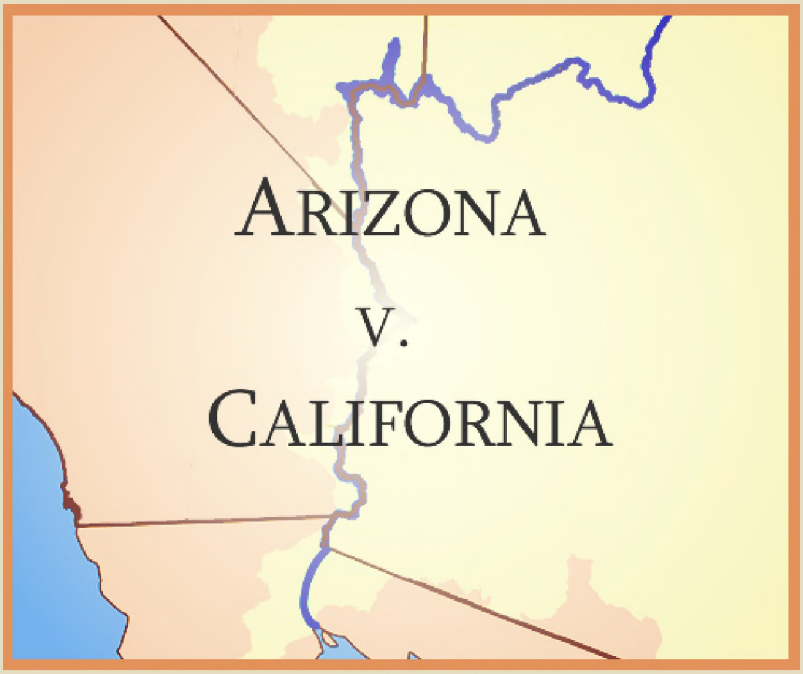

Elbert P. Tuttle, Special Master[:] Report[,] February 22, 1982, Arizona v. California, No. 8, Original, 1981 Term (U.S.).

Decision:
Arizona v. California, 460 U.S. 605 (1983).

No. 8, Original

In the Supreme Court of the United States

October Term, 1981

State of Arizona,
COMPLAINANT

v.

State of California, Palo Verde Irrigation District, Imperial Irrigation District, Coachella Valley County Water District, The Metropolitan Water District of Southern California, City of Los Angeles, California, City of San Diego, California, and County of San Diego, California,
DEFENDANTS

The United States of America and State of Nevada,
INTERVENERS

State of Utah and State of New Mexico,
IMPLEADED DEFENDANTS

Colorado River Indian Tribes, Fort Mojave Indian Tribe, Chemehuevi Indian Tribe, Cocopah Indian Tribe, and Fort Yuma (Quechan) Indian Tribe,
RECOMMENDED INTERVENERS

Elbert P. Tuttle, *Special Master*

REPORT

February 22, 1982

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Calif. Exh.	California's Exhibit
CH. Exh.	Chemehuevi Indian Tribe's Exhibit
C.R. Exh.	Colorado River Indian Tribes' Exhibit
F.M. Exh.	Fort Mojave Tribe's Exhibit
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PART ONE

PART ONE

I. Statement of the Case

This case boasts a long, complex history of litigation over the rights to the waters of the Colorado River. The United States and the State Parties, a group of several western state and local governments and seven public agencies of California, participated in the earlier proceedings. In those proceedings the United States acquired water rights for five Indian Reservations. The United States now seeks to have those water rights increased. Seeking larger increases, the Tribes[1] have filed petitions to intervene.

The suit began in 1952 when Arizona filed a motion for leave to file a bill of complaint against California and seven public agencies of the state.[1.1] The complaint invoked the original jurisdiction of the Supreme Court under Article III, section 2, clause 2 of the United States Constitution. Arizona sought confirmation of her title to water in the Colorado River system, limitation of California's annual beneficial consumptive use of Colorado River system water at 4,400,000 acre-feet, and placing of a permanent injunction against assertion of claims inconsistent with Arizona's title.[2] Arizona brought her claims under the Colorado

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1. Colorado River Indian Tribes, Fort Mojave Indian Tribe, Chemehuevi Indian Tribe, Cocopah Indian Tribe, and Fort Yuma (Quechan) Indian Tribe.

1.1. Palo Verde Irrigation District, Imperial Irrigation District, Coachella Valley County Water District, The Metropolitan Water District of Southern California, City of Los Angeles, City of San Diego and County of San Diego.

2. S. Rifkind, Report of the Special Master — Arizona v. California 1-2 (1960) [hereinafter cited without cross-reference as Special Master's Report]. As the prior Master noted, an acre-foot of water is water sufficient to cover an acre of land to a depth of one foot; that amount equals approximately 325,850 gallons. *Id.* at 1 n.5 (citing Pr. Ariz. Exh. 1000, at 17 (Pre-Trial Order)).

River Compact and the Boulder Canyon Project Act, 43 U.S.C. § 617 (1976). Nevada later intervened seeking a determination of her water rights. The United States also intervened seeking water rights on behalf of various federal establishments, including five Indian Reservations[3]—the Colorado River Indian Reservation, the Fort Mojave Indian Reservation, the Fort Yuma Indian Reservation, the Chemehuevi Indian Reservation, and the Cocopah Indian Reservation. In 1955 Simon Rifkind was appointed Special Master *vice* George I. Haight, deceased, and lengthy hearings and deliberations occupied the next several years.

In 1960, Master Rifkind filed his report recommending a certain division of the Colorado River waters and generally sustaining the United States' claims. His findings were substantially adopted by the Supreme Court in its 1963 opinion, 373 U.S. 546, and its 1964 Decree, 376 U.S. 340. In 1979, the Court issued a Supplemental Decree which set forth the various priorities to be attached to these earlier decreed water rights. 439 U.S. 419 (1979). The major questions in these earlier proceedings involved the division of water rights among the states and the priorities to be allocated to those water rights. The claims made by the United States for water rights to the five Indian Reservations were a relatively small part of the larger picture.

Most of the larger questions concerning water rights on the Colorado River were resolved by the 1964 and 1979 Decrees. These Decrees, however, left open the question of the final determination of some of the boundaries of the Indian Reservations. In addition,

3. SPECIAL MASTER'S REPORT at 6. A map of these Reservations was introduced as Pr. U.S. Exh. 100.

prior to the issuance of the 1979 Decree, the Tribes filed motions seeking leave to intervene.[4] The Tribes and later the United States[5] claimed, in various amounts, water rights for additional acreage. Two types of claims were asserted: claims of water rights for acreage which was newly recognized as part of the Reservations within the newly-final boundaries, and claims of water rights for acreage which although recognized in 1964 as part of the Reservations was allegedly omitted from earlier consideration by error. On January 9, 1979, the Court appointed the undersigned as Special Master to consider the issues raised by these motions.[6]

Following the Court's appointment of a Master, the State Parties responded by alleging that neither type of claim could presently be litigated. The claims within the old boundaries were, according to the State Parties, precluded by *res judicata*. The claims based on the new boundaries were allegedly premature because the boundaries were not yet final with respect to the State Parties and, thus, this or other litigation must first establish that finality before a sufficient foundation is laid for the water rights claims. They also opposed many of the water rights claims on the merits. Moreover, they opposed in varying degrees the Tribes' participation in the proceedings.

Substantial evidence was received on these issues. The first trial session began on September 2, 1980 in the United States Courthouse at Denver, Colorado. Before the final trial session on April 7, 1981, the re-

4. Motion of Chemehuevi, Fort Mojave and Quechan (Ft. Yuma) Tribes for Leave to Intervene (Dec. 1977); Motion of Colorado River and Cocopah Tribes for Leave to Intervene (Apr. 1978).

5. Motion of United States for Modification of Decree (Dec. 1978).

6. 439 U.S. 419, 436 (1979).

cord of evidence consisted of approximately 7,300 pages of testimony and several hundred exhibits.

From the record now assembled the questions presented by the parties can be answered. This Report addresses several issues including: (1) the propriety of intervention by the Tribes; (2) whether the boundaries to the Reservations have been finally determined; (3) whether the claims of water rights for lands omitted from the 1964 Decree are precluded by that Decree; and (4) whether the additional acreage merits a decree awarding additional water rights to the Indian Reservations.

In order to put these issues in context, it is necessary to focus on the earlier proceedings before the prior Master and the Court. Moreover, the adoption of various standards and methods in the earlier proceedings should substantially guide my present decision in this case.

A. *Prior Litigation*

1. *Special Master's Report of 1960*

On December 5, 1960, after lengthy trial proceedings, Master Rifkind filed his Report with the Court. The Special Master's Report provided for the division of the Colorado River water among the Lower Basin States and sustained the United States' claims for reserved water rights for several federal establishments, including claims made on behalf of the Indian Reservations in the lower Colorado River Valley. The dispute included controversies over both the mainstream and tributary water in the Colorado River system. The mainstream controversy is the most important for present purposes.

(a) *Division of Colorado River Water Among the States of the Lower Basin*

The States of the Colorado River Basin had entered into an agreement known as the Colorado River Compact. The basin was divided into two parts at a point on the River in northern Arizona known as Lee Ferry. The Upper Basin States and the Lower Basin States agreed that each basin would have annually 7,500,000 acre-feet of water from the Colorado River system, while the Lower Basin had "the right to increase its beneficial consumptive use of such waters by one-million acre-feet per annum." The States agreed that the Mexican Treaty obligation (set by treaty in 1944 at 1,500,000 acre-feet of water per annum), would be met by the surplus beyond the amounts specified above and, if there was not sufficient surplus, the deficiency should be borne equally by the two basins. In any event, the Upper Basin was not to deplete the flow of the River at Lee Ferry below a total of 75,000,000 acre-feet for any period of ten consecutive years.[7]

From this background, the interstate allocation of mainstream water in the Lower Basin proceeded. The authorities controlling this question were diverse. Master Rifkind concluded that "the claims of Arizona, California and Nevada to water from Lake Mead and from the mainstream of the Colorado River below Hoover Dam are governed by the Boulder Canyon Project Act, [43 U.S.C. § 617 (1976)], the California Limitation Act, Act of March 4, 1929, and the several water delivery contracts which the Secretary of the Interior has made pursuant to the authority vested in him by

7. *See* SPECIAL MASTER'S REPORT at 138-51; 373 U.S. at 557-58.

Section 5 of the Project Act."[8] *See* 43 U.S.C. § 617(d). He found the Project Act to be "the source of authority for the allocation and delivery of water to Arizona, California, and Nevada from Lake Mead and from the Colorado River below Lake Mead."[9] He derived this authority of the Secretary of the Interior from his reading of several sections of the Project Act[10] as well as the legislative history of the Act. In addition, the California legislature had limited the amount of water that a state could divert annually.[11] One significant limitation on the Secretary's authority was that Section 6 of the Project Act requires the terms of the contracts to satisfy water rights perfected by June 25, 1929,[12] the effective date of the Project Act. *See id.* § 617(e). Master Rifkind viewed the Project Act as, thus, setting the terms for water unappropriated as of that date. Such water could, according to Master Rifkind, be made available for use within the state only if the Secretary should contract for the delivery of the water to that state.[13] Once the contracts were in force, the Secretary retained discretion to decide how much of this water could be consumed.[14] Of course, once the water was released for consumption, the Secretary was obliged to allocate certain quantities to each state.[15]

Under these authorities, Master Rifkind found the division of water rights among these three states. He found California limited annually to 4,400,000 acre-

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8. SPECIAL MASTER'S REPORT at 138.
9. *Id.* at 151-54.
10. *Id.* at 151-64.
11. *Id.* at 166 & n.27.
12. *Id.* at 152 & n.20.
13. *Id.* at 152-53.
14. *Id.* at 221-37.
15. *Id.* at 222.

feet of consumptive use[16] of the first 7,500,000 acre-feet of water stored in Lake Mead and flowing in the mainstream from Hoover Dam.[17] He found that the Secretary effectively contracted with the three states or entities within those states. Under these contracts, Arizona was entitled to an annual share of 2,800,000 acre-feet of consumptive use of water. California agencies were entitled under contract to 5,362,000 acre-feet of consumptive use per year, subject to the limitation that the Master found elsewhere which restricted California's share to 4,400,000 acre-feet annually. Nevada was entitled to 300,000 acre-feet.[18] The water in excess of 7,500,000 acre-feet, he found, belonged 50% to California and 50% to Arizona, unless the Secretary contracted with Nevada to allocate 4% of the surplus to Nevada at the expense of Arizona.[19] In event of a shortage, below 7,500,000 acre-feet in a year, the states were to receive a proportional allocation based on their respective shares of the first 7,500,000 acre-feet.[20] Water rights perfected under state law or reserved under federal law before June 25, 1929, the effective date of the Project Act, were titled "present perfected rights"[21] and were to be satisfied first in any event.[22] Thus, rights in existence at the time of the Project Act

16. As used by the Special Master and the Court, the phrase consumptive use means the diversions from the river less any return flow available for consumptive use in the United States or in satisfaction of the Mexican Treaty obligation. For the definition as adopted in the Court's decree, see 376 U.S. at 340.

17. SPECIAL MASTER'S REPORT at 167-94.

18. *Id.* at 201-10, 221-47.

19. *Id.* at 224-25.

20. *Id.* at 233.

21. *Id.* at 306-11. For the definition as adopted in the Court's decree, see 376 U.S. at 341.

22. SPECIAL MASTER'S REPORT at 306-07.

were protected. Master Rifkind further concluded that "[a]ll consumption of mainstream water within a state is to be charged to that state, regardless of who the user may be."[23]

(b) *United States Claims on Behalf of Five Indian Reservations*

The prior Special Master sustained the claims made by the United States on behalf of the Indian Reservations to the extent of approximately 900,000 acre-feet of annual diversions of water from the Colorado River.[24]

The Master found that the United States has the power to create a water right appurtenant to Reservation lands without complying with state law. *Winters v. United States,* 207 U.S. 564 (1908). The reservation of water rights is effective as of the date of the creation of the Reservation, without regard to subsequent appropriative use. The United States may create such a Reservation by Executive Order and effectively reserve such water rights.[25]

An implied intent to reserve water rights for Indian lands is sufficient. Such an intent is not difficult to find for desert Reservations because otherwise the land given the Indians would be virtually useless and incapable of sustaining life. By this reasoning the Master found an intent on the part of the United States to reserve water for the five Indian Reservations.[26]

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23. *Id.* at 247.
24. *Id.* at 257.
25. *Id.* at 257-59.
26. *Id.* at 259-60.

The Master further found that the reservation of water was not limited to current needs but rather extended to future agricultural and related uses. The reservation of water was thus intended to be established at the creation of the Reservations. It was not dependent upon the acquisition of appropriative rights under state law. Any other conclusion would subject the Indians to a competition for water with the white settlers. In competition with the whites the Indians, by their lack of farming experience, would surely lose. The Master found that result to be inconsistent with the intention to convert the Indians to an agricultural economy. Thus, in order to accommodate future growth on the Reservations the United States intended to reserve enough water to meet expanding needs despite state water law.[27]

In determining the quantity of water reserved, the Master settled on the now-familiar formula: the United States reserved "enough water to irrigate all of the *practicably irrigable lands* on a Reservation and that the water rights thereby created would run to defined lands."[28]

In reaching this conclusion, the Master rejected other possible methods of determining quantity. He specifically rejected attempts to tie the quantity to the actual or expected number of Indians living on the Reservation because if the water rights grew with the Indian population the junior water rights would be uncertain. Similarly, if the water rights were fixed to accommodate present uses, the Indians' growth would be stifled. Conversely, if the water rights were based on future predicted needs, a hazardous, and probably in-

27. *Id.* at 260-62.
28. *Id.* at 263 (emphasis added).

correct, prediction would be required about the future needs.[29]

Further, the Master found that the water rights may be utilized regardless of the identity of the particular user. He specifically mentioned the possibility of leasing lands with water rights to non-Indians.[30]

Finally, for each Reservation, he found that for the benefit of the Indians the United States has the right to an annual maximum diversion of a specified number of acre-feet of water from the Colorado River or the quantity of water necessary to supply the consumptive use of irrigation of a specified number of acres and for the satisfaction of related uses, whichever is less. He also found priority dates for these water rights.[31] In arriving at his conclusion with respect to irrigable acreage, he found it necessary to resolve certain boundary disputes regarding the Fort Mojave and Colorado River Indian Reservations.[32]

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29. *Id.* at 262-65.
30. *Id.* at 266.
31. *Id.* at 267-87.
32. *Id.* at 274-78, 283-87.

Indian Water Rights Recommended by Master Rifkind

	Acre-Feet Diversion	Acres	Priority Date
Chemehuevi	11,340	1,900	2/2/1907
Cocopah	2,744	431	9/27/1917
Ft. Yuma	51,616	7,743	1/9/1884
Colorado River	717,148	107,588	3/3/1865 11/22/1873 11/16/1874 5/15/1876 11/22/1915*
Ft. Mojave	122,648	18,974	9/18/1890 2/2/1911*
Total	905,496	136,636	——

*The Master did not specify the acres to be given these priorities because the evidence did not permit such a finding.[33]

2. *Supreme Court Opinion on the Special Master's Findings*—Arizona v. California, *373 U.S. 546 (1963)*

The Supreme Court generally upheld the Master's findings as to the division of the Colorado River water among the States and as to the reservation of water for federal establishments.

With respect to the allocation of water among the States, the Court had few difficulties with the Master's conclusions. The significant differences resulted in an increase in the discretionary power accorded the Secretary. The Secretary was allowed, without regard to state law, to determine the intrastate allocation of water under the Project Act by deciding with whom to contract within a state and what the priorities are for various intrastate uses. 373 U.S. 585-90. Moreover, in

33. *Id.* at 274 n.33, 283 n.57.

the event of a shortage of water, the Secretary was given broad discretion to allocate the remaining water. *Id.* at 592-94. At this point, the Court noted the Secretary's statutory obligation to respect "present perfected rights" as of the date the Act was passed. *Id.* at 594. Finally, the Secretary was allowed to charge Nevada and Arizona for diversions above Lake Mead up to Lee Ferry, the beginning of the Lower Basin of the Colorado River. *Id.* at 590-91.

The Court similarly adopted the majority of the Master's decisions respecting the reservations of water for federal establishments. The Indian Reservations issue attracted the greatest attention among these. The Court found that the United States has the power to reserve water rights for Indian Reservations, *id.* at 597-98, and that the United States implicitly intended to exercise that power with respect to the five Indian Reservations. *Id.* at 598-600. Thus, the Court held that these water rights having vested before the Act became effective on June 25, 1929, were "present perfected rights" entitled to priority under the Act. *Id.* On the issues of quantity the Court further upheld the Master's findings that the rights were reserved for future use, that the rights should be measured by the water required to irrigate the practicably irrigable acreage, and that the number of acres found to be practicably irrigable was reasonable. *Id.* at 600-01.

On one point the Court disagreed with the Master. It felt that he should not have determined the disputed boundaries of two of the Indian Reservations. Finding it unnecessary to resolve those issues, the Court left these disputes to future resolution.[34] *Id.* at

34. In its opinion the Court appeared to suggest that this was a *title* dispute and that the Secretary had some discretion in any event to de-

601. Because the Court had agreed with the Master's finding on the number of irrigable acres on the Reservations, the Court's holding with respect to boundaries meant that only those irrigable acres found by the Master to be within the Reservations' boundaries were to receive water rights.

The legal directives to implement the principles of the 1963 opinion were delayed to allow the recommended decree to be amended to accommodate minor points on which the Court disagreed with the Special Master. *Id.* at 602.

3. *The 1964 Decree*—Arizona v. California, *376 U.S. 340 (1964)*

In 1964, the Court issued a decree implementing the findings of its 1963 Opinion. This 1964 Decree substantially settled the water rights among the states, as well as the water rights of the Indians to water from the states' allotments. But some matters were clearly left open by this Decree.

The 1964 Decree carried out its purpose in the form of an injunction. The United States and its operatives were enjoined to release the Colorado River mainstream water only in specified allotments that tracked the findings of the 1963 Opinion.

The division in Article II among the Lower Basin states provided the basis of the Decree. If the mainstream water downstream from Lee Ferry equalled 7,500,000 acre-feet of water for annual consumptive

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liver water to the disputed areas. *See* 373 U.S. at 601. When the 1964 Decree set a fixed quantity for diversions, the Court stated that the quantities then fixed could be adjusted by decree or agreement if the *boundaries* were finally determined. 376 U.S. at 345. This subject is more fully addressed later. *See* Part One at II.B. *infra.*

use: 2,800,000 was to go to Arizona, 4,400,000 was to go to California, and 300,000 was to go to Nevada. Water in excess of 7,500,000 acre-feet was to be shared equally by California and Arizona unless the United States contracted with Nevada to give 4% of the excess to that state out of Arizona's share. If the water supply was less than the annual consumptive use of 7,500,000 acre-feet, then the Secretary of the Interior was directed to satisfy "present perfected rights," (which included the Indian water rights), "in order of their priority dates without regard to state lines." *Id.* at 342.

The Indian Reservation water rights and their priority dates were set forth later in Article II. The United States was directed to release water to federal establishments only in accordance with the allocations specified. The Decree then specified the diversions in acre-feet of water, number of irrigable acres and priority dates determined by the Master. Each Reservation was to receive either the diversions specified or the consumptive use of water necessary to serve the acres found irrigable, whichever amount was less.

The 1964 Decree lacked a full listing of the "present perfected rights" and their priority dates. The Indian water rights were specified to some degree,[35] but the other "present perfected rights," later known in the 1979 Decree as "miscellaneous present perfected rights" remained unspecified. Article VI thus provided that:

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35. In the 1979 Decree the Indian water rights were again spelled out and each acre-foot of water was then matched with a priority date. 439 U.S. at 423, 428, 436. Due to evidentiary problems this match was not possible at the time of the 1964 Decree. *See* note 33 and accompanying text *supra*.

> Within two years[36] from the date of this decree, the States of Arizona, California, and Nevada shall furnish to this Court and to the Secretary of the Interior a list of the present perfected rights, with their claimed priority dates in waters of the mainstream within each State, respectively, in terms of consumptive use, except those relating to federal establishments. Any named party to this proceeding may present its claim of present perfected rights or its opposition to the claims of others. The Secretary of the Interior shall supply similar information, within a similar period of time, with respect to the claims of the United States to present perfected rights within each State. If the parties and the Secretary of the Interior are unable at that time to agree on the present perfected rights to the use of mainstream water in each State, and their priority dates, any party may apply to the Court for the determination of such rights by the Court.

376 U.S. at 351-52. The determinations envisioned in Article VI were extremely important because the amounts and dates set under that article would determine the quantities of water and order of priority in times of shortage. Such "present perfected rights" would take priority over any junior rights. Similarly, the non-Indian claims to be classified as "present perfected rights" could take priority over Indian claims if given a priority date that predated the establishment of an Indian Reservation.

In closing, the Court, following the recommendation of the Master, included a provision, Article IX, recognizing the non-final nature of the 1964 Decree:

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36. This period of time was amended on February 28, 1966, to allow three years from March 9, 1964, for a determination of prior perfected rights and priority dates. 383 U.S. 268 (1966).

> Any of the parties may apply at the foot of this decree for its amendment or for further relief. The Court retains jurisdiction of this suit for the purpose of any order, direction, or modification of the decree, or any supplementary decree, that may at any time be deemed proper in relation to the subject matter in controversy.

Id. at 353.

4. *Completing the Priority System Through Article VI of the 1964 Decree: The 1979 Decree*—Arizona v. California, *439 U.S. 419 (1979)*

The deadline set in Article VI for determining priorities was not met by the parties. Over several years the State Parties and the United States unsuccessfully attempted to fashion a list of present perfected rights with priority dates and a decree to implement the mandate of Article VI for a complete list of priority of claims to present perfected rights including all such state and federal claims.

Because of the parties' inability to agree upon the "present perfected rights" and their priority dates, the State Parties in May, 1977, filed with the Court a joint motion for determination of those rights and for entry of a supplemental decree.[37] The United States, in November, 1977, responded with a motion objecting to parts of the supplemental decree proposed by the State Parties.[38] Later these initially-opposed forces found themselves in agreement over these matters and on May 30, 1978, filed a joint motion for a supplemen-

37. Joint Motion for a Determination of Present Perfected Rights and the Entry of a Supplemental Decree (May 1977).

38. Response of the United States (Nov. 1977).

tal decree under Article VI, including a listing of rights and priority dates.[39] The parties in agreement, comprising a group of all named parties, applied to the Court for entry of the supplemental decree "in order to avoid future controversies."[40]

On January 9, 1979, the Supreme Court entered a supplemental decree as requested by the then-existing parties. Arizona v. California, 439 U.S. 419 (1979).

That Supplemental Decree established the priority of water rights in the event of an insufficient water supply (*i.e.*, less than 7.5 million acre-feet annually). Under that Decree the Indian water rights, as present perfected rights, were explicitly given general priority over the major water rights of the State Parties. This preference for Indian water rights included any rights associated with expanded-recognized boundaries. But with respect to "miscellaneous present perfected rights," listed in this Decree, the order of priority was to be determined by "priority date." And the Indian water rights and the "miscellaneous present perfected rights" were listed in this 1979 Decree with the acre-foot entitlements matched with their respective priority dates. *Id.* at 423-36. Thus, the work outlined in Article VI had been completed.

The 1979 Decree also contained several limitations on its scope. It specifically stated that:

> (1) The following listed present perfected rights relate to the quantity of water which may be used by each claimant and the list is not intended to limit or redefine the type of use set forth in [the 1964] Decree;

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39. Joint Motion for the Entry of a Supplemental Decree (May 1978).
40. *Id.* at 23.

(2) This [1979 Decree] shall in no way affect future adjustments resulting from determinations relating to settlement of the Indian reservation boundaries referred to in Art. II(D)(5) of [the 1964] Decree [boundaries to the Colorado River and Fort Mojave Indian Reservations];

(3) Article IX of the [1964 Decree] is not affected by this list of present perfected rights;

(4) Any water rights listed . . . may be exercised only for beneficial uses.

439 U.S. at 421.

B. *Present Proceedings*

The 1979 Decree resolved major issues in the litigation. But before that Decree was entered new questions arose. The five Indian Tribes followed by the United States made claims for additional water rights to Reservation lands.

The Indian Tribes previously had no part in the litigation. The United States had represented them. Then in December of 1977, the Fort Mojave, Chemehuevi and Quechan (Ft. Yuma) Indian Tribes moved for leave to intervene as indispensable parties.[41] On April 7, 1978, those three Tribes, apparently joined by the Colorado River Indian Tribes,[42] filed a petition

41. Motion for Leave to Intervene as Indispensable Parties (Dec. 1977).

42. The Colorado River Indian Tribes did not wish to join in this motion. The State Parties response to this petition notes that the Tribes had noted that they did not join in this motion and asked that their name be removed from the pleadings. Response of State Parties to Petition of Intervention 5 n.1 (May 1978). *See* Letter from Franklin McCabe,

for intervention.[43] Then on April 10, 1978, the Colorado River Indian Tribes and the Cocopah Indian Tribe filed a motion for leave to intervene and a petition for intervention.[44]

The Fort Mojave, Chemehuevi, and Quechan Indian Tribes sought in their intervention to oppose entry of the 1979 Decree that was to set the priority order for water rights in the Colorado River. The Petition of the Cocopah and Colorado River Indian Tribes did not seek to oppose the entry of the Decree.

Both groups of Indians raised claims outside the scope of the Article VI determinations intended to be embodied in the 1979 Decree. They sought to intervene because they felt the United States could not adequately represent their interests. All five Tribes, in essence, claimed entitlement to water rights appurtenant to two types of land: (1) boundary land — land that was or should have been officially recognized for the first time as a part of the Reservations; and (2) omitted lands — irrigable lands, within the recognized 1964 boundaries of the Reservations, for which the United States failed to claim water rights in the earlier litigation. The motion filed by the Fort Mojave, Chemehuevi, and Quechan Tribes claimed that these issues could be raised because of the inadequate prior representation of the United States. The Cocopah and Colorado River Indian Tribes alleged that the omitted lands claim was open to relitigation, because of inadequate representation, but with respect to that claim and the boundary lands claim these two Tribes also

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Jr., Chairman, Tribal Council of Colorado River Indian Tribes, to Clerk of the Court (May 10, 1978).

43. Petition of Intervention (Apr. 7, 1978).

44. Motion for Leave to Intervene and Petition of Intervention (Apr. 10, 1978).

found support in the 1964 Decree's Article IX which permitted amendment of the Decree's provisions. These two Tribes also noted that the 1964 Decree specifically left open the boundary lands question regarding the Colorado River Indian Reservation.

Before the entry of the supplemental decree, the State Parties and the United States filed papers which opposed these motions to intervene. The United States initially argued against intervention by the Fort Mojave, Chemehuevi, and Quechan Tribes because: (1) it adequately represented the Indians; (2) the then-proposed decree which was offered under Article VI of the 1964 Decree fully protected the Indians; (3) the omitted and boundary lands claims could be brought later under Articles II and IX of the 1964 Decree.[45] But later, the United States stated that it would not oppose intervention after a Decree on Article VI was entered.[46] The State Parties argued that intervention by these three Tribes should be denied because: (1) intervention would authorize a suit by the Tribes against the states in violation of the Eleventh Amendment; (2) any claims for additional water rights should be brought under Articles II and IX; and (3) the Indians did not meet the conditions for either permissive intervention or intervention as of right — mainly due to the untimely application.[47] Subsequently, the four California urban agencies[48] filed a response separate from the other State Parties opposing the substantive

45. Memorandum of United States (Feb. 1978).

46. Memorandum of United States (May 1978).

47. Response of State Parties to the Fort Mojave, Chemehuevi, and Quechan Tribes' Motion for Leave to Intervene as Indispensable Parties (Jan. 1978).

