachella Valleys to be served by AAC	
3(b)	Palo Verde Irrigation District -- 16,000 acres of mesa lands	
4	Metropolitan Water District and/or City of Los Angeles and/or others on coastal plain	550,000
5(a)	Metropolitan Water District and/or City of Los Angeles and/or others on coastal plain	550,000
5(b)	City and/or County of San Diego	112,000
6(a)	Imperial Irrigation District and lands in Imperial and Coachella Valleys	300,000
6(b)	Palo Verde Irrigation District -- 16,000 acres of mesa lands	
	TOTAL	5,362,000

Under the Supreme Court decision in Arizona v. California, 373 U.S. 546, 83 S.Ct. 1468 (1963), California's share of the 7.5 million acre-feet per annum (mafa) allocated to the lower basin states is limited to 4.4 mafa plus one-half of any surplus over the 7.5 mafa. Thus, California's allotment when no surplus water is present would fulfill only the first four priority claims. Of the total 1,212,000 afa to which Metropolitan Water District has claims,[3] only 550,000 afa will be provided if California is limited to a total of 4.4 mafa. This amount could be further reduced if other rights and claims not covered by the Seven-Party Agreement are deducted from MWD's fourth priority right (CRB, 1, Table 2.) If use of water by any of the higher priority users were reduced below the agreed upon allotments, however, the unused water would be available to Metropolitan Water District or the other parties to the agreement in order of priority as specified in the above schedule.

7.3 Water Delivery Contracts

Following execution of the Seven-Party Agreement in 1931, the Secretary of the Interior entered into water delivery contracts with the water users in California. Each of the current contracts with the parties to the Seven-Party Agreement includes the complete schedule of priorities and quantities established by that agreement. (CRB, 1, p. 10.) Thus, under the contract between the Secretary of the Interior and IID dated December 1, 1932, the IID and the other areas

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[3] This includes the MWD allotments which total 1.1 mafa as shown in Table 1 plus the allotment to the City and/or County of San Diego of 112,000 afa that has been assigned to MWD.

listed in the first three priorities of the Seven-Party Agreement are to receive 3,850,000 afa total. Of this amount, IID's "present perfected right"[4] has been determined to be the lesser of 2,600,000 afa or the quantity necessary to supply the consumptive use required for irrigation of 424,145 acres and for satisfaction of related uses. Arizona v. California, 439 U.S. 419, 429 (1979). To the extent that the first and second priority users do not utilize their full allotments, IID may receive additional water. In recent years, IID's water use has averaged about 2,900,000 afa. (DWR, 1, p. 50.)

7.4 U.S. Supreme Court Decisions

Although the Boulder Canyon Project Act authorized the lower basin states to enter into an agreement allocating their respective shares of Colorado River water, no such agreement was reached. Nevertheless, the Secretary of the Interior entered into contracts for delivery of water to users in the lower basin states, before the water rights of each state were resolved. In order to obtain Congressional authorization for the Central Arizona Project, Arizona filed suit in the Supreme Court in 1952 against California and seven public agencies within California. Following an extensive trial, the Supreme Court

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4 "Present perfected right" was defined by the Supreme Court as a "water right acquired in accordance with state law, which has been exercised by the actual diversion of a specific quantity of water that has been applied to a defined area of land or to definite municipal or industrial works" and, in addition, present perfected rights include rights created by federal reservation whether or not applied to beneficial use. As used in the Arizona v. California decree, present perfected rights were determined as rights existing as of June 25, 1929, the effective date of the Boulder Canyon Project Act. (376 U.S. 340, 341, 84 S.Ct. 755, 756 (1964).)

issued its opinion on June 3, 1963. (Arizona v. California, 373 U.S. 546, 83 S.Ct. 1468.)

Three points in the Court's opinion are particularly significant with respect to determination of the rights of California as a state, and the rights of the water users within the state to the water of the Colorado River. First, the Court concluded that by enacting the Boulder Canyon Project Act, Congress established a statutory apportionment of mainstream Colorado River water among the lower basin states. The division of water adopted by Congress allocates 4.4 mafa to California, 2.8 mafa to Arizona and 300,000 afa to Nevada. Any surplus water after the first 7.5 mafa would be divided evenly between Arizona and California. Although the lower basin states had failed to enter into an agreement as authorized by the Act, the Court concluded that the Act gave the Secretary of the Interior adequate authority to accomplish the allocation of water among the lower states by empowering the Secretary of the Interior to make contracts for water delivery and by providing that no person could have water without a contract. (Id., 373 U.S. at 564, 565, 83 S.Ct. at 1480.)

The second important point of the Supreme Court decision is that it settled the issue of whether the allocation of water reflected in the Boulder Canyon Project Act referred to water in the Colorado River and its tributaries, or whether it referred only to water in the "mainstream" of the river. Contrary to California's position, the Court held that Congress intended the allocation to apply only to mainstream water downstream from Lee Ferry and not to water in Colorado River tributaries downstream of that point. (373 U.S. at 572, 83 S.Ct. at 1483.)

The third point relevant to evaluation of California water users' rights to Colorado River water is that the Court held that Congress intended that the contracts entered into by the Secretary of the Interior would determine which users within each state were entitled to receive water. The Court further held that the Secretary's contracts were not limited by the law of prior appropriation. (373 U.S. at 580, 581, 83 S.Ct. at 1487, 1488.) However, the Court went on to acknowledge that despite the significance of the Secretary's contracts, Section 18 of the Boulder Canyon Project Act "plainly allows the States to do things not inconsistent with the Project Act or with federal control of the river." (373 U.S. at 588, 83 S.Ct. at 1491, 1492.)

The role of state law with respect to the water rights of Imperial Irrigation District was explained further by the Supreme Court decision in Bryant v. Yellen, 447 U.S. 352, 100 S.Ct. 2231 (1980):

> "In the first place, it bears emphasizing that the §6 [of the Boulder Canyon Project Act] perfected right is a water right operating under state law...in providing for these rights the Secretary [of Interior] must take account of state law. In this respect, state law was not displaced by the Project Act and must be consulted in determining the content and characteristics of the water right that was adjudicated to the District by our decree [in Arizona v. California]." 447 U.S. at 371, 372.

Regulation to prevent waste and unreasonable use of water within each of the states receiving Colorado River water is not inconsistent with any provision of the Boulder Canyon Project Act. Further, as discussed in Section 8.0 below, regulation to prevent waste and unreasonable use of water is a clearly established element of

California water law. Therefore, in accordance with the Supreme Court decisions in Arizona v. California, supra, and Bryant v. Yellen, supra, the use of water by Imperial Irrigation District is subject to the provisions of California law regarding waste and unreasonable use.

7.5 Transfer of Conserved Water

Under the existing allocation system, conserved water not used by IID would be available to other parties to the Seven-Party Agreement in order of priority. In appropriate conditions, the conserved water presumably could be transferred directly to another party by agreement between IID and the other party. Due to the structure of the Seven-Party Agreement, it may also be prudent to secure the consent of parties who hold higher priority rights than are held by the party to whom the conserved water would be transferred. As a practical matter, consent to the transfer by the Secretary of the Interior or his designee would be required since the Bureau of Reclamation controls the flow of Colorado River water. The written statement submitted by the Bureau of Reclamation indicates that the major incentive for the Bureau to study water conservation potential within the IID was to identify water which could be made available to other users. (USBR, 1, p. 3.) Thus, the evidence indicates that the Bureau would support a workable water transfer arrangement.

The representative of the Colorado River Board expressed the opinion that the consent of all parties to the Seven-Party Agreement would be required to achieve a direct transfer (T, IV, 102,19 - 103,11), but the agreement itself is silent on the subject. If a given party were not adversely affected by a proposed transfer, it is by no means

certain that the party's consent would be required. Even if consent of all seven parties were required, there has been no indication that such consent would not be forthcoming.

One example of a water transfer arrangement is presently in effect. The transfer involves an agreement between MWD and the Coachella Valley Water District (CVWD) for use of a portion of the water conserved by lining the Coachella Branch of the All-American Canal. At such times as the CVWD does not need all or a portion of the conserved water, MWD will be able to receive the water in exchange for paying a portion of CVWD's repayment costs of lining the Coachella Branch of the All-American Canal. (EDF, 3, 61.)

The distribution of Colorado River water among California water users is governed by the users' contracts with the Secretary of the Interior. In addition to contractual rights to the delivery of water by the USBR, IID holds appropriative water right permits from the State.[5] Following the Arizona v. California decision, supra, the role of the state permit system is not entirely clear. However, if the IID were to engage in a water transfer arrangement, the area of use specified in the permits could be amended following submission and approval of a petition to change the place of use. (Water Code Sections 1701 et seq.) Where other water users are not adversely affected, no provision of state law would prevent a transfer of water from occurring. In fact, Water Code Section 1011 expressly authorizes the sale, lease, exchange or other transfer of water saved through conservation efforts. Under appropriate circumstances, the maximum

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[5] Imperial Irrigation District has received water right permits on Applications 7482, 7739, 7740, 7741, 7742, 7743, and 8534.

beneficial use provision of Article X, Section 2 of the California Constitution may mandate the transfer of surplus water to water-short areas.

In summary, although a direct water transfer arrangement would require agreement between IID and another participating party, together with at least the tacit approval of the Bureau of Reclamation, there do not appear to be any significant legal barriers to such a transfer.

7.6 Summary of Water Right Considerations

The Supreme Court's ruling in Arizona v. California, supra, established that rights to water from the main stem of the lower Colorado River are governed primarily by the provisions of water delivery contracts with the Secretary of the Interior. In the case of California users, the water delivery contracts are based upon the Seven-Party Agreement which in turn is based upon claims to water rights acquired under state law. The priorities reflected in the Seven-Party Agreement were carried over into the Secretary of the Interior's contracts with major Caifornia water users.

The Supreme Court's 1964 decree calls for delivery of 4.4 mafa to California water users out of the first 7.5 mafa available to the lower basin states. (Arizona v. California, 376 U.S. 340, 84 S.Ct. 755.) Subsequent legislation provides that the Secretary must deliver at least 4.4 mafa to California at any time the Central Arizona Project diverts any water. (43 U.S.C. §1521(b).) In addition to the 4.4 mafa, the Secretary must deliver to California half of any surplus over 7.5 mafa which he determines is available to the lower basin states. In addition, the Secretary can allow California to divert water allocated to Nevada and Arizona which they cannot use in a

particular year. A reduction of water diversion by Imperial Irrigation District would increase the water available to serve unfulfilled contractual demands by California water users. A reduction of water diversion by IID could also occur as part of a water transfer agreement. The subject of alternative uses and demand for water conserved by IID is addressed below in Section 11.