48. The Metropolitan Water District of Southern California, City of Los Angeles, City of San Diego, and County of San Diego.

claims of all five Tribal groups to any additional water rights but not opposing intervention of the Colorado River and Chemeheuvi Tribes if the Tribes had independent counsel and if the entry of the 1979 Supplemental Decree would not be delayed.[49] Moreover, those agencies did not oppose litigation of the boundary lands question if they were permitted to challenge the correctness of the characterization of these lands as Reservation lands. California and Nevada, joined by two water districts, filed a response consenting to intervention of the Colorado River and Cocopah Tribes if: (1) the United States did not oppose intervention; (2) the Supplemental Decree was entered promptly, at least concurrent with a grant of intervention; (3) intervention was limited to the purpose of adjudicating only the claims of additional water rights under Articles II and IX (apparently including water rights claims for boundary and omitted lands); (4) the Indians were represented only by individual counsel; (5) the intervention was permissive and not as a matter of right.[50] Arizona later filed a response apparently opposing any intervention.[51]

Then on December 22, 1978, the United States moved for entry of a Supplemental Decree to grant additional water rights for boundary lands and omitted lands.[52] That memorandum recommended that the matter be referred to a Special Master. But the United

49. Response of the Urban Agencies to Motion of Colorado River Indian Tribes and Cocopah Indian Tribe for Leave to Intervene and Petition of Intervention (June 1978).

50. Response of California and Nevada to the Cocopah and Colorado River Tribes' Motion (June 1978).

51. Response of Arizona to the Cocopah and Colorado River Tribes' Motion (June 1978).

52. Motion of United States for Modification of Decree and Supporting Memorandum (Dec. 1978).

States, wanting to limit the issues to be examined by the Special Master and to avoid unnecessarily protracted hearings, suggested that the Court lay down the following governing principles:

> (1) That the claims advanced in respect of "boundary lands" are now ripe for adjudication, and that this Court (and therefore its Master) will not undertake to review in these proceedings the correctness of the boundary adjustments which have been settled or accepted by the Secretary of the Interior, nor to decide any title disputes affecting particular parcels within a Reservation;
>
> (2) That the entitlement of any Reservation to additional mainstream diversions on account of boundary adjustments is determined in accordance with the standard and the formulae utilized by the Court in its original decision;
>
> (3) That, accordingly, the only task of the Special Master in relation to the claims made for "boundary lands" is to make findings as to the "practicably irrigable" acreage comprised within the restored areas and to recommend additional mainstream diversions by applying the acre-feet per acre ratios already established for each Reservation;
>
> (4) That the claims in respect of "omitted lands" are not foreclosed and must be determined on their merits;
>
> (5) That additional diversions on account of areas not before considered should be determined in accordance with the standard and the formulae previously established;
>
> (6) That, accordingly, the only task of the Special Master in relation to the claims made for "omitted lands" is to make findings as to the "practicably irrigable" acreage comprised within the areas omitted from consideration during the original proceedings and to recommend addi-

tional mainstream diversions by applying the acre-feet per acre ratios already established for each Reservation.[53]

The State Parties responded that the omitted lands question was subject to the principles of *res judicata* and none of the boundaries under consideration had been finally determined, making the correctness of the purported boundaries to be an issue ripe for adjudication for the purpose of resolving water rights claims.[54]

The 1979 Decree followed the recommendations of the State Parties and the United States in setting the priority rights to the water. Moreover, in that Decree, the Court denied the motion of the Fort Mojave, Chemehuevi, and Quechan Tribes to intervene insofar as they sought to oppose entry of the Supplemental Decree. Recognizing that other matters raised by this motion, the Colorado River and Cocopah motion, and the United States' motion were unresolved, the Court referred these motions to the undersigned, as Special Master.[55]

The State Parties, although not always in complete agreement among themselves, generally adopted positions similar to those taken in their motions to the Court.[56] Accordingly, on March 29, 1979 I presented to

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53. *Id.* at 33-35.

54. Response of State Parties to Motion for Modification of Decree (Feb. 1979).

55. 439 U.S. 419, 436 (1979); 440 U.S. 942 (1979).

56. Arizona, California, and Nevada stated that the 11th Amendment barred intervention without their consent. California and Nevada would have given their consent upon certain conditions. Arizona unconditionally refused to consent. The three states and the Coachella Valley County Water District stated that the Reservation boundaries should now be finally determined by the Master. Memorandum of the States of Arizona, California, and Nevada and the Coachella Valley County Water District Regarding Certain Preliminary Issues (Apr. 1979). The four Cali-

the parties and the movants for intervention three questions to be briefed and argued orally:

(1) Have "the boundaries of the respective [Indian] reservations . . . [been] finally determined" within the meaning of Art. II(D)(5) of the March 9, 1964 Decree, 376 U.S. 340?

(2) Does the Eleventh Amendment bar intervention in this suit by the Indian Tribes without the consent of the State Parties?

(3) Is there a procedure whereby the Indian Tribes may appear and participate as if they were parties pending a ruling on their motions to intervene?

After conducting a hearing on these preliminary issues, I entered a memorandum and report on August 28, 1979, granting the Indian Tribes leave to intervene in the subsequent hearings on the merits.[57]

In granting the Tribes leave to intervene, I followed the guidance of Rule 24 of the Federal Rules of Civil Procedure. I concluded that the Indian Tribes should be permitted to intervene because the Tribes' direct pecuniary interests will be determined by this litigation and because the asserted claims of the government's conflict of interest created the possibility that the government's representation of the Tribes' interest

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fornia urban agencies adopted California's view of the 11th Amendment and the Intervention issues. They also stated that the boundaries were not yet finally determined and that I should now adjudicate title to all such areas with all interested persons joined as parties. In the alternative they asked that the United States bring suit to quiet title to the land and water rights in federal district court. Memorandum of the Urban Agencies re Indian Reservation Boundary Question (Apr. 1979).

57. Memorandum and Report on Preliminary Issues (Aug. 28, 1979). Each of these issues is discussed in more detail in my 1979 Report.

"may be" inadequate. *See, e.g., Trbovich v. United Mine Workers,* 404 U.S. 528 (1972).

I further concluded that the States' Eleventh Amendment immunity was not implicated by the Tribes' motion to intervene. Because the intervenors' claims are ancillary to a case or controversy already within the Supreme Court's jurisdiction, *see, e.g., Aldinger v. Howard,* 427 U.S. 1, 6-14 (1976); *Freeman v. Howe,* 24 U.S. (24 How.) 450 (1861), they are within the scope of the State's constitutional surrender of immunity. *See, e.g., Principality of Monaco v. Mississippi,* 292 U.S. 313 (1934). In its 1964 Decree, the Court retained its exclusive jurisdiction over the distribution of the waters of the lower Colorado River and thus the present case provides the sole vehicle by which the Indian Tribes can assert their claims. 376 U.S. at 341-46, 353. In the alternative, I concluded that 28 U.S.C. § 1362[58] is a congressional abrogation of the State's immunity. *Moe v. Confederate Salish & Kootenai Tribes of the Flathead Reservation,* 425 U.S. 463 (1976). My decision permitting the Indian Tribes to intervene obviated the need to consider alternatives to intervention.

I also concluded that the facts regarding irrigability of both the boundary and omitted lands should be presented. For the purpose of the determination of Reservation water rights in this litigation, I found the

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58. This statute provides:

> The district courts shall have original jurisdiction of all civil actions, brought by any Indian tribe. . . wherein the matter in controversy arises under the Constitution, laws or treaties of the United States.

28 U.S.C. § 1362 (1976). It is clear that § 1362 does not withdraw the Supreme Court's jurisdiction over Indian claims in cases in which a state is a party, but merely confines federal question claims by Indian Tribes to federal courts in general. 439 U.S. 419, 436-37 (1979).

boundary determinations made by the district courts and by the Secretary of the Interior to be final. I initially deferred decision on the omitted lands question but have since concluded that those claims are not barred by *res judicata* or related doctrines. The rationales underlying the determinations are explained in some detail below. *See* Part One at II.B. *infra*.

Following determinations made in the 1979 preliminary report, the parties, including the five Indian Tribes,[59] thoroughly litigated the issues in this case. Based on the evidence received in these hearings, I now make my findings.

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59. Since the early stages of the present proceedings, the alignment of the positions of the Tribes has altered substantially. As the hearings commenced, the Colorado River Indian Tribes, Fort Mojave Indian Tribe, Chemehuevi Indian Tribe, and Cocopah Indian Tribe have presented a united front by filing briefs jointly and the first three groups retained the same expert witnesses. For convenience these Tribes will be referred to as the Four Tribes. The remaining Tribe is the Quechan Tribe of the Fort Yuma Indian Reservation, a Tribe which has often asserted what appear to be separate views but which in fact were later adopted to some extent by the other Tribes.

II. Types of Claims to be Considered

Two basic types of water rights claims have been alleged by the United States and the Tribes. The difference is found in the character of land to which the rights are claimed to be appurtenant. First, there is land which was acknowledged at the time of the earlier proceedings to be within the Reservations. Second, there is land that since that time has either been added to the Reservations or recognized now to be within the boundaries of the Reservations. The parties have generally labelled these claims respectively as "omitted lands" claims and "boundary lands" claims in reference to the type of land with which the claims are associated. The State Parties have with respect to each sort of claim raised defenses which would cut short the water rights inquiry at various points. I find little merit in the State Parties' arguments and believe that for both types of lands the arguments should proceed to a determination of the quantity of water for these acres.

In connection with a discussion of the reasons for such decisions, I should note that several related arguments have been raised by either the State Parties or the Tribes and might profitably be discussed in this context because these points also concern the number of acres properly held to be within the Reservations and, thus, eligible for water rights.

A. Omitted Lands—Preclusion

Since the filing of the motions for modification of the decree, the State Parties have opposed any litigation over water rights to the so-called "omitted lands" for which water rights might have been claimed in the

litigation preceding the 1964 Decree. The prior determination of Indian water rights in that Decree, the State Parties claim, precludes relitigation of that issue by the United States. Although the Indians were not parties to that litigation, the State Parties contend that adequate representation of the Indians' interests by the United States would preclude assertion of the omitted lands claims by the Indians. *See Heckman v. United States*, 224 U.S. 413, 445-46 (1912). Drawing from these principles the State Parties have moved for dismissal of these omitted lands claims pressed by the United States and the Indians.[1]

The Tribes and the United States urge that the 1964 Decree understates the Tribes' rights and should be corrected. The evidence in the record convinces me that the prior decree is significantly in error on this point. I conclude that the Court has the power to reach these claims and should exercise that power to determine the substantive merits of those claims.

If these claims were presented in a proceeding separate from the original case, they would have been subject to the normal rules of preclusion. Contrary to the suggestions by some parties,[2] the water rights for the omitted lands are not new claims, separate from

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1. Motion to Reject the "Omitted Lands" Claims of the United States and the Intervening Indian Tribes and Memorandum of Points and Authorities in Support of Motion Filed on Behalf of the Metropolitan Water District of Southern California (Jan. 1981) [hereinafter cited as Memorandum of Metropolitan Water Memorandum]; State Parties' Motion and Memorandum of Points and Authorities re the Doctrine of Res Judicata (Mar. 1981) [hereinafter cited as State Parties' Memorandum on Res Judicata].

2. Four Tribes' Opening Post-Trial Brief 109 (May 1981); *cf.* Four Tribes' Pre-Trial Brief 5-8 (Aug. 1980); United States' Pre-Trial Brief 16 (Aug. 1981); United States' Opening Post-Trial Brief 22-23, 23 n.18 (May 1981).

the claims pressed in the prior proceeding. The claim in the original case, when properly described, embraced the totality of water rights for the Reservation lands. The failure of the United States to present evidence regarding the particular acres now referred to as the omitted lands does not mean that claims regarding such lands constitute new claims made by either the United States or the Tribes. Similarly it is not a new issue either, because the total amount of practicably irrigable land was litigated and determined in the earlier proceeding. Under these circumstances, the normal rules of and exceptions to preclusion would apply to additional water rights claims presented in a separate action. *See United States v. Truckee-Carson Irrigation District*, 649 F.2d 1286, 1301-09 (9th Cir. 1981). Such considerations, however, are not completely applicable to the present situation where the claims are presented in the same action in which the prior claims were adjudicated.

If a party properly moves the rendering court in the same proceeding to correct or modify its judgment, *res judicata* and collateral estoppel do not apply. *Stolberg v. Members of the Board of Trustees*, 541 F.2d 890, 893 (2d Cir.), *cert. denied*, 429 U.S. 485 (1976); *McRae v. United States*, 420 F.2d 1283, 1286 (D.C. Cir. 1969); 1B MOORE'S FEDERAL PRACTICE ¶ 0.407, at 931-35 (2d ed. 1980); R. FIELD, B. KAPLAN & K. CLERMONT, CIVIL PROCEDURE 860 (4th ed. 1978). In such a case there is no final judgment from a separate action which should be accorded such preclusive effect. The proper inquiry then concerns whether there exists a procedure allowing the Court to consider the request. The present case turns upon the proper interpretation of Article IX of the 1964 Decree which provides that:

> Any of the parties may apply at the foot of this decree for its amendment or for further relief. The Court retains jurisdiction of this suit for the purpose of any order, direction, or modification of the decree, or any supplementary decree, that may at any time be deemed proper in relation to the subject matter in controversy.

376 U.S. at 353. This provision, not the rule of *res judicata*, determines the ability of the Court to examine the omitted lands claims.

The definition of the power reserved by Article IX presents a difficult task. Its history and the proceedings before the prior Master are not conclusive and would support either a broad or narrow interpretation. The State Parties urge that the Master sought to recommend that the Court grant a final and fixed quantity of Indian water rights in order to allow the other parties the certainty required for planning.[3] For example, some of the remarks of the Master indicate that he might be disinclined to allow the United States to use Article IX to correct an error in the Indian water rights determination.[4] On the other hand, some statements in the earlier proceedings indicate that Article

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3. SPECIAL MASTER'S REPORT at 264 ("Financing of irrigation projects would be severely hampered if investors were faced with the possibility that expanding needs on an Indian Reservation might result in a reduction of the project's water supply."). *See also id.* at 264-66.

4. The State Parties cite the Master's references in his report to fixed quantities of Indian water rights, *see* note 3 *supra*, and his statements in the hearings indicating that the United States would be "bound" by the claims it then made. *See* Pr. Tr. 14155. Although these statements by the prior Master tend to make the intended point, I find closer to the mark an immediately subsequent exchange between the Master and United States counsel. After the Master told counsel that he was bound, counsel responded that, if there was a mistake in the Indian water rights claims, the United States would later "ask for leave to correct it." This suggestion was plainly rebuffed by the Master. Pr. Tr. 14156-57.

IX was desired to allow generally for the correction of virtually any error.[5] Perhaps all that can conclusively be drawn from the history of Article IX is that the provision itself is not explicitly referenced to the request of the United States to leave the Indians' water rights in an open-ended state.[6] Finding no clear resolution of this matter in the provision's history, I must turn to other sources.

Outside authority provides some limited guidance. Provisions virtually identical to Article IX can be found in other interstate water cases in the original jurisdiction of the Court. *See, e.g., Wisconsin v. Illinois,* 278 U.S. 367 (1929), *remedial measures considered,* 281 U.S. 179, *decree entered,* 281 U.S. 696 (1930), *decree temporarily modified,* 352 U.S. 945 (1956), 352 U.S. 983 (1957), *decree superseded,* 388 U.S. 426 (1967); *New Jersey v. New York,* 283 U.S. 336, *decree entered,* 283 U.S. 805 (1931), *modified,* 347 U.S. 995 (1954). But such cases do not directly speak to the present issue of preclusion. Rather, they merely illustrate that the Court may make even major modifications of decrees in cases over which it has retained jurisdiction.

The State Parties argue that all such cases involved the concept of equitable apportionment which fre-

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5. A provision such as Article IX was urged upon the Court by one of the State Parties to avoid "the possible claim that this Court may not alter or modify its rulings herein on the basis that the Decree is res adjudicata of the issues sought to be considered or reconsidered" because the Court "should not desire to find itself embarrassed by a provision in the Decree or ruling if the United States or parties can later convince this Court that this Court's determination has been erroneous or unworkable." Supplement and Amendment to Imperial Irrigation District's Form of "Decree of Court as Heretofore and Herewith Submitted" 11 (Dec. 1963).

6. *See* Pr. Tr. 12456-69, 13508.

quently alters the parties' rights in light of changed circumstances.[7] Considering that the present case does not concern such a concept, they conclude that Article IX is limited "to correction of a genuine mistake of fact such as a mathematical miscalculation by parties to the prior proceedings."[8] I question whether all those cases concerned equitable apportionment. *See Wisconsin v. Illinois*, 278 U.S. 367 (1927). Moreover, despite the inapplicability of the concept of equitable apportionment to the present case, the Court adopted the present Article IX which is equally as broad as the provisions used in the previous interstate water cases. Had the Court intended to impose the limits urged by the State Parties the language might have been tailored to fit those limits. A provision for the correction of merely clerical errors, such as that envisioned by the State Parties, would also seem entirely superfluous because a court normally possesses the inherent power to correct its decrees in such a manner. *See Briggs v. Pennsylvania R.R.*, 334 U.S. 304, 306 (1968); *Perkins v. Standard Oil Co.*, 487 F.2d 672, 674 (9th Cir. 1973). The State Parties' view that Article IX incorporates the normal aspects of *res judicata* appears unduly restrictive because it renders that provision almost meaningless.

The best indicator of the scope of Article IX is thus its very language. On its face Article IX would permit very broad modifications of the 1964 Decree. Certainly it contains no limiting language. In the absence of

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7. *See* Memorandum of Metropolitan Water District 27-30 (Jan. 1981).

8. Memorandum of Metropolitan Water District 29 (Jan. 1981). *Cf.* State Parties' Memorandum on Res Judicata 17-18 (Mar. 1981) (mistakes of the kind under consideration not correctable by use of Article IX); Trial Brief of Nevada on Res Judicata 11-16 (May 1981).

more convincing arguments, I believe that the Court, by employing a broadly-drafted Article IX, retained the power to make virtually any modification in its 1964 Decree that it deemed proper "in relation to the subject matter in controversy."

Such a conclusion does not mean that any wide-ranging amendment would be made. I believe that the prior definition of water rights based on "practicable irrigability," as used in the prior proceedings and as reaffirmed in various particulars in the 1979 Supplemental Decree, should be retained. Other questions similarly should not be open for contest. For example, since equitable apportionment is not applicable to this case, evidence of changed circumstances, such as new technology regarding irrigability, should not ordinarily move the Court to alter its decree in a manner appropriate for a case involving such a doctrine. *See generally Nebraska v. Wyoming,* 325 U.S. 589, 616-20 (1945). To this extent, the State Parties' argument regarding the scope of Article IX has some merit. Matters once litigated and decided should not be reconsidered *absent some good reason.* Such concerns, however, are addressed to the exercise of the Court's sound judgment rather than its power.

The precise definition of the finality principle applicable to this case appears to be somewhat cloudy. No party has offered an explanation or authority that seems fully satisfactory. *Res judicata* for reasons explained above is not applicable. Yet the 1964 Decree would have no meaning if it is not accorded some degree of finality. Perhaps the most nearly applicable concept would be "law of the case" which is discussed

by some of the parties.[9] I believe that an analogy, useful in considering the present case, may be drawn from that doctrine as it operates in cases which are not within the original jurisdiction of the Supreme Court.

The doctrine of "law of the case" differs from *res judicata* because the latter compels adherence to a prior decision while the former merely directs the Court's discretion. It is a matter of good practice, not a limitation on the Court's power. *See Southern Ry. v. Clift*, 260 U.S. 316, 319 (1922); *Messenger v. Anderson*, 225 U.S. 436, 444 (1912). Because such an inquiry involves the Court's sound judgment, any justifiable reliance interests ought to be weighed in the balance. *See* 1B *Moore's Federal Practice* ¶¶ 0.404[2], 0.404[3], at 431-35 (2d ed. 1980). On the other hand, a prior holding may be avoided if the Court is convinced that such a holding was clearly erroneous and would work a manifest injustice. *See White v. Murtha*, 377 F.2d 428, 431-32 (5th Cir. 1967). In such cases, "[j]ustice is better than consistency." *Seagraves v. Wallace*, 69 F.2d 163, 165 (5th Cir.), *cert. denied*, 293 U.S. 569 (1934). My inquiry will be to determine, as best as possible, the manner in which the Supreme Court should exercise its sound discretion.

Every party has presented relevant arguments that touch upon this question. The United States and all the Tribes offer a number of reasons for opening the question of water rights for the omitted lands. The United States argues that the complexity of the prior litigation caused the mistake leading to the exclusion of the omitted lands from its prior claims.[10] The

9. *See* United States' Opening Post-Trial Brief 18a n.12 (May 1981); State Parties' Memorandum on Res Judicata 1 (Mar. 1981). *Cf.* Nevada Reply Brief 9 (June 1981).

10. United States' Pre-Trial Brief 16 n.21 (Aug. 1980).

United States also notes that even the State Parties admit that the vast majority of the omitted lands within the United States claims are practicably irrigable.[11] Some of the Tribes note that their absence as actual parties in the prior proceedings is a factor to be considered, because they did not have an opportunity to protect their interests.[12] In addition, all of the Tribes have, at different times and in varying degrees of vigor, argued that the United States' earlier representation of their interests was inadequate because of a conflict of interest and this circumstance alone vitiates the State Parties' defense of preclusion.[13] Other reasons of less persuasive force have also been offered.[14]

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11. *Id.* at 13 & nn. 15 & 16; United States' Opening Post-Trial Brief 23 (May 1981); United States' Closing Post-Trial Brief 12-13 (June 1981). *See* S. P. Exh. 110, at Table 1 (showing 17,314 gross irrigable acres of omitted lands compared to 24,415 of same represented as being claimed by United States). *See also* Four Tribes' Pre-Trial Brief 14-15 (Aug. 1980).

12. *See* Four Tribes' Pre-Trial Brief 15 (Aug. 1980).

13. Four Tribes' Pre-Trial Brief 16-20 (Aug. 1980); Trial Brief of Quechan Tribe 33-42 (Aug. 1980).

14. For example, the Four Tribes have claimed that the 1964 Decree should be reopened because the quantification standard for the Indians' water rights was adopted by the Court after the evidence in the case was developed. Four Tribes' Pre-Trial Brief 10-11 (Aug. 1980); Four Tribes' Opening Post-Trial Brief 109 (May 1981). Although the standard may not have been approved by the Court until after the evidence was prepared, the prior Master desired that the United States present evidence meeting that standard, and the United States on numerous occasions represented that it was presenting such evidence. *E.g.* Pr. Tr. 12461. Even if the law was unsettled at the time of trial, the standard, which was later adopted by the Master and the Court, was the same standard which the Master required the United States to use in its trial presentation. This fact thus adds little to the Tribes' case except insofar as the United States may have consciously departed from the standard while pressing its claims. That consideration would, however, bear more on the question of the adequacy of the United States' representation of the In-

The State Parties argue that any reopening of this once litigated issue would be unfair to them. Although the facts vary with the individual cases, most of the State Parties claim that they have relied upon the Court's prior determination of the Indians' water rights.[15] This reliance will have been undercut, these parties argue, if the quantity of Indian water rights is increased.

The detrimental impact on these parties by such an amendment cannot be seriously denied. What the Tribes gain someone else will lose, at least in the future.[16] But the present inquiry centers upon detrimental reliance rather than impact.

In some aspects, Arizona appears to present the most compelling case of detrimental reliance. That state initiated the present lawsuit to achieve certainty regarding its share of the Colorado River water. Fol-

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dians rather than the unfair surprise that may have resulted from the Court's adoption of a new legal standard for quantification of water rights.

15. Memorandum of Metropolitan Water District 27-34 (Jan. 1981); State Parties' Memorandum on Res Judicata 21-22 (Mar. 1981); Arizona Supplemental Res Judicata Brief (May 1981); Arizona Reply Brief 7-15 (June 1981); Nevada Trial Brief on Res Judicata 20-22 (May 1981); Nevada Reply Brief 10-12 (June 1981); State Parties' Post-Trial Opening Brief 233-34 (May 1981); State Parties' Post-Trial Closing Brief 55-70 (June 1981).

16. The Tribes argue that by removal of phreatophytes, vegetation along the river, the impact on the states will be lessened. *See* F.M. Exh. 17. The effect of this action does not seem so clear because no state is presently charged with such use of water by phreatophytes and if such water were available it would be part of the remaining water which could be used to satisfy the Mexican Treaty obligation. It is not clear whether under those circumstances the states would benefit in the amounts projected by the Tribes. This argument appears to be simply a claim to additional water rights through an alleged savings. As such it ignores that consumptive use is measured by diversions less return flows. 373 U.S. at 601.

lowing the 1964 Decree, Arizona successfully persuaded Congress to provide for the construction of the Central Arizona Project, a system for delivery of water to central Arizona.[17] In considering this legislation Congress examined the sufficiency of the water supply available to Arizona in light of the 1964 Decree.[18] The Senate concluded that even under the most conservative analysis the Project was feasible.[19] This calculation accounted for all water rights, including the Indians' prior decreed rights.[20] The Project was to receive the remainder of Arizona's share of the water.[21] Following the congressional approval of the Project, the Arizona legislature created a multi-county water conservation district to contract with the Secretary of the Interior for the Project's water and to collect taxes for repayment of the Project's costs.[22] By the time of the recent hearings, that entity had been collecting ad valorem taxes for approximately six years and was then holding in reserve approximately $9,500,000 to assist in the repayment of the Project's costs.[23] Any water rights given the Indians would reduce, by almost

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17. Colorado River Basin Project Act, Pub. L. No. 90-537, § 301, 82 Stat. 887 (1968) (codified at 43 U.S.C. § 1521 (1976)).

18. S. REP. No. 408, 90th Cong., 1st Sess. 18-21 (1967), *presented in evidence as* U.S. Exh. 161.

19. *Id.* at 32. The Senate calculated that annual Project deliveries would equal:

Year	1975	1990	2000	2030
Thousands of acre-feet	1,809	1,281	1,061	723

Firm supply in the year 2030 was estimated to be less than 361,500 acre-feet of water. *Id.* at 35 & n.3.

20. Tr. 2692-93.

21. *Id.*; S. REP. No. 408, *supra* note 19, at 32-35.

22. Tr. 2694.

23. Tr. 2695.

identical amount, the water to be used by Arizona for the Project.[24] If all of the present Indian claims are upheld, the possible loss to the diversions for the Central Arizona Project would be 128,000 acre-feet per year resulting in a loss of delivery of 115,000 acre-feet per year to central Arizona.[25]

This reliance analysis might be questioned because of some additional facts. Arizona presently expects that its firm supply of Colorado River water for the Central Arizona Project will be 550,000 acre-feet in the year 2035.[26] When Congress considered the feasibility of the Project, it based its analysis on a firm supply of less than 316,500 acre-feet by the year 2030.[27] Thus, Arizona might have more water available for use in the Project than was anticipated when Arizona and Congress relied upon the 1964 Decree.[28] From this information, it would appear that the Project would still have been built if the new firm supply had then been known even if it were reduced by the additional claims for the Reservations. But there is still great uncer-

24. Tr. 2723.

25. Tr. 2752. These figures offered by the Director of the Arizona Department of Water Resources apparently accounted for losses to Arizona from the claims of the Tribes as well as the claims of the United States. *See* Tr. 2723 (claims of government and Tribes would deplete the diversions to Central Arizona by 128,000 acre-feet per year). Apparently this figure represents an estimate of the amount of water claimed for both omitted lands and boundary lands because Arizona contends that the omitted lands claim will "directly" affect the amount of water for the Project, and that the Tribes, as of September, 1980, claimed 114,788 acre-feet of water for omitted lands and 15,824 acre-feet of water for boundary lands. Arizona Supplemental Res Judicata Brief 6 (May 1981). These latter figures assume a consumptive use rate of 4.0 acre-feet per net acre.

26. Tr. 2707.

27. *See* note 19 *supra*.

28. The average figures for available water are similarly greater than expected. The current estimates as offered by Arizona are:

tainty regarding the future supply of water available to Arizona. The United States Water and Power Resources estimates Arizona's firm supply for the Central Arizona Project at 400,000 acre-feet.[29] At the time of trial even allocations within the State were uncertain.[30] The real impact of additional Indian water rights is in the future. Whether Arizona relied to its detriment in these respects is not yet determinable.

Arizona's reliance can, however, also be seen from a different perspective. Arizona has consistently argued simply that it relied upon all Indian water rights as fixed by the 1964 Decree.[31] Arizona's position might be supported by the view that in making its plans Arizona accepted all gains or losses arising from predictive error. If the prediction was high and there was a shortfall, Arizona could accept that because it also knew that if the prediction was low it would have the benefit of the excess water in the otherwise leaner years when the Upper Basin was developed. In this manner also, Arizona might have detrimentally relied upon the 1964 Decree.

Two other State Parties have presented similar, yet less convincing, evidence of reliance. The Metropolitan Water District, after losing certain water rights under the 1964 Decree, contracted with the California State Water Project for an additional annual entitlement of

Year	Avg.*	Firm*
1985	1,600	1,600
2005	N/A	700
2035	1,000	550

*These figures are indicated in thousands of acre-feet per year.
Tr. 2703, 2706-07. *Compare* note 19 *supra*.

29. Tr. 2767.
30. Tr. 2693-94, 2761, 2708-18.
31. Arizona Reply Brief (June 1981).

500,000 acre-feet of water.[32] The Project could feasibly be expanded at that time and was enlarged to accommodate the District's increased need.[33] Further enlargement would not be presently feasible,[34] and a second aqueduct for delivery of additional water would be a more costly alternative.[35] Following the 1964 Decree the District annexed new areas and, thus, obligated itself to larger commitments for the delivery of water.[36] When the District is ready to use its full entitlement of State Project water, unless an alternative source is secured, there will be a shortfall by any new losses the District suffers, whether the District's call on the State Project reaches its maximum in 1990 as originally expected or 20 to 30 years later as now expected.[37]

This showing of the District's reliance is clouded by an additional consideration. As the United States notes "the record does not indicate the decrease in [the District's] supply if the additional claims" are upheld.[38] The District's reply to this challenge does not fully explain why the District will receive less water if the Tribes receive additional water rights.[39] Neverthe-

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32. Tr. 2925-26. In addition the District knew that Los Angeles was also increasing its water supply by 150,000 acre-feet from the Owens Valley and that increase would also help offset the loss which totalled 662,000 acre-feet. Tr. 2928-29.

33. Tr. 2926-31.

34. *Id.*

35. Tr. 2932.

36. Tr. 2929.

37. Tr. 2923-24.

38. United States' Opening Post-Trial Brief 31 (May 1981).

39. State Parties' Post-Trial Closing Brief 67-68 (June 1981).

The District's literature indicates that its 550,000 acre-feet firm share will yield only 450,000 acre-feet after allowing for higher priority uses and system losses. U.S. Exh. 94, at 3. This estimate is qualified by the cautionary statement that possibly only 400,000 acre-feet will be available. Although the Tribe's decreed rights and petition for additional rights

less some measure of impact can be expected because of the nature of the District's entitlement to the water. Under the Seven Party Agreement,[40] the District has the fourth and fifth priorities for over 1,000,000 acre-feet of water per year from California's share of water in the river. In years of normal water supply, the District would not receive the entire contractual amount when Arizona uses its entitlement. The District's entitlement would be further ousted to some extent by additional senior water rights because its water rights are currently the most junior in a normal year.

Some additional loose ends are more troubling and leave serious questions regarding whether the District would have taken different action if the present Indian claims had been successfully presented in the earlier proceedings. The District apparently sought only to replace losses in 1964 that went to Arizona.[41] The losses that went to the Tribes apparently were not considered as losses that required replacement. This attitude toward the Indian rights has continued, because no plans have apparently been made regarding the possibility of increased awards in the event the Reservation boundary questions are resolved against the State Parties.[42] From this evidence one could find that the District simply ignores the Indian water rights in its planning process and thus does not rely on an award at a specific level. Nevertheless, I believe that the District

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were both mentioned the literature did not specifically state the impact of either. The District's witness at one point seemed to indicate that the decrease to 400,000 acre-feet would include additional losses to the District resulting from additional gains by the Tribes, but the specific magnitude of such losses was not indicated. Tr. at 2955.

40. Pr. Ariz. Exh. 27.

41. Tr. 2925-26.

42. Tr. 2943-44.

in taking such actions as annexing new areas may have relied upon the terms of the 1964 Decree.

Nevada's claim of reliance presents an entirely different situation. Nevada's presentation was unpersuasive. Nevada undoubtedly relied upon the decree.[43] But the reliance according to Nevada's presentation does not appear to have been to Nevada's detriment even if the present claims are granted. Under the 1964 Decree, that state was allocated, for its annual consumptive use, 300,000 acre-feet of water.[44] Following the 1964 Decree, Nevada began construction of the Southern Nevada Project which will have a "total diversion capability" of 299,000 acre-feet of water.[45] Nevada's expert witness stated that these diversions would result in a net return flow of approximately 35%, which could be credited to lessen Nevada's consumptive use of water through the Project.[46] The consumptive use of the Project thus approaches only 194,350 acre-feet per year. Despite the representations of Nevada's counsel and witness, this figure is not "practically the entire state's allocation."[47] Nevada did not show that granting the present claims would impair the ability of the state to divert 299,000 acre-feet of water per year through this Project in a normal year. The Nevada witness did state that any additional Indian water rights would be deducted from the Project's diversion rights,[48] but in light of Nevada's confu-

43. Tr. 2988, 2992-93, 3040-41.

44. 376 U.S. at 342.

45. Tr. 3013.

46. Tr. 3050-51. That witness later indicated that 35% for return flows would not apply to all diversions in the state and that, according to its contracts, Nevada could divert a total of approximately 400,000 acre-feet of water. Tr. 3059-60.

47. Tr. 2989.

48. Tr. 3031.

sion over the distinction between diversion and consumptive use this conclusional statement is unimpressive as a general proposition. This same witness indicated that Nevada's water allocation contained 10,000 acre-feet of water for which there was no contract as yet.[49] The real concern must lie in years of shortage.[50] But even then Nevada's claim of detrimental impact seems flawed. Nevada has presently set aside for the Indians a total *consumptive use* figure of 12,500 acre-feet of water per year.[51] Under the 1964 Decree the one Tribe in Nevada acquired the right to *divert* approximately 12,500 acre-feet per year to irrigate its land.[52] Obviously, if any water returns to the river, Nevada's total consumptive use will be decreased by that amount. Yet Nevada made no allowance for such return flows. This decision was made either because, according to its experts' first explanation, Nevada mistakenly understood the 12,500 acre-feet figure to be a consumptive use figure rather than a diversion figure[53] or because, according to his second explanation, she was uncertain whether there would be any return flows.[54] Some return flows should logically be credited and by any formula used in this case the consumptive use of the present claims together with the decreed rights would not exceed the amount Nevada has already set aside for the Indians.[55]

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49. Tr. 3022-23.

50. Tr. 3008, 3024-25.

51. Tr. 3019.

52. *See* Tr. 3019-20; Pr. Calif. Exh. 3517; U.S. Exh. 1322; SPECIAL MASTER'S REPORT at 282.

53. Tr. 3019.

54. Tr. 3049.

55. Nevada for its own Project assumes return flows of approximately 35%. Tr. 3051. This figure indicates that when the Tribe diverts 6.46 acre-feet per acre that consumptive use would be approximately 4.2 acre-

Absent additional facts or a more coherent explanation of the present evidence, I cannot find that Nevada has demonstrated that her reliance on the 1964 Decree would be undercut by the granting of the present claims.

Much of the discussion regarding reliance is superfluous. Not a great deal of evidence is really needed to convince anyone that western states would rely upon water adjudications. Some parties have presented in this case more specific and convincing proof of detrimental reliance than have others. Nevertheless, it would be unrealistic to conclude that those parties would not have used the 1964 Decree as a basis of future plans. Under some circumstances every party might suffer a detriment because of reliance on that Decree even though I find it difficult to determine from the testimony exactly what significant, different action the State Parties would actually have taken if the Indian Reservations had received in 1964 the water rights now requested. This litigation is, thus, important to all such parties, aside from the simple possibility that they might lose an expectancy from the 1964 Decree. This reliance, however, might not be sufficient to foreclose the present claims.

With a full sense of the seriousness of the matter I conclude that the omitted land question should be de-

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feet per acre. Other experts in this case have used return flows of a similar magnitude in arriving at a consumptive use figure of 4.0 acre-feet per acre. Tr. 1084; F.M. Exh. 1. The past decreed rights cover approximately 1939 net acres. *See* note 52 *supra*. The present claims would add approximately 749 gross acres to that total. *See* F.M. Exh. 2, Table 8; U. S. Exh. 42, Table 7. Even if the current claims are not reduced to a net amount and 2688 acres receive a diversion of 6.46 acre-feet of water per acre, the consumptive use of approximately 11,290 acre-feet is still less than the 12,500 acre-feet Nevada has set aside in its planning process for the Tribe's consumptive use.

termined on the merits rather than held foreclosed by the State Parties' plea of preclusion. A number of considerations guide my decision.

As the United States notes, this case has from the beginning involved a number of complex issues and difficult matters of proof. No one should be surprised that some mistakes occurred earlier. In fact, an absence of mistake would have been reason for surprise. For just such a reason water rights decrees often include a retention of jurisdiction which may be used to adjust the water rights decreed in the event an error is discovered. 6 *Waters and Water Rights* § 531.7, at 522 (R. Clark ed. 1972). *See City of Los Angeles v. City of Glendale*, 23 Cal.2d 68, 142 P.2d 289, 297 (1943). *See also Taylor v. Tempe Irrigating Canal Co.*, 21 Ariz. 574, 193 P. 12, 14-15 (1920); *Benson v. Burgess*, 192 Colo. 556, 561 P.2d 11, 13-14 (1977). Article IX, consistent with similar provisions in other cases of this nature, reserved jurisdiction in the Supreme Court in order to consider any mistakes which the Court might wish to correct. Certainly the parties seemed to perceive it as such a provision.[56] Although the 1964 Decree may have given a relatively stable allocation of water rights, unyielding reliance upon it was inappropriate, because it was modifiable for good reason.

The omitted lands claim presents just such a matter. *One of the few aspects of this case that has drawn agreement among the parties is the existence of irrigable lands which were "omitted" from the claim for water rights in the earlier proceedings.* The State Parties admit that the large majority of omitted lands for which water rights are claimed by the United States are practicably irrigable. The policies underlying pre-

56. *See* note 5 *supra.*

clusion, however salutary generally, begin to offend the appearance of justice when a party admits that his opponent received less than a full measure of justice before the Court and cannot now remedy the situation by modifying the original decree.

This aspect of fairness holds particular importance in the present case. I would be more reluctant to allow the United States to relitigate a matter that concerned only its own interests. In this case, however, the Tribes would bear the burden of this injustice. During the earlier proceedings they were not parties. The United States as trustee or guardian represented them. *See* 25 U.S.C. § 175 (1976). They had no opportunity to present their case. This fact represents a compelling reason for the Court to exercise its power to correct what otherwise would be a serious error in defining their rights. In my view Article IX should be used in this case as an instrument of justice to give the Tribes what rightly belongs to them. That provision clearly reserves such power for the Court and this matter constitutes sufficient good reason to risk upsetting whatever reliance may have been based upon the Court's prior conclusions.

My recommendation draws additional support from my reading of the record of the prior hearings in this case. I believe that the "omission" of a significant amount of factually supportable claims clearly occurred in the earlier proceedings. Although the United States lawyers at the earlier trial presented substantial claims for the Tribes, these claims fell short of the maximum possible claims under the standards required by the prior Master. In a paternalistic sense the result obtained by the United States might seem fair because the Tribes received much-needed water rights. But the trustee's duty is not to decide what is *fair*, his

duty is to present the *best* case for his Indian wards. An objective view of the facts reveals that actual fairness was not achieved in the sense that under the legal standards applied in this case the Tribes would have received more if the United States as trustee had dedicated its efforts to maximizing the Tribes' welfare.[57]

The indications of this occurrence can readily be located in the transcript of the prior proceedings.[58] Using a few examples, an expert engineering witness for the United States during the earlier proceeding revealed during cross-examination that the United States had mistakenly failed to include all irrigable land in its claims.[59] This witness also offered various

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57. United States counsel represented that he was presenting claims that were "fair" to the Indians and "fair" to everyone else. Pr. Tr. 12471. As trustee the United States was obligated to assert maximum claims, not merely claims that it believed were "fair." This duty was recognized by counsel later. Pr. Tr. 12564. But the inference remains that the United States was too concerned about fairness to the other parties.

58. *See, e.g.*, Pr. Tr. 14113-19, 14150-57.

59. Pr. Tr. 14151-53. One might argue that irrigable is not necessarily the same as practicably irrigable. The initial line of questioning began with the suggestion that irrigable meant arable on the basis of soil classification. Pr. Tr. 14150. But the context of the testimony forecloses such an argument. The witness would never have described his failure to include those lands as a factual mistake if he was not using the word irrigable to mean lands that were practicably irrigable, in the sense that the then-claimed lands were practicably irrigable. *Id.* Moreover, both the examiner and witness stated later that they used the word irrigable to mean feasible to irrigate. *See* Pr. Tr. 14152-53, 14214. This discussion was premised upon the extent that the United States accounted for economic feasibility in its claims, *see* Pr. Tr. 14119-25. Thus it would have been nonsensical for the witness to have used the word irrigable without regard to practicability. The witness, thus, must have meant "practicably irrigable" when he used the word "irrigable."

In order to present all the facts, I must state that this witness later testified that he did not make a "mistake." This retraction occurred only after the Master and the United States counsel redefined "practicably irrigable" to mean land served by existing or then-proposed irrigation

unpersuasive reasons for limiting the claims.[60] In addition, the basic methodology of those experts seems flawed. The United States engineers mapped certain tracts of land for irrigation projects which they generally considered to be clearly economically feasible and then the soils expert classified such land within the mapped boundaries.[61] This order of inquiry and loose analysis of general economic feasibility was obviously not designed to discover the maximum extent of the practicably irrigable acreage on the Reservations.[62] Some of these same lands, I believe, are lands for which the United States now claims water rights.[63]

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systems. This second definition constituted more of a legal limitation of claims rather than a factual test. In this light, the witness might consistently state that in that sense he did not make a mistake and still claim that irrigable land was excluded from the claims. Pr. Tr. 14152-64.

60. Pr. Tr. 14113-19, 14150-51.

61. *See* Pr. Tr. 14119-57, 14264-66A.

62. For example, when pressed about the economic feasibility of his project design, the United States witness replied that he only considered such things as "appear[ed] reasonable" and that most of the designs he presented were "entirely feasible at very rigid economic feasibility." Pr. Tr. 14122. This investigation was not designed to produce the maximum claims because the experts were not attempting to determine whether the marginal returns equalled the marginal costs. Rather they designed irrigation systems that they felt were clearly economically feasible. "[I]t was not limited. We did not have occasion to investigate the limits of it because they are all entirely within practices of economics." *Id.* Obviously, unless such an inquiry is pressed to a close marginal analysis, the maximum feasible claim has not been determined.

63. The mesa lands on Fort Mojave which the witness said he mistakenly omitted most probably lie in the present Calada Unit. *See id.* at 14151-52. A large amount of land along the Arizona side of the River on the Colorado River Indian Reservation was also noted to be susceptible to farming but was omitted primarily because of the "recreational possibilities of the area." The witness also mentioned that he thought the area would serve as a buffer zone for the irrigation unit to the east of the levee in case of flood. He concluded by stating that it is "possible that some of that should be irrigated too." Pr. Tr. 14113-14. These reasons appear rather weak in light of the purposes of this inquiry. This area

The State Parties initially characterized the United States' failure to claim water rights for the omitted lands as a "reasoned tactical decision."[64] They did not reveal what legitimate tactical basis would have supported a decision by the United States as trustee to fail to press water rights claims for the omitted lands. The United States replies that it finds it impossible to determine the reason for the limitation of its claims in the prior proceeding.[65] The precise reason for this failure may be unknown but the failure to claim such lands is clear.

The State Parties later offered the explanation that these claims were not pressed because the United States believed the land was not practicably irrigable.[66] This theory is belied by several factors. First, the United States' own witnesses indicated at the hearings that irrigable land was mistakenly excluded from the claim. Second, the method utilized by the engineers and soils experts was not designed to discover a maximum claim. Most important, the State Parties' concession that the majority of the omitted lands claimed now by the United States is practicably irrigable tends to show that water rights for the land were omitted for some reason other than a belief that the land did not meet the standards used in the case. If such amount of those lands is so clearly practicably irrigable as to provoke such a concession from an adversary, a trustee such as the United States would certainly reach the

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consists of several thousand acres for which the United States presented a claim in the present proceedings. *See* U.S. Exh. 42, map of Colorado River Indian Reservation. *See also* Pr. U.S. Exhs. 560, 562.

64. Memorandum of Metropolitan Water District 20 (Jan. 1981).

65. United States' Closing Post-Trial Brief 11-13 (June 1981).

66. State Parties' Post-Trial Closing Brief 64 (June 1981), Arizona Supplemental Res Judicata Brief 9 (May 1981).

same conclusion if the proposition were fairly studied. The record does not support the State Parties' assertion that the United States originally found the lands to be non-irrigable.

I cannot imagine any legitimate reason, from the perspective of the Tribes, that would cause the United States to present less than the maximum claims which may be made in good faith on behalf of the Tribes. The State Parties' statement regarding tactical decisions approaches an admission on their part that the United States openly failed to carry out its trust responsibility. For some reason, the United States openly failed to present evidence of the maximum claims for the Tribes as measured by the standard called for by the prior Master.[67]

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67. The reason for the inadequacy of representation seems unimportant and perhaps unknowable. Everyone recognizes that in this case as in many others the United States represents interests which conflict with its Indian wards. There was, however, no direct evidence that such a conflict influenced the litigation strategy of the United States, largely because the United States successfully invoked claims of privilege at the relevant points during the hearings. Perhaps the closest explanation lies in the United States' support, in the earlier proceedings, for an open-ended decree which allowed for relitigation of additional Indian water rights. *See, e.g.*, Pr. Tr. 12451-69-A. *See also* United States v. Ahtanum Irrig. Dist., 236 F.2d 321 (9th Cir. 1956), *cert. denied*, 352 U.S. 988 (1957); Conrad Investment Co. v. United States, 161 F. 829 (9th Cir. 1908); Motion of the United States for Modification of Decree and Supporting Memorandum 28-29 (Dec. 1978). The United States recognized the conflict between a final adjudication and complete protection of the Tribes' rights. Pr. Tr. 12466-67, 12469. Perhaps the claims were for some reason prepared with the view that the Court would expressly leave its decree open-ended with respect to the Indians' water rights. Such an assumption, of course, would have been unwarranted and at odds with the representations of United States counsel to the prior Master. But such an explanation has the merit of explaining former counsel's suggestion that if some irrigable lands were omitted the United States would later file leave to amend. Pr. Tr. 14156.

Such a modification may have been within the expectation of the prior Master. The State Parties have placed special emphasis on his inclination to fix finally the Indians' water rights and his statements that he considered the United States bound on its claims brought for the Indians. But the inescapable fact is that he wrote a broadly-phrased Article IX which was adopted by the Court. The context in which he wrote it is important. In any interstate water case there will be strong need for the retention of this sort of power for many reasons. The Master was specially put on notice that the United States might have been understating the Indians' rights.[68] Of course, the Master pressed the United States counsel, because it was in all parties' interest to get the Indians' rights fixed as near the permanent level as possible. But in view of the likelihood of an error or omission by the United States, the former Master might have viewed a modification of the Indians' rights as one of the amendments which might be necessary in the future. For this reason among others, he may have desired that Article IX be included in the decree to protect the Indians' rights if an error was made in those proceedings.

The present request for modification does not, in my view, come too late. Obviously the decree must be considered closed on these matters at some time. But in the context of this case the present motions occurred at a reasonable time. Only recently did the Court upon joint motion of the State Parties and United States enter its decree listing the present perfected rights in the lower Colorado River Basin. According to the 1964 Decree this process was to have been finished by 1966. Yet this important step, with-

68. Pr. Tr. 12469, 12559-60, 14119-57.

out which there doubtless was great uncertainty, did not occur until 1979, almost fifteen years after the entry of the initial decree. The present motions for modification antedate the 1979 Decree because in 1977 three Tribes raised this "omitted lands" issue in their motion to intervene.[69] Shortly thereafter in 1978 the two other Tribes filed a similar motion as did the United States.[70] Even though these motions occurred years after the initial decree they were not tardy when viewed in the context of a case that has progressed slowly since the filing of the complaint nearly thirty years ago. Although the case had reached a point where the allocation of water rights was relatively stable they were not irrevocably fixed when the present motions occurred, and thus those motions were not tardy.

I recommend that the Court exercise its power under Article IX and reach the merits of the "omitted lands" claim.[71] The importance of this litigation to the State Parties, although impressive, does not outweigh the sense that the Court should correct an unjust result. The State Parties' reliance does not alter my conclusion. All parties knew that Article IX might be uti-

69. Motion for Leave to Intervene as Indispensable Parties by the Fort Mojave Tribe, the Chemehuevi Tribe and the Quechan Tribe. (Dec. 1977).

70. Motion of Colorado River Indian Tribes and the Cocopah Indian Tribe for Leave to Intervene (Apr. 1978); Motion of the United States for Modification of Decree (Dec. 1978).

71. This conclusion makes unnecessary any consideration of the arguments raised by the Tribes that due process prevents preclusion of them because they were represented in the prior proceedings by a party not in privity with their interests. *See* Hansberry v. Lee, 311 U.S. 32, 41 (1940); United States v. Truckee-Carson Irrigation Dist., 649 F.2d 1286 (9th Cir. 1981). Undoubtedly some of the same considerations as discussed in text would apply to such an inquiry, but I believe my recommendation should presently rest on the narrower ground of Article IX of the 1964 Decree.

lized to modify the prior decree. Although the present claims are not so "insignificant" as the United States contends,[72] they do appear to be relatively minor adjustments of the kind which might legitimately be expected in the aftermath of a much larger original case. Similarly the timing of the claims can best be understood in view of the long history of this mammoth case. In my view, fairness to the Tribes prevents the State Parties' absolute reliance upon a modifiable decree from foreclosing the omitted lands claims.

B. *Final Determination of Reservation Boundaries*

The 1964 Decree in paragraph II(D)(4) provided for the allocation of water for the benefit of the Colorado River Indian Reservation. Similarly, paragraph (5) provided for the allocation for the Fort Mojave Indian Reservation. The last clause of paragraph (5) contained the following language:

> provided that the quantities fixed in this paragraph and paragraph (4) shall be subject to appropriate adjustment by agreement or decree of this Court in the event that the boundaries of the respective reservations are finally determined.

376 U.S. at 345. The 1979 Decree specified that the latter provision is unaffected by the Court's determination of present perfected rights. 439 U.S. at 421. In addition, the 1979 Decree contained the following language similar to paragraph II(D)(5):

> the quantities fixed in paragraphs (1) through (5) of Art. II(D) of [the 1964] Decree shall con-

72. *See, e.g.*, United States' Opening Post-Trial Brief 23 (May 1981).

> tinue to be subject to appropriate adjustment by agreement or decree of this Court in the event that the boundaries of the respective reservations are finally determined.

Id. Now, not only the Fort Mojave and Colorado River, but the other three Tribes as well, and the United States on behalf of all of them, seek an adjustment providing additional present perfected rights. They contend that boundary line changes since 1964 have increased the practicably irrigable acreage of the Reservations. The Tribes and the United States rely on the present boundaries as fixed by orders of the Secretary of the Interior, certain court decisions and an act of Congress as satisfying the condition that the water rights may be adjusted "in the event that the boundaries of the respective reservations are finally determined."

All the parties agree that the Court should now determine any additional present perfected rights. Although the 1964 Decree acknowledged and expressly provided for boundary disputes only with respect to the Fort Mojave and Colorado River Indian Reservations, the additional proviso of the 1979 Decree, issued after the Court was apprised of boundary disputes concerning the other Reservations, indicates that the amounts determined for all five Reservations "shall continue" to be subject to adjustment. Thus, adjustments for boundary determinations affecting any of the Reservations were explicitly provided for in the 1979 Decree and impliedly contemplated in the 1964 Decree "in the event that the boundaries of the respective reservations are finally determined."[73]

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73. In any event, Article IX, even most narrowly construed, would recognize the propriety of entertaining claims as to the Chemehuevi, Fort

The State Parties concede that when the boundary lines have been finally determined, the Court should allot the water rights in proportion to the practicably irrigable acreage of additional boundary lands, and urge that the Court should now consider such an allotment.[74] They contend, however, that the boundaries have not been finally determined and that I should make a de novo determination of the boundaries for recommendation to the Court. The issue, then, is whether the Secretarial orders, court judgments, and Act of Congress relied on by the Tribes and the United States are the sort of final determinations contemplated by the Court's Decrees.

The parties are not in disagreement over the land areas involved in the boundary determinations at issue. They are here outlined as presented by the motion of the United States,[75] and not disputed by the State Parties or by the Indian Tribes.

1. *Fort Mojave Indian Reservation*

Two boundary adjustments affect this Reservation: (1) the restoration of that portion of the so-called Hay and Wood Reserve west of the Blout survey of 1928; and (2) the adjudication of a tract, formerly claimed

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Yuma, and Cocopah Reservations paralleling those that can be raised as to the Fort Mojave and Colorado River Reservations under Article II(D)(5). *See* Wisconsin v. Illinois, 388 U.S. 426 (1967), *modifying* 281 U.S. 696 (1930); New Jersey v. New York, 347 U.S. 995 (1954), *modifying* 283 U.S. 805 (1931). *Cf.* Winters v. United States, 207 U.S. 564 (1908).

74. Response of the States of Arizona, California, and Nevada, and Other California Defendants to the Motion of the United States for Modification of Decree 20-25 (Feb. 1979).

75. Motion of the United States for Modification of Decree and Supporting Memorandum 17-23 (Dec. 1978).

by the LaFollettes, as properly part of the Reservation.

(a) *The Hay and Wood Reserve*

The Hay and Wood Reserve — once attached to the Camp Mojave Military Reservation for supplies of hay and wood and transferred by Executive Order with the camp in 1890 to the Department of the Interior for the benefit of the Tribe — constitutes approximately 9114.81 acres of a central portion of the Fort Mojave Indian Reservation. The Executive Order described by courses and distances such an area that straddled the Colorado River. Contrary to the description by courses and distances, a surveyor, Sidney Blout, determined under the direction of the General Land Office that the western boundary of this parcel lay further to the east than the description would allow. The correctness of that survey which eliminated several thousand acres from the Reservation was long disputed within the Interior Department. The United States in the original proceedings in this case claimed that the description by courses and distances in the Executive Order determined the Reservation boundary. The Master made findings and conclusions of law accepting the Blout survey as determinative but the Court disapproved the Master's effort to determine disputed Reservation boundaries, 373 U.S. at 601, and the question remained open. As a result the Court decreed water rights only for the portion of this parcel that was undisputedly within the Reservation as surveyed by Blout. On June 3, 1974, the Secretary of the Interior, acting on the advice of the Solicitor of Interior, resolved the internal dispute within the Interior Department by declaring null and void the 1928 Gen-

eral Land Office survey by Blout and restoring the former boundary for the Hay and Wood Reserve a little more than a mile westward. A new plat was prepared reflecting the order; it was protested by alleged patentees of land in the disputed area; these objections were overruled and the final plat was approved and filed on November 6, 1978. This plat added to the Reservation some 3,500 acres not treated as part of the Fort Mojave Reservation when the water allocations were decreed in 1964. The United States alleges that this tract contains approximately 2,000 practicably irrigable acres.[76]

(b) *The LaFollette Tract*

This tract is on the west side of the Fort Mojave Reservation, south of the Hay and Wood Reserve and east of the River. Here the Tribe obtained a stipulated judgment in is favor against the assignees of a railroad patent grant, which had the effect of adding most of a section to the Reservation.[77] The United States alleges that this judgment placed approximately 500 additional irrigable acres within the adjusted Reservation boundary.[78] The Fort Mojave Tribe also claims water rights for some additional boundary lands in this area.[79]

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76. U.S. Exh. 42, Table 7.

77. Fort Mojave Tribe v. LaFollette, Civ. No. 69-324MR (D. Ariz. Feb. 7, 1977).

78. U.S. Exh. 42, Table 7.

79. F.M. Exh. 2, plate no. 1; F.M. Supp. Exh. (Sept. 1981), record item no. 192; Letter from Thomas W. Fredericks (Nov. 10, 1981), record item no. 202.

2. *Chemehuevi Indian Reservation*

The boundary change at this Reservation adds some 2,430 acres along Lake Havasu. These lands were restored to the Chemehuevi Indian Reservation by Secretarial Order of August 15, 1974, the result of a determination that part of the land taken from the Reservation for the construction of Parker Dam was not needed. Although the United States once alleged that the restored land contained 150 practicably irrigable acres, neither the United States nor the Tribe presently makes a claim of irrigability for any boundary lands.[80] Thus, I will consider their claims as dealing with only omitted lands.[81]

3. *Colorado River Indian Reservation*

There are two boundary adjustments affecting this Reservation. The first is the so-called "Benson Line" area; the other lies along the northwest boundary.

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80. U.S. Exh. 42 at Table 9; CH. Supp. Exh. (Sept. 1981), record item no. 184.

81. The exhibits tendered in the proceedings before the prior Master show some of the acreage presently claimed as omitted land to be labelled "Reclamation Withdrawn Area to be Restored." Pr. U.S. Exh. 1207. I have received no information indicating that the area so described to any extent coincides with the area restored by the 1974 Secretarial Order.

The State Parties once claimed that the restored acres, having been transferred from the trust for the Indians, retained no reserved water rights upon the reconveyance to the trust. Memorandum of the Urban Agencies re the Indian Reservation Boundary Question 10 (Apr. 1979). In light of Pr. U.S. Exh. 1207, this argument, to the extent it has any bearing on the present case, appears equally applicable to the omitted lands claim made presently as well as to any other restored lands denoted as boundary lands. The State Parties, however, have not pursued this argument and, in any event, it seems foreclosed by the Court's award of water rights to a large amount of such restored land in the 1964 Decree. *See id.*

(a) *The Benson Line*

At the time of the original hearings before the prior Master, doubt existed whether the central western boundary was the mobile west bank of the Colorado River or a line meandered by W.F. Benson in 1879, now well into the California side of the river. The Master undertook to resolve the question also, but the Court disapproved his attempt to fix the the boundary, and the matter was left open. Subsequently, on January 17, 1969, the Secretary of the Interior formally adopted the Benson Line as the western boundary of the Reservation along the entire segment covered by the Benson survey. The United States subsequently obtained final judgments in title disputes with private parties in the United States District Court for the Central District of California,[82] partially stipulated, quieting its title as trustee for the Tribes to separate parcels within this additional area. This Secretarial Order added some 4,400 acres to the Reservation.

(b) *The Northwest Boundary*

During the investigation of the Benson Line problem, the Secretary discovered what he considered to be another surveying error. As a result of this discovery, the Secretary directed that the old survey be suspended, and he approved a corrected plat on December 18, 1978. This new plat moved one end of the northwest boundary to a point westward and added approximately 450 acres to the Reservation from public lands of the United States.