8.0 LEGAL ASPECTS OF WASTE AND UNREASONABLE USE DETERMINATIONS

8.1 Constitutional and Statutory Provisions

The State's policy on prevention of waste and unreasonable use of water is based upon Article X, Section 2 of the California Constitution which provides:

> "It is hereby declared that because of the conditions prevailing in this State the general welfare requires that the water resources of the State be put to beneficial use to the fullest extent of which they are capable, and that the waste or unreasonable use or unreasonable method of use of water be prevented, and that the conservation of such waters is to be exercised with a view to the reasonable and beneficial use thereof in the interest of the people and for the public welfare. The right to water or to the use or flow of water in or from any natural stream or water course in this State is and shall be limited to such water as shall be reasonably required for the beneficial use to be served, and such right does not and shall not extend to the waste or unreasonable use or unreasonable method of use or unreasonable method of diversion of water.... This section shall be self-executing, and the Legislature may also enact laws in the furtherance of the policy in this section contained."

A similar limitation is repeated in Section 100 of the Water Code. In addition, Section 275 of the Water Code charges the Department of Water Resources and the State Water Resources Control Board with the responsibility of preventing the misuse of water:

> "The department [of Water Resources] and board [the State Water Resources Control Board] shall take all appropriate proceedings or actions before executive, legislative, or judicial agencies to prevent waste, unreasonable use, unreasonable method of use, or unreasonable method of diversion of water in this State."

The language of the California Constitution and the Water Code refer to "waste or unreasonable use or unreasonable method of use or unreasonable method of diversion of water" as matters which are to be prevented. This broad language clearly establishes that any misuse of water is prohibited whether the misuse results from the type of use, the manner of use or the manner of diverting the water to the place of intended use. Since all types of misuse are prohibited, it generally is not productive to attempt to label a given practice or situation as an "unreasonable use" as opposed to an "unreasonable method of use", etc. In all instances, the key determination is one of reasonableness. This fact is implicitly recognized in the administrative regulations discussed below which refer generally to the "misuse" of water.

8.2 Joint Administrative Regulations

As previously discussed in Section 3.0, the present case was brought to the attention of the Board and the Department of Water Resources by a complaint filed by John Elmore pursuant to Title 23 of the California Administrative Code, Sections 4000 et seq. These regulations establish a procedure for investigating alleged misuses of water and notifying the water supplier of findings of the investigation. Normally, the investigation is conducted by the Department of Water Resources. If a misuse of water is determined to

exist by DWR's investigation, the water supplier must either terminate the misuse or demonstrate that no misuse has occurred or is occurring. If the water supplier fails to do so within the time specified by DWR, the regulations provide that the Board may hold a hearing to determine if a misuse of water has occurred or is occurring. After the hearing, the Board may issue an order requiring prevention or termination of any misuse of water. The Title 23 regulations also describe various enforcement procedures available to the Board.

The brief submitted by IID after the close of the hearing suggests that the Department of Water Resources may not have concluded that the District's practices result in a waste or unreasonable use of water, and that therefore there may have been no need for a hearing before the Board. (IID Brief, 2/21/84, p. 3.) The District bases this suggestion in part upon the statement by DWR witness Clyde Arnold that waste of water in these proceedings is now a matter for determination by the Board. (T, III, 16, 10-15.) The District also cites a statement from a letter from former DWR Director Ron Robie to Imperial Irrigation District that it is "not presently economic for you [IID] to salvage much of this water for your own uses." (Board, 1, Correspondence File, letter dated 12/31/82 from Ron Robie to Gerald Moore, President of IID Board of Directors.)

The Board believes that a thorough review of the record leaves no doubt that the Department concluded that IID practices result in a misuse of water. Following completion of its investigation, the Department advised both the District and the IID farmers of its

conclusion that waste and misuse of water was occurring. (DWR Exhs. 9 and 10; T, III, 2,1 - 3,24.) Similarly, the Department repeated its conclusion that there was a "waste of water" within IID in its letter dated November 1, 1982, referring the matter to the Board for hearing. (Board, 1, Correspondence File, letter dated 11/1/82 from Ron Robie to Carole Onorato, Chairwoman, SWRCB.) Finally, the written closing statement of the Department reviews the basis for the Department's conclusions regarding misuse of water and cites evidence in the DWR report of investigation in support of that conclusion. (DWR Closing Statement, 2/21/84.)

In summary, the Board concludes that the procedural steps established by California Administrative Code, Title 23, Sections 4000 et seq. have been followed. It should be recognized, however, that Section 4007 of the regulations provides that said regulations shall not be construed as a limitation or constraint on the authority of the Board or DWR to prevent the misuse of water. Thus, the general authorization for the Board to take all appropriate actions to prevent waste or unreasonable use of water under Water Code Section 275 is not limited by any provisions of the Title 23 regulations.

8.3 Meaning of Reasonable and Beneficial Use Requirement

The "reasonableness" of the diversion and use of water within IID cannot be determined in the abstract or by some inflexible standard. The California Supreme Court has described the nature of the reasonable and beneficial use requirement of the California Constitution as follows:

> "What is a beneficial use, of course, depends upon the facts and circumstances of each case. What may be a reasonable beneficial use, where water is present in excess of all needs, would not be a reasonable beneficial use in an area of great scarcity and great need. What is a beneficial use at one time may, because of changed conditions, become a waste of water at a later time." (Tulare Irr. Dist. v. Lindsay-Strathmore Irr. Dist., 3 Cal.2d 489, 45 P.2d 972, 1007 (1935), emphasis added.)

In a more recent decision, the Court elaborated further on the meaning of the reasonable use standard and stated:

> "Although, as we have said, what is a reasonable use of water depends on the circumstances of each case, such an inquiry cannot be resolved in vacuo isolated from state-wide considerations of transcendent importance. Paramount among these we see the ever increasing need for the conservation of water in this state, an inescapable reality of life quite apart from its express recognition in the 1928 amendment [now Article X, Section 2 of the California Constitution]." Joslin v. Marin Munjcipal Water District, 67 Cal.2d 132, 429 P.2d 889 (1967), cited with approval in Environmental Defense Fund, Inc. v. East Bay Municipal Utility District, 26 Cal.3d 183, 161 Cal.Rptr. 466 (1980).

Thus, in determining the "reasonableness" of water usage within IID, the law requires an examination of the ascertainable facts concerning such water usage and an evaluation of such facts in view of the increasing need for water conservation within California. Although each case must be evaluated on its own merits, prior court decisions, prior decisions of the Board, and several statutes provide guidance in

evaluating water usage within Imperial Irrigtion District.[6] Several factors which should be considered are described below.

8.4 Factors to be Considered in Evaluating Instances of Alleged Waste and Unreasonable Use

8.4.1 Other Potential Beneficial Uses for Conserved Water

One of the most important factors to be considered in evaluating the reasonableness of IID's present use of water is identification of other beneficial uses to be made of water which could be conserved. In Joslin v. Marin Municipal Water District, Id., the court weighed the competing demands for water of a water district and the people it served against the demands of a riparian landowner who depended upon an unobstructed flow of water to replenish the rock and gravel which the landowner excavated from the streambed and sold. The Court concluded that the riparian's insistence on the full unobstructed flow was unreasonable. Similarly, in SWRCB Decision 1463 the Board concluded that filling a recreational lake during a drought was an unreasonable use of water since the same water could otherwise be used to reduce the need for water imports from Northern California where several areas were experiencing water shortages.

The position of IID is that "[i]f there are no competing users and some beneficial use is being made of the water, the water involved may be considered surplus water, but it is not 'wasted water'." (IID Brief 2/21/84, p. 26.) In reliance upon this position, the IID presented evidence intended to show that there have not been any

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[6] See Kramer and Turner, "Prevention of Waste and Unreasonable Use of Water: The California Experience". 1. Agricultural Law Journal 519, 522 (1980).

shortages of water among diverters from the lower Colorado River in recent years. The water supply situation of Colorado River diverters and the subject of other beneficial uses to be made of conserved water are addressed in Section 11.0 below.

Although evaluation of the alternative uses to be made of conserved water is an important aspect of evaluating the reasonableness of the District's water usage, a finding of unreasonable use or method of use does not require the existence of a dispute between competing users. For example, excessive diversion or an unreasonable method of diversion of water to the detriment of instream fish and wildlife uses may be wasteful even if there are no objections from competing consumptive users. (Environmental Defense Fund v. East Bay Municipal Utility District, supra, 200 Cal.3d at 200.) Similarly, if other parties demonstrate an intention to utilize water which could be conserved through reasonable conservation measures, the failure to undertake such conservation may be found to be unreasonable. The parties interested in utilizing the conserved water are not required to file a lawsuit or an administrative complaint in order for the Board to acknowledge that there are other beneficial uses to be made of water which can be conserved.

8.4.2 Whether the Excess Water Now Serves a Reasonable and Beneficial Purpose

Although there may be means for increasing the efficiency of water use by a particular water user, the availability of excess water for other beneficial purposes may serve to mitigate what might otherwise be an unreasonable situation. For example, if virtually all of an irrigator's tailwater reenters the stream where it is available for

downstream use, and if the diversion has no adverse effect on instream uses, then it may not be unreasonable to allow large quantities of tailwater. Similarly, if a water user's canal seepage contributes to the recharge of a groundwater basin, such seepage could be beneficial and considered reasonable in certain circumstances since underground storage of water for future use is recognized as a beneficial use. (Water Code Section 1242.) A third possibility, as discussed in Section 12.0 below, is the availability of irrigation return flow for the enhancement of fish and wildlife resources which is recognized as a beneficial use of water under Water Code Section 1243.

8.4.3 Probable Benefits of Water Savings

The probable economic, environmental and other benefits that would result from more efficient use of water should be identified. These benefits may serve to offset a portion of the cost of more stringent water conservation policies.

8.4.4 The Amount of Water Reasonably Required for Current Use

Determining a reasonable duty of water or reasonable water use requirements can assist in providing a general indication of whether a water user is in compliance with the constitutional requirements of reasonable and beneficial use. In a large complex situation such as IID, however, cropping patterns may vary from year to year, leaching requirements vary with location, and other factors affecting water consumption may also vary considerably. In the absence of comprehensive data on all water demands within the IID, it is extremely difficult to estimate the total "reasonable" water requirements of the District. Nevertheless, the Board may evaluate

the reasonableness of those aspects of IID's operations on which meaningful information is available.