82. The opinions are unpublished.

The United States claims that approximately 3,500 acres of boundary land on this Reservation are practicably irrigable.[83]

4. *Fort Yuma Indian Reservation*

By order of December 20, 1978, the Secretary of the Interior upheld a long-standing claim by the Quechan Tribe of Fort Yuma which had previously lost the same dispute before the Solicitor of the Interior Department. This order resulted from a subsequent argument to the Solicitor who then (1978) issued an opinion in favor of the Tribe. The order determined that the original boundaries of this Reservation as established in 1884 are the true boundaries.[84] At the time of the original proceedings in this case, the boundaries were considered to contain only the area allotted by trust patents to members of the Tribe. The Solicitor's Opinion notes that some 25,000 acres are affected by his ruling. The opinion and order are, however, subject to a number of third party interests acquired prior to the recent rulings. The United States claims approximately 5,800 acres of irrigable boundary lands within this Reservation.[85] The Quechan Tribe claims that several thousand additional acres of boundary land are irrigable.[86]

5. *Cocopah Indian Reservation*

The boundary of the West Cocopah Reservation has been adjusted by two occurrences since the 1964

83. U.S. Exh. 42, Table 8.

84. Quechan Indian Reservation Boundaries, Secretarial Determination and Directives, 46 Fed. Reg. 11372.

85. U.S. Exh. 42, Table 10.

86. F.Y. Supp. Exh. (Nov. 1981), record item no. 199.

Decree which have affected separate portions of the Reservation: (1) an area of accretion to the west of the old boundary; and (2) a tract added by an act of Congress to the south of the accreted lands.

(a) Substantial lands accreted to the western side of the Reservation because of the gradual western movement of the Colorado River. The government relies on a final judgment entered May 12, 1975, for its claim that 883.53 acres have thus been recognized to be a part of the Reservation.[87]

(b) By Act of June 24, 1974, 88 Stat. 266, Congress extended the boundaries of the West Cocopah Reservation.

The United States contends that there is a total of 1,161 acres of practicably irrigable boundary lands in the Cocopah Reservation.[88]

There is no dispute as to the total number of acres of land that would be added to the several Reservations if the boundaries, outlined above, are accepted as finally determined for the purposes of the motion to adjust the Court's Decree.

I conclude that the determinations that have been made with respect to the stated boundary changes may be accepted as final for the purpose of considering additional allocations of water rights to the Reservations. This conclusion is limited to that specific purpose. I make no findings with respect to titles to the land involved, either as to private claimants or as to any other contestant over the correctness of the boundary lines. Nor do I consider that the acts of the Secretary or of the courts in private litigation are *res judicata* of

87. Cocopah Tribe of Indians v. Morton, No. Civ-70-573-PHX-WEC (D. Ariz. May 12, 1975).

88. U.S. Exh. 42, Table 9.

the boundaries as to litigants who were not parties to such proceedings. I consider only whether the acts of the Secretary and the acts of the courts in private litigation accepted by the Secretary fall within the sphere of finality to permit the parties to act on them until some interested party succeeds by a plenary action in vacating or setting aside such determinations. For present purposes, I believe that these acts provide the sort of finality contemplated by the Court when it left the boundary disputes concerning the Reservations for later determination.

At the outset, it is important to bear in mind the role which the boundary determinations play in this case. This is a water rights case, not a land case. The acreage of the Reservations is an issue because practicably irrigable acreage is made the measure of the Reservations' water rights. In *Winters v. United States*, 207 U.S. 564 (1908), the Court established that the United States, when it creates an Indian reservation, impliedly reserves water for needs of the reservation, and that water rights established subsequent to those of the reservation give way to those of the reservation as its needs expand. The Court applied the *Winters* doctrine in its original opinion in this case, holding that at the time it created the five Reservations at issue here, the United States reserved enough water "to satisfy the future as well as the present needs of the Indian Reservations." 373 U.S. at 600. The Court concluded, agreeing with the Master, "that the only feasible and fair way by which reserved water for the reservations can be measured is irrigable acreage." *Id.* at 601. The Master's choice of irrigable acreage as a measure was based on the conclusion that it provided an estimate of the amount eventually needed to make the otherwise arid lands productive. The Indians' actual

use of the water remains unrestricted. Practicably irrigable acreage, then, is a rough measuring stick, a tool toward an informed equitable estimate of the Indians' needs, both present and future. To use this measuring device, in turn, it is necessary to know the extent of the Reservations, and to measure the latter, the boundaries. The boundaries are a reference point for an issue itself secondary to the central concern of this case, water rights.

The model of the previous treatment of the boundary determinations by the Court itself much weakens the contention of the State Parties. They say that I should now receive de novo evidence of the correct boundary lines and the claims of private individuals for a recommendation to the Court so that it would make a determination of the correct boundaries in this litigation. In the original litigation of this case, the Master received evidence touching on the boundaries of two of the Reservations drawn in question before him. Upon its later adoption of most of his report, the Court disapproved of his attempt to adjudicate the boundary lines. The Court said:

> We disagree with the Master's decision to determine the disputed boundaries of the Colorado River Indian Reservation and the Fort Mohave Indian Reservation. We hold that it is unnecessary to resolve those disputes here. Should a dispute over title arise because of some future refusal by the Secretary to deliver water to either area, then the dispute can be settled at that time.

373 U.S. at 601. Rather than resolve the boundary dispute then and there, the Court provided for an adjustment in water rights "in the event that the boundaries . . . are finally determined." 376 U.S. at 345. Except

for the boundary disputes mentioned in the Court's opinion, all parties in the original litigation were dealing with boundaries set either by acts of Congress or by executive order. Whatever challenge might have been raised to these, no State Party contested the right of the Court to accept as final and binding *for the purpose of that litigation* such established boundaries. These were all deemed to be final for the purpose of the water allotments then presented to the Court.

The treatment of the boundary disputes suggests an intention similarly to adopt by reference determinations of the disputed boundaries. That it was "unnecessary" to determine those disputes "here" indicates that it was adequate to do so elsewhere. And rather than making some specific provision for the determination of the boundary disputes, *cf. Oklahoma v. Texas,* 256 U.S. 602, 605-07 (1921), the Court merely left its decree open to adjustment "in the event" the disputes were resolved. This conditional language belies any intent to settle the disputes. The language the Court used with respect to a potential dispute, while it concedes the possibility that the Court might be required to settle title disputes, seems clearly to indicate that any dispute with respect to secretarial action would be instituted by a party which was refused water, in other words, a party claiming title to the land, not one seeking a collateral determination of title.[89] It is evident that the Court, in the sparing exer-

89. This reference to the Secretary's "refusal" to deliver water to the disputed areas appears to have contemplated that the Secretary would have discretion to determine whether water should be delivered to the disputed lands. Such discretion is inconsistent with the ultimate decree, which based rights for the Reservations on irrigable acres without involving the disputed lands and enjoined the Secretary from delivering water

cise of its original jurisdiction, contemplated that the boundaries of the Reservations would be determined elsewhere, and such determination relied on for the purpose of allocating water rights.

This conclusion appears particularly appropriate in light of the nature of the dispute in the earlier proceedings. Generally speaking, those disputes concerned conflicting positions within the Interior Department or ambiguities in the description of boundaries. A significant amount of relevant executive action has transpired in the interim.

The various Secretarial Orders have defined the ambiguities or removed the inconsistencies which earlier caused uncertainty. I see no need to further question the boundary determinations in this case. There is really no doubt regarding where the government presently draws the boundary lines between the parcels of public land in question. The disputes presented to the prior Master and the Court no longer exist.

The Court in 1963 rebuffed the earlier Master's attempt to choose from among the various interpretations of the executive department regarding these boundaries. There is no reason to believe that the Court would be more receptive to a present Master's attempt at adjudication of the boundaries. In fact there is good reason to believe that such a course would be more ill-advised today than over twenty

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except in accordance with these provisions. Instead the Decree provided for an adjustment by agreement or decree.

While awarding the Secretary discretion to deliver additional water to the disputed areas would affirm the conclusion that boundary determinations by the Secretary should be accepted as final, limiting that discretion to instances where there is agreement among the parties does not affect the conclusion that the Court preferred that the boundaries of the Reservations be settled elsewhere.

years ago. The Secretary of the Interior has now made definitive executive interpretations which sweep aside inconsistencies and ambiguities. The Secretary has overruled Interior Department actions that were contrary to his determination. If this action had occurred earlier it, to a large extent, would have removed any choice that the prior Master may have had regarding the proper boundaries.

Even if the course of the proceedings in this case did not indicate such a result, the normal treatment of similar situations reveals that secretarial orders resolving those problems are appropriate determinations for adoption by reference in this litigation as a measuring stick for determining additional irrigable acreage. In large part we are concerned with actions by the Secretary of Interior[90] concerning lines surveyed between the public lands of the United States and Indian reservations whose concern is a matter of the highest priority to the United States. The United States, in the exercise of its plenary power to regulate Indian affairs,[91] may establish Indian reservations by executive order. *Arizona v. California*, 373 U.S. 546, 598 (1963).[92] The Secretary and the Interior Department by surveys and other means undoubtedly may determine or correct boundary lines in public lands. *See* 43 U.S.C. §§ 1, 2, 751, 752, 772 (1976). *See also* 25 U.S.C. § 176 (1976). Once determined the boundaries fixed by these

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90. No contention is raised that the Act of Congress, 88 Stat. 266 (1974), extending the boundary of the Cocopah Reservation, is subject to redetermination.

91. *See, e.g.*, McClanahan v. Arizona State Tax Comm'n, 411 U.S. 164, 168-69 (1973); United States v. Kagama, 118 U.S. 375, 381-82 (1886).

92. In its 1963 Opinion, the Court counted the creation of the Chemehuevi Indian Reservation by the Secretary of the Interior as the creation of a reservation by Executive Order. 373 U.S. at 596 n.100.

surveys are conclusive in collateral proceedings, because the matter rests within the jurisdiction of the executive branch. *Borax Consolidated Ltd. v. City of Los Angeles,* 296 U.S. 10, 16-17 (1935); *Stoneroad v. Stoneroad,* 158 U.S. 240, 250-52 (1895); *Knight v. United States Land Association,* 142 U.S. 161, 176-78 (1891); *Cragin v. Powell,* 128 U.S. 691, 698-99 (1888). In fact, the Court explained that its rationale, for the conclusive effect given to the Interior Department's survey, was to eliminate the necessity for a landholder to litigate "in every action at law between itself and its neighbors . . . the question of the accuracy of the survey." *Russell v. Maxwell Land Grant Co.,* 158 U.S. 253, 256 (1895).

> And in the nature of things a survey made by the government must be held conclusive against any collateral attack in controversies between individuals. There must be some tribunal to which final jurisdiction is given in respect to the matter of surveys, and no other tribunal is so competent to deal with the matter as the Land Department. None other is named in the statutes. If in every controversy between neighbors the accuracy of a survey made by the government were open to question, interminable confusion would ensue.

Id. at 258. If the Bureau of Land Management, or its predecessor the General Land Office, 1946 Reorg. Plan No. 3, § 403, 11 Fed. Reg. 7876, *reprinted in,* 43 U.S.C.A. § 1 note (1964), prepared a survey which the courts must regard as conclusive, a dissatisfied litigant might still appeal to the Secretary of the Interior, as has happened in this case. *Stoneroad v. Stoneroad,* 158 U.S. 240, 253 (1895); *Knight v. United States Land Association,* 142 U.S. 161, 177-78 (1891); *Snyder*

v. Sickles, 98 U.S. 203, 210-12 (1878); *Wasserman v. Udall*, 234 F. Supp. 651, 654 (D.D.C. 1964). *See also Boesche v. Udall*, 373 U.S. 472, 483 (1963). The Secretary and Interior Department may even resurvey and redetermine the boundaries. *See Lane v. Darlington*, 249 U.S. 331, 333-34 (1919); 43 U.S.C. § 771, 772 (1976). In general, these are precisely the sorts of determinations and proceedings which have occurred within the Interior Department in this case.

Under these principles the Secretarial Orders now in effect determine the boundaries for purposes of this case. The State Parties contend that the Interior Department's power to make a "land survey is far different from resolving a complex boundary dispute involving questions of law and fact."[93] But such a statement ignores the nature of the dispute, if any. As the parties have argued the case the boundaries in question separate parcels of federal public land. The purpose of the boundaries is to designate the extent of land within the several Indian Reservations as created by the federal government.[94] The Secretary of the Interior whose duty it is to determine the boundaries of Indian land may issue orders which, while not reapportioning land

93. Response of State Parties to the Motion of the United States for Modification of Decree 15 (Feb. 1979).

94. There have been frequent assertions in this case that the presently-questioned boundaries divide only parcels of federal public land. *See generally* Transcript of Oral Argument in Supreme Court, *Arizona v. California* 62 (Oct. 10, 1978); Motion of the United States for Modification of Decree and Supporting Memorandum 13 (Dec. 1978); Special Master's Memorandum and Report On Preliminary Issues 39-40 (Aug. 28, 1979). The State Parties have not questioned these assertions in any manner that would clearly put such an issue in contest. *See* Response of State Parties to the Motion of the United States for Modification of Decree 11-25 (Feb. 1979); Motion of State Parties for Leave to File Exceptions to Memorandum and Report of Special Master; Exceptions; and Opening Brief 29-30 (Nov. 1979).

with respect to either federally-owned parcel, do establish conclusively what has always been the actual boundary. 25 U.S.C. § 176 (1976); *Pueblo of Taos v. Andrus*, 475 F. Supp. 359, 367 n.7 (D.D.C. 1979). *Cf. French v. United States*, 49 Ct. Cl. 337, 346-47 (1914) (Interior Department surveys conclusively determine boundaries of Indian reservations when such a question is collaterally in issue at trial). *See also* 42 Op. Att'y Gen. 441, 452-53 (1972).

The State Parties asserted only that a present review of the Secretarial Orders by a Master and the Court would prove them to be invalid or incorrect because the Secretary was wrong in his determinations.[95] Although the federal government, through properly issued Secretarial Orders,[96] may concede, for all purposes, that the lands are held in trust for the Tribes, rather than held in some other federal capacity, the State Parties ask the Court to order the federal government to draw its boundary to exclude these lands, at least for the purpose of water rights. Such a conclusion seems patently unreasonable. Under these circumstances, the Secretarial Orders and the surveys which conform thereto, should be taken as legally operative authority determining the boundaries between the Reservations and other federal public land. Because the issue of boundaries arises as a collateral matter in this lawsuit the boundaries drawn by the Interior Department should be accepted as conclusively showing

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95. Response of State Parties to Motion of the United States for Modification of Decree 13 (Feb. 1979) (invalidity); Memorandum of the Urban Agencies re the Indian Reservation Boundary Question 5-10 (Apr. 1979) (correctness). *See* Transcript of Formal Hearing in San Francisco, Arizona v. California 80, 91-103 (Apr. 17, 1979).

96. Transcript of Formal Hearing in San Francisco, Arizona v. California 80, 93 (Apr. 17, 1979).

that fact at this time.[97] Under these principles, there was no issue for trial when there was no dispute over the acreage covered by the Secretarial Orders.[98]

The State Parties are not necessarily foreclosed from challenging these orders. Rather the questions raised by the State Parties appear more properly raised in a direct proceeding. *See Cragin v. Powell*, 128 U.S. 691, 699 (1888); *Steel v. Smelting Co.*, 106 U.S. 447, 453-55 (1882). Such a conclusion is also suggested by the type of review the State Parties sought of the

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97. There is authority which indicates that Interior Department action such as surveys cannot limit an Indian reservation to a smaller area than originally set aside for the Indians. *See* Northern Pac. Ry. v. United States, 227 U.S. 335, 366-67 (1913); Sekaquaptewa v. MacDonald, 626 F.2d 113, 118 (9th Cir. 1980); United States v. Romaine, 255 F. 253, 260 (9th Cir. 1919). Perhaps such a reason motivated the Court to reject the prior Master's findings that land department surveys and other Interior Department action limited permanently the extent of the Reservations' water rights. *See* SPECIAL MASTER'S REPORT at 274-78, 283-87. The Tribes do not now allege that any lands in the particular areas are erroneously excluded from the Reservations by the Secretarial Orders.

98. Similarly, I conclude that the two court decisions affecting respectively the Cocopah and Fort Mojave Reservations should be treated as final for present purposes. Certainly the Interior Department accepts those boundaries as affected by the decrees. Any challenge by the State Parties to these boundaries should proceed in a manner similar to the contests regarding the other boundaries. The most complete articulation of the State Parties' opposition on this issue was that they should be "free to adjudicate the proper boundaries in a separate action to establish water rights which depend, in part, on the true reservation boundaries." Motion of the State Parties for Leave to File Exceptions to the Memorandum and Report of the Special Master; Exceptions; and Opening Brief 25 (Nov. 1979). Given that such an expression is as far as I understand their argument to extend, the State Parties' failure to propose any persons with a colorable claim to the land makes it appear that if those decisions are not final by now the United States and the Tribes might need to wait indefinitely for a claimant who is not precluded to appear. The alternative of relitigation over the "true boundaries" with the State Parties opposing the Tribes makes little sense, absent further explanation, when those persons with a colorable claim have surrendered.

Secretarial Orders in this action where the question was raised collaterally.[99] Perhaps the State Parties are correct in arguing that the Interior Department's action constitutes agency action creating a legal wrong for which they are entitled to judicial review under the Administrative Procedure Act, 5 U.S.C. § 702 (1976). The appropriate standard of review[100] and the question of the appropriate time-bar[101] were questions not resolved here. But it would appear that for such action to be undertaken in the original jurisdiction of the Supreme Court would be highly unusual.

Moreover, the present inquiry regards water rights only. The actions upon which the boundary lands claims rest should be challenged in a direct action where their validity or correctness may be tested for all purposes.[102] Absent such a direct challenge the boundaries stand determined by the various proceedings described in the United States' motion. If the boundaries are not accorded finality for purposes of this litigation, the Tribes might be required to wait in-

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99. *See* notes 95-96 *supra*.

100. The United States argued that the arbitrary and capricious standard would apply. Memorandum of the United States on Preliminary Issues 9 (Apr. 1979). The State Parties proposed no standard but would have accorded the orders far less deference. Transcript of Formal Hearing in San Francisco 80, 93 (Apr. 17, 1979).

101. Only upon the fulfillment of the water rights claims would the agency action affect the State Parties. *See* Nuclear Data, Inc. v. AEC, 344 F. Supp. 719, 727 (N.D. Ill. 1972).

102. The State Parties express concern regarding their standing to raise these issues elsewhere. *See* Motion of the State Parties for Leave to File Exceptions to the Memorandum and Report of the Special Master; Exceptions; and Opening Brief 33-35 (Nov. 1979). Those parties would appear to be injured by the agency action and thus have standing. The more doubtful proposition would appear to be their ability to establish that the federal government may not draw its boundaries as they have been drawn.

definitely, as one Secretarial Order has now stood unchallenged for over ten years.

The State Parties argue that such analysis would depart from the practice of the prior Master who took evidence on the issue of the boundaries.[103] Such an assertion ignores the prior Master's finding that a land department survey was conclusive and not subject to collateral attack when the issue of a reservation boundary is collaterally in issue.[104] The current Secretarial Orders will control his subordinates' actions. If all parties before the prior Master had admitted the existence of such orders delimiting a Reservation to a specified number of acres, his analysis would have made unnecessary the taking of evidence on the issue.

Neither the power of the Secretary or of the courts to make boundary determinations nor the Court's intent to have these determinations made by such decisionmakers, if possible, is diminished by the State Parties' contention that they did not have their "day in court" before these decisionmakers. I am aware of no claim to land in any of the disputed areas by any of the State Parties. Their interest lies only to the extent that if some other party — or they themselves as aggrieved persons or intervenors in proceedings elsewhere now pending or commenced — should successfully contest the boundaries as now fixed by Secretarial Order or the title to the land within these boundaries, the allotments of water now sought on behalf of the Tribes would be reduced. Title questions are different from those boundary issues discussed above. *See Borax Consolidated Ltd v. City of Los Angeles*, 296 U.S. 10, 16-21 (1935); *United States v. State*

103. *Id.* at 30.
104. SPECIAL MASTER'S REPORT at 283-87.

Investment Co., 264 U.S. 206 (1924). But the private contestants for title do not present a new problem to this case. This concern can be met by the inclusion in the final decree of the Court of a provision that would reduce the allotment now sought on behalf of the Tribes *pro tanto* for lands found to be practicably irrigable which subsequent litigation determines not to be Indian land. The Court previously adopted this method to provide for land associated with the Fort Mojave Reservation and determined to have been conveyed to California and to the Southern Pacific Railroad. *See* 376 U.S. at 345. This procedure, having once gained the Court's approval, provides a common sense solution to the problem of accounting for whatever land within the Interior Department's boundaries ultimately may be determined to belong to non-Indians.[105] Such a solution would additionally accommodate any future changes in the boundaries.

In sum, I agree with the position put forward by the United States that:

> It would be wholly arbitrary to consider the Reservation boundaries as they were understood in 1964 to be sufficiently "determined" to support a specific water allocation calculated on acreage — albeit no court judgment has ever vindicated the survey — but to deny comparable affect [sic] to subsequent dependent surveys of the boundaries because no court had approved them.[106]

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105. I note that some private litigation continues regarding these Reservations. *See, e.g.*, United States v. Aranson, No. 77-2295 (9th Cir. Mar. 30, 1981), *withdrawn* (Apr. 17, 1981).

106. Motion of the United States for Modification of Decree and Supporting Memorandum 13-14 (Dec. 1978).

I also agree with the State Parties that adjustments in tribal water rights should be considered now rather than await piecemeal litigation, so that some stability and predictability in the allocation of water rights can be reached.[107]

Subject, therefore, to a proviso which would reduce the allocations which I eventually recommend on account of the enlarged recognized boundaries on the basis of any valid court decisions withdrawing any lands from the Reservations as now defined, I shall accept the boundary changes set forth in the motion by the United States filed on December 22, 1978, as having been finally determined within the meaning of the Court's 1964 Decree and Supplemental 1979 Decree.

C. *Miscellaneous Boundary and Related Problems*

1. *Fort Mojave Reservation Boundaries*

(a) *United States Claims*

The United States claims for water rights on the Fort Mojave Reservation are met by the State Parties with the challenge that the United States has not demonstrated that substantial relevant acreage is within the Reservation boundaries. The State Parties'[108] engineer testified that several isolated parcels were neither in the boundaries recognized in the earlier proceeding[109] nor my order of August 28, 1979[110] and thus the United States had no basis for drawing

107. *See* Response of the State Parties to Motion of the United States for Modification of Decree 20-25 (Feb. 1979).

108. State Parties' Post-Trial Opening Brief 224-25 (May 1981).

109. *See generally* Pr. U.S. Exhs. 1317, 1318.

110. *See generally* Special Master's Memorandum and Report on Preliminary Issues (August 28, 1979).

the boundaries as depicted on the present exhibits.[111] The United States counters with the testimony of their expert who stated that he took the boundaries for his maps as given by the BIA.[112]

This state of the record does not present a sufficient basis for an award of water rights with respect to these disputed parcels. The United States has simply presented evidence that the Interior Department has not yet finally resolved these boundaries because the exhibits tendered by the United States in the earlier proceedings conflict with those presently tendered. No satisfactory explanation is offered for this discrepancy. The Court found that the prior Master's attempt at the resolution of such a conflict was "unnecessary" and I see no reason to follow a once disapproved course.

The United States claims may be discussed in two parts.

(i) *Intermediate Tract*

The first dispute centers on what is known as the Intermediate Tract of the Fort Mojave Reservation. It lies between the northerly portion of the Reservation known as the Old Post Reserve, which is almost a square figure, and the central portion known as the Hay and Wood Reserve, which is an irregularly-shaped rectangle. These three tracts, which were originally part of the old military reserve created in 1870, became an Indian Reservation in 1890 by executive order.[113] The Intermediate Tract lies:

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111. *See* Tr. 5255 *et. seq.*; S.P. Exh. 159.

112. Tr. 579-81.

113. Executive Order of March 30, 1870, General Order No. 19 of the War Department of August 4, 1870; Executive Order of September 19, 1890. *See* 2 EXECUTIVE ORDERS RELATING TO INDIAN RESERVATIONS: FROM

> between the military and the hay and wood reservations bounded on the west by the Colorado River and on the east by a line running from station No. 1 of the hay and wood reserve to station No. 1 of the military reserve.

The Associate Solicitor of the Interior Department has stated that: "This 'intermediate tract' clearly belongs to the tribe."[114] That statement seems indisputably correct but our present inquiry concerns the more murky question of the proper location of that tract's western boundary along "the Colorado River."

The dispute between the United States and the State Parties over this tract involves a puzzling set of facts. The United States in the hearings before the prior Master introduced into evidence maps purporting to show the Reservation boundaries as well as acreage claimed to be irrigable.[115] Remarkably, some of the acreage on the Intermediate Tract for which water rights were requested, as shown on the maps, lies outside the boundaries as shown on the same maps.[116] Although the State Parties objected to the United States' claims concerning the boundaries of other parts of the Reservation, the Intermediate Tract apparently suffered no similar attack and even those claimed areas outside the western boundary apparently received

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MAY 14, 1855 TO JULY 1, 1912 12 (1912) (hereinafter cited as Executive Orders). The 1890 order and accompanying papers apparently omitted mention of the Intermediate Tract although the two other parcels clearly became Indian land. This oversight was remedied in 1903 when the tract was recognized to be a part of the Indian Reservation. *Id.*

114. Memorandum, April 12, 1974, Associate Solicitor, Indian Affairs to Solicitor of the Department of the Interior, Boundary of the Fort Mojave Hay and Wood Reserve 6b n.1.

115. *See* Pr. U.S. Exhs. 1317, 1318.

116. *See id.*

water rights.[117] In the present proceedings the State Parties' expert testified that he could not determine the status of those then-claimed areas west of the boundary. as drawn on the map.[118] And the United States asserts that it cannot solve this riddle either.[119] The State Parties, however, do not claim that any acreage was erroneously considered in 1964 to be within the Reservation boundaries. Thus, the present contest concerns only presently-claimed water rights on specified acres. These acres lie to the west of the boundary shown on the old exhibits. But those acres lie east of the boundary shown on the present exhibits. The United States apparently believes the boundary lies further west than was shown on the older exhibits.

This dispute concerns the relative correctness of the various depictions of the western boundary as it was originally set by the River. If the State Parties are correct, the boundary lies to the east of the present river channel and follows the boundary shown on the prior exhibits. If the United States is correct, the boundary lies roughly along the western edge of several islands which lie closest to the eastern bank of the River as shown on the prior exhibits.[120] A boundary marked by a river is not necessarily constant. Depending on the type of river movement, the land area within a legal boundary may increase, decrease, or remain constant.

I have no basis for deciding precisely where the proper boundary now lies, because there is no evidence in the record of the River's former location(s) or of the

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117. *Compare* Pr. U.S. Exhs. 1317, 1318, 1320, 1321, 1322 *with* Pr. Calif. Exhs. 3515, 3516, 3517.

118. Tr. 5299-300.

119. United States' Post-Trial Opening Brief 15 (May 1981).

120. *See* Pr. U.S. Exh. 1318.

types of movement which brought it to its present channel. The United States has in this case introduced conflicting maps of the western boundary of this tract. Both the older map[121] and the newer one[122] were allegedly based on boundary descriptions from such sources as the BIA and the General Land Office. Other than the testimony indicating that the boundaries of the Reservation were given by the BIA, there is no evidence showing that these boundaries presently claimed by the United States are officially recognized. The United States offers no reason for according this view any greater weight than the evidence of official recognition of a more restrictive boundary produced by the United States in the 1950's. Moreover, in light of the history of this case and my previous discussion of the more general boundary issues, I am persuaded that this is not an appropriate issue for resolution in this forum. If the United States is correct in its argument that the prior "Master ought not to have attempted to do the job of the Secretary of the Interior" by deciding which of the then-purported boundaries was accurate, I should not now undertake such a task.

In view of the confusion surrounding this issue, I believe that the various legal and factual questions concerning the proper location of this river boundary should be first resolved by a definitive ruling from the Interior Department before an award for water rights can be made.[123] Until the Interior Department acts

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121. *See* Pr. U.S. Exh. 1317.

122. *See* Tr. 579-81; U.S. Exh. 3. In fact the United States' soils expert prepared a map in November, 1979 which indicated that this boundary was "indefinite." *See* Ariz. Exh. M.

123. The United States claims these lands as "omitted lands." *See* U.S. Exh. 42, Table 7. That description seems inaccurate since the United States has defined "omitted lands" to be "lands which were con-

more definitively, I cannot find that this boundary question involving a river boundary has been "finally determined," particularly in light of the different positions asserted in the evidence rendered by the United States. 376 U.S. at 345.

(ii) *Checkerboard Area*

The second dispute over the Fort Mojave Reservation boundaries concerns the southerly portion of the Reservation sometimes known as the Checkerboard Area because this general area in Arizona contains sections of land that are alternatively within and without the Reservation.[124] The State Parties have questioned whether several parcels, adjacent to the Reservation sections as shown on the prior exhibits,[125] are within the Reservation as recognized for these proceedings.[126] The United States contends that the lands are boundary lands and that the BIA believes that the areas are within the Reservation.[127]

In light of the discussion contained in the just preceding section, a relatively brief treatment of this issue will suffice. The Checkerboard Area was added to the Fort Mojave Indian Reservation by Executive Order in

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ceded to be within the several Reservations at the time of the original proceedings" and there is no evidence that these lands were subject to such a concession. *See* Motion of the United States for Modification of Decree and Supporting Memorandum 23 (Dec. 1978). Neither are these lands truly "boundary lands" that were "once treated as being outside the Reservations but since determined to be within their true boundaries." *Id.* at 6.

124. *See* Pr. U.S. Exhs. 1317, 1318.

125. *See id.*

126. *See* Tr. 5255 *et seq.*; S.P. Exh. 159.

127. United States' Post-Trial Opening Brief 16 (May 1981).

1910.[128] This reserve was modified two months later in 1911 and certain parcels were deleted from the prior reserve.[129] For example, at the prior hearings, section 30, T. 17 N., and section 36, T. 17 N., were originally claimed by the United States to have been within the Reservation boundaries.[130] But testimony revealed that these two parcels were deleted from the Reservation by the Executive Order of 1911.[131]

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128. *See* Executive Order of December 1, 1910, *reprinted in* 2 EXECUTIVE ORDERS 13.

129. *See* Executive Order of February 2, 1911, *reprinted in* 2 EXECUTIVE ORDERS 13-14.

130. *See* Pr. U.S. Exhs. 1317, 1318.

131. *See* Pr. Tr. 14172-74, 20375-76; Pr. Calif. Exhs. 3515, 3516, 3517. This reduction did not involve two full sections of land, but amounted to only 1,037 gross acres of which 847 were classified as irrigable. *See* Pr. Calif. Exh. 3516. The net irrigable acres claim was thus reduced by 762 acres. *See* Pr. Calif. Exh. 3517.

The maps of the claimed acreage also show what appears to be a fractional section (apparently section 16) just southwest of section 10, T.17, N., claimed to be irrigable and within the Reservation boundaries. Yet the Executive Order of February 2, 1911 does not appear to include any portion of this section within the Reservation. And this fact was recognized by the United States in the earlier proceedings. Pr. Tr. 14069-71. But no information presented by the parties touches directly upon this matter. This fractional section is apparently decreed land, unless some correction was made which has not come to my attention. The United States apparently believes that the land was given water rights earlier because the United States does not indicate that this section was one of the sections for which the water rights claim was disallowed in the earlier hearings. *See* Memorandum on Areas on Ft. Mojave Reservation Considered Before Special Master Rifkind, (Sept. 1980) record item no. 92. The State Parties appear to hold this view as well. *See* Tr. 5277. But the United States has apparently requested water rights again for part of this fractional section as part of Unit FM-12 despite its apparent prior success on this issue in the earlier proceedings. *See* U.S. Exh. 3. The State Parties claim this decreed land (72 gross acres) cannot again be awarded water rights. *See* S.P. Exh. 160 n.b. That statement is correct. But the State Parties do not advance even further and claim that this land is not within the Reservation boundaries recognized in the 1911 Executive Order. Because the parties have not raised this issue of whether

The State Parties now claim that areas adjacent to the alternate sections of the Checkerboard Area Reservation land are not within any formal boundary adjustment claimed by the United States.[132] The United States believes that these irregularly-shaped areas should now be included within the Reservation boundaries even though they were not so recognized in the prior proceedings.[133] But the United States offers no clear basis for this adjustment.[134] And these irregularly-shaped areas do not appear to be included in the Reservation by the 1911 Executive Order. The State Parties' explanation of the reasons for the present confusion is apparently not in the record,[135] except to the extent that they believe the United States has not sufficiently supported its position. Given this situation the United States has merely introduced evidence that conflicts with its previously introduced evidence over the proper boundaries for this area of the Reservation. Without more dispositive evidence I cannot conclude that the boundaries have been determined to be larger than recognized in the earlier proceedings.

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this 72 acres should now lose its water rights, if any, I will ignore this possibility.

132. *See* Tr. 5255 *et seq.*; S.P. Exh. 159.

133. *See* Tr. 5302-05.

134. Perhaps, as the United States suggested, there has been some sort of a trade between these lands and others. The Executive Order of 1911 appears to grant more land in the southerly portion of the Checkerboard Area than shown on U.S. Exh. 3. But the United States points to no such formal adjustment.

135. *See* Tr. 5302.

(iii) *Adjustment to the United States Claims on the Fort Mojave Indian Reservation*

My agreement with the State Parties' view, regarding certain parcels that lie outside the Fort Mojave Reservation boundaries as they were recognized by the prior Master or as they have been officially recognized in subsequent years, necessitates an adjustment of the United States claims from the beginning of my analysis. The State Parties have offered uncontradicted evidence that the United States has claimed that 1,075 gross acres of such land is practicably irrigable.[136] In some minor respects this figure might be inaccurate.[137] These inaccuracies are not fatal in any event because some adjustment must be made. And the United States may offer evidence correcting such inaccuracies at some time in the future.

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136. *See* S.P. Exh. 160. This figure includes the 72 gross acres which the State Parties allege were awarded water rights in 1964. *See id.* at n.b.

137. For example, the State Parties' figure does not account for any non-arable land which might be subject to another adjustment in a subsequent part of my report. As a consequence of such a possibility of overlapping adjustments, there must be a minor difficulty.

In addition, the areas designated on S.P. Exh. 159 do not entirely coincide with the relevant areas. For example, the State Parties have, I believe, indicated too large an area of Unit FM-2 to be outside the boundaries recognized by the prior Master. The State Parties' exhibit indicated a southwestern boundary of the old Post or Military Reserve that implicitly terminates approximately in the middle of the present channel of the Colorado River. The southwestern boundary should be drawn to a length equal to that of the northeastern boundary of the old Post Reserve. *See* Pr. U.S. Exhs. 1317, 1318, 2 EXECUTIVE ORDERS 12. If the southwestern boundary of the nearly-square Old Post Reserve is extended southeasterly until its length equals that of the opposite boundary, the southeasterly boundary will intersect FM-2 at a more southerly point than depicted on S.P. Exh. 159 and some amount of the land appears to have been erroneously excluded by the State Parties.

S.P. Exh. 159 also fails to show that the northern tip of FM-7 lies in the disputed zone, which I believe it does.

My factual findings regarding the practicable irrigability of the Reservation lands should be taken to apply to these lands regardless of my views on this boundary question. The parties have gone to a great deal of time and expense to litigate the irrigability of all these lands. If the areas are later determined to be within the Reservation my findings as they apply to these lands may be reinstated at that time.

(b) *Fort Mojave Tribe's Claims of Error*

The Fort Mojave Tribe has also raised claims which might naturally be discussed in the context of the boundary disputes regarding the Fort Mojave Indian Reservation. The Tribe in the hearings filed an expert report which purported to discover two errors in the original findings of this case.[138] First, the report alleged that a measurement error caused the United States to claim 1,776 too few acres as irrigable. Second, the report claimed that a large portion of the land, 1,069 acres, with decreed water rights, was not within the Reservation's boundaries. Neither claim is persuasive.

The State Parties disputed the first claim at trial.[139] The Tribe did not brief the question and merely asserted a claim that 1,739 gross acres on the Reservation are irrigable beyond those acres claimed by the United States.[140] This figure apparently does not allow for any adjustment for a previous error. In any event, the State Parties' position appears to be the

138. *See* F.M. Exh. 2, at 5-9.

139. *See* Tr. 5268 *et. seq.*; S.P. Exh. 162.

140. Four Tribes' Opening Post-Trial Brief 82 (May 1981). *See* F.M. Supp. Exh. (Sept. 1981), record item no. 192.

most accurate.[141] I find that there was no such mistake as alleged by the Tribe.

The second claim of error in the Tribe's expert report is apparently not discussed in any of the briefs. I hesitate to discuss an unbriefed issue, but for the record I will briefly indicate my views on this subject. The areas alleged to have decreed rights are depicted upon a map accompanying the expert's report.[142] The majority of the land depicted as erroneously receiving decreed rights did not in fact receive such rights. As discussed above, two sections in Arizona (sections 30, 36 in T. 17 N.) were originally claimed by the United States.[143] But at the earlier trial the State Parties discovered that those lands were not included within the Reservation under the 1911 Executive Order, and the United States claims were reduced.[144] Thus, those lands do not have decreed water rights. Two smaller areas are shown by the Tribe to have been subject to the same mistake. These lands are apparently ac-

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141. The Tribe's expert apparently took his figure from the table appearing on Pr. U.S. Exh. 1318 because that map contains the figure of 22,147 gross irrigable acres referred to in the expert's report, F.M. Exh. 2, at 6. The resulting calculations of that expert thus fail to account for the substitution made by the United States at the prior hearings. The table on Pr. U.S. Exh. 1318 was excluded from evidence and Pr. U.S. Exh. 1321 was substituted for the figures on the table on the map. *See* Pr. Tr. 14245-47. The corrected figures on Pr. U.S. Exh. 1321 reveal that 23,639 gross irrigable acres were considered on the Reservation. In addition, another 367 gross acres of nonirrigable land lay in the irrigation units. The total then before the Court was 24,006 gross acres. The present expert's estimate that there were really 23,923 such acres portrayed on the map is within the expected margin of measurement error. Tr. 5271. Certainly 1,776 acres were not missing. Subsequent adjustment did occur to the 24,006 acre total to reach the total for which water rights were decreed.

142. *See* Map. No. 1, F.M. Exh. 2.

143. *See* Pr. U.S. Exh. 1318.

144. *See* Pr. Tr. 14172-74.

knowledged by the United States to be outside the Reservation boundaries.[145] But there is no evidence which shows the number of acres within these parcels and my attention has not been called to information indicating whether an adjustment may have previously occurred to prevent these non-Reservation lands from receiving decreed Indian water rights. I leave this issue to future contest upon the State Parties' motion.

2. *Adjustments on the Colorado River Indian Reservation*

The State Parties assert that the irrigable acreage on two portions of the Colorado River Indian Reservation was miscalculated in the prior proceedings. They claim that a survey by the Bureau of Land Management revealed that the "Ninth Avenue Loop" and the "Olive Lake Loop" contain 72 and 146 net acres less than previously thought to be within these parcels.[146] The United States stipulated to the factual accuracy of these figures.[147] In my view, Article IX of the 1964 Decree permits the correction of such an error, and I find that the decreed water rights for this Reservation should be adjusted accordingly.

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145. *See* U.S. Exh. 3. The two parcels lie respectively immediately 1) south and 2) southeast of the decreed lands in section 24 of T. 17 N. *Compare* Pr. U.S. Exh. 1318. The parcel which is closer to the River may have been discovered to have been outside the Reservation, but I do not know if any adjustment was made. Pr. Tr. 14069-71.

146. *See* Tr. 5262-64; S.P. Exh. 161. The decreed acreage was 222 net acres for the Ninth Avenue area and 2,058 net acres for the Olive Lake area. *See* SPECIAL MASTER'S REPORT at 271-72. The new figures would be 150 and 1,912 net acres respectively for these parcels. *See* S.P. Exh. 161.

147. *See* Tr. 5262-64.

III. Proof of the Case

A. *Standard of Proof*

The United States and the five Tribes have sought to prove that certain lands are practicably irrigable. They bear the burden of persuasion. The State Parties have noted that the claimants must establish their asserted points by a preponderance of the evidence.[1] This is the standard of proof which I believe to be clearly appropriate and which I shall use to judge all claims. I must necessarily reject the State Parties' accompanying suggestions that the seriousness of this litigation and the uncertain nature of the subject matter somehow transforms the burden of persuasion into a greater standard variously phrased by them as "reasonable certainty," "high standard of proof," "very high standard," and "clear and convincing evidence."[2] In fact, the State Parties ultimately argue that the Tribes must "resolve all doubts in their favor or see their claims rejected."[3] These standards are clearly inappropriate. All litigation constitutes serious business and any departure from the use of the civil case standard of preponderance of the evidence would inject unnecessary confusion into an already complicated case. The proof which I shall accept for my findings will be the more convincing evidence on any given element, including such elements as may be difficult to prove.

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1. State Parties' Post-Trial Opening Brief 6 (May 1981).
2. *Id.* at 8, 79, 99, 186.
3. *Id.* at 186.

B. *The Quantification Standard—The Meaning of Practicably Irrigable*

1. *General*

The present Indian Reservations clearly possess reserved water rights under the doctrine traced to the landmark decision of *Winters v. United States*, 207 U.S. 564 (1908). The more difficult question concerns the quantity of water reserved.

Prior to the earlier proceedings in this case, courts had reached various quantification standards. The goal was undoubtedly to reserve enough water to satisfy the Indians' present and future needs. The accomplishment of that goal was met by various schemes. For example, a fixed decree giving the Indians an amount of water historically used was possible if circumstances clearly showed that the future needs will not increase. *United States v. Walker River Irrigation District*, 104 F.2d 334, 340 (9th Cir. 1939). Under other circumstances the Indians had been entitled to enough water to irrigate all irrigable reservation land. *Skeem v. United States*, 273 F. 93, 95-96 (9th Cir. 1921); *United States v. Hibner*, 27 F.2d 909, 911 (E.D. Idaho 1928). Indeed, courts had held that Indians may be entitled to such water as is required to meet present needs with the qualification that if their needs increase such Indians may apply to the Court for an increase in the decreed amount. *Conrad Investment Co. v. United States*, 161 F. 829, 832-35 (9th Cir. 1908); *United States v. Ahtanum Irrigation District*, 236 F.2d 321, 326-28 (9th Cir. 1956), *on appeal from district court decision on remand*, 330 F.2d 897 (1964). No standard was definitive for all cases.

The earlier proceedings in this case concerned the same issue. The former Special Master and the Court eventually settled upon a standard which most nearly satisfied all concerns relevant to the parties. The United States desired for the Indians enough water to satisfy their present and future needs. Such water would be needed to fulfill the very purpose of the Reservations and to make those lands livable. A relatively stable allocation to the Tribes would also allow other water users better opportunities for planning. The Court, thus, concluded that "the only feasible and fair way by which reserved water for the reservations can be measured is irrigable acreage." 373 U.S. at 601. In such a holding, the Court adopted the "practicably irrigable" standard used by the Special Master. *See id.* at 600-01. That quantity of water equalled the amount required to make the Reservations livable. *See Montana v. United States*, ___ U.S. ___, ___, 101 S. Ct. 1245, 1258 n.15 (1981); *Washington v. Washington State Commercial Passenger Fishing Vessel Association*, 443 U.S. 658, 685-87 (1979). Although the Court did not necessarily adopt this standard as the universal measure of Indian reserved water rights,[4] it constitutes the law of this case for the five Reservations under consideration.[5]

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4. Meyers, *The Colorado River*, 19 STAN. L. REV. 1, 70-71 (1966).

5. The State Parties have urged a new standard based on the quantity of water necessary for a moderate standard of living. State Parties' Motion to Include for Consideration the Standard of Living of the Tribes (June 1980), record item no. 54. Of course, the prior Master rejected such arguments which would tie the quantity of water to present needs. SPECIAL MASTER'S REPORT at 263-65.

The irrigable acres standard has been criticized by others as being too generous to the Indians, because, for example, there was some evidence in the earlier proceedings that only 23 acres of the Fort Mojave Reservation had ever been irrigated and only one family then lived on the Reser-

That this standard should now be applied as requested by the United States and the Tribes is supported by recent events in this case. The practicably irrigable standard was recently reaffirmed by the Court in the 1979 Decree which provided, regarding the quantity of water rights for boundary lands, that:

> Additional present perfected rights so adjudicated by such [boundary land] adjustment shall be in annual quantities not to exceed the quantities of mainstream water necessary to supply the consumptive use required for irrigation of the practicably irrigable acres which are included within any area determined to be within a reservation by such final determination of a boundary and for the satisfaction of related uses. The quantities of diversions are to be computed by determining net practicably irrigable acres within each additional area using the methods set forth by the Special Master in this case in his Report to this Court dated December 5, 1960, and by applying the unit diversions quantities thereto, as listed below:

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vation. Shrago, *Emerging Indian Water Rights: An Analysis of Recent Judicial and Legislative Developments*, 26 ROCKY MTN. MIN. L. INST. 1105, 1113-14 & n.36, 1136 & n.105 (1980); Note, *A Proposal for the Quantification of Reserved Indian Water Rights*, 74 COLUM. L. REV. 1299, 1312 & n.80 (1974). *See* Pr. Tr. 14100-02, 14140, 14157-57-A. Even if these statements were true at the time, the present evidence shows that several hundred members of the Tribe reside on the Reservation and that much of the Reservation is under agricultural development. *See* Tr. 1383-91; U.S. Exhs. 43, 44. Decreed water rights for the Reservation have undoubtedly made the Reservation more livable for and attractive to the Indians. Moreover the irrigable acres standard was adopted to represent the present *and future* needs of the Indians. And if the Indians do not consume the water, it remains in the River for others to use.

Indian Reservation	Unit Diversion Quantity Acre-Feet Per Irrigable Acre
Cocopah	6.37
Colorado River	6.67
Chemehuevi	5.97
Ft. Mojave	6.46
Ft. Yuma	6.67

439 U.S. 421-22. Although this guidance was explicitly applicable to water rights for boundary lands, I believe that it should be used to quantify any additional water rights which might be awarded the five Indian Reservations under consideration.[6] Furthermore, any present determination regarding the definition of practicably irrigable acreage appears linked by the above-quoted language to the methods used by the prior Master as he specified them in his Report and as he implicitly based his decisions upon the evidence then before him.[7] The parties have, consistent with this view, sought to present evidence which conforms, as close as is reasonably possible, to the general methodology used previously. Of course, over the years changed conditions and the normal difficulties of reconstructing events of over twenty years ago have thwarted a perfect match. In addition, the parties are not entirely in agreement regarding the interpretation to be given the prior record.

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6. Although the quantity of water rights is to be determined by the amount of irrigable acreage, the reference to irrigable acreage does not constitute a restriction on the usage of such rights. 439 U.S. at 422.

7. Some of the "methods" of the prior Master are not explicitly set forth in his Report. *See* SPECIAL MASTER'S REPORT at 254-87. Rather such matters as the means of determining net acreage and the definition of practicably irrigable are revealed only by the testimony and physical evidence upon which he based his findings.

Subject to the State Parties' opposition to reopening the Decree, and their other motions filed in the pre-trial stages of the present proceedings, all parties concede that the Indians may receive sufficient water to irrigate all[8] reservation land that is "practicably irrigable." Seventeen years after the 1964 Decree, the parties' differences have narrowed to a disagreement over the proper definition of that phrase. There are two principle disputes over the appropriate definition. First, all the parties are in various stages of disagreement over the relevance of economics to the definition. Second, the State Parties at least implicitly also disagree with all other parties regarding the date of the technology which should control a finding of feasability. Each of these questions must be resolved as nearly as possible with reference to the prior proceedings of this case.

Not every detail can be specified in any opinion. The parties agree that neither the Special Master nor the Court defined the phrase "practicably irrigable."[9] But many parties have presented different definitions of that phrase. First, the Quechan Tribe of the Fort Yuma Indian Reservation has consistently maintained that studies of economics are almost irrelevant to the definition which to their thinking is limited to findings

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8. The State Parties contended at the pre-trial stage that accreted land should not be granted water rights. *See* State Parties' Motion to Exclude From Consideration All Lands Which Have Accreted Since the Time the Five Reservations Were Established (June 1980), record item no. 57. Because the 1964 Decree awarded water rights to accreted lands, I believe that a similar course should be followed presently. *See* SPECIAL MASTER'S REPORT at 272 & n.32.

9. United States' Opening Post-Trial Brief 46 (May 1981); State Parties' Post-Trial Opening Brief 5 (May 1981); Trial Brief of Quechan Tribe 7-8 (Sept. 1980); Four Tribes' Post-Trial Reply Brief 6 (Aug. 1980).

regarding arability of the soil and physical engineering feasibility of the projected irrigation projects.[10] The other Four Tribes, to some extent, join this position by stating that not all the costs of the irrigation projects should be considered in determining what amount of land is "practicably irrigable."[11] The State Parties and the United States agree that the land must be arable and the project within engineering feasibility. But they would impose one further requirement for a finding of "practicably irrigable." Between themselves, the United States and the State Parties agree that economic feasibility is the appropriate general inquiry.[12] But those parties have some minor differences in theoretical approach and the application of principles to specific cost items. Each party has designed its evidence to some degree to fit its theory of the case.

After studying the record of the proceedings before the former Special Master, I conclude that "practicably irrigable," as used by the parties and Court in the prior proceedings, very nearly means "economically feasible." The testimony at the prior hearings reveals that the United States submitted for consideration only lands that its experts believed to possess the characteristics necessary for the benefits from irrigated farming to exceed costs.[13] In fact, the Master and the witnesses called their analysis a study of "economics" or "economic feasibility."[14] The testimony further

10. Trial Brief of Quechan Tribe 6-33 (Sept. 1980).

11. Four Tribes' Post-Trial Reply Brief 6-9 (Aug. 1980).

12. State Parties' Post-Trial Opening Brief 5-6 (May 1981). *See* Pre-Trial Order, II.A.1-9, record item no. 69.

13. Pr. Tr. at 12763-74, 13241-49, 13265-71. The feasibility tests may not have been done in detail, but the testimony definitely indicates that a benefit-cost analysis was the standard then used as it was for the other federal projects studied by the United States experts. Pr. Tr. 13238-39.

14. *See, e.g.*, Pr. Tr. 12771, 13247, 14120.

reveals that the standards used by the experts generally conformed to Bureau of the Budget Circular A-47 which was the general standard used to measure the feasibility of all federal water resource projects including those developed by the Bureau of Indian Affairs.[15] The Master made one isolated comment which might be interpreted to mean that he thought that those benefit-cost analyses were not relevant to this case.[15.1] But his comment could easily be read to indicate his disinclination to pursue an example outside the facts of this case that counsel was carrying too far. And in any event, his findings followed the evidence supported by economics that was offered by the United States.[16]

Given this background I believe that the present approaches of the United States and the State Parties more nearly adhere to the law of this case. The arguments by the Tribes that the definition of practicably irrigable should incorporate various subsidies to Indian Tribes, such that any analysis is a financial analy-

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15. Pr. Tr. 12771-72, 13241, 13247-49. One commentator has reached this conclusion based on his study of the case. Note, *Indian Reserved Water Rights: The* Winters *of Our Discontent*, 88 YALE L.J. 1689, 1696 n.51 (1979). Because the Master's Report is not explicit on this point, such a conclusion can only be made from a study of the entire presentation of the parties, including, the exhibits before the prior Master and the bases upon which those exhibits were prepared. Ranquist, *The* Winters *Doctrine and How It Grew: Federal Reservation of Rights to the Use of Water*, 1975 B.Y.U. L. REV. 639, 660 n.89.

15.1. Pr. Tr. 13269-71.

16. In determining the irrigable acreage on the Reservations, the Master generally relied upon a series of exhibits prepared by the United States experts. *See* SPECIAL MASTER'S REPORT at 267-82. Those exhibits were U.S. Exhs. 1210, 1009, 1121, 570, 1322. *See also* Pr. Calif. Exhs. 3546, 3517. The document, Circular A-47, upon which one United States expert stated the conclusions in the United States' exhibits were based, was introduced by California. *See* Pr. Calif. Exh. 2603; Pr. Tr. 13249.

sis from the point of view of the Indians, are misguided. The past analysis accepted by the former Master and the Court clearly was a non-Indian economic analysis measuring total benefits against total costs for water without regard to the special considerations available to the Tribes.[17] I simply do not believe as do the Quechans that the very few details of the actual calculations introduced in the testimony means that economics were not considered. Rather than reaching the conclusion that no economic analysis was undertaken, I am convinced that the analysis was actually too loose in that no attempt was made to locate the maximum claims by marginal analysis. *See* text

17. Pr. Tr. 13265-66. *See* Ranquist, *supra* note 15, at 660. Thus, the deferred repayment provisions of the Leavitt Act, 25 U.S.C. 386a (1976), should not be considered to increase the feasibility of the projects on the issue of whether water rights should be decreed. The rejection of the consideration of the Leavitt Act in the prior proceedings makes untenable the Tribes' suggestions. This determination, of course, has no effect on other cases in which the quantification standard used might incorporate general reclamation standards along with such matters as the Leavitt Act in order to give the Indians sufficient water to make a particular reservation livable. *See* Ranquist, *supra* note 15, at 660-61. There have also been theoretical economics arguments along these lines. *See* Burness, Cummings, Gorman & Lansford, *United States Reclamation Policy and Indian Water Rights*, 20 NAT. RESOURCES J. 807, 822-24 (1980).

The later Article has been brought to my attention by the Four Tribes. The authors' theme is that the Leavitt Act deferment provisions should be compared to power revenues generated by reclamation projects in which the power revenues are used as a societal benefit to offset the costs of the project. *Id.* The analogy, however, seems imperfect because the Leavitt Act benefits to Indians are not generated by Indian irrigation projects as power revenues are generated by reclamation projects. Perhaps the Leavitt Act provisions might be viewed as quantifying the intangible benefits accruing to society when the Indians utilize such benefits to provide for themselves in a constructive manner. Because of the prior practice in this case, such concerns are, however, not presently relevant.

supra at pp. 49-50. The claims presented were only those that were obviously economic.

Neither the State Parties nor the United States sought to match perfectly the evidence introduced before the former Special Master. My choice is limited somewhat by the evidence introduced by the parties. On the whole, the approach followed by the United States appears to be the most theoretically pure economic analysis[18] that resembles what was done in the past. The State Parties urge that the appropriate standard is an "objective" one that does not consider the status or situation of the intended project user,[19] but their own expert admitted that his analysis is a combination of an economic and financial analysis.[20] Moreover, only the United States presented testimony of an expert economist who was qualified to offer opinions regarding economic theory and its application. The State Parties most vigorously dispute the United States' application of economic theory in such cases as the choice of the proper interest rate and power cost. My analysis will generally adopt the theory and application presented by the United States. In dealing with particular benefits or cost items, I shall indicate my reasons for adopting a particular figure.

As a final wrinkle, the State Parties have raised the question of the appropriate date from which to measure feasibility. In the extreme example, they have pursued the matter to the extent of investigating the

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18. For a discussion of the economic theory aspects of the reclamation standards such as those used in this case, see generally Burness, Cummings, Gorman & Lansford, *supra* note 17.

19. State Parties' Post-Trial Opening Brief 61 (May 1981).

20. Tr. 5361. Actually, he testified that his analysis "really fits both these categories," an outcome that is highly unlikely, if it is not impossible. *Id.*

limited reservation acreage that might feasibly have been irrigated in the nineteenth century.[21] This opposition has remained throughout the case although it has become a more implicit position that is manifested in the State Parties' adoption of various outdated assumptions which will be discussed later. My reading of the transcript reveals that the evidence of "practicable irrigability" was determined by then-current standards.[22] I am similarly convinced that my determinations of practicable irrigability should be based on present standards. Reference to past standards would introduce an additional complication in an already complex case. Given that these issues are to be litigated presently,[23] the most sensible method of determining feasibility is by using present standards.[24]

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21. *See* S.P. Exh. 26, at VI-1 to -5 (Apr. 1980). Such a part of this report was received as an offer of proof. Tr. 3636, 3643.

22. *See, e.g.*, Pr. Tr. 14120.

23. An advance in technology that enhances the feasibility of irrigation projects would not by itself present a good reason to reopen the Decree for an adjustment of the water decreed to the Tribes.

24. The above discussion indicates that prior practice of using current technology should guide the present decision. Some theoretical concerns might be disposed of, as well. Using technology in existence at the time of quantification may cause the quantity potentially to be fixed to increase with technological advances depending on the date of adjudication. *See* Clyde, *Special Considerations Involving Indian Rights*, 8 NAT. RESOURCES LAW. 237, 246-47 (1975); Price & Weatherford, *Indian Water Rights in Theory and Practice: Navajo Experience in the Colorado River Basin*, 40 LAW & CONTEMP. PROB. 97, 106-07 (1976). Quantification based on technology at the date of establishment of the reservation may provide a fixed quantity, but it also creates the difficulty of determining the technological possibilities of the nineteenth and early twentieth centuries. That inquiry is not likely to be reliable and might consume a large amount of trial time by itself. A "single" "brightline standard applicable to all reserved rights" might be a desirable approach. *See* YALE Note, *supra* note 15, at 1696 n.51. But the "practicably irrigable" standard seems to defy such an approach by definition. The ultimate inquiry is: Practicable by what standards? That question inherently incorporates a

2. Profit Margin

The State Parties claim that their experts believe that "equality of benefits and costs should not constitute irrigability, that there should be a profit margin to compensate for risks inherent in agriculture and for recovery of capital invested in project development."[25] Those experts offer as appropriate the purported policy of the "Federal Government [which allegedly] has traditionally considered that an irrigation project is financially feasible if the annual project costs do not exceed about 75 percent of the estimated payment capacity."[26]

For several reasons, I am not certain that this statement correctly summarizes federal irrigation policy as it relates to this case or is theoretically correct in other particulars.[27] In any event, I believe that the earlier practice established in this case was based upon a comparison of benefits and costs with the conclusion that if benefits at least equal costs the land is irrigable.[28] I need not directly address such a question be-

reference to technology which always implies a specific date. Such a statement is not really a criticism of the "practicably irrigable" standard. Uniformity of quantification may be a fine theoretical goal, but given that water rights are quantified in separate judicial proceedings, the variation in evidence produced and the vagaries of the fact-finding process will undercut any pretense to uniformity from case to case. The variant proofs in this case should illustrate that point. Moreover, the "practicably irrigable" standard is not necessarily a standard to be used in all cases and when it is used it may not have the exact meaning it holds in this case. The amount reserved in each case is the amount required to make each reservation livable.

25. State Parties' Trial Brief 19 (Aug. 1980).

26. S.P. Exh. 26, at V-1.

27. *See generally* Burness, Cummings, Gorman & Lansford, *United States Reclamation Policy and Indian Water Rights*, 20 NAT. RESOURCES J. 807 (1980).

28. *See* Pr. Tr. 12771-72, 13238-71; Pr. Calif. Exh. 2603.

cause the State Parties' experts did not challenge any United States claims on this basis.[29] Moreover, the course of this litigation has removed the necessity of consideration of the most extreme situations of this nature.[30] For present purposes, a finding that annual benefits exceed costs will suffice for a finding of practicable irrigability.