8.4.5 Amount and Reasonabless of the Cost of Saving Water

The fact that water conservation may require the water user to incur additional expense provides no justification to continue wasteful or unreasonable practices. In People ex rel. State Water Resources Control Board v. Forni, 54 Cal.App.3d 743, 126 Cal.Rptr. 851 (1976), the court ruled that water users may properly be required to "endure some inconvenience or to incur reasonable expenses" in order to comply with the constitutional standard of putting the water resources of the state to maximum beneficial use. The decision in the Forni case indicates that the Board may require a water user to build water reservoirs or make other physical improvements if that is the only feasible method of achieving the constitutional mandate of reasonableness. (54 Cal.App.3d at 751-752.)

The determination of whether the cost of a particular conservation measure is reasonable must be made with respect to the resources available for financing water conservation efforts as well as the value of the water which would be conserved. Where outside parties are willing to finance improvements in exchange for conserved water, the availability of financing from those parties should also be considered.

8.4.6 Whether the Required Methods of Saving Water Are Conventional and Reasonable Rather Than Extraordinary

Water Code Section 100.5, enacted in 1980, states:

> "It is hereby declared to be the established policy of this state that conformity of a use, method of use, or method of diversion of water with local custom shall not be solely determinative of its reasonableness, but shall be considered as one factor to be weighed in the determination of the reasonableness of the use, method of use, or method of diversion of water within the meaning of Section 2 of Article X of the California Constitution."

Although this statute confirms the traditional view that local custom should be considered in evaluating reasonableness of water use, it clarifies that conformity with local custom alone does not foreclose a finding of waste and unreasonable use in appropriate circumstances. The Board also recognizes that determining the local custom with which the operations of an irrigation district should be compared is difficult if no closely comparable districts exist. This is a problem with respect to the IID where irrigation return flow is not available for further consumptive use. In contrast, the return flow from most districts eventually reenters a natural stream system and is available for further use.

8.4.7 A Physical Plan or Solution

This factor is closely related to consideration of other potential uses of water to be saved, as discussed above in Section 8.4.1. In disputes between competing water users, courts have frequently considered whether there is a "physical solution" available by which the needs of both users can be met. (Peabody v. Vallejo, 2 Cal.2d 351, 383-384, 40 P.2d 486 (1935), Waterford Irr. Dist. v. Turlock Irr. Dist., 50 Cal.App. 213, 194 Pac. 757 (1920), People ex rel. State Water Resources Control Board v. Forni, supra, 54 Cal.App.3d at 751-752.) If there is such a solution, then the constitutional goal of

promoting maximum beneficial use of the State's waters will be served by adopting the "physical solution", provided other water users and instream uses are not adversely affected.

In the present case, there currently is no dispute between competing water right holders and, therefore, consideration of a "physical solution", as the term is normally used, is not required. However, there are impending shortages of water which are reasonably certain to exist within the period in which a physical solution to avoid the shortages could be implemented (see Section 11.0). Therefore, it is proper to initiate steps immediately which will assist in alleviating the shortage.

9.0 WATER LOSSES WITHIN IMPERIAL IRRIGATION DISTRICT

9.1 Summary of Estimates of Water Losses

Approximately one million acre-feet per annum of irrigation return flow enter the Salton Sea from Imperial Irrigation District. (See Table 2 below.) Unlike return flows in most areas, this water is lost to further beneficial consumptive use. The four main sources of water loss within IID which were identified at the hearing are: tailwater, canal spills, canal seepage, and leachwater. The total quantity of loss attributable to all four sources can be determined fairly accurately by subtracting the flow in the New River and Alamo River as they enter IID from the flow in those rivers as they enter the Salton Sea. Adjustments must also be made for District lands which drain directly into the Salton Sea and for various other factors such as precipitation within the District.

Although there is general agreement on the quantity of total water losses within IID, there is considerable variation in the estimates of losses attributable to each of the four main sources described. The difficulty in determining the quantity of loss from each source is due to the lack of measurements of canal spills and tailwater and problems in accurately estimating losses due to canal seepage and leachwater.

The information presented in Table 2 below is based on studies submitted by the named parties which cover similar periods of time. The processes used to develop each of the parties' estimates are described briefly in Sections 9.2 through 9.4 below. The various parties approached the process of accounting for water use within IID differently. In some instances, in order to present values for components of IID water use in a comparable form, the values in Table 2 below were derived from information submitted by the parties.

TABLE 2

ESTIMATED WATER LOSS FROM THE
IMPERIAL IRRIGATION DISTRICT
(Acre-feet per annum)

	DWR, 1 & DWR, 17	ELMORE, 3	IID, 16
	1, pp. 13, 30, 41-43 17, pp. 7-11	3, Table 4	16, Attachment 13
1. Period of Record	1975-1979	1976-1980	1977-1979
2. Inflow to IID-Drop 1	2,791,000	2,744,000[e]	2,757,000[h]
3. Operational Losses (including Canal Seepage)	253,000	97,000[f]	254,000
4. Canal Spill	53,000	58,000	135,000
5. Delivered to Users	2,537,000[a]	2,500,000[g]	2,368,000[i]
6. Crop Evapotranspiration	1,664,000	---	1,736,000
7. Leachwater	250,000[b]	309,000	281,000
8. Tailwater	380,000[c]	559,000	312,000
9. Excess Leach and Tailwater	190,000[d]	-0-	-0-
10. TOTAL -- Leachwater + Tailwater (7 + 8 + 9)	820,000	868,000	593,000
11. TOTAL LOSS (3 + 4 + 10)	1,126,000	1,023,000	982,000
12. Loss As Percent of Inflow	40%	37%	36%

a. Assumed by DWR to include the 53,000 canal spills on Line 4.
b. Assumed by DWR that 15 percent crop ET is necessary for leaching.
c. Assumed value based on IID maximum allowable tailwater. Actual value includes some of quantity reported in Line 9.
d. Water loss which exceeds assumed leachwater and tailwater values. Quantity which must be allocated to each source of loss could not be determined.
e. Included by Board from IID, 3, p. 112 for comparison.
f. Includes canal seepage only.
g. Includes the 58,000 afa canal spills shown on Line 4.
h. Includes 34,000 afa seepage recovery.
i. Includes 39,000 afa delivered to non-farm users.

9.2 Department of Water Resources Estimates

The Department of Water Resources selected the years 1975 to 1979 as a representative period for studying recent operations of IID. The quantity of water delivered to IID via the All-American Canal at Drop 1 was determined from IID records. The 53,000 afa value reported for canal spills was estimated based upon a limited amount of data from one canal. This estimate was very close to the value of 2 percent of delivered water which was estimated by Robert Wilson of the IID Water Department. (DWR, 17, p. 10.) The Department of Water Resources estimated that canal spills could be reduced by approximately 50,000 afa. (DWR, 17, p. 11.)

The Department estimates of canal seepage, which are included in the value shown for operational losses in Table 2, were based upon information in the IID Annual Summary. (DWR, 17, 16-17.) The Department estimates that approximately 140,000 afa could be conserved through additional canal lining and seepage recovery lines. In addition, the Department estimates a potential savings of 70,000 afa from lining the All-American Canal. (DWR 1, p. 56.) The water loss due to seepage in the All-American Canal is not reflected in Table 2 above.

The value for crop evapotranspiration (ET) reported in Table 2 above was calculated by subtracting the component of Salton Sea inflow derived from IID deliveries to farmers from the total value for IID deliveries to farmers. (DWR 1, p. 42.) The calculated value compared closely with DWR's revised estimate based on an empirical analysis. (DWR, 18, p. 6, Table 2.) The calculated value for ET reported in Table 2 equals about 66 percent of the water delivered to farmers.

The remaining 34 percent was assumed to consist of canal spills (2 percent) and tailwater plus leachwater (32 percent). Based on a review of available literature and consultation with local experts, the Department estimated that leachwater equals 15 percent of ET, which in this instance equals about 10 percent of deliveries to farmers.

The 380,000 afa reported in the table as tailwater is based on the assumption that tailwater equalled 15 percent since that is the maximum allowed under IID regulations. Based on estimates using IID data and estimates from Lee Hersmeir of the USDA Agricultural Research Station, however, the Department experts believe that tailwater is probably higher than 380,000 afa and may be as high as 558,000 afa. (DWR 17, pp. 8-11; DWR 1, p. 32.)

Assuming that tailwater equals 15 percent of deliveries, leachwater equals 10 percent of deliveries, canal spills equal 2 percent of deliveries, and ET equals 66 percent of deliveries, then the quantity of delivered water which is unaccounted for equals 7 percent of delivered water. This quantity of water is shown in Table 2 above as approximately 190,000 afa in the category of "Excess Leachwater and Tailwater". Due to the limited data available, the Department did not attempt to determine how much of this water was due to tailwater and how much was due to leachwater. The Department concluded, however, that approximately 7 percent of delivered water could be conserved through reduction of excess tailwater losses and excess leachwater losses. (DWR, 17, p. 10.)

9.3 Estimates Submitted by John Elmore

The engineering firm of Krieger and Stewart examined the data available from DWR, IID and Hess Geotechnical Corporation in the preparation of their estimates of water loss prepared for Mr. Elmore. (Elmore, 3, p. 2.) Although they examined data for the period 1965-1980, their estimates for the period 1976-1980 were selected for use in Table 2 above because it more closely matched the period studied by DWR.

Losses of water from IID were estimated by reviewing the estimates of DWR, IID and the Bureau of Reclamation, and applying independent judgment where possible. The Krieger and Stewart canal seepage estimate is based upon DWR estimates and was adjusted in proportion to the increase in canal lining in later years. (Elmore, 3, p. 12.) Similarly, Krieger and Stewart modified the DWR estimate for canal spills (2 percent of delivered water) because it was assumed that the two regulatory reservoirs constructed in 1976 and 1977 resulted in a reduction of canal spills by 30,000 af in 1978. They assumed that canal spills approximated 3 percent of IID deliveries before 1977, 2-1/2 percent during 1977, and 2 percent after 1977. They stated that this assumption was believed to be conservative. (Elmore, 3, p. 12.)