C. *Gross-to-Net Reduction in Acreage*

The parties in various degrees dispute the proper figure for computing the net acreage that would be farmed after farm roads and farm steads have been constructed. The State Parties initially claimed that this question was *res judicata* and that the same figures used in leading to the 1964 Decree should be applied to the additional gross acres of practicably irrigable land which are the subject of the present proceedings.[31] This motion was denied in the pre-trial stages,[32] and this issue was included among those is-

29. *See* S.P. Exh. 26, at V-1; State Parties' Trial Brief 19 (Aug. 1980).

30. In U.S. Exh. 60 several irrigation units are represented as having annual benefits exceeding annual costs by no more than two dollars. *Id.* at 18. For those units on the Colorado River Indian Reservation the parties' stipulation makes unnecessary any further consideration of those parcels. With regard to the two parcels of this description on the Fort Mojave Reservation, FM-7 now shows lower annual costs than originally projected and my other findings have eliminated the Quail Hollow Unit claim that was based on the United States' proof.

31. State Parties' Brief Regarding Gross to Net Acreage Reduction Percentages Utilized in the Original Proceeding 3 (June 1980), record item no. 55.

32. *See* Order of August 8, 1980, record item no. 68. The appropriate reduction factor can vary widely. For the larger Reservations these reduction percentages were approximately 8% on Chemehuevi, 10% on Fort Mojave, and 12% on Colorado River. *See* Pr. U.S. Exhs. 1210, 1322, 570. The figure chosen is a matter of judgment based upon such factors as land characteristics and development plans. *See* Pr. Tr. 14857-61.

sues listed for resolution in the pre-trial order.[33]

The basic dispute as presented by the parties' evidence is relatively minor. The United States favored a reduction of 4% on all Reservations except Chemehuevi where it used a 2% figure.[34] Both the Four Tribes and the State Parties used a basic reduction percentage of 5%.[35] The State Parties also added an additional 1% reduction, because some of the lands for which water rights are presently requested are devoted to uses other than farming or services ancillary to farming.[36]

Every expert's opinion is basically competent. Each used his experience to evaluate the appropriate gross-to-net reduction figure.[37] The State Parties and the Tribes agree that 5% is an appropriate basic reduction percentage for land for such items as farm roads and farm ditches which would occupy land that would not require water rights even if the greater parcel were irrigated. This figure is reasonable and I adopt it as the correct basic reduction percentage for the claims on all five Reservations except for those presented only by the Quechan Tribe. That Tribe has presented evidence relating to its claim regarding the Fort Yuma Reservation which indicates reduction figures of 6% and 10% for its claim. I will accept those latter figures only for that claim.

Even the State Parties' expert believed that the use of the earlier reduction percentages was neither reasonable nor appropriate for present purposes concerning the lands under consideration. Tr. 4335-36.

33. *See* Pre-Trial Order, at 3, record item no. 69.

34. U.S. Exh. 42, at 3.

35. F.M. Exh. 2, at 34; C.R. Exh. 1, at 34; CH. Exh. 1, at Table 9 & n.2. *See* Tr. 3687. *See also* S.P. Exh. 26, at II-11.

36. *See* Tr. 3687-88, 4336. *See also* S.P. Exh. 26, at II-11.

37. *See* 521-23, 1126-27, 3687-88.

The State Parties claim that an additional 1% should be added to this basic figure. This addition would account for "permanent developments" on the concerned lands.[38] They note that no other experts attempted to account for these "permanent developments."[39] The other experts were correct. The Tribes under the earlier *Special Master's Report*[40] and the 1979 Supplemental Decree[41] are not limited in the use of decreed water rights to agricultural purposes. The quantity of water is determined by the number of practicably irrigable acres on the Reservations. The actual use of the lands for other purposes is irrelevant. The State Parties failed to understand the point.[42] I, thus, find that the basic reduction factor need not be increased by the 1% figure.

The State Parties also raise one other point meriting discussion. They note that the United States' evidence in the earlier proceeding allowed for diversions for such nonagricultural uses as "domestic and stock watering purposes."[43] Such uses were allocated an additional amount equal to 1% of the "agricultural con-

38. Tr. 4336.

39. State Parties' Post-Trial Opening Brief 222 (May 1981).

40. SPECIAL MASTERS REPORT at 265.

41. 439 U.S. at 422-23.

42. This confusion is apparent in the testimony of the State Parties' expert. His initial answers implied that this land was excluded from water rights consideration because it would not be farmed. Tr. 4336. Later he stated that: "The fact that the development exists leads us to conclude that it does have a water supply and that additional water supplies for that particular piece of ground are not required. That is why we used the one percent." Tr. 4399. This reasoning makes no sense if as that expert acknowledged the lands under consideration do not presently have water *rights*. *See* Tr. 4399-4400.

43. State Parties' Post-Trial Opening Brief 223 (May 1981). *See* Pr. Tr. 14863-65.

sumptive use."[44] From that fact the State Parties conclude that 1% was subtracted from the reduction percentage in the earlier case. This conclusion is erroneous. The 1% nonagricultural use factor does not have an additive relationship to the gross-to-net acreage reduction factor.[45] The factor instead is subsumed in the unit diversion rate applicable to the individual Reservations.[46] For present purposes, no attention need be directed to this 1% figure.

The gross practicably irrigable acreage should be reduced to appropriate net acreage figures by a simple reduction of 5% except for those lands claimed only by the Quechan Tribe for which a different figure discussed below is used.

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44. *See* Pr. Tr. 14863.

45. For example, if the State Parties' methods were used on the Colorado River Indian Reservation figures introduced in the prior proceeding a different diversion requirement than that originally projected by the United States would be reached. *See* Pr. U.S. Exhs. 561, 563, 570; Pr. Tr. 14857-66. That total diversion amount was not accepted by the prior Master because he found less irrigable acreage to be within that Reservation's boundaries. *See* SPECIAL MASTER'S REPORT at 272.

In order to closely follow the prior analysis, I should ignore this 1% decrease in the reduction percentage. The unit diversion quantity in acre-feet per irrigable acre is 6.67 on this Reservation.

$\left(\frac{734{,}886 \text{ AF}}{110{,}244 \text{ acres}} = 6.665995\right)$. *See* 439 U.S. at 422; Pr. U.S. Exh. 570.

The diversion rate would be 6.6 if the nonagricultural consumptive use were not counted ($363{,}806 \times 2 = 727{,}612$; $\frac{727{,}612}{110{,}244} = 6.60001$).

Thus, the nonagricultural consumptive use is incorporated into the 6.67 diversion rate figure, and no further adjustment need be made.

46. *See* 439 U.S. at 422.

IV. Priority Dates for Additional Water Rights

The question concerning a water right's priority date is vital since in times of shortage a junior right may lose out to a senior right. The purpose of the 1979 Decree, 439 U.S. 419 (1979), was to set the priority dates for various present perfected water rights along the Colorado River. The issue of priority dates for additional water rights to be awarded[1] was included in the pre-trial order as an issue to be determined. This issue may be of some lingering theoretical significance but for all practical purposes it appears controlled by the language of the 1979 Decree which states that the Secretary of the Interior in the event of shortage should, except for the satisfaction of miscellaneous present perfected rights, "first provide for the satisfaction in full of all rights of [the five Tribes] as set forth in Art. II(D)(1)-(5) of [the 1964] Decree." 439 U.S. at 421. The 1979 Decree then further provides that the quantities specified in Art. II(D)(1)-(5) were "subject to the appropriate adjustment" by decree "in the event that the boundaries of the respective reservations are finally determined." *Id.* Upon amendment of the Decree, all water rights successfully asserted with respect to land designated as boundary land[2] in this

1. The United States observes, correctly I believe, that the pre-trial order's reference to land "added to the reservation" is somewhat misleading because the land designated as boundary land generally belonged to the Reservations before 1964 but only recently was such land recognized as part of the Reservations. *See* United States' Pre-Trial Brief 19 (Aug. 1980).

2. This would include the 1974 addition to the Cocopah Reservation. 88 Stat. 266. *See also* 376 U.S. at 344 (United States may make further reservations of Colorado River waters). Of course this statement implies what I believe to be indisputable: the Congress intended to reserve water rights for this land when setting it aside for the Cocopah Indian Tribe.

case should, thus, take the priority specified in that Decree. The water rights successfully asserted with respect to boundary lands as well as omitted lands should logically be eligible for a possibly earlier priority dating from the time when such land was made a part of the Reservation.[3] But the importance of such an earlier priority seems small in light of the 1979 Decree.[4]

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3. The prior Master did not have sufficient evidence regarding the priority dates on the Colorado River and Fort Mojave Reservations to make a specific finding on the subject. *See* SPECIAL MASTER'S REPORT at 274 n.33, 283 n.57. Those dates were specified with respect to specific acres in the 1979 Decree. *See* 439 U.S. at 423-36. With respect to the omitted lands, I am unaware of any such evidence which might be used for these present purposes.

4. Certainly the State Parties could not fairly challenge such a description of the priority, given that in a 1979 oral argument regarding the then-proposed supplemental decree, they represented to the Court that under the later-adopted Decree:

1) any additional water rights with respect to boundary lands would be prior to all major non-federal present perfected rights; and
2) any additional rights from omitted lands, regardless of the subordination agreement, could have an earlier priority date tied to the original priority dates for the respective reservations.

Transcript of Oral Argument in Supreme Court, *Arizona v. California* 7, 9 (Oct. 10, 1979).

V. Requested Water Rights

The water rights requested may be conveniently expressed in tabular form. The requested water rights are expressed first in terms of the acreage which the claimant believes to be practicably irrigable. Upon such a finding the water rights may then be expressed in terms of a diversion right for each Reservation by calculating the total from the acre-feet of water to be received for each irrigable acre. *See* 439 U.S. at 422. Because the location of the acreage and its character as either boundary or omitted land are important issues in this case, I will attempt to make such specifications as the evidence permits.

The United States claims that the following acreage is practicably irrigable:

United States Claims in Gross Acres

Reservation	Fort Mojave	Chemhuevi	Cocopah	Colorado River	Fort Yuma
California					
Omitted	323	1,415	0	1,853.5	216
Boundary	1,956	0	0	3,600	4,217
	2,279	1,415	0	5,453.5	4,433
Arizona					
Omitted	2,885	0	81	16,180.5	0
Boundary	1,244	0	1,161	0	1,517
	4,129	0	1,242	16,180.5	1,517
Nevada					
Omitted	182	0	0	0	0
Boundary	0	0	0	0	0
	182	0	0	0	0

Reservation	Fort Mojave	Chemehuevi	Cocopah	Colorado River	Fort Yuma
Total					
Omitted	3,390	1,415	81	18,034	216
Boundary	3,200	0	1,161	3,600	5,734
	6,590[1]	1,415[2]	1,242[3]	21,634[4]	5,950[5] = 36P41

1. U.S. Exh. 42, Table 7; S.P. Exh. 110; Table B-1; United States' Post-Trial Opening Brief 52-54 (May 1981); State Parties' Post-Trial Closing Brief 13 (June 1981).

2. U.S. Exh. 42, Table 9; S.P. Exh. 110, Table B-3; United States' Post-Trial Opening Brief 52-54 (May 1981).

3. U.S. Exh. 42, Table 9; S.P. Exh. 110, Table B-4; United States' Post-Trial Opening Brief 52-54 (May 1981); State Parties' Post-Trial Closing Brief 13 (June 1981).

4. Stipulation of September 8, 1980, record item no. 91; United States' Post-Trial Opening Brief 52-53 (May 1981); State Parties' Post-Trial Closing Brief 13 (June 1981). The United States expert report, U.S. Exh. 42, originally asserted that Units CR-4 and CR-16 contained both omitted and boundary lands without separately identifying the small amount of boundary lands. *See* U.S. Exh. 42, Table 8 nn. *. The State Parties separately identified 104 acres of boundary lands on CR-4 and 24 such acres on CR-16. *See* S.P. Exh. 110, Table B-2. The United States has subsequently stated that the figures used by the State Parties are correct. *See* Letter from Scott McElroy (Sept. 28, 1981), record item no. 188. Noting in that letter that this matter was covered in the Stipulation, the United States further notes that under that agreement the Tribe may assert claims outside the parcels delineated in U.S. Exh. 42.

5. *See* State Parties' Post-Trial Closing Brief 13 (June 1981). *See also* U.S. Exh. 42, Table 10; United States' Post-Trial Opening Brief 53 (May 1981); S.P. Exh. 110, Table B-5. The State Parties noted in their reply brief certain errors in the United States' statement of claims as they appear in the United States brief and U.S. Exh. 42, Table 10. The United States agreed with the corrections then noted. *See* Letter from Scott McElroy (Sept. 28, 1981), record item no. 188. The corrections changed the claims made in U.S. Exh. 42 for four units as follows:

Unit	Original Claim (gross acres)	Present Claim (gross acres)
FY-4 Cal. Omitted	160	216
Cal. Boundary	606	550
FY-7 Cal. Boundary	335	807
Ariz. Boundary	807	335

The State Parties' response creates an issue of fact. They admit that significant amounts of the acreage claimed by the United States are practicably irrigable. In fact, with respect to the Colorado River Indian Reservation, all interested parties have stipulated as to the irrigability of part of the acreage claimed only by the United States.[6] The State Parties, however, dispute the remaining claims of the United States. The State Parties admit that the following acreage is practicably irrigable:

State Parties' Response to United States Claims
in Gross Irrigable Acres

Reservation	Fort Mojave	Chemehuevi	Cocopah	Colorado River	Fort Yuma
California					
Omitted	15	42	0	1,853.5	83
Boundary	1,861	0	0	3,600	4,008
	1,876	42	0	5,453.5	4,091
Arizona					
Omitted	353	0	58	16,180.5	0
Boundary	1,220	0	1,119	0	1,063
	1,573	0	1,177	16,180.5	1,063

FY-8	Cal. Boundary	631	28
	Ariz. Boundary	28	631
FY-9	Cal. Boundary	551	649
	Ariz. Boundary	649	551

The United States claims, thus, conform in these respects to the outline of United States claims in S.P. Exh. 110, Table B-5. The United States claim regarding Unit FY-10 also differs from the description in S.P. Exh. 110, because the United States describes the entire parcel as boundary land while the State Parties originally divided it between boundary and omitted land. *Compare* U.S. Exh. 42, Table 10; S.P. Exh. 110, Table B-5. The State Parties, however, have acknowledged that the United States' description of this parcel is correct. *See* Letter from Douglas Noble (Sept. 23, 1981), record item no. 187.

6. *See* Stipulation of September 8, 1980, record item no. 91.

Nevada					
Omitted	2	0	0	0	0
Boundary	0	0	0	0	0
	2	0	0	0	0
Total					
Omitted	370	42	58	18,034	83
Boundary	3,081	0	1,119	3,600	5,071
	3,451[7]	42[8]	1,177[9]	21,634[10]	5,154[11]

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Four of the five Indian Tribes have asserted claims on their own behalf. These Tribes have also generally adopted the claims made by the United States. In addition, they have asserted claims which supplement those of the United States. The Tribes claim that the following additional acreage is practicably irrigable:

Water Rights Requested Only by the Tribes in Gross Acres

Reservation	Fort Mojave	Chemehuevi	Colorado River	Fort Yuma
California				
Omitted	97	1,770	0	0
Boundary	0	0	0	10,982
	97	1,770	0	10,982
Arizona				
Omitted	867	0	8,662	0
Boundary	208	0	0	218
	1,075	0	8,662	218
Nevada				
Omitted	567	0	0	0
Boundary	0	0	0	0
	567	0	0	0

7. S.P. Exh. 110, Table B-1.
8. *Id* at Table B-3.
9. *Id.* at Table B-4.
10. Stipulation of September 8, 1980, record item no. 91.
11. S.P. Exh. 110, Table B-5.

Reservation	Fort Mojave	Chemehuevi	Colorado River	Fort Yuma
Total				
Omitted	1,531	1,770	8,662	0
Boundary	208	0	0	11,200
	1,739[12]	1,770[13]	8,662[14]	11,200[15]

The State Parties view these claims as being much less meritorious than the claims made by the United States. They admit that the following acres are practicably irrigable:

State Parties' Response to the Tribes' Claims in Gross Acres

Reservation	Fort Mojave	Chemehuevi	Colorado River	Fort Yuma
California				
Omitted	0	0	0	0

12. F.M. Supp. Exh. (Sept. 1981), record item no. 192; Letter from Thomas Fredericks (Nov. 10, 1981), record item no. 202. One parcel, FM-130, had been reduced in size from the time when the original report was written and parcel FM-201 was eliminated. *See* F.M. Exh. 2, Map No. 1. These changes and others were apparently made to conform to changes in the United States claims. *See* C.R. Exh. 50.

13. CH. Supp. Exh. (Sept. 1981), record item no. 190.

14. The Tribe claimed on Unit CR-6 a number of acres beyond those claimed by the United States for that parcel to be irrigable. I understand this acreage is subject to the stipulation of September 8, 1980. *See* C.R. Exh. 1, Table 7; C.R. Exh. 2; Four Tribes' Post-Trial Opening Brief 92 (May 1981).

15. F.Y. Exh. 18, at 56-58; F.Y. Exhs. 19, 30; F.Y. Supp. Exh. (Nov. 1981), record item no. 199; Letter with attachments from Raymond Simpson (Nov. 5, 1981), record item no. 199. The sum of the acres claimed on the F.Y. Supp. Exh. does not equal the total given in that exhibit. The total adopted here was derived from an independent calculation on the separate amounts claimed in F.Y. Supp. Exh. for each individual parcel. The Tribe did claim 191 acres less than the United States' claim for Unit FY-4. To the extent that the United States is successful in this assertion, I will ignore the fact that the Tribe has not claimed the 191 additional acres.

Reservation	Fort Mojave	Chemehuevi	Colorado River	Fort Yuma
Boundary	0	0	0	183
	0	0	0	183
Arizona				
Omitted	108	0	0	0
Boundary	111	0	0	0
	219	0	0	0
Nevada				
Omitted	0	0	0	0
Boundary	0	0	0	0
	0	0	0	0
Total				
Omitted	108	0	0	0
Boundary	111	0	0	183
	219[16]	0[17]	0[18]	183[19]

16. S.P. Exh. 147; F.M. Supp. Exh. (Sept. 1981), record item no. 192; Letter from Ralph Hunsaker (Nov. 17, 1981), record item no. 203.

17. S.P. Exh. 149; CH. Supp. Exh. (Sept. 1981), record item no. 190.

18. S.P. Exh. 148; C.R. Exh. 1, Table 7, C.R. Exh. 2; Four Tribes' Post-Trial Opening Brief 92 (May 1981).

19. S.P. Exh. 151; S.P. Exh. 110, Table B-5; F.Y. Exh. 18, at 56-58; F.Y. Exh. 19; F.Y. Exh. 30; F.Y. Supp. Exh. (Nov. 1981), record item no. 199; Letter with attachments from Raymond Simpson (Nov. 5, 1981), record item no. 199. The Tribe claims acreage designated by United States parcel number but adds more acreage to these parcels. *Id.* As a result, the State Parties reply in S.P. Exh. 151 notes additional irrigable acreage for two such parcels, Units FY-3 and FY-12, when compared to S.P. Exh. 110, Table B-5.

VI. Findings of Fact and Conclusions of Law Relating to the Irrigability of Disputed Lands

The views of the United States,[1] the Tribes,[2] and the State Parties[3] are, to varying extents, each supported by competent expert opinion evidence. Under these circumstances the findings in this case might be set forth simply as summary factual findings without explanation. That summary is contained in this section. The extensive and painstaking work of all counsel, however, justifies a more complete explanation of those findings, which is contained in Part Two of this Report.

In general I have found the evidence of the United States and the Tribes to be more persuasive at various significant points. On the other hand, regarding a substantial number of points, I have found the State Parties position to be more convincing, particularly with respect to the lands claimed solely by the Tribes to be practicably irrigable. The process of choosing between opposing opinions, I believe, has resulted in a deep appreciation of the close scrutiny which the experts have given to the merits of this case. In the words of one of the Tribes' experts:

> I do not know of any agricultural analysis that has gone into in the depth and in detail that the investigation of these lands on the Colorado River area has gone through. . . . We have gone to great depths to determine that this land is indeed suitable for the growing of these crops. We have gone to extreme lengths to determine

1. U.S. Exhs. 1-18, 42, 60.
2. C.R. Exhs. 1, 2, 50; CH. Exhs. 1, 2; F.M. Exh. 2; F.Y. Exhs. 18, 19, 30, 57, 58a.
3. S.P. Exhs. 26, 110, 158A-MM.

the feasibility, the economic feasibility of growing these crops.[4]

Under such careful opposing analysis only serious and potentially meritorious contentions could survive unretracted. The parties' competing arguments, thus, merit careful attention which is forthcoming in Part Two of this Report. To conclude this Part of the Report those findings should now be set out in summary form.

United States Claims
Findings of Fact

1. Competent evidence of practicable irrigability of Reservation lands supports the claims of the United States.[5] The State Parties' responses also are competent and partially support their position in the disputes with the United States.[6] The evidence supporting the claimant, the United States, is more persuasive with respect to the most significant issues of practicable irrigability of Reservation land with such exceptions as noted below.

2. Within the irrigation units designated in the United States claims, there are a number of acres classified in soils classification studies as non-irrigable. Such acres are not practicably irrigable:

Reservation	Nonirrigable Gross Acres
Cocopah	10
Ft. Yuma	84

4. Tr. 6501-02.
5. U.S. Exhs. 1-14, 16-18, 42, 60.
6. S.P. Exhs. 26, 110, 158A-MM.

Chemehuevi	329
Ft. Mojave	776[7]

3. Within the irrigation units designated in the United States claims as practicably irrigable acreage on the Fort Mojave Indian Reservation, there are a number of acres for which there has not been a sufficient showing that they are presently within the Reservation boundaries:[8]

Description	Gross Acres
California omitted land	200
Arizona omitted land	118
Arizona boundary land	757
Total	1,075[9]

7. *See* U.S. Exhs. 3, 6, 14, 17. *See also* U.S. Exh. 1, at 51, 54, 57, 65, 69. The entire non-irrigable acreage on the Cocopah Reservation is Arizona omitted land and on the Chemehuevi Reservation the entire amount of such land is California omitted land. For the Fort Yuma and Fort Mojave Reservations, such specifications were not initially made by the United States' soils expert whose testimony I found to be persuasive on the merits of the soils classification. Upon my request, the United States supplied this information but due to a delay in its response the information did not arrive until after this Report had gone to the press. Should this information be required it is in the record. Letter from Scott McElroy (Jan. 5, 1982), record item no. 206. Without explanation, the total of the figures now specified by the United States does not match the figures previously used in this case. To use these new figures now would allow the United States to change its claims at an extremely late stage. Despite the probable perception of the United States that this does not change its claim, given that it has always claimed these non-irrigable lands, I will not permit this late amendment. For my purposes, the specification is not essential, although the Court's holding may yet require it.

8. Actually there is involved in this matter a boundary dispute similar to that which occurred in the earlier proceedings.

9. S.P. Exh. 160. *See also* Tr. 5297; U.S. Exh. 42, Table 7 and map of Fort Mojave Reservation; S.P. Exh. 159.

4. There are 218 fewer net acres on the Colorado River Indian Reservation than were found within the Reservation by the Court in the earlier proceedings.[10]

5. The United States claim for California boundary land in the amount of 95 gross acres within the Quail Hollow Unit on the Fort Mojave Reservation is not persuasive on the evidence presented by the claimant.[11]

6. The gross irrigable acreage on each Reservation should be converted to a net figure for computation of diversion rights based on a reduction of 5%.[12]

7. The following practicably irrigable acres presently without water rights lie on the Reservations:

Reservation	Gross Acreage	Net Acreage
Ft. Mojave	4,644[13] x .95	= 4,412
Chemehuevi	1,086[14] x .95	= 1,032
Cocopah	1,232[15] x .95	= 1,170

10. S.P. Exh. 161.

11. *See* U.S. Exh. 42, Tables 7, B-8.

12. *See* S.P. Exh. 26; U.S. Exh. 42; C.R. Exh. 1; F.M. Exh. 2; CH. Exh. 1.

13. Claimed Acreage	6,590
— Nonirrigable	776
— Calada Unit	95
— Boundary dispute	1,075
Gross Acreage	4,644
14. Claimed Acreage	1,415
— Nonirrigable	329
Gross Acreage	1,086
15. Claimed Acreage	1,242
— Nonirrigable	10
	1,232

Colorado River	21,634[16] x .95	-218[17]	= 20,334
Ft. Yuma	5,866[18] x .95		= 5,573

Conclusions of Law

1. For the benefit of the following Reservations the United States has the right to the annual diversion of the following respective additional amounts of water from the Colorado River or to the quantity of mainstream water necessary to supply the consumptive use required for the irrigation of the following net irrigable acres and for the satisfaction of related uses, whichever is less:

Reservation	Unit Diversion Quantity A.F./Ac.[19]		Net Irrigable Acreage	Diversion Amounts in Acre-Feet
Ft. Mojave	6.46	x	4,412	= 28,502
Chemehuevi	5.97	x	1,032	= 6,161
Cocopah	6.37	x	1,170	= 7,453
Colorado River	6.67	x	20,334	= 135,628
Ft. Yuma	6.67	x	5,573	= 37,172

208916

2. The additional water rights granted possess priority dates identical to the dates when the land to which the rights are appurtenant became a part of the Reservation. The priority dates for all Reservations are generally given in the 1964 Decree.[20] The irrigable acres within the area of 360 acres added to the

16. Stipulation of September 8, 1980, record item no. 91.

17. Correction from S.P. Exh. 161.

18. Claimed Acreage 5,950
— Nonirrigable 84
5,866

19. Diversion amounts are fixed by the 1979 Decree. 439 U.S. at 422.

20. The evidence does not permit the specific assignment of dates to parcels of land and accompanying water rights on the Fort Mojave and

Cocopah Indian Reservation by the direction of Congress have a priority date of June 24, 1974.[21] In addition, all water rights appurtenant to land designated as boundary land in this proceeding have a first priority to satisfaction in the event of a shortage of water except for the earlier priority of satisfaction that may lie with miscellaneous present perfected rights with earlier priority dates held by non-Indians.

The Tribes Claims
Findings of Fact

1. Competent evidence of practicable irrigability of Reservation lands substantially supports the claims of the several Tribes.[22] The State Parties' responses also are competent and partially support their position in the dispute with the Tribes.[23] The evidence supporting the claimants, the Tribes, is more persuasive with respect to the most significant issues of practicable irrigability of Reservation land, with such exceptions as noted below.

2. Within the irrigation units designated in the Tribes claims there are a number of acres that are non-irrigable. Such areas are not practicably irrigable:

Colorado River Indian Reservations where sections were reserved at more than a single instance.

21. 88 Stat. 266. (1974).

22. C.R. Exhs. 1, 2; F.M. Exh. 2; CH. Exhs. 1, 2; C.R. Exh. 50; F.Y. Exhs. 18, 19, 30, 57, 58a.

23. S.P. Exhs. 26, 110, 147-52, 158.

Reservation	Land Type	Nonirrigable Gross Acres
Colorado River Chemehuevi	Arizona Omitted	861[24]
	California Omitted	1,150[25]
Ft. Mojave	California Omitted	55
	Arizona Boundary	76
	Arizona Omitted	435
	Total	566[26]
Ft. Yuma	Arizona Boundary	218
	California Boundary	3,970
	Total	4,188[27]

24. S.P. Exh. 148; See Part Two at II.B.(3) *infra*.

25. S.P. Exh. 149; see Part Two at II.B.(4).

26. S.P. Exh. 147; see Part Two at II.B.(2) *infra*.

27. S.P. Exh. 151; S.P. Exh. 110; F.Y. Exh. 18, at 56-58; F.Y. Supp. Exh. (Nov. 1981), record item no. 199; see Part Two at II.B.(1) *infra*. For Units FY-9 and FY-10A the increase in non-arable land shown on S.P. Exh. 151 over that shown on S.P. Exh. 110 gives the amounts 76 and 142 gross acres (218 total acres) of Arizona boundary land respectively within these units. The other land is California boundary land. The totals for Units FY-3 and FY-12 are 38 and 80 acres respectively. For the lands north of the Canal there are 3,852 gross non-irrigable acres. These last three figures total 3,970 acres. *See* S.P. Exh. 151. These totals appear in text.

3. There are 129 fewer gross acres of California boundary land in the Fort Yuma irrigation units than estimated by the Tribe.[28]

4. The evidence presented by the Fort Mojave Indian Tribe proves that the 95 gross acres that constitute the Quail Hollow Unit are practicably irrigable.[29]

5. The gross irrigable acreage on each Reservation should be converted to a net figure for computation of diversion rights based on a reduction of 5%,[30] except on the Fort Yuma Indian Reservation where the reduction should be 6% for lands south of the All American Canal and 10% for lands north of the Canal.[31]

6. The following practicably irrigable acres presently without water rights, in addition to those claimed by the United States, lie on the Reservations:

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28. For Unit FY-12 the Tribe claims 284 gross acres. F.Y. Exh. 18 at 56. The State Parties claim that there are 273 gross acres in that unit. S.P. Exh. 151. The difference, 11 acres, constitutes the amount within the total in text for that unit. The Tribe claimed 10,755 irrigable acres in the area north of the Canal. The State Parties' estimate that there are 10,637 acres in this unit. The difference of 118 gross acres is included in the textual total.

29. *See* F.M. Exh. 2; Part Two at I.C.(1)(a) *infra*.