Krieger and Stewart estimated the composite leaching fraction for IID to be about 14 percent of net IID delivered water after adjusting for the percentage of net irrigated area which is tiled for leachwater. This estimate was based upon information from several experts on local leaching requirements, the recommended leaching requirements published in the IID 10-Year Report for 1977, and the annual inventory of

crop acreages published by IID in its 1982 Water Report. (Elmore, 3, p. 13.)

The quantity of tailwater was calculated by subtracting from IID inflow to the Salton Sea, the previously derived values for rainfall runoff entering the Sea, canal spills, canal seepage and leachwater. For the period 1976 to 1980, tailwater was calculated to be an average of 559,000 afa, or about 22 percent of IID delivered water. (Elmore, 3, pp. 13, T-4, Table 4.)

9.4 Estimates Submitted by Imperial Irrigation District

Bookman-Edmonston Engineering, Inc., prepared a water balance for the Imperial Valley for the period 1977-1979 based on their review of IID records and information developed by the Department of Water Resources and other experts. (T, VIII, 154; IID, 16, Attachment 13.) Crop evapotranspiration was based upon records of crops grown, and the values for quantity of water used per acre as developed by DWR and Kaddah-Rhoades. The quantity of leachwater was estimated by comparing the quality of tile drainage water with that of the New and Alamo Rivers and the All-American Canal. (T, VIII, 157,23 - 158,12.) Tailwater was calculated as the closure item of the portion of the equation used in determining total IID inflow to the Salton Sea. (T, VIII, 158, 11-21.)

9.5 Estimates Prepared by the United States Bureau of Reclamation

The U. S. Bureau of Reclamation (USBR) conducted an investigation of water use within the Imperial Irrigation District to determine if there were feasible measures to recover drainage water being lost to the Salton Sea. Although some field measurements were made by the

USBR staff and the IID staff in this cooperative venture, it was necessary to estimate some components of water loss. The estimates of water loss presented as evidence by the USBR are set forth in Table 1 on page 4 of USBR Exhibit 1. In cross-examination of the USBR witnesses, however, it was shown that a previous draft of the USBR report on water conservation within IID contained substantially different estimates of water losses attributable to various sources. (T, VI, 31,13 - 147,8; IID, 3, p. 9.) Portions of earlier USBR draft reports and related documents were presented as evidence to demonstrate the differences. (Elmore, 8 to 20.) Since there was no satisfactory resolution of the different values reflected in the various USBR documents, the Board was not able to rely upon the estimates stated in USBR Exhibit 1 in comparing water loss estimates within Imperial Irrigation District.

9.6 Conclusions Regarding Water Losses Within IID

The estimates of water loss shown in Table 2 above are based on periods of time when the inflow to IID at Drop No. 1 was approximately the same. Although the parties differed on the quantity of losses estimated for various components, their estimates of total water loss as a percentage of inflow at Drop No. 1 are relatively close, between 36 and 40 percent. The numbers stated in Table 2 provide a general guide to the likely range of values for water losses due to particular factors in IID. In view of the previously noted limitations in available data, the Board will not attempt at this time to refine the numbers further in order to derive its own water balance for the Imperial Valley.

As discussed in Section 10.0 below, there is considerable evidence that various components of the water loss within IID could be reduced through reasonable conservation measures. The lack of reliable information on the sources of water loss within IID, however, impedes the development of a comprehensive water conservation plan. In view of the maximum beneficial use requirement of Article X, Section 2 of the California Constitution, the Board concludes that the right to make use of a large quantity of water carries with it the responsibility to account for its use accurately. Therefore, the IID should develop reliable procedures for determining the disposition of all water imported by the District with an emphasis on (1) an accurate accounting of farm deliveries, (2) measurements of canal spills, (3) measurement of tailwater, and (4) either measurement or computation of leachwater and canal seepage. Since the components of total IID water losses will vary from year to year based on cropping patterns, total acreage under irrigation, and other factors, the District's water accounting procedure should be capable of normalizing the data in order to make the information comparable from year to year.

10.0 IRRIGATION PRACTICES AND OPPORTUNITIES FOR WATER CONSERVATION

The allegations in the complaint filed by John Elmore relate to water losses due to canal spills and excess tailwater. The Elmore allegations are addressed in Sections 10.1 to 10.5 below. In addition to information regarding the specific allegations of the Elmore complaint, evidence was also presented on related aspects of IID water management practices and on other opportunities for water

conservation. These subjects are addressed in Sections 10.6 through 10.8.

10.1 Maintaining Canals in "Overly Full Conditions"

The first allegation of the Elmore complaint states that in order to provide quick delivery service of irrigation water, canals are kept overly full to such an extent that overflow gates at the terminal ends of the canals frequently spill over into drains where the water is not subject to reuse.

There was testimony that maintaining a high water level assists in maintaining an accurate measurement and delivery to the farmer's headgate. If a high water level is maintained, fluctuations in canal flow have less effect on the rate of delivery than if the water level is low. Maintaining a uniform headgate delivery allows for a more efficient distribution of water throughout the field. (T, VII, 90,18 - 92,14.) No evidence was submitted to refute the need for maintaining a constant headgate delivery.

The problem of canal spills is increased if farmers reject part of their order as allowed by the 21-Point Program. Under this program a farmer may cut back his order by two cubic feet per second (cfs) if the system can accommodate the request. Also, a farmer may reject up to 50 percent or five cfs of his order, whichever is less, during the last 12 hours of a run. Although the rejected water is paid for by the farmer, it remains in the canals and may contribute to the canal spills. (T, IV, 36, 13-18; 21-Point Program items l, m, n, p.) No record is kept of the amount of water rejected by the farmers and

therefore the extent of the problem this creates cannot be fully determined.

In addition to the unintentional spills, there are also operational spills which occur when canals are dewatered every four to eight weeks in order to control aquatic weeds. There was evidence submitted, however, that canals are spilling approximately 77 percent of the time. (T, V, 68, 20; SSPO, 16.) Therefore, it is reasonable to conclude that a large portion of canal spill losses are unintentional.

Since water spilled from the canals is lost without any beneficial consumptive use having been made, steps should be taken to improve the IID system so that operational flexibility can be provided without relying upon the storage capacity of the delivery canals. The regulatory reservoir program discussed below provides one means of increasing this flexibility.

10.2 Absence of Regulatory Reservoirs

The second allegation of the Elmore complaint states that the absence of regulatory reservoirs causes unnecessary delivery of excess amounts of water producing spillovers and runoff into the Salton Sea.

The IID has constructed four regulatory reservoirs to date and pledged to construct one a year until a total of 20 to 22 reservoirs are in operation. (IID, 10D.) Although the charge for water delivered by IID includes an assessment to generate the revenue for construction of reservoirs, reservoir construction was stopped because of economic problems. (T, VII, 87, 14-26.)

Regulatory reservoirs would help to reduce canal spills by creating needed storage to allow a greater flexibility for the District's water delivery practices and for the farmer in ordering water. (T, I, 50,15 - 51,06; T, III, 92, 04-09; T, VII, 87, 14-26.) The U. S. Bureau of Reclamation report presented by Robert McCullough states that large regulatory reservoirs and spill-interceptor systems also would produce a high degree of certainty on the increment of water that could be conserved. (T, V, 196, 24-26; USBR, 1, Table 6.)

The record indicates that Imperial Irrigation District and most other parties support the use of regulatory reservoirs. The District stated that the cost of the reservoirs and the difficulty of locating and obtaining the necessary reservoir sites have been the major obstacles to continuation of the reservoir construction program. (T, VII, 87, 14-26.)

Although testimony indicates that the regulatory reservoir program has been suspended, there was no evidence that the water conservation assessment included in the charge for water has been discontinued. If the revenue generated is to be used for the purposes for which it is collected, then the District will continue to have funds available for water conservation measures. The acknowledged benefits of the regulatory reservoirs support the conclusion that the reservoir construction program should be resumed.

10.3 Excess Delivery of Water to Farmers' Headgates

John Elmore's third allegation states that water should not be delivered in an amount greater than that actually needed by the farmer, and that provisions should be made to divert water to other

users when farmers miscalculate the amounts of water they actually need.

The District has no precise way of determining whether farmers' orders are reasonable or excessive. Therefore, the District provides all the water ordered. There was testimony that one-third to one-half of IID deliveries average 0.2 cfs more than was actually ordered. (T, I, 92, 7-16.) This results in excessive tailwater and/or rejected water at the headgate causing excessive water in the canals. (DWR 1, 25.)

The least expensive way to control wastewater is through careful ordering and proper application of water at the head end of the field. (T, I, 130, 16-19; T, VI, 14,11 - 15,02.) While there are many problems in ordering the right amount of water, the testimony indicates that the biggest problem is the "human factor". (T, VIII, 95, 06-07.) This highlights the need for a good educational program for water users. (See Section 10.8.)

10.4 Absence of Tailwater Recovery Systems

The fourth allegation of the Elmore complaint states that tailwater runoff which is currently draining directly into the sea could be captured by a recovery system and reused.

The volumes of tailwater runoff submitted in the water balance studies as listed in Table 2 range from 312,000 afa to 559,000 afa. As a percentage of delivered water, these quantities range from 13 percent to 22 percent. The IID's 21-Point Program specifies that 15 percent of the farmer's running order is the maximum tailwater that is allowed without penalty. Dr. Malek Kaddah testified that no one could defend tailwater and that even 10 percent was too high. (T, VII, 32,

17-18.) However, on cross-examination, Dr. Kaddah indicated that 10-percent tailwater would be a realistic goal within the IID. (T, VII, 69, 7-26.)

The use of tailwater recovery systems to control excess runoff is not a widely used method within the District. John Elmore testified that he uses portable tailwater recovery systems and estimates the cost to be about $9 per acre-foot. (T, I, 112, 23; T, I, 114, 07.) Steven Elmore has used a tailwater recovery system for six or seven years but only for the germination of crops. (T, I, 98, 12-13.) During the remainder of the season his tailwater normally is within the authorized limits. He testified that he would recommend a recovery system any time there would be enough runoff that a triple charge could be assessed under the District regulations.

Jewel Meyer, of the University of California at Riverside, testified that while tailwater recovery systems are very effective, they are also expensive. The use of a recovery system can also cause increased crop scalding problems during hot periods of the year. (T, III, 80, 10-18; T, III, 75, 1-3.) Mr. Meyer also testified that excessive runoff can be reduced by a change in the IID's policies to allow for a more flexible delivery of water and by improved on-farm irrigation techniques. (T, III, 90, 11-14.)