30. C.R. Exh. 1; F.M. Exh. 2; CH. Exh. 1.

31. F.Y. Exh. 18, at 59.

Reservation	Gross Acreage x Reduction Factor	Net Acreage
Ft. Mojave	1,268[32] x .95	= 1,204
Chemehuevi	620[33] x .95	= 589
Colorado River	7,801[34] x .95	= 7,411
Ft. Yuma	98 x .94	= 92
	6,785[35] x .90	= 6,107
	Ft. Yuma total	= 6,199

15495

Conclusions of Law

1. For the benefit of the following Reservations the United States has the right to the annual diversion of the following respective additional amounts of water from the Colorado River or to the quantity of mainstream water necessary to supply the consumptive use required for the irrigation of the following net irrigable

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32. Claimed Acreage	1,739
+ Calada	95
— Nonirrigable	566
Gross Irrigable	1,268
33. Claimed Acreage	1,770
— Nonirrigable	1,150
Gross Irrigable	620
34. Claimed Acreage	8,662
— Nonirrigable	861
Gross Irrigable	7,801
35. *See* note 42 *supra*.	
North of Canal-claimed	10,637
— Nonirrigable	3,852
Gross Irrigable	6,785
South of Canal-claimed	434
— Nonirrigable	
Arizona	218
California	118
Gross Irrigable	98

acres and for the satisfaction of related uses, whichever is less:

Reservation	Unit Diversion Quantity A.F./Ac.[36]		Net Irrigable Acreage	Diversion Amounts in Acre-Feet
Ft. Mojave	6.46	x	1,204	= 7,778
Chemehuevi	5.97	x	589	= 3,516
Colorado River	6.67	x	7,411	= 49,431
Ft. Yuma	6.67	x	6,199	= 41,347

2. The additional water rights granted possess priority dates identical to the dates when the land to which the rights are appurtenant became a part of the Reservation. The priority dates for all Reservations are given in the 1964 Decree.[37] In addition, all water rights appurtenant to land designated as boundary land in this proceeding have a first priority to satisfaction in the event of a shortage of water, except for the earlier priority of satisfaction that may lie with miscellaneous present perfected rights with earlier priority dates held by non-Indians.

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36. Diversion amounts are fixed by 1979 Decree. 439 U.S. at 422.

37. The evidence does not permit the specific assignment of dates to parcels of land and accompanying water rights on the Fort Mojave and Colorado River Indian Reservations where sections were reserved at more than a single instance.

PART TWO

PART TWO

All five Indian Reservations—Colorado River, Fort Mojave, Fort Yuma, Chemehuevi, and Cocopah—contain land for which additional water rights are now requested. The United States has presented claims for these five Reservations. The Tribes adopted the claims of the United States and, except for the Cocopah Indian Tribe, claimed additional water rights based on their own expert reports. The tribal claims are considerably different from those presented by the United States. My discussion of those tribal claims must, therefore, be distinct from an evaluation of the United States presentation.

I. Claims Presented by the United States

A. *Introduction*

The claims of the United States meet with general agreement from the State Parties. In fact, the State Parties concede that approximately 80% of the acreage claimed by the United States is "practicably irrigable."[1] Of the disputed acreage claimed by the United States on the Colorado River Indian Reservation, the State Parties stipulated to a settlement which split the difference between the two parties.[2] Of the disputed acreage on the other four Reservations, the State Parties candidly admit that it is "land clearly subject to reasonable dispute."[3]

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1. State Parties' Post-Trial Opening Brief 1 (May 1981).
2. *See* Stipulation, September 8, 1980. This stipulation holds 21,634 acres on the Reservation to be practicably irrigable.
3. State Parties' Post-Trial Opening Brief 1 (May 1981).

This statement by the State Parties almost constitutes an admission that a finding sustaining all the United States factual claims would not be erroneous even if the State Parties dispute these claims. I agree with that characterization of this dispute. But I believe that the United States' evidence is generally stronger. After considering the competing presentations I find the United States' evidence to be the more convincing and, with noted exceptions, sustain its claims.

My resolution of this dispute does not merit a detailed discussion of the complete methodology employed by each side in demonstrating that crops can or cannot be grown profitably on these lands. Rather this matter can be adequately treated by briefly outlining the main areas of contention such as the effect of or proper accounting for: sandy soils; gravelly-cobbly soils; inclusion of non-arable land in irrigation units; gross-to-net acreage reduction; and costs. My discussion will be limited to those points of contention as noted in the State Parties' briefs.

B. *Sandy Lands*

The State Parties contend that approximately 1750 gross acres claimed by the United States are non-arable, lacking an ability to produce profitably any crops, because of their sandy nature.[4] These acres are primarily located on the Fort Mojave Reservation (irrigation units labelled by the parties as FM-2, FM-6, FM-7)

4. State Parties' Post-Trial Opening Brief 11 (May 1981); S.P. Exh. 110, Tables B-1, B-3, B-4, B-5. This figure excludes the 176 gross acres found non-arable for this reason on the Colorado River Indian Reservation. *See id.* at Table B-2. The stipulation regarding that Reservation removed those acres from controversy. Similarly the total of 1922 gross acres for all Reservations in Table B-6 must stand corrected as well.

and on the Fort Yuma Reservation (Unit FY-8).[5] The State Parties find this land non-arable primarily based on the investigation by their soils expert.[6] They claim that this expert's analysis was confirmed by payment capacity analysis using predicted yields and costs adjusted for sandy lands.[7]

1. *Low Moisture-Holding Capacity*

The State Parties' initial and most forceful objection regarding these sandy soils relates to the moisture-holding capacity of the soils. Their soils expert's finding of non-arability was based upon his own field work[8] and laboratory tests. The most crucial test for my findings is the moisture-holding capacity analysis which indicated lower moisture retention levels than considered acceptable by the State Parties' experts.[9]

This conclusion by the State Parties' soils expert was primarily determined by rather venerable standards for moisture-holding capacity developed over thirty years ago by another of the State Parties' experts, who testified primarily with respect to sandy lands and has undoubtedly achieved a good deal of professional recognition for his work in this field.[10] The test was designed to determine what is called "plant available moisture." This amount is determined by first identifying the soils' "field capacity" which is the amount of water remaining in a saturated soil profile after losses to gravity. This natural process is sim-

5. S.P. Exh. 110; Tr. 3699.
6. *See* Tr. 3063-91, 3102-12.
7. Tr. 3699-711; S.P. Exhs. 113, 114, 115.
8. *See generally* Tr. 3107-10, 3463-64; S.P. Exh. 27.
9. *See* Tr. 3102-03; S.P. Exh. 22.
10. *See* Tr. 2344-75, 3111; S.P. Exhs. 14, 15, 16.

ulated by an applied pressure test of 0.1 atmosphere (one-tenth bar). The plants generally begin to wilt when 50% of the water at field capacity remains. The difference in terms of water between "field capacity" and "wilting point" is "plant available moisture." This concept represented the amount of water held in the soils for effective use by the plants and was measured in terms of inches per the top four feet of soil. The experiments long ago designed by the State Parties' expert determined that approximately 2.5 inches of plant available moisture was necessary before soil could be considered arable.[11] The major disputed parcels of sandy soils following laboratory tests all failed to qualify as arable by this standard.[12]

Although this test has long been used by the Bureau of Reclamation, now the Water and Power Resources Service (WPRS), I do not consider it to be the best current test for determining acceptable levels of moisture retention in all soils. The State Parties and their expert claim that WPRS still uses this test in the lower Colorado River Valley.[13] An abundance of other evidence convinces me that the standard proposed by the State Parties is both outdated and in any event is not an absolute requirement of arability of soils. As early as 1952, the Bureau of Reclamation recommended farming sandy lands with as little as 1.9 inches of plant available moisture per four foot soil pro-

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11. Tr. 2387, 2484; *see* S.P. Exh. 26, at II-6 (the general guideline is a range between 2.3 and 2.6 inches).

12. Tr. 2368-71, 2373-76, S.P. Exh. 22. The four units failed in varying degrees. On FM-2 three samples revealed plant available moisture of .885 to 1.128 inches in a four foot profile. Samples from FM-6 and FM-7 were similar. Of the samples from FY-8 the highest score was 2.492 inches. S.P. Exh. 22.

13. Tr. 2385-90.

file.[14] The method of using 50% of field capacity has apparently been replaced by the Bureau of Reclamation[15] with a test which measures the plant available water as the difference between the water retained at .1 Bar and 15 Bars atmospheric pressure. Other scientists have also concluded that the test proposed by the State Parties significantly understates the amount of water available to plants on sandy soils.[16] In addition, the test used by the State Parties seems inevitably linked to the feasibility of older types of irrigation systems such as flood or gravity systems.[17] In deciding what is presently feasible, current systems must be considered,[18] and the efficiency of such systems have so changed that the feasibility criteria have changed and water holding capacity has thus become relatively "unimportant."[19] The State Parties' experts should therefore be concerned with the cost[20] of such modern systems. The final blow to the State Parties' standard comes from the successful agricultural development, primarily on the Von Santau Ranch, that presently exists on lands once classified as non-arable by the State

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14. *See* U.S. Exh. 89, Report on Ft. Mojave Project, Nevada 28-29 (Oct. 1952). Such lands were by then successfully farmed on the Colorado River Indian Reservation as well. *Id.*

15. U.S. Exh. 90, at ¶¶ 517.6.2D, 517.6.3, 517.6.3D, figure 17. Rather than 50% of field capacity, roughly 60% of the field capacity is believed available for plants. *Id.* ¶ 517.6.2C.

16. *See* U.S. Exh. 126, E. Rivers & R. Shipp, *Available Water Capacity of Sandy and Gravelly North Dakota Soils*, 113 SOIL SCIENCE 74, 78 (1972).

17. *See* Tr. 2498. *See also* U.S. Exh. 76.

18. Peters Deposition at 42, 52, 58-61.

19. U.S. Exh. 124, S.L. Rawlins, *Principles of Managing High Frequency Irrigation*, 37 SOIL SCI. SOC. AMER. PROC. 626, 628 (1973).

20. Tr. 2518-20.

Parties' expert on sandy lands.[21] This test is not necessarily rendered useless by this conclusion, but it definitely represents a criterion which I consider unduly restrictive for the present inquiry.

The United States proposes to evaluate these lands in a different manner. At one time the United States' soils expert had classified much of these lands as non-irrigable or non-arable due to their sandy character. Because certain sandy lands were being farmed primarily on the Fort Mojave Reservation, the United States' expert re-evaluated his standards regarding sandy soils.[22] The soils expert for the United States classified the sandy soils as Rositas sand[23] which is considered irrigable or arable. This determination was made under the standards of the Soil Conservation Service (SCS),[24] which stated in its standards that:

> Rositas soils are used principally for growing citrus fruits, grapes, alfalfa and truck crops.[25]

Indeed, SCS considers all Rositas soils to be "irrigable" or suitable for some crops without considering economics.[26] For the purposes of this litigation, such a characterization does not guarantee a finding of practicable irrigability. As the United States poses the question: "The main concern in using sandy land for growing crops is the low available moisture holding

21. *See* Tr. 795-99; 1611-21, 1633-36, 2499-510, 5621-48; F.Y. Exh. 72; U.S. Exhs. 77-88, 115, 121, 122.

22. Tr. 160-61.

23. Tr. 165; U.S. Exh. 1, app. A; *see also* Tr. 166-69. The actual term used by this witness to describe this soil was "irrigable" which meant suitable for irrigation without yet considering economics. Tr. 118; U.S. Exh. 1, at 1.

24. *See* Tr. 165; U.S. Exhs. 19, 20.

25. U.S. Exh. 1, app. A.

26. *See* Tr. 253-54; U.S. Exh. 1, at 1.

capacity of such soils,"[27] which translates into an engineering problem of design, management and economics.[28]

The SCS classification of sandy soils, used by the United States, measures moisture retention using the measure 0.1 Bar-15 Bars test. The difference between these two tests is called available water-holding capacity (AWC).[29] The State Parties contend that even the SCS classification requires a minimum average water holding capacity of 2.5 inches per five feet of soil or .5 inches per foot of soil.[30] The United States' soils expert testified that only the SCS standards for California have this lower limit, and, in any event, he made a point of adding that the SCS standards are merely guides.[31] From this I conclude that the standards do not represent rigid limits. The State Parties note some portions of the testimony by the United States' engineering expert where under cross-examination he seemed to imply that .5 inches/foot AWC was required for the continuous move sprinkler systems he projected for the disputed lands.[32] That same expert, however, when asked the question directly, replied that the standard was not an absolute limit for this type of system[33] and that the system he had designed

27. United States' Opening Post-Trial Brief 64 (May 1981).

28. Tr. 251-52, 176. The United States' expert did later state that the SCS California standards had a lower limit for acceptable water holding capacity. Tr. 339. The Arizona standards, however, do not have a lower limit. *Id.* In any event, the expert emphasized that the standards were merely guides. *Id.* Hence I do not believe they should be taken as rigid limits.

29. Tr. 170-75.

30. Tr. 3156, 3274, 3369-70; S.P. Exh. 21.

31. Tr. 339.

32. Tr. 727-28.

33. Tr. 731-32.

would adequately service crops in these sandy soils, including any problems associated with irrigating those soils.[34] He also stated that this .5 figure was not necessary where drip irrigation was used.[35]

I find that the United States is correct and that this matter under present technology involves sound judgment rather than rigid limits. As a result, I find that the United States' engineering evidence demonstrates the possibility of farming these sandy lands regardless of the low moisture retention capacity.

This conclusion is bolstered by the studies made by the United States of comparable sandy lands presently irrigated. The United States' soils expert prepared a table within his report which compared the water-holding capacities of the claimed lands with the capacities of presently-irrigated lands.[36] The State Parties note that on average the irrigated lands shown in that table have at least a 30% greater water-holding capacity.[37] But some of the irrigated lands also have a lower capacity than the disputed lands. This illustration convinces me that the United States is correct in claiming that lands, with as low a water-holding capacity as the disputed lands, can be farmed with irrigation. The relevant concern then becomes economics in the sense that the costs of an adequate system of irrigation must be measured against the benefits.[38]

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34. *See, e.g.*, Tr. 5672-84, 5729-30, 5765-66, 5769, 5819-20. *See also* U.S. Exh. 1, at 33-36, 40-44, U.S. Exh. 42, at 9-10.

35. Tr. at 731.

36. *See* U.S. Exh. 1, at 46.

37. *See* Tr. 2472-75; S.P. Exh. 23.

38. The State Parties note that no expert for the United States established that these comparable sandy lands were economical to irrigate. State Parties' Post-Trial Opening Brief 20-21 (May 1981); State Parties' Post-Trial Closing Brief 4-5 (June 1981). This argument very nearly amounts to an admission by the State Parties that the proper focus of

2. *Related Deficiencies of Sandy Lands*

The State Parties also note several "related deficiencies of sandy lands" that support their belief that the disputed sandy lands are not arable.[39] They do not present any quantified analysis regarding these aspects of sandy lands.[40] Their presentation on this matter consists mainly of impressionistic statements that indicate some additional difficulties of farming these sandy lands. These arguments as presented are unpersuasive. The United States' experts recognized that such problems exist and accounted for such matters in their projects' design and cost.[41] Moreover, the problems that are raised under the heading of "related deficiencies" appear to be a grouping of several problems discussed more specifically by the State Parties under such headings as moisture-holding capacity, yields, and production costs.[42] Absent a quantitative demonstration on this point, I shall treat these "related deficiencies of sandy lands" as being addressed primarily in the various preceding and succeeding sections of the State Parties' argument.

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this sandy lands dispute over water-holding capacity is the economic focus on devising a system for the more frequent delivery of water used by the United States.

39. State Parties' Post-Trial Opening Brief 22-25 (May 1981).

40. *See, e.g., id.*; S.P. Exh. 26, at II-5 to -6.

41. *See, e.g.*, Tr. 5672-88; U.S. Exh. 42, at 9-11.

42. *Compare* State Parties' Post-Trial Opening Brief at 22-25 *with id.* at 14-21 *and id.* at 25-37.

3. *Economic Analysis of Sandy Lands*

(a) *Introduction*

The State Parties offered as a confirmation of the non-arability of these sandy lands an economic analysis of the yields and costs which they expect would result if these lands were farmed.[43] With decreased yields and higher production costs on these sandy lands, the lands showed a negative payment capacity[44] which meant that farming would be unprofitable before the costs associated with water delivery are considered.[45] I find the State Parties' analysis of payment capacity less convincing than the competing analysis prepared by the United States.

(b) *Yields for Sandy Lands*

The State Parties adjusted their yield predictions for the sandy lands because of the expected lower productivity of these lands. They relied upon the judgment of their soils experts to determine the order of magnitude of the reduction in yield that would be subtracted from the base figure.[46] This reduction was quantified by reference to the SCS Soil Survey of Palo Verde Area, California.[47] That survey indicated that for alfalfa, for example, a yield of 4-6 tons per acre could be expected on sandy soils.[48] The State Parties used the 6 ton figure as their adjusted yield figure.[49]

43. Tr. 3699-700.
44. Tr. 3701-02, 3707-11; S.P. Exhs. 113, 114, 115.
45. Tr. 3601.
46. Tr. 3702, 3878-79.
47. Tr. 3702, 3879-80, 4326-27; F.Y. Exh. 34.
48. F.Y. Exh. 34, Table 2.
49. S.P. Exh. 113, 114, 115.

The United States relies upon the testimony of its agricultural economics expert in support of its claim that the expected yields would be 7.5 tons per acre on the Fort Mojave sandy lands and 9 tons per acre on the Fort Yuma sandy lands[50] after adjusting for decreased yields on sandy lands. This disagreement is potentially fatal to some of the United States claims because, using the agreed price for alfalfa of $70 per ton,[51] the United States projects only $10 or less net benefits per acre after subtracting cost of delivery of water for the three units in Fort Mojave.[52] Although the State Parties' analysis is competent, I find the United States' yield projections more persuasive.

The agricultural economist for the United States was an expert unusually qualified to make this sort of study and he undertook a comprehensive and detailed analysis of the expected yields for all lands claimed by the United States to be practicably irrigable. His lengthy and impressive experience as an agricultural economist active in economic analysis in the lower Colorado River region was simply unmatched by any other witness in this case.[53] This expert also had direct experience as a farmer in Arizona. In addition, he had served as project leader of a research project for "conducting research in the correlation of economic and physical factors affecting the selection of lands for irrigation."[54] In this capacity, he supervised field experi-

50. U.S. Exh. 60, at 2, 10-11, 18-19.

51. U.S. Exh. 60, Table A-5; S.P. Exh. 113.

52. U.S. Exh. 60, at 18. On Fort Yuma the disagreement is larger but equally critical. The State Parties estimate that if the United States' yield figure is overstated by only slightly over 1 ton, then the water delivery costs would exceed revenues. State Parties' Post-Trial Opening Brief 28 (May 1981); *see* Tr. 6039-41; U.S. Exh. 60, at 19.

53. *See* Tr. 743-45, 749-50, 752; U.S. Exh. 60, app. F.

54. U.S. Exh. 60, app. F-2.

ments "using irrigation water and fertilizer on various crops . . . to determine the production function or the response of crops upon varying soil qualities ranging from the very good loamy soils down to the other soils at the end of the spectrum which are the lighter soils."[55] This expert was remarkably suited by training and experience to answer this question of yields.

In carrying out his task, he computed an analysis that was notable for its comprehensiveness in relation to this question. He reviewed the relevant literature regarding expected yields for the region as well as drawing upon his own experience in the area. In addition, he interviewed farmers in the immediate vicinity to learn more fully the yields possible from the lands. Finally, he visited each parcel under consideration.[56] His conclusions on the economic feasibility of farming these lands were incorporated into a lengthy report which dealt specifically with expected crop yields and revenues.[57] His analysis resulted in his own projection of expected yields and reductions in yields for sandy lands.[58]

The State Parties contend that this expert's base yields are too high and his reductions in yields on sandy lands are too low. In particular, they claim that he erred in projecting yields possible on the disputed lands if those lands were farmed by the better farmers using a high level of management.[59] They note that this approach which uses the results obtained presently by the most successful farmers is claimed, by the

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55. Tr. 745.

56. Tr. 763-66.

57. U.S. Exh. 60.

58. *See* Tr. 5997-98; U.S. Exh. 60, at 2.

59. State Parties' Post-Trial Opening Brief 29 (May 1981). *See generally* U.S. Exh. 60, at ii, 2, 9, 11-12.

United States, to be indicative of future average results.[60] The State Parties criticize this analysis as comparing future average yields with present average costs and prices.[61] Their expert relied on representative yields derived from statistical reports and confirmed by farm advisors and farmers with knowledge of yields.[62] Their position regarding the magnitude of reduced yields on sandy lands derives its primary support from the Palo Verde Soils Survey which shows lower yields on sandy lands than the yields projected in the study by the United States' agricultural economist.[63] This issue turns upon two sub-issues: whether the State Parties' reliance upon the Palo Verde Soils Survey[64] is preferable to the United States' more specific and detailed inquiry and whether it is error to use the yields from better farmers.

The first issue is relatively easy to answer. The State Parties' expert has in the past analyzed payment capacities of irrigation projects and his work in this case appears to be entirely within generally accepted professional standards. A comparison of his testimony with the United States' economist, however, convinces me that the latter is more within his field of expertise

60. U.S. Exh. 60, at 9; Tr. 786-89, 866, 6092-93.

61. Tr. 4325-26, 4389-90.

62. Tr. 3659, 3831-32, 3836-37.

63. State Parties' Post-Trial Opening Brief 31-34 (May 1981). They contend that the United States' economist did not lower his projected yields sufficiently to account for these limitations. They do not indicate specifically the reduction that should have been made, but instead return to the Palo Verde Soils Survey from which their expert derived his base yields. *Id.* at 31-32. Both the base yields and reduction questions, thus, appear to turn upon the correctness of using the soil survey yields as opposed to using an approach which incorporates this survey into a much broader study.

64. F.Y. Exh. 34.

on this issue. The work of the United States' economist on yields in this case simply represents another task which perfectly matches his past career. To be sure, his base yield figures were derived from his research of a variety of sources specifically relevant to this case such as publications and interviews with farmers.[65] But that inquiry was merely a natural progression of his ongoing study of such matters in general. His own description of the sources he synthesizes into his expert opinion provides a good summary of the extent of his background and how it relates to this case.

> We maintain as part of our resources extensive data on crop prices and crop yields and we have a pretty good idea what crop yields are and what they are expected to be. That is one reason why I try to stay close to the agricultural production, too. But we review extension publications, talk with extension agents, other consultants who are working directly with the farmers to get their feel for yields in particular areas. And then primarily armed with that information I talk to the farmers then. And I ask them about their yields and what the yields, the average yields were over the last two or three years. And I like to ask them the question, because it is particularly telling, I put it to them usually in this manner: If the section next to you were desert and you were contemplating developing that land, bringing it into production, and you knew you were going to have to make the investment and to do the whole thing, what sort of crop yields would you use in analyzing whether you would develop that or not.[66]

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65. Tr. 759-60, 776-77, 844-45, 990-92, 5989-93, 6093-94.
66. Tr. 759-60.

This witness' basic yield figure represents an estimate derived from a very comprehensive study of the subject matter.

The clearest showing of the superiority of the United States' expert lies in the debate over the proper yield reduction for sandy lands. The State Parties flatly state that "[R]eliance on the Palo Verde survey for sandy lands yields is the correct method."[67] Of course that is the method chosen by their expert. But it is not clear that the State Parties' expert fully appreciated potentially important aspects of this issue. The Palo Verde Soils Survey,[68] relied upon by the State Parties for the expected yields on sandy lands, bears the date of 1974 but contains data collected in the period of 1962-68. The State Parties' expert, however, did not know that the age of some of the data in this Survey was 19 years at the time of his testimony.[69] This statement followed his statement that yields would have improved within the last 20 or 30 years.[70] He did state that he confirmed the ranges of the yields shown in this survey,[71] but the conclusion is inescapable that he did not appreciate the age of this data. As the United States has noted, improvements in yields must be considered to have occurred since 1968, and certainly since 1962.[72] The exact increase applica-

67. State Parties' Post-Trial Opening Brief 32 (May 1981).

68. F.Y. Exh. 34.

69. Tr. 3880-83.

70. Tr. 3882.

71. Tr. 3883-84.

72. *See* Tr. 6005-06; U.S. Exh. 146. One of the State Parties' experts agreed with the United States on this point, at least with respect to wheat. Tr. 4984. The State Parties criticize U.S. Exh. 146 because the yield increase for Arizona from 1968 to 1979 shown on the exhibit may not apply perfectly for the yield increases expected during that time frame in the more limited region of the lower Colorado River. They also

ble to these sandy lands is a matter of expert judgment. The United States' expert contended that if the State Parties' analysis, based on the Palo Verde Soils Survey, had considered appropriate yield increases, their projections would have been similar to those yields which he projected.[73] The United States' economist considered the Palo Verde Soils Survey in order to develop a percentage reduction in sandy land yields from his base figure for expected yields generally.[74] The ultimate figure adopted was quite properly a matter within his judgment, in which he considered such factors as yields actually achieved on sandy lands in the area.[75] I find this broadly-based analysis to have a more solid foundation than one which is almost exclusively based on a publication which appears to be somewhat dated and thus not likely to render a reliable yield figure by itself.

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criticize it because it shows only the increase for all soil types and not for sandy soils specifically. State Parties' Post-Trial Opening Brief 33-34 (May 1981). This exhibit may not be perfect in its support of the United States' contention that the expected yields have increased for these particular sandy lands. It, nevertheless, is relevant and probative of the general idea that some rational provision must be made for such an increase in expected yield. The actual magnitude of that increase is ultimately a question of expert judgment. If the United States' expert finds the Arizona increase to be generally most appropriate, that is a judgment to be made that is within his expertise. Similarly, he might in his expert judgment conclude that sandy soils would experience a similar increase or he might even conclude that in some particular cases the increase might be slightly above that indicated for Arizona generally. And he is most certainly not limited to applying mechanically that increase to the range of yields given in the Palo Verde Soils Survey if the data known to him combines with his expert judgment to inform him that a higher yield is indicated.

73. Tr. 6005-09.

74. Tr. 5997-98.

75. Tr. 777-80.

I am also convinced that his overall theoretical approach is the most sound as well. His decision to emphasize the yields of the better farmers was consistent with economic theory.[76] As the only true economist to testify, this expert provided the most convincing evidence upon which I can base a judgment regarding whether his use of the better yields and high-level management is consistent with a proper economic inquiry. I should note, however, that his conclusions accord with what I consider to be the sensible approach, because the present inquiry concerns the ability of the lands to produce crops profitably, not the likelihood of any particular person, average or otherwise, to succeed in such an operation. If the land can profitably be farmed by anyone, considering *all* relevant costs and benefits, the land might beneficially be irrigated.

For these reasons, I find the approach and application of the United States to be the preferable method regarding projected yields and would adopt its findings.

(c) *Production Costs on Sandy Lands*

The State Parties also contend that the United States underestimated production costs on sandy lands. Because of the "increased level of activity" necessary to farm these lands, they estimated that the production costs (other than harvest costs) should increase by 25%, a figure that they sought to confirm by an "item by item estimate" of the costs.[77] The State Parties list the items of cost which make up this total 25% increase in production costs: 1) increased capital

76. Tr. 788.

77. State Parties' Post-Trial Opening Brief 35 (May 1981); *see* Tr. 3706-07, 3904-05, 4342-43, 4407-15; S.P. Exh. 26, Tables C-1, C-4, C-5.

cost of sprinkler irrigation over flood irrigation; 2) increased cost of irrigating more frequently; 3) increased land preparation costs; 4) increased planting costs due to germination problems; 5) increased fertilizer costs; and 6) increased management costs.[78] The total of the increased costs attributable to these items resulted in a 25% increase in overall production costs.[79]

Again I find the United States' evidence more convincing. This finding could be based upon the State Parties' vague and unconvincing approach in this matter. The overall figure of 25% began as a representative number for all production costs based upon the experts' judgment without itemized estimates.[80] When pressed to identify the magnitude of the increases attributable to individual items of production costs, the State Parties' expert was less than clear about the magnitude associated with any particular item among those listed above.[81] Although this expert very confidently stated that he verified the overall figure by an item by item analysis,[82] the vast majority of the cost items were never quantified in any reasonable form that would allow anyone else to check his analysis. Perhaps the depth of his analysis is best indicated in his own words when he described his verification work on this issue as "just the back-of-the envelope type calculation."[83] I cannot accept a figure such as this 25% figure because it combines so many different ele-

78. *See* Tr. 3706, 3878, 3895-904, 4411-15.

79. Tr. 4342-43, 4408-09. The State Parties' calculation incorporated one decreased cost item, harvest costs. As expected yields would be less on sandy lands, some variable costs in harvest would decrease. Tr. 3710, 3893-94; S.P. Exh. 113, 114, 115.

80. Tr. 3706-07.

81. Tr. 3892-905.

82. Tr. 4342-43.

83. Tr. 4409.

ments which are subject to individual variation. I have no reasonable method of knowing if the cost increases truly add to the total given by the expert. I am more convinced by the United States' economist's opinion that many of these costs would not increase as projected by the State Parties,[84] primarily because his inquiry was tailored from the start to deal with conditions existing on the individual parcels of land.[85] In short, I agree with his conclusion that a 25% cost increase for these items "seems totally out of line."[86] In choosing between expert opinions I believe the opinion offered by the United States is persuasive.