John Kubler, who was recognized by other witnesses as an efficient irrigator, stated that farmers could approach the savings in runoff realized by a recovery system if their fields were leveled and they used better water management practices. In those areas where it was not economically feasible to level the fields, some method such as a

recovery system may be required. (T, VI, 23, 01-23.) Mr. Kubler also testified that limiting tailwater also requires flexibility in water delivery by the IID to allow adjustments by the farmers. (T, VI, 24, 05-25.)

There was testimony that a recovery system created a savings by returning fertilizers to the field that were lost through excessive runoff. (T, I, 99, 02-03.) However, there are also added costs such as added insurance, vandalism, and theft. (T, VI, 7, 12-15.) It also was suggested that by pumping tailwater back to the head of the field, localized areas of weeds and nematodes may be spread throughout the field. (T, VII, 7, 04-11.) There was expert testimony that reuse of tailwater does not present a problem due to increased salinity. (T, VII, 68, 09; T, VI, 6, 21-26.) There was also expert testimony, however, that the salinity increase in tailwater is a problem which should be examined. (T, VI, 205, 12.)

The record indicates there is excess tailwater that could be conserved. The use of a tailwater recovery system in some situations would be useful, while better on-farm water management practices would help in almost all cases. It was not adequately demonstrated that use of tailwater recovery systems should be required by the Imperial Irrigation District. If sufficient water can be conserved by better water ordering and other on-farm practices, this would be a more cost-effective method.

10.5 Requirements That Farmers Order Water in 24-Hour Delivery Intervals

The final allegation of the Elmore complaint states that the delivery of water cannot reasonably be terminated after the farmer receives

sufficient amounts of water and the excess from the delivery drains unused into the sea. Mr. Elmore alleges that other potential water users are not contacted to use excess water, and miscalculation in estimating the amount of water needed by a farmer results in significant waste.

There was testimony that the requirement that water must be ordered in multiples of 24-hours means farmers tend to over order. Because of these excessive orders and because the canals are kept full, rejection of water due to over ordering causes excessive canal spills. (T, V, 29,16 - 30,01.)

Sequential water delivery was cited as a method used in some areas, but one expert testified that it would not be workable in the Imperial Valley. (T, III, 75, 04-21.) He also testified that most of the districts on sequential irrigation are beginning to head toward a 24-hour or 36-hour demand system. While a demand system is more difficult for an irrigation district to manage, it has advantages for the growers. (T, III, 75, 22-26.) There was also testimony identifying the problems which could arise if a sequential delivery system resulted in farmers receiving their initial delivery of water at night. (T, VII, 100, 09-23.)

There was not sufficient evidence presented at the hearing from which the Board can determine that any particular change in the District's water delivery policy is feasible and should be implemented at this time. Water conservation which could be achieved through changes in delivery scheduling, however, presumably would not involve a large capital construction outlay. Therefore, the District should carefully

examine the possibility of implementing changes in the existing water delivery policy.

10.6 Enforcement of Tailwater Restrictions

In addition to evidence on the specific allegations of the Elmore complaint, evidence was presented on the importance of enforcing tailwater restrictions. Due to the relatively low cost of water within the IID, there is little incentive for many farmers to reduce tailwater. (T, V, 37, 12-18; T, V, 76, 9-14; Elmore, 8, p. 2; Elmore, 12, p. 11.) Therefore, reduction of tailwater losses depends to a large extent on effective enforcement of tailwater restrictions. However, several problems with the existing tailwater monitoring program were identified.

The first problem with the IID tailwater enforcement program, as reflected in District records for 1977-1981, is that only about 20 percent of the fields receiving water were checked for excessive tailwater. (Elmore, 3, p. 16.) A memo dated July 1, 1983, from Robert Wilson to the IID irrigation superintendents and the watermaster directs that the zanjeros are now to check tailwater from all fields receiving headgate deliveries. (T, IV, 7,19 - 9,22). Some questions were raised regarding the possibility of carrying out this directive with the existing workforce. (T, IV, 23,9 - 27,25.) Unfortunately, no records were introduced showing the extent to which the announced policy has been implemented in recent months.

A second problem with the existing 13-Point Program is that no assessment is levied for excess tailwater unless discharges equal 15 percent or more of the water being delivered on two successive

occasions at least 9 hours apart in a 24-hour period. (IID, 10D, p. 2.) Although there was evidence indicating that a single measurement should not serve as the basis for an excess tailwater assessment (T, VII, 11,18 - 12,12), the existing requirement that there be 9 hours between measurements appears to have the effect of impeding rather than promoting effective enforcement. (T, I, 60,20 - 61,1; T, I, 63,20 - 64,25.)

The third problem with present tailwater enforcement efforts is that the poor condition of tailwater structures and approach channels makes accurate tailwater measurement difficult. It is also difficult for a farmer to control tailwater if he lacks a convenient way of determining if tailwater exceeds allowable limits. The importance of maintaining tailwater structures is acknowledged by the second point of the 13-Point Program which provides for "reconstruction of farm outlet boxes as required". Robert Wilson testified that the District made a one-time effort to repair tailwater structures in 1976, but since that time maintenance of the boxes has been left to the individual farmers. (T, IV, 10,22 - 11,8.) A recent sampling of 82 tailwater structures selected at random showed that approximately 40 percent were damaged or sub-standard and should be replaced. In addition, approximately 65 percent of the approach channels were silted or filled with trash and weeds. (Elmore, 3, pp. 13-14; T, I, 75, 3-7.)

A fourth problem with the District's efforts to control tailwater is that the sanctions seem to be ineffective in reducing tailwater even when a violator is caught. U. S. Bureau of Reclamation documents were presented which indicate that the triple charges assessed for

tailwater violations are unlikely to promote substantial water conservation. (Elmore, 8, p. 8; T, I, 87,16 - 89,9.) Records of the IID Water Conservation Advisory Board also indicate that the present tailwater monitoring program has not altered the behavior of so-called "chronic wasters". (Elmore, 22, p. 1.) This evidence supports the conclusion that extensive tailwater monitoring and increasing the sanctions levied against those having repeated tailwater violations are necessary if enforcement of tailwater limitations is to be effective.

The estimates of tailwater discharge set forth in Table 2 range from 312,000 afa to 559,000 afa. Even the smallest of these estimates is a large quantity of water. The evidence presented indicates that the District's present tailwater enforcement program has been ineffective and that it could be significantly improved as discussed above. Effective implementation of the District's announced policy requires, at a minimum, that tailwater structures be repaired and maintained, and that the District monitor all deliveries for excess tailwater as it contends it is now doing.

10.7 Irrigation Education Program

There was testimony from two farmers in the District that the least expensive way to control tailwater was by reducing the flow of water into the furrows at the head end of the field. (T, I, 130, 16; T, III, 81, 8.) However, a common practice is for farmers to order more water than needed to be sure of receiving enough to irrigate the entire field. This tendency to over order results in excess tailwater runoff. (T, VII, 97, 20-25.)

Virtually all of the evidence received indicates that an improved program of educating farmers and irrigators in better irrigation practices would have beneficial results. Engineer William Gookin testified that an educational water management program is needed and that it could be achieved with a small expenditure of funds. (T, V, 32, 23-26.) Such a program could reduce excess water orders without structural or capital costs. (T, V, 108,19 - 109,7.)

A representative of the IID Water Conservation Advisory Board, John Kubler, testified to what he considered to be four basic principles of good water management. First, the field must be graded for maximum uniformity of water distribution. Second, all structures related to delivery of water must be in good repair. Third, the water user, his foreman and the irrigators must understand the principles of good water management and the reasons for water conservation. The irrigators must be trained and closely supervised. Fourth, the farmer must order the right amount of water. (T, VI, 14,10 - 15,3.) The success which Mr. Kubler has had in reducing tailwater without use of a tailwater recovery system indicates what can be achieved by proper water management. (T, VII, 51,21 - 52,14.)

The potential for reducing tailwater by irrigation scheduling and other on-farm management techniques is also demonstrated by the results of a U. S. Bureau of Reclamation study involving approximately 38 farmers. At the outset of the study average tailwater runoff was estimated to range between 20 and 25 percent of delivered water. After implementing USBR suggestions and participating in the study for over a year, participating farmers were able to reduce tailwater to an average of 14 percent. (Elmore, 17, p. 28; T, VI, 65, 08-13.)

Imperial Irrigation District has taken some preliminary steps which indicate a growing recognition of the value of educating irrigators in improved on-farm management techniques. The District has hired a Supervisor of Water Conservation who works with farmers in developing water conservation plans, conducts irrigation scheduling and assistance programs, and works directly with irrigators in the field. (T, VI, 202,11 - 205,24.) In view of the extensive evidence regarding the effectiveness of improved on-farm management techniques in reducing tailwater and in view of the relatively low cost to the District, it is reasonable to expect the District to expand its present irrigation education program significantly.

10.8 Other Water Conservation Opportunities

The items discussed in Sections 10.1 through 10.7 relate primarily to reduction of water losses due to tailwater and canal spills. The two other large sources of water loss identified in the DWR Report of Investigation (DWR 1) and at the hearing were canal seepage and leachwater.

10.8.1 Lining Main Canals and Lateral Canals

The estimates of net seepage from main canals and lateral canals range from a low of 97,000 afa by the consultants for John Elmore to a high of 200,000 afa by the Department of Water Resources. (Elmore, 3, Table 4; DWR, p. 37.) The District has been involved in a canal lining program since the early 1960s in cooperation with local farmers. (IID, 4, p. 13.) The program has been criticized, however, because the priority for lining canals is established by those farmers who are willing to participate rather than by the District on the

basis of seepage losses. (T, I, 61, 15-20.) The relatively high cost of canal lining appears to be the main reason that the program has not been accelerated.

The Department of Water Resources estimates that the cost per acre-foot of water conserved by canal lining was $31 at 1981 prices, or roughly double the cost of recovering an acre-foot of tailwater. (DWR, 1, p. 59.)[7] One advantage of canal lining, however, is that the potential water savings can be determined with a relatively high degree of certainty. Canal lining also reduces the cost of weed control and canal maintenance. (DWR, 1, p. 36.) Therefore, an expanded canal lining program may be a likely candidate for financing by an outside party in exchange for conserved water. There was insufficient evidence, however, for the Board to conclude that the IID should be directed to change its present canal lining program at this time.

10.8.2 Lining the All-American Canal

The Department of Water Resources also identified seepage losses from the All-American Canal as a potential target for water conservation. The Department estimated that relocating and lining the All-American Canal would result in water savings of 70,000 afa at an estimated cost of $115 per acre-foot. (DWR, 1, pp. 56, 59.) As in the case of lining main and lateral canals, the potential water savings could be determined with a high degree of certainty. However, the District

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[7] This estimate and other cost estimates in DWR Exhibit 1 are from a variety of sources and may not be based upon a common price index. The estimates are referred to in this decision to provide an indication of the relative expense of the suggested conservation measures.

could not reasonably be expected to finance the lining of the All-American Canal under present conditions unless outside funding were available.

10.8.3 Reduction of Leachwater

The Department of Water Resources was not able to arrive at firm estimates for leachwater. However, the Department concluded that if the quantity of water used for leaching were substantially over 15 percent of ET, there would be an opportunity of reducing leachwater by as much as 178,000 afa. (DWR, 1, p. 49.) There was substantial evidence at the hearing, however, that leaching requirements in the Imperial Valley are unusually high and that they vary substantially according to local soil conditions. Although use of excessive leachwater should be avoided, there was insufficient evidence to establish that excessive leachwater is a widespread problem requiring corrective action at this time.

10.8.4 System Automation and Other Improvements

Some of the technical reports entered into the record discuss the potential for water conservation through system automation and other improvements not discussed in preceeding sections. Some of these measures hold sufficient promise to justify further study, but there is insufficient evidence for the Board to require immediate implementation.

11.0 BENEFICIAL USES FOR CONSERVED WATER

An important consideration in evaluating what conservation measures should be pursued, and at what rate, is the existence of other beneficial uses of water which could be conserved. As discussed

below, the evidence indicates that there are beneficial uses to be made of water conserved by IID and that in the near future there are likely to be substantial water shortages among California users of Colorado River water.

11.1 Use for Irrigation Within Imperial Irrigation District

Under the Supreme Court's decision in Arizona v. California, 439 U.S. 419, 429 (1979), Imperial Irrigation District has a present perfected right to divert a maximum of 2,600,000 afa at Imperial Dam. (See Section 7.4.) In accordance with its contract with the Secretary of the Interior, the District has been diverting approximately 2,900,000 afa. After the Central Arizona Project comes on line in 1985 or 1986, the District may have to conserve water to maintain its present irrigated acreage. (IID, 2, p. 15.) The quantity of water which must be conserved will depend on the rate of development of the Central Arizona Project, the water usage of other parties to the Seven-Party Agreement and future salinity of Colorado River water. There is also a potential to increase the irrigated acreage by developing the West Mesa, but much of this area is in federal ownership which prevents full development. (CRB, 1, p. 19.)

11.2 Coachella Valley Water District

The 1934 agreement between the IID and CVWD restricts the sale of any conserved water outside of IID if landowners within the CVWD need such water for reasonable irrigation purposes or for potable uses. (IID, 2, p. 14.) The CVWD has stated that it can beneficially use any salvaged water not used by the IID. (DWR, 1, Section V, p. 51.) A water conservation program that involves a third party would be subject to the 1934 agreement between the CVWD and IID.

11.3 Metropolitan Water District

The Metropolitan Water District has an existing contractual right to 1,212,000 afa from the Colorado River, subject to the prior rights of other users. MWD has been diverting about 800,000 afa in recent years. In some years, however, MWD has taken its full contractual entitlement of 1,212,000 af. Of the 4.4 mafa adjudicated to California by the U. S. Supreme Court, MWD holds a right to 550,000 afa in a fourth priority among California water users. Thus MWD could face a 662,000 afa reduction from its current entitlement when the Central Arizona Project reaches full development. (T, IV, 86, 15-18; T, IV, 102, 14-16; CRB, 1, Table 2.) The water available to MWD will be reduced further by prior rights of Indians and present perfected right holders that were not a party to the Seven-Party Agreement. The full extent of the reduction depends on the outcome of pending litigation. (CRB, 1, pp. 11, 12.)

The above figures show that there will be a definite need for additional sources of water within the MWD in the near future. The statement by the MWD representative at the hearing confirms that MWD would be interested in utilizing water conserved in the Imperial Valley if IID determines that such a transfer is in its interest. (T, IV, 136; MWD brief, 1.)

11.4 Groundwater Storage

There are three major groundwater basins where Colorado River water could be used for recharge, or to replace state project water that could be used for recharge. These are the San Fernando, Chino and Coachella Valley Groundwater Basins. The San Fernando Basin has a

capacity of 1,500,000 af. The Chino Basin also has a capacity of 1,500,000 af and there is some groundwater storage occurring there presently. The use of Colorado River water by the MWD allows use of state project water for groundwater recharge in the Chino Basin. (T, VIII, 108,10 - 109,20.)

The Coachella Valley is presently overdrafted by 600,000 af. The contractual arrangements which have made it possible to recharge the groundwater basin in Coachella Valley provide an example of how a transfer/groundwater storage program might operate in other areas. (EDF, 3, p. 59.) In this example, a portion of the entitlements of the Coachella Valley Water District and the Desert Water District to State Water Project water are received by MWD. In exchange, the two districts take annual delivery of like amounts of MWD's Colorado River water entitlements. This water is diverted from the MWD Colorado River Aqueduct for recharging the Coachella Valley Groundwater Basin. MWD can provide "excess" quantities of Colorado River Water for groundwater recharge which are credited to its account. In time of water shortage, MWD can decrease its delivery of Colorado River water to the groundwater basin to the extent it has "credit" in previously stored groundwater, and use the Colorado River water within its own area.

11.5 Development of Geothermal Power

The Imperial Valley has one of the largest potential geothermal resources in the State. The U. S. Geological Survey delineated six "Known Geothermal Resources Areas" in the valley as part of a program authorized by the Geothermal Leasing Act of 1970. Leasing of federal lands began in 1974 and there are approximately 23 companies presently

engaged in some facet of geothermal exploration in Imperial County. (Board, 12, 58-59; T, VIII, 90, 03-04.)

An indication of the amount of water required for operation of a geothermal plant was provided by Mr. Deter of the California Energy Commission who stated that 50 to 100 af of water is needed for cooling purposes for each megawatt year of electricity. Mr. Deter estimated that geothermal development could require between 90,000 and 180,000 afa by the year 2002. (T, II, 16, 17-20.)

These figures indicate that if there is to be any significant development of geothermal power in Imperial County, a large supply of freshwater will be necessary. Use of water from the Salton Sea would require expensive pretreatment that would add substantially to the costs. (T, II, 17, 06-09.) Therefore, conservation of existing supplies of freshwater provides the best source of water for local geothermal development.

11.6 Economic Feasibility of Water Transfer

Preliminary investigations by both the Environmental Defense Fund and the Bureau of Reclamation demonstrate the potential economic benefits to IID resulting from water conservation and transfer of water by IID to other users. (Elmore 8, p. 4; EDF, 3, p. 55.) The EDF analysis shows it would be economically feasible for MWD to participate in financing water conservation measures, if the conserved water were made available for use within the MWD. The EDF analysis also concludes that it would be in the economic interest of IID to participate in a water transfer arrangement with MWD, even after adjusting for the loss of hydroelectric generation which would result

from reduced flow in the IID system. (EDF, 3, p. 55.) The Bureau of Reclamation study of water conservation opportunities in IID makes a preliminary estimate that the benefit cost ratio of a transfer of conserved water to MWD is 4.41 to 1. (Elmore, 8, p. 4.) With the reduction in the water supply available to MWD from the Colorado River, sufficient capacity would be available in the Colorado River Aqueduct to handle any transfers from IID. A transfer of conserved water could partially satisfy future Southern California needs. (EDF, 3, p. 53; DWR, 1, p. 51.)

12.0 EFFECTS OF IID INFLOW ON THE SALTON SEA

12.1 Description and History of the Salton Sea

The Salton Sea is located at the bottom of a closed basin. Normal precipitation in the basin does not exceed evaporation so the continued existence of the Sea is dependent on the drainage from irrigation water imported from the Colorado River. The Sea has risen gradually since about 1920 in response to the increase in irrigation drainage from the Imperial and Coachella Valleys and Mexico. (Board, 12, pp. 11-12.) At various times in geologic history, the site of the present Salton Sea has been covered with water. As the water evaporated, salts accumulated in the soil which was the former lake bed. These salts were redissolved as the existing Salton Sea formed. Additional salts are brought into the Sea by the irrigation drainage water.

12.2 Water Level of the Salton Sea

The maximum annual level of the Salton Sea reached about -231 feet for several years during the period 1968-1971, but increased to a higher

level each year during the years 1972-1981. (Elmore, 3, Tables 1 and 3; IID, 16, Attachments 18 and 19.) During this period, it reached a maximum level of about -226.2 feet. (IID, 16, Attachment 16.) Examination of an area-capacity chart of the Salton Sea Basin shows that the rise of 4.8 feet in the annual maximum level flooded approximately 15,750 acres of adjoining private and public land. (Board, 12, Fig. 1.) The evidence received by the Board variously attributes the rapid increase in Sea level to drainage from IID (Elmore, 1, p. 3), a series of tropical storms (IID, 7, p. 2; CVWD, 2, p. 5), and an increase in the drainage from Mexico (CVWD, 2, p. 7). The average annual contribution of IID to Salton Sea inflow for the period 1965 to 1980 was about 71 percent. During the period 1972 to 1982, however, the average annual contribution by IID increased to 78 percent of total Salton Sea Inflow. (Elmore, 3, Table 3.)

Mr. Robert Wilson of Imperial Irrigation District testified that the slight decline in the water level of the Salton Sea during 1982 is one indication of the effectiveness of the District's current water conservation program. (T, IV, 21, 14-26.) However, more recent information from the United States Geological Survey shows that the water level of the Salton Sea in February of 1984 was the highest level recorded for February in approximately 70 years. (Records of USGS Field Station at Santee, Westmoreland Gage.)[8] The Department of Water Resources reports that precipitation in the Colorado Desert Region for the period October 1, 1983, through April 30, 1984, averaged 70 percent of normal. (Department of Water Resources,

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[8] The Board takes official notice of this information under California Administrative Code, Title 23, Section 733(e) and Evidence Code Section 452.

California Cooperative Snow Surveys Bulletin 120-84, "Water Conditions in California", May 1, 1984.)[9] Therefore, it is questionable whether the continuing increases of the Salton Sea water level in recent months can be attributed to precipitation. It is apparent that the water conservation measures of the District have not been sufficient to control the rising elevation of the Salton Sea.

The rise in the level of the Salton Sea threatened to flood land farmed by the Elmore family and it was necessary for them to construct dikes around certain fields. (T, I, 95, 7; T, I, 108, 12.) As the Sea level increased, it became necessary to increase the size and strength of the dikes. It also became necessary to pump irrigation drainage water since the agricultural land was at a lower elevation than the surface level of the Sea. (T, I, 101,18 - 102,21.)

Although Imperial Irrigation District holds flooding easements over much of the property flooded by the Salton Sea, the flooding has resulted in significant damage and lawsuits against the District. (T, V, 69, 1-26; IID Brief, 9/27/83, p. 19.) There are numerous legal issues involved in these lawsuits including the validity of the easements, charges of negligence and the extent of damages. Resolution of these issues is not within the jurisdiction of the Board. The fact that productive property has been flooded, however, is a factor to be considered in evaluating the reasonableness of Imperial Irrigation District's use of water.

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9 The Board takes official notice of this information. (See Footnote 8.)

12.3 Salinity of the Salton Sea

The salinity of the Salton Sea increased from about 32,500 ppm in 1954 to about 39,000 ppm in 1975, causing concern for the fish life which supports a major recreation fishery. Reproduction of the fish is expected to fail at salinity levels above 40,000 ppm. (T, IV, 175, 20.) The adult fish would be adversely affected at salinity levels above 50,000 ppm. (T, IV, 176, 6.) Between 1975 and 1980, the salinity of the Sea decreased to about 38,000 ppm due to the large inflow of fresh water. However, as an indication of how rapidly changes can occur, the year-end Sea surface elevation decreased by only 0.3 foot between 1980 and 1982, but the salinity increased to about 39,000 ppm. (IID, 16, Attachment 18.)

12.4 Effects of Reducing Inflows to the Salton Sea

Since IID contributes approximately 70 percent of the inflow to the Salton Sea, it is clear that irrigation drainage from IID will be a major factor governing the future level and salinity of the Sea. The IID Board of Directors has announced a commitment in Resolution No. 8-84 to conserve 100,000 afa by July 1, 1985. (IID, Brief 2/1/84, Exhibit 1.) It has also recognized that it may be possible to conserve up to 400,000 afa. (IID, Brief 2/21/84, p. 19.) A long-term reduction of 100,000 to 400,000 afa in the IID contribution to Salton Sea inflow would have a significant effect on both the surface level and the salinity of the Sea.

Various other parties presented estimates of the water level and salinity of the Salton Sea under certain conditions of reduced inflow. The estimates differ because of differences in assumed conditions. Review of the Salton Sea Operation Studies prepared for

IID provides a general indication of the impact of reducing IID drainage to the Salton Sea. (IID, 16, Attachment 23, Sheet 12.) The following table contains a summary of three of these studies:

TABLE 3

ESTIMATED EFFECTS OF REDUCED INFLOW TO SALTON SEA

Assumed Condition	Estimated Elevation as of 12/82 (Sea Level--feet)	Elevation Difference from Historic (Feet)	Estimated Salinity as of 12/82 (PPT)	Salinity Difference from Historic (PPT)
1. Historic Inflow	-227.55	---	39.8	---
2. Historic Inflow less 100,000 afa since 1975	-230.21	-2.26	43.3	+3.5
3. Historic Inflow less 200,000 afa since 1975	-232.95	-5.40	47.5	+7.7

It is difficult to predict accurately the level of inflow to the Salton Sea in the near future. The results from the studies shown above, however, demonstrate that the water level and salinity of the Salton Sea are sensitive to changes in the rate of inflow of the magnitude likely to result from expected water conservation measures. If other factors remain relatively constant, a long-term reduction in the average rate of IID inflow by about 100,000 afa would eventually stabilize the water level at or near the -227.55 level existing in December 1982. A more substantial long-term reduction of IID inflow would result in eventual stabilization of the Salton Sea at a lower level.

The beneficial effects of a moderate reduction in the current water level include alleviating flooding of private property, increasing land available for wetlands habitat (CWA, 1), and exposing presently submerged land for geothermal energy development. (T, VIII, 89,5 - 90-10.) These changes would in turn be expected to reduce IID's expenses from pumping irrigation drainage water (Elmore, 4, p. 17); to increase IID's revenue from the leases of District land for potential geothermal development (T, VIII, 90,11 - 92,23); and, possibly, to assist the District in resolving or avoiding lawsuits from property owners adjoining the Salton Sea whose land has been flooded.

It is impossible to predict when the salinity will adversely affect the fishery either with or without a planned reduction in IID inflow. However, the rapid rise in salinity between 1980 and 1982 shows that salinity could exceed 40,000 ppm, the danger level for fish reproduction, in less than five years whether or not a planned reduction in inflow takes place. Therefore, it is apparent that a prolonged delay in water conservation measures would not save the fishery for an appreciable length of time.

13.0 REVIEW OF IID WATER CONSERVATION MEASURES

13.1 13-Point Program and 21-Point Program

The measures taken by Imperial Irrigation District to promote water conservation are described in the "Report on Water Conservation" prepared by Bookman-Edmonston Engineering, Inc. (IID, 4.) Although the District pursued certain measures to conserve water prior to 1976, the District's first formal water conservation program was initiated in July 1976 by IID Board Resolution 45-76 which established the

13-Point Program. The provisions of the 13-Point Program were supplemented and clarified by the adoption of the 21-Point Program in 1980. The specific provisions of each program are set forth or summarized in several of the exhibits. (IID, 10D, pp. 2-7; IID, 4, pp. 6-13; DWR, 1, pp. 103-105.) The District acknowledges that the 21-Point Program "does not generally expand upon the water conservation measures set forth in the 13-point program but rather, defines policies...for administering and enforcing the 13-point program." (IID, 4, pp. 12, 13.)

Although several aspects of the 13- and 21-Point Programs are directed at conserving water, the programs do not establish a comprehensive water conservation plan nor do they establish a schedule for implementing specific water conservation measures. In addition, the evidence indicates that certain aspects of the programs have not been carried out on a regular basis or are not being carried out currently. For example, item 2 of the 13-Point Program calls for "reconstruction of farm outlet boxes, as required". In addition, IID Exhibit 4 refers to the "present program" of the District as including "[c]ontinuance of a program to reconstruct or install farm delivery boxes of standard design to provide accurate measurement and control of water deliveries...." (IID, 4, pp. 13, 14.) As discussed in Section 10.6, however, the testimony indicates that there was a one-time effort to repair tailwater structures in 1976, but that approximately 40 percent of the structures checked in a recent sampling were in need of repair or replacement. Similarly, item 4 of the 13-Point Program calls for "[d]aily inventory of surface field discharge...." This appears to imply checking all deliveries for

excess tailwater, yet, as discussed in Section 10.6, IID records for 1977-1981 indicate that only about 20 percent of the fields receiving water were checked for excessive tailwater. (Elmore, 3, p. 16.)

13.2 IID Response to DWR Request to Prepare a Water Conservation Plan

Following the conclusion of its investigation, the Department of Water Resources determined that there was water being wasted within Imperial Irrigation District which could be saved for beneficial purposes by use of widely accepted practices. In a letter dated December 1, 1981, the Department requested the District to prepare a water conservation plan which was to include specific elements, sources of funds, a schedule for implementation, and additional specified information. (DWR, 9.) The District's original response indicated a water conservation plan would be submitted. (IID, 10B.) The District later requested an extension of time to prepare the plan. (IID, 10C.)

In a letter dated September 29, 1982, to Jack Coe of the Department of Water Resources, however, the District stated its conclusion that its use of water "is reasonable and does not involve unnecessary waste". The District went on to enumerate the elements of its existing water conservation program, most of which had been considered previously in the DWR investigation. Contrary to earlier indications that the District would prepare a water conservation plan of the type requested, the September 29 letter clearly indicates that the District had decided against such action. The letter also states that the District Board of Directors pledged to construct one regulatory reservoir each year until a sufficient number (estimated to be 20 to 22) is in place to accomplish objectives. Finally, the letter states

that the District will "make certain that the various conservation programs, as amended, will be carried out to the letter without reservation". (IID, 10D.) As discussed in preceding sections, the District has not continued the regulatory reservoir program at the announced rate and there is considerable evidence that other elements of the District's own announced program have not been fully pursued.

13.3 IID Board of Directors Resolution 8-84

Following the close of the evidentiary portion of the Board hearing in this matter, on January 24, 1984, the IID Board of Directors adopted a resolution calling for reduction of IID inflow to the Salton Sea by 100,000 afa by July 1, 1985. (IID Brief, 2/21/84, Exhibit 1.)[10] Although the resolution indicates the District's acknowledgement that an increased conservation effort is appropriate, the resolution does not state, except in very general terms, how the proposed water conservation would be achieved. Furthermore, the resolution does not specify the level of inflow to the Salton Sea from which the proposed reduction is to be measured. Without more details on what the District intends to achieve and the steps to be taken, it appears likely that July 1, 1985, will arrive and it will be impossible to determine whether or not the objective of Resolution 8-84 has been achieved. In order to resolve these problems, the District should (1) specify in advance the standard by which it intends to measure the reduction of inflow to the Salton Sea and (2) identify and implement specific water conservation measures directed at achieving the intended reduction of inflow.

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10 The Board takes official notice of this information. (See Footnote 8.)

14.0 NEED FOR A COMPREHENSIVE WATER CONSERVATION PLAN

Imperial Irrigation District has taken several steps to promote water conservation over the last several years and there is evidence that a considerable effort to conserve water has been made by some of the farmers in the District. As discussed above, however, the evidence also establishes that there are additional steps which should be taken to develop a more effective water conservation program. Some of these measures such as maintenance of tailwater structures and better tailwater monitoring are called for under announced District policy, but have not been fully or consistently implemented. Other water conservation measures are not required under existing District policy, but would be in the interests of the District as well as in the overall interest of maximizing beneficial use of water.

The primary responsibility for evaluating and implementing potential water conservation measures for IID lies with the District itself. The fact that the District has the primary responsibility, however, does not justify non-performance of that responsibility. In December of 1981 the Department of Water Resources advised the Board of Directors of its conclusion that a misuse of water was occurring and requested the District to prepare a detailed water conservation plan. Now, some two and one-half years later, this Board concludes that development and implementation of a detailed water conservation plan for Imperial Irrigation District are still necessary in order to make maximum beneficial use of available water in accordance with Article X, Section 2 of the California Constitution. The IID water conservation plan should address the subjects specified in the order which follows.

15.0 CONCLUSION

Approximately one million acre-feet per year of Colorado River water enter the Salton Sea as irrigation return flow from Imperial Irrigation District. This large quantity of freshwater is lost to further beneficial consumptive use and has contributed to the flooding of property adjoining the Salton Sea. Following diversion of major quantities of water by the Central Arizona Project which is scheduled to begin in late 1985 or 1986, there will be insufficient water available from the Colorado River to satisfy the existing level of demand of California water users. Although Imperial Irrigation District has taken some steps to conserve water, the evidence establishes that there are additional practical measures available to reduce the present losses of water within the District. Under the circumstances of this case, the Board concludes that the failure to implement additional water conservation measures at this time is unreasonable and constitutes a misuse of water under Article X, Section 2 of the California Constitution and Section 100 of the California Water Code.

The water conservation measures which the Board has determined should be implemented as soon as possible are specified in Paragraphs 1.1, 1.2, 1.3 and 1.5 of the order below. The required measures will assist in reducing the amount of excess tailwater and canal spills, but will not limit the amount of water necessary for effective irrigation and leaching of fields. The evidence supports the conclusion that the required measures are reasonable and, in most instances, are already called for, but not fully implemented, under

the District's announced policies. The record also establishes that additional water conservation would have several beneficial effects for the Imperial Irrigation District and the farmers within the District.

Other water conservation measures identified in the hearing record can be evaluated in the preparation of a comprehensive water conservation plan. Efficient water management and development of a water conservation plan will be facilitated by the availability of accurate information regarding quantities of water losses attributable to various aspects of irrigation and water delivery operations. Therefore, Imperial Irrigation District should develop reliable procedures for determining the disposition of all water which it imports through the All-American Canal.

ORDER

IT IS HEREBY ORDERED that Imperial Irrigation District shall do the following:

1.1 Submit evidence to the Board by February 1, 1985, demonstrating that the District has fully implemented its announced policy of monitoring the tailwater discharge of all fields receiving water deliveries.

1.2 Repair or require the water users within the District to repair defective tailwater structures and approach channels by February 1, 1985. The District shall also submit a plan by February 1, 1985, to ensure that the tailwater structures and approach channels are properly maintained on a continuing basis.

1.3 Develop and submit by February 1, 1985, a water accounting and monitoring procedure which will result in quantifying the following

with reasonable accuracy: (1) actual deliveries to farmers' headgates, (2) tailwater, (3) canal spills, (4) canal seepage, and (5) leachwater. The water accounting procedure shall be capable of normalizing the data in order to make the information comparable from year to year. The District shall specify a schedule for implementing the water accounting procedure.

1.4 Submit a detailed and comprehensive water conservation plan by February 1, 1985, which includes the following elements:

a. Tailwater Control: The plan shall specify maximum acceptable tailwater limits and shall state how such limits were determined. A means of reducing tailwater from all deliveries to the specified limits within one year of the plan's initial implementation shall be specified. The plan shall describe an accurate method to be used for measuring tailwater from fields receiving deliveries. The plan shall include an evaluation of the present tailwater monitoring program, particularly the requirement that assessment for excessive tailwater must be preceded by two measurements at least nine hours apart. The plan shall specify in detail the role which an expanded irrigation education program will play in assisting to reduce tailwater.

b. Canal Spills: The plan shall identify the quantity of water lost in operational spills needed for occassional dewatering of unlined canals. The plan shall specify methods by which unintentional canal spills can be eliminated and shall establish a schedule for implementing such methods.

c. Canal Seepage: The plan shall include a priority list of canals or portions of canals which need improvements to reduce canal seepage. The most feasible method of financing those improvements shall be identified and a schedule for making the improvements shall be established.

d. Leachwater: Minimum leaching requirements shall be discussed. An evaluation of current leaching practices within the IID shall be made to assess the potential for savings from reduced leachwater application. Leaching requirements shall be specified for each of the major crops grown in the IID.

The water conservation plan shall specify the estimated costs of implementing the selected measures, the method of financing each measure, the schedule for implementation, and the persons who will be responsible for implementation of each selected measure. The plan shall also describe the measures implemented to achieve the District's announced goal of reducing inflow to the Salton Sea by 100,000 acre-feet per annum by July 1, 1985. A report on the progress to date in meeting this goal shall be provided.

1.5 Submit a plan to the Board by February 1, 1985, for resumption of the regulatory reservoir construction program. This plan shall identify the number of reservoirs to be built, the time schedule for construction and the proposed method for financing the program. The development of this plan shall be guided by the letter dated September 29, 1982, from former IID Board of Directors' President Gerald Moore to Jack Coe of the Department of Water Resources pledging to construct one reservoir per year.

1.6 Submit a progress report to the Board by October 1, 1984, specifying the steps that have been taken to comply with provisions 1.1 through 1.5 above. The Chief of the Division of Water Rights shall inform the District of specific information to be submitted in the progress report.

IT IS FURTHER ORDERED that:

2.1 Following submission of the plans required in provisions 1.2 through 1.5, the Board will review said plans for their adequacy to meet the specified objectives and the schedule for implementing the proposed actions.

2.2 After the Board determines that a plan is adequate to meet the specified water conservation objectives, the District shall submit progress reports every six months until the objectives have been achieved.

2.3 If the Board determines that a plan is inadequate to meet the specified objectives, the District shall submit a revised plan in accordance with further direction from the Board.

IT IS FURTHER ORDERED that:

3.1 The Board reserves jurisdiction in this matter for the purposes of reviewing the adequacy of the required plans and District actions, to monitor the progress of the District in carrying out the various elements of the water conservation plan, and to take such other action

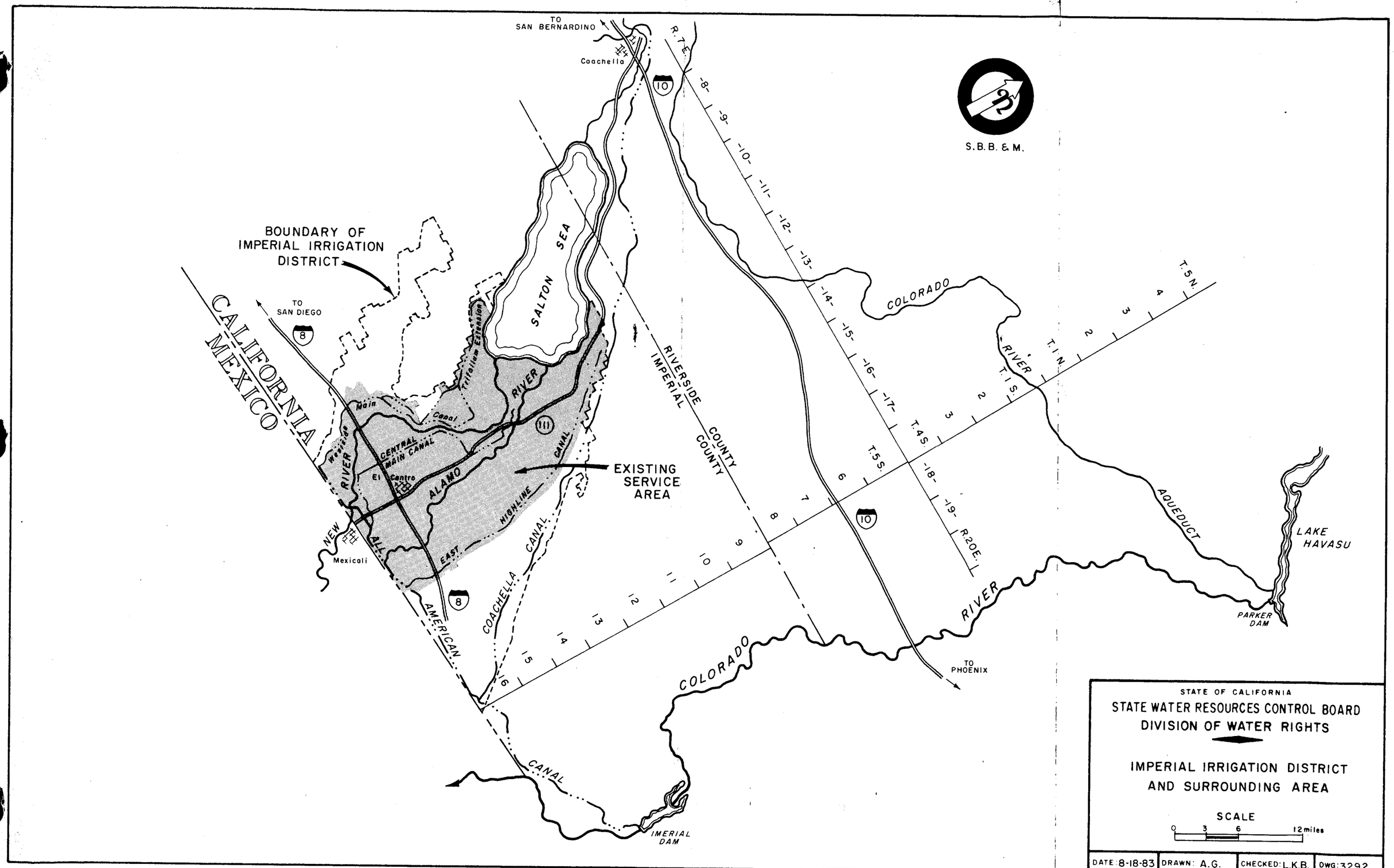
as may be appropriate. The Board will continue to reserve jurisdiction until it determines that the requirements of Article X, Section 2 of the California Constitution are being met.

Dated: JUN 21 1984

CAROLE A. ONORATO, Chairwoman

WARREN D. NOTEWARE, Vice-Chairman

KENNETH W. WILLIS, Member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MEXICO
SALTON SEA
Trifolium Extension
RIVER
Main
Canal
CENTRAL MAIN CANAL
El Centro
ALAMO
HIGHLINE
CANAL
EAST
ALL
NEW
RIVER
Mexicali
AMERICAN
COACHELLA
CANAL
EXISTING SERVICE AREA
RIVERSIDE COUNTY
IMPERIAL COUNTY
COLORADO
RIVER
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AQUEDUCT
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PARKER DAM
TO PHOENIX
CANAL
IMERIAL DAM
STATE OF CALIFORNIA
STATE WATER RESOURCES CONTROL BOARD
DIVISION OF WATER RIGHTS
IMPERIAL IRRIGATION DISTRICT
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DRAWN: A.G.
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