Moreover, I am not certain that any meaningful disagreement exists over some items or that other disagreements have been effectively presented. For example, the United States analysis does include an increased cost figure for fertilizer on sandy lands.[87] In addition, the largest cost increase for irrigating sandy lands mentioned by the State Parties' expert was the capital cost using sprinkler irrigation on the farm lands rather than gravity irrigation. The gravity system was estimated by the State Parties' expert to cost $400 per acre while the sprinkler on-farm system would cost between $800 to $1,000 per acre.[88] The State Parties' analysis of this issue simply criticizes the United States' agricultural economist for minimizing this aspect of the problems associated with farming sandy lands and notes that the economist would never increase his costs for increased costs associated with sprinkler irrigation because his payment capacities do

84. Tr. 6029-35.
85. *See* U.S. Exh. 60.
86. Tr. 6035.
87. *Id.*
88. Tr. 3902.

not include on-farm irrigation system costs.[89] This latter observation, although true, is misleading and illustrates a major difficulty in attempting to approach this question in the manner used by the State Parties. The State Parties' argument implies that there is some additional cost factor associated with sprinkler systems that the United States has failed to include in its studies. The United States has always proposed sprinkler systems for irrigating these sandy lands and has clearly indicated the costs estimated to be appropriate for such on-farm systems as projected.[90] The United States did not overlook the desirability of using sprinklers on these sandy lands and it prepared cost analyses of such systems. The State Parties, on the other hand, did not design on-farm systems and merely took a per-acre cost estimate.[91] Moreover, the cost of systems that have actually been built support the United States' estimate.[92] The State Parties' presentation regarding the cost of sprinkler irrigation systems hardly impairs the persuasiveness of the United States' detailed cost analysis. The State Parties' expert merely states, with reference to on-farm capital costs, that sprinklers cost more than flood irrigation, but he does not specify how the United States has erred.[93] From

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89. State Parties' Post-Trial Opening Brief 36-37 (May 1981). *See* Tr. 961, 6029-35.

90. *See* Tr. 490-94, 5604-05, 5841-43; U.S. Exh. 42, at 30-35, 37, Table 7, Table 10, app. B, app. C.

91. Tr. 3874-76, 3878.

92. Tr. 5604-06, 5841-43, 490-94.

93. Any comparison on this state of the evidence and argument is hampered by some differences in the manner of presentation adopted by the parties. The United States' capital cost estimates for irrigation systems include costs for the distribution system, required to bring the water to the edge of the farm, as well as the costs for the on-farm system, such as sprinklers, required to apply the water to the land. *See* U.S. Exh.

the arguments presented, I simply cannot tell precisely to what extent the State Parties' 25% increase in costs is already accounted for in the United States' figures. In any event, I am more impressed with the detailed analysis performed by the United States' experts.

I conclude that the United States' cost projections are convincing.

C. *Gravelly and Cobbly Soils*

The State Parties next contend that approximately 1,800 gross acres claimed by the United States as practicably irrigable contain such amount of gravel or cobble[94] to be non-arable, lacking a positive payment capacity.[95] These disputed lands located on the mesa areas of the Reservations consist of major portions of the projected farming units known as FM-5, Calada, CH-4, as well as a smaller portion of CH-3.[96] The State Parties' soils expert classified this land as either suitable only for permanent crops such as tree or vine crops or unsuitable for any crops.[97] As confirmation of this conclusion, they computed payment capacities for

42, app. B. The State Parties include only the capital cost of the distribution system in their capital cost of irrigation facilities. S.P. Exh. 26, at IV-7 to -14. The on-farm delivery costs of water appear as charges against annual benefits used by the State Parties in arriving at an annual payment capacity per acre. S.P. Exh. 26, at V-1 to -5, app. C. The State Parties would adjust the payment capacities in Appendix C of their experts' report, S.P. Exh. 26, to account for a difference of cost resulting from the use of sprinklers. *See* Tr. 3902.

94. Gravel consists of rock particles from 2 millimeters to 3 inches in diameter. Cobble consists of rock particles from 3 inches to 10 inches in diameter. Tr. 150, 199-200, 3305; S.P. Exh. 26, at II-6 to -7.

95. State Parties' Post-Trial Opening Brief 37 (May 1981); S.P. Exh. 110, Tables B-1, B-3.

96. S.P. Exh. 110, Tables B-1, B-3; S.P. Exh. 26, at B-13 to -16, B-18, B-25 to -28.

97. Tr. 3157-82.

these areas for both field crops and permanent crops and decided that no crop would generate a positive return if the yields and costs were adjusted to allow for the physical character of the soils.[98] From these analyses they conclude that this land cannot be "practicably irrigable."

The United States disputes these conclusions. It contends that the lands are not so rocky as the State Parties claim and that lands with some gravel or cobble may still be farmed economically.[99]

The result of this inquiry, like that of many others depends upon what is believed to be the question. The State Parties claim that there is "some difference between the experts as to what they observed" but the "more important difference between the experts is not in what they observed, but in how the gravel and cobble in these soils affect crop suitability."[100] This astounding statement slights the substantial attempt made by the United States to demonstrate that these lands were not so gravelly or cobbly[101] as the State Parties had claimed in their expert's report.[102] The State Parties operating from the false premise then attempt to demonstrate that lands, as rocky as they

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98. *See* Tr. 3651-53, 3716-17; S.P. Exh. 26, at II-7 to -8; Tr. 3720-24, 3891-92; S.P. Exhs. 113, 116. The State Parties did consider the soils suitable for generating a positive payment capacity if grapes are considered. Tr. 3652-53, 3692-94, 3698, 3713-14. Once water delivery costs are fully considered, however, even grapes would be a losing venture, according to the State Parties who also believe that this region's climate will not sustain grapes in any event. *See* State Parties' Post-Trial Opening Brief 38 n.4 (May 1981).

99. United States' Opening Post-Trial Brief 74-79 (May 1981).

100. State Parties' Post-Trial Opening Brief 40 (May 1981).

101. *See* Tr. 128-29, 138-55; U.S. Exhs. 23, 25-32, 22 DD, 22 EE, 22 GG, 22 HH, 22 II, 22 JJ, 22 KK, 22 AAA, 22 BBB, 22 CCC, 35-37. *See also* Tr. 3299-307 (cross-examination of State Parties' soils experts).

102. S.P. Exh. 26, at B-13 to -16, B-18, B-25 to -28.

claim these lands to be, cannot be farmed economically. A demonstration that these lands cannot be irrigated within economic practices is, of course, aided by an assumption that the land was so rocky that often sufficient exploratory pits could not be dug or that 50-80% of the surface was covered by up to an inch of gravel.[103] That assumption I cannot make in light of the substantial evidence to the contrary introduced by the United States. In fact, I believe that the United States' position is correct. The United States' expert originally classified this land as arable or irrigable[104] and specifically reexamined these lands to confirm his original analysis.[105] Upon review of the evidence I find that presentation persuasive. Having reached that conclusion, I find the United States' evidence on yields and costs applicable to farming these lands to be closer to the mark and persuasive.[106] Because these findings rest on the facts presented, a specific discussion of the evidence relating to some of these lands might be useful.

1. *Physical Analysis of the Parcels*

The nature of this factual inquiry presents some very difficult obstacles to a factfinder. The broad issue is which side's evidence more fairly represents the actual character of these disputed tracts of lands. Any conclusion must rest on the testimony of the competing experts and the record exhibits. But the inquiry is such that precise findings are not possible. No Court

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103. *See* State Parties' Post-Trial Opening Brief 40 (May 1981); Tr. 3157-58, 3174-75, 3338-40.

104. U.S. Exhs. 1, 2, 3, 5, 6.

105. Tr. 137-59.

106. *See* Tr. 763-95, 5716-20, 5998, 6035-38, 6056-62.

can determine exactly the character of each square foot of this land. The acreage involved is considerable and the non-technical evidence presented offers only brief glimpses of the lands. From these bits and pieces I am afforded my only opportunity to test the broader opinions of these soils experts. A review of the evidence reveals that the United States' expert appears more reliable. This observation joined with the evident care and attention to detail in the report by the United States soils expert[107] makes his opinion overwhelmingly convincing.

(a) *The Calada Unit*

Perhaps the greatest disagreements centered upon the disputed character of the Calada Unit. The United States' soils expert found that on the surface "there are some small gravels occasionally. Cobbles were rare. . . . And as I indicated the lower part of the [60 to 80 inch soil] profile is very gravelly."[108] The State Parties' soils expert described this land as "undulating . . . cobbly and gravelly in places" on the surface and "rather cobbly" soils in those places where the land was not so rocky as to prevent his digging.[109] Although this is a question of degree, the disagreement is clear.

The State Parties' expert, in addition to the testimony quoted above, added several details supporting his conclusions. He stated that the soil on this unit was so cobbly that often a sufficient hole could not be made and that backhoe holes made by someone else prior to his second visit to the area revealed solid

107. U.S. Exh. 1.
108. Tr. 150.
109. Tr. 3157.

cobble in the subsoil from 12 to 18 inches in depth.[110] These conclusions only applied to the northern two-thirds of the Calada Unit (484 acres).[111]

Some objective evidence supports this position. This witness examined a photograph that was later admitted into evidence.[112] This photograph reveals almost solid cobble in the soil profile shown, and the soils expert stated that "if anything, it is a little less cobbly than what I saw in the holes that were dug."[113] One other photograph of the northern Calada Unit produced by the State Parties shows a somewhat less extreme concentration of cobble, but the soil is still very cobbly in that second view.[114] Thus, the State Parties' position is supported by evidence showing some cobbly land in the northwest portion of the Calada Unit.

But that much was admitted by the United States' expert. He acknowledged that near the top of the northwestern escarpment there were cobbly or gravelly areas exposed where erosion had washed away the topsoil.[115] But such areas were on the margins of the Calada Unit.[116] That evidence hardly establishes the typical character of the Calada Unit. The pictures of the northwest Calada Unit introduced by the State Parties for the most part depict the extreme boundaries of that parcel[117] if they depict the unit at all.[118]

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110. Tr. 3158.

111. Tr. 3299-301.

112. S.P. Exh. 46. This photograph depicts a road cut near the northwest edge of the Calada Unit. Tr. 3537-38.

113. Tr. 3159.

114. S.P. Exh. 106 (photo F-36).

115. Tr. 342-43.

116. Tr. 344.

117. *Compare* S.P. Exhs. 46, 86, 106 (photo F-36).

On the other hand, the State Parties have also introduced two other photographs of the northern part of the Calada Unit.[119] These photographs show a vast expanse of flat land with scattered surface gravel.[120] In fact, these photographs show land remarkably similar to that shown in the United States' photograph taken somewhat to the north and west.[121] Thus, by the State Parties' own evidence there is some reason to question whether their expert correctly characterized the soil of the entire northern Calada Unit.

The question is fully settled by a review of the evidence offered by the United States. Its soils expert returned to the Calada Unit to confirm his original classification following the State Parties' claim that the land was too gravelly or cobbly. He dug nine test pits scattered throughout the parcel to confirm his findings.[122] This reexamination did in fact confirm his previous classification.[123] The surface soils varied from

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118. The witness who supplied the foundation for these exhibits testified that he located his position on the map by the reading on his car's odometer. Tr. 3538-39. Given the undisputed fact that the pictures were taken near the border of the unit, the photographs might very easily depict lands just out of the unit if a reasonable margin of error is allowed. There is some reason to doubt the precise location of the areas in these photographs. *See also* Tr. 3560-61. *Compare* S.P. Exh. 86.

119. The State Parties did introduce two photographs showing cobbly soil in the southern Calada Unit. *See* S.P. Exh. 106 (photos F-31, F-33). The State Parties do not, however, claim that the southern portion is too cobbly to use for field crops. *See* Tr. 3299-301. Photo F-33, however, does confirm my belief that many of these cobbly areas on the Calada Unit are relatively small in relation to the unit as a whole. That photograph shows large cobbles in the foreground and shows in the background a large expanse of flat land.

120. S.P. Exh. 106 (photo F-3, F-4).

121. *Compare* U.S. Exhs. 23, 22DD *with* S.P. Exhs. 86, 106 (photo F-3, F-4).

122. Tr. 137-38.

123. Tr. 138-52.

loamy sand to gravelly sand.[124] The sub-surface soils often contained gravel beginning at depths ranging from 21 to 47 inches.[125] He found cobble in the northern Calada Unit in only one test pit beginning at a depth of 23 inches.[126] His conclusions are effectively summarized in documentary form and supported by photographic evidence.[127] This evidence was a thorough and systematic proof of the United States' position.

The opposing expert's reply was unconvincing. In examining two of the photographs[128] of these pits the State Parties' soils expert grudgingly admitted that the lack of cobble in the upper portion of the soil profile made the area surrounding the pits suitable for field crops, although he had classified them as suitable solely for permanent crops.[129] The photographs of the other four test pits made in the northern Calada Unit were not shown to this witness.[130] Although some of those four pits show more gravel than the first two, none of the photographs introduced by the United States shows amounts of gravel and cobble approaching the amount which the State Parties' expert indicated was typical of the Calada Unit soils.[131] The State Parties' soils expert did not present any photographs depicting the soil profiles upon which he claimed to base his opinion. His response to the United States' evidence which rebutted his conclusion was to state

124. U.S. Exh. 23.
125. *Id.*
126. *Id. See* Exh. 22JJ.
127. *See* U.S. Exhs. 22DD, 22EE, 22GG, 22HH, 22II, 22JJ, 22KK, 22AAA, 22BBB, 22CCC, 23-32.
128. U.S. Exhs. 22AAA, 22BBB.
129. Tr. 3301-06.
130. *See* U.S. Exhs. 22EE, 22GG, 22JJ, 22KK.
131. *See* Tr. 3158-59; S.P. Exh. 46.

simply that such evidence indicates the variability of the soils in that unit where some small parts might be arable.[132] He later implied that the United States' soils expert may have chosen to dig sample pits in specific areas where the results would be more likely to favor the United States.[133] This witness based his most specific opinion on an unspecified number of pits which he discovered in the Calada Unit and which he stated showed cobble at depths of 12 to 24 inches.[134] I consider significant this witness' failure to support his testimony with documentary evidence. He never offered proof, such as photographs, field charts of soil profiles, or soil classification maps, that generally contradicted the evidence submitted by the United States.[135] Neither did he attempt to account for the alleged "variability" of the northern part of the Calada Unit in any manner except to pronounce the northernmost two-thirds of the parcel to be non-arable. I must conclude that the better-documented and more precise proof presented by the United States soils expert is more nearly correct regarding the physical character of the Calada Unit. Perhaps the State Parties are correct to the extent that certain small portions of the northern part of the unit contain a good deal of cobble[136] as illustrated in the much-discussed photograph of a road cut on the northwestern edge of the unit. But considering all the documentary evidence, that photograph cannot justify a finding that the northernmost 484 acres of the unit is generally as gravelly or cobbly as

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132. Tr. 3306.

133. *See* Tr. 3469-70.

134. Tr. 3469. The record does not indicate who made these pits.

135. *Compare* U.S. Exhs. 2, 3, 22DD, 22EE, 22GG, 22JJ, 22KK, 22AAA, 22BBB, 23-32.

136. *See* S.P. Exh. 46.

the State Parties claim.[187] Furthermore, having claimed that the unit is "variable," the State Parties give me no reason based on either testimonial or documentary evidence to exclude from further consideration the rocky portion of the northern unit. The United States presented a sound general case and in addition attempted to specifically rebut the State Parties' claim regarding the stoniness of this parcel of land. The United States proceeded as far as one party reasonably could to prove its position with specific examples. Any further demands upon the proof by that party would approach a requirement that it prove a negative. Absent more specific evidence from its opponent, the United States' case is convincing.

(b) *Unit FM-5*

Another unit alleged by the State Parties to be too gravelly and cobbly to farm is FM-5. Although it is clear that for this reason they dispute the arability of

137. Indeed, the State Parties do not call my attention to any of the photographs or other exhibits entered on their behalf regarding the "gravelly and cobbly" soils. My citation of such exhibits as S.P. Exhs. 46, and 106 derives from my independent review of the record. From such exhibits I can merely conclude that the extreme margins of the Calada Unit are cobbly, an admitted fact. *See* note 102 and accompanying text *supra*. The United States, on the other hand, cites numerous exhibits showing the physical character of the land. *See* United States' Post-Trial Opening Brief 75 (May 1981). Given the volume of exhibits in this case, I must rely to a large extent upon the adversary system to call to my attention the relevant evidence in the record. The State Parties' failure to cite any documentary or objective evidence rebutting that cited by the United States causes me to believe that such evidence is not in the record. That belief is confirmed by my own recollection as well as my independent review of the record. I can only conclude that no evidence in the record justifies a finding that the entire 484 acres found irrigable by the United States is so cobbly or gravelly that the entire amount cannot be practicably irrigable.

large portions of this unit, the particular acres under dispute for this reason and their location are not clearly defined.[138] The State Parties' soils expert testified that these allegedly gravelly and cobbly lands were very similar to the soils found in the Calada Unit.[139] The United States' expert rested upon his initial opinion that the lands were irrigable.[140] Under these circumstances I find, consistent with my findings regarding the similar Calada Unit, that the United States characterization of these soils is correct.

The State Parties did introduce several photographs of this unit showing very rocky soils but such photographs appear to have been taken in areas classified as non-irrigable by the United States' soils expert.[141] Because the State Parties do not attempt to connect these lands to the specific areas they excluded for its gravelly or cobbly character rather than those excluded because they are non-arable for any crops, they give me no basis to use these photographs in this manner.[142] And I believe that these photographs merely show that there are cobbly areas near the extreme margins of the areas classified as irrigable by the United States' soils expert. For the reasons given with regard to my decision on the Calada Unit, I am unpersuaded that such evidence justifies exclusion of all

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138. *See* S.P. Exh. 26, at B-13 to -16; Tr. 3160-62; State Parties' Post-Trial Opening Brief a-8 (May 1981).

139. Tr. 3161.

140. *See* U.S. Exhs. 1-3.

141. *Compare* U.S. Exh. 3 *with* S.P. Exhs. 86, 96-101. Indeed, the testimony offered regarding the location of the areas depicted in these photographs can only be described as confused and inconsistent. Tr. 3543-57. Therefore, some of these photographs might very well depict lands not on the allegedly irrigable lands of Unit FM-5.

142. The photographs may show such cobbles which at some depth underlay the units of Calada and FM-5.

areas of a parcel classified as generally irrigable by one party.

(c) *Unit CH-4*

The State Parties excluded as gravelly and cobbly approximately 937 acres from the unit on the Chemehuevi Reservation known as CH-4.[143] The State Parties' soils expert found 50-80% of the surface area covered by gravel with frequent patches of cobble.[144] The United States' soils expert, on the other hand, found the surface to have 30-40% gravel with only scattered cobble.[145] This latter expert originally classified this area as irrigable and later confirmed his initial classification on a second trip during which he dug three sample pits to observe the soil profile.[146] From these conflicting reports, there exists a fact dispute regarding the amount of surface gravel on the unit.

There is no question that this land is covered by a considerable amount of gravel. The State Parties' photographic evidence of lands within these sections claimed by the United States to be irrigable clearly shows a substantial amount of surface gravel.[147] In fact, there are portions of the unit which have surfaces 50-80% covered with gravel as stated by the State Parties' expert.[148]

On balance, I believe that the United States' expert more fairly represented the typical character of the surface soil. The State Parties' expert thought the

143. S.P. Exh. 26, at B-26; S.P. Exh. 110, Table B-3.
144. Tr. 3174-75.
145. U.S. Exh. 1, at 62; U.S. Exhs. 35, 36, 37.
146. *See* Tr. 153-55; U.S. Exhs. 35, 36, 37; U.S. Exh. 1, at 62.
147. *See* S.P. Exh. 107.
148. *See* S.P. Exh. 49.

photographs showing the greatest amount of gravel and cobble depicted views typical of the soil in the unit, although the other photographs clearly show less gravel and cobble.[149] The United States' expert has consistently recognized that a significant amount of gravel covered this land. He originally classified this land as containing "gravel, cobble or stoniness in the surface and subsoil."[150] This classification matches that given the surface and subsoil of land on this same Reservation found to be irrigable in the earlier proceedings of this case.[151] Thus, I am convinced that the gravelly character of this land should not result in a striking of the water rights claims appurtenant to this parcel.

(d) *Unit CH-3*

The State Parties raise a similar question regarding the rockiness of Unit CH-3 on the Chemehuevi Reservation. My findings are the same as those for CH-4 be-

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149. *See* Tr. 3176-77.

150. *See* U.S. Exh. 6.

151. *See* Pr. U.S. Exh. 1208. The State Parties note that the majority of CH-4 is classified by the United States' expert as BIA Class IV soil, U.S. Exh. 6, which is designated as suitable for "permanent" crops, U.S. Exh. 1, at 3. *See* State Parties' Post-Trial Opening Brief 40 n.5 (May 1981). With this information the State Parties argue that none of the crops projected for this unit are permanent crops and thus the land cannot be practicably irrigable. Even the State Parties at least implicitly recognize that this argument is overly broad because much acreage which is claimed on other Reservations to be irrigable but not subject to such dispute is Class IV land. In addition, the United States' expert noted that although the BIA Standards indicate that Class IV land is suitable for permanent crops, they do not restrict the class to that type of crop. Tr. 119. This testimony derives substantial support from the projection of alfalfa and small grain crops on the Colorado River Indian Reservation, including the Class IV lands, by the experts who worked with these standards in the earlier proceedings. Pr. Tr. 14524.

cause the disputed gravelly/cobbly lands are similar on both units.[152]

(e) *Summary of Physical Analysis*

The State Parties discuss at length the difficulties associated with farming gravelly and cobbly soils.[153] This list includes such items as rock-damage to farm equipment and yield reductions due to germination problems as well as rock-damage to plants. From this assortment of agricultural headaches the State Parties conclude without any analysis of costs and benefits that these lands cannot be farmed with field and row crops. They then state that the United States' experts provided no evidence to negate these conclusions.[154] Of course, it is impossible to refute the broad proposition that rocks damage farm equipment. Anyone would probably agree that running a plow through a field totally covered with eight-inch cobbles would be uneconomic farming. Most situations, including the present one, however, lack such clarity. This view holds particular importance where the parties disagree over the amount of gravel and cobble on this land and where I have found that the land contains significantly less rocks than alleged by the State Parties. Their argument thus lacks a vital part of its foundation.

This issue eventually turns upon the soils classification of the two competing experts. The United States' soils experts classified these lands as irrigable under the objective BIA Standards designed for the soils in the lower Colorado River Valley.[155] The standards

152. *See* Tr. 3179; *see also* S.P. Exhs. 82-85, 107.
153. State Parties' Post-Trial Opening Brief 40-47 (May 1981).
154. *Id.* at 42.
155. *See generally* U.S. Exh. 1, at 3.

used by the State Parties' soils expert may be derived from his lengthy experience in soil classification,[156] but those standards are certainly ill-defined and incapable of objective verification.[157] As indicated above, I believe that the State Parties and their experts also have overstated to some extent the degree of rockiness of these soils.[158] The United States appears to have more correctly classified these lands in soil categories that indicate their suitability to farming. Other lands containing a significant degree of gravel and cobble are now farmed at nearby locations.[159]

The State Parties' soils expert classified these lands as better suited to trees and vines than the field and row crops projected by the United States' experts.[160] Permanent crops are discarded by the State Parties at a later stage. These lands may be "very poorly suited" to field and row crops, but if that much is true, the appropriate inquiry should be the effect of such gravel on costs and yields as experienced by others who had farmed such land. But the State Parties' soils expert did not make such inquiries.[161]

Under these circumstances, I should not find these lands to be non-practicably irrigable because of alleged difficulties generally associated with gravelly lands.

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156. *See generally* Tr. 3064-91.

157. In fact, this soils expert testified at trial that: "I did not follow any specific set of standards. The standards are in my head." Tr. 3262.

158. *See* note 101 and accompanying text *supra*.

159. *See* Tr. 6056-60; U.S. Exhs. 148-59.

160. Tr. 3291-94, 3299.

161. Tr. 3294-99.

2. *Economic Analysis of Gravelly and Cobbly Lands*

Anticipating my findings regarding their qualitative analysis of the gravelly lands, the State Parties also offer a quantitative analysis of the irrigability of these lands.[162] They challenge both the productivity and cost figures for these lands. The United States naturally disputes this quantitative analysis adhering to its original estimates.

I find that the United States presents the more convincing case in this issue. A lengthy discussion of the reasons for my decision is not necessary. This gravelly lands question involves many considerations similar to those factors which influenced my decisions regarding yields and production costs applicable to sandy soils.[163] For example, the State Parties have again found the Palo Verde Soils Survey to be dispositive regarding the yields expected on gravelly lands,[164] and they have found that gravelly lands merit a 25% increase in production costs beyond costs for normal lands, the same increase which they found appropriate for sandy lands.[165] I have found the identical arguments relating to sandy lands to be unpersuasive. For the sake of consistency as well as logic I find the State Parties' comparable views regarding gravelly lands to be unpersuasive and would only note in general that the United States' view is well-supported by the record.[166]

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162. State Parties' Post-Trial Opening Brief 47-54 (May 1981).

163. *See* notes 46-93 and accompanying text *supra*.

164. *See* State Parties' Post-Trial Opening Brief 49-51 (May 1981).

165. *Id.* at 52-54.

166. Tr. 905-10, 5997-99, 6035-38, 6056-68; U.S. Exhs. 146, 148-59. *See also* Tr. 5872, U.S. Exh. 42, at A-16 to -17.

Despite that conclusion a few further comments are perhaps in order. First, I note that an additional reason for following the United States' analysis is my belief that the State Parties' yield and cost estimates are based upon an inaccurate perception of the gravel or cobble content of the soils on these parcels.[167] Second, I believe that some of the statements in the State Parties' brief are misleading. For example, they state that the United States' economist, although projecting a cotton yield of 1125 pounds per acre on gravelly lands, gave only one example of a cotton yield on gravelly soils and that figure was 1,000 pounds per acre.[168] This statement overlooks the later testimony by this witness where he stated that one farm with gravelly soil obtained cotton yields of between 1,250 to 1,500 pounds per acre, a figure significantly exceeding his projection for the disputed gravelly lands.[169] Such considerations confirm my belief that the United States is correct on this question and the gravelly lands should not be excluded from being practicably irrigable.

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167. *See* notes 100-06, 158 and accompanying text *supra*. This statement applies with more force to the analysis of the Fort Mojave Reservation units which I believe contain relatively less surface gravel than the units on the Chemehuevi Reservation.

168. State Parties' Post-Trial Opening Brief 51 (May 1981); *see* Tr. 905-08.

169. *See* Tr. 6059-61. The State Parties later attack the qualifications of this witness to testify that the other farms had soils similar to that in the Reservations. State Parties' Post-Trial Closing Brief 6 (June 1981). This agricultural economist may not be a soil classifier but in considering yield and cost questions he must be able to consider such relevant factors as the amount of gravel in the soil and how that would affect yields and costs. And in that context his job must entail comparisons between soils of different parcels.

D. *Inclusion of Non-arable Lands in United States Claims*

The State Parties next question the United States claim of water rights for non-arable or non-irrigable lands which were included in the proposed irrigation units to "square-off" the units.[170] This issue concerns lands other than those alleged by the State Parties to be too sandy or gravelly.[171] The United States contends that the units as designed by their experts include this non-arable land because a farmer would include these non-arable parcels in order to serve efficiently the arable lands.[172] This dispute concerns approximately 1,200 acres. The parties however do not agree precisely upon the acres which fit this description.[173] I believe that the State Parties, in excluding this land, have generally adopted the correct approach

170. State Parties' Post-Trial Opening Brief 54-58 (May 1981).

171. *See* S.P. Exh. 110.

172. United States' Post-Trial Opening Brief 88-91 (May 1981). *See* Tr. 503-06, 902-03; U.S. Exh. 42, at 34-35.

173. For example, the United States' soils expert classified a portion of Unit FM-9 as having soil that is non-irrigable but the United States claimed water rights for the entire unit including the admittedly non-irrigable portions. The State Parties, however, concede that the entire parcel is not only arable but practicably irrigable. *Compare* U.S. Exh. 3 *with* S.P. Exh. 110, Table B-1. The amount of these disputed lands on each Reservation are:

	U.S.	S.P.
Cocopah	10	56
Fort Yuma	84	179
Chemehuevi	329	405
Fort Mojave	776	522
	1199	1162

U.S. Exh. 1, at 54, 57, 65, 69; S.P. Exh. 110, Tables B-1, B-3, B-4, B-5. In the context of the total amount of land involved in this dispute, the parties are separated by only 37 acres. But to the individual Tribes the difference is significant.

and find that this land which is non-irrigable or non-arable is not practicably irrigable and does not qualify for additional water rights.

The State Parties' argument, as I understand it, is that the percentages of non-arable lands included by the United States in the proposed farming units is too high and must be reduced to a reasonable figure.[174] The United States' expert stated that the non-arable lands were included to allow for a more efficient irrigation of the contiguous arable land.[175] The State Parties' expert seemed more convincing in his testimony that there were equally satisfactory methods of squaring off the parcels without the inclusion of such a great deal of non-arable land.[176] This conclusion seems particularly well illustrated by the inclusion of a large amount of non-arable land on the northern end of CH-4.[177] The United States argues that this witness was insufficiently familiar with the individual parcels to draw this conclusion.[178] Strictly as a matter of common sense I agree with the State Parties because it is inconceivable that some of these large amounts of non-arable land are necessary to square off the irrigation units when this land is found on the extreme margins of units and equally squared up units can be fashioned with less non-arable land.

Other than this judgment decision, the United States presents for its position no detailed and systematic engineering arguments such as an inability to efficiently design a smaller irrigation system for each par-

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174. Tr. 5187-93.

175. *See* Tr. 503-07; U.S. Exh. 42, at 34-35.

176. Tr. 5190-92.

177. *See* U.S. Exh. 6.

178. United States' Post-Trial Opening Brief 89-90 (May 1981). *See* Tr. 5310-20.

ticular parcel of arable land. The United States does argue in some instances either that the land could be improved to arable status by various operations such as rock-picking or that the land is currently farmed.[179] This argument implicitly means that the United States' initial soil classification was erroneous and these portions classified as non-irrigable or non-arable are actually irrigable. The United States' soils expert performed in an extraordinarily scientific and persuasive manner. Although the United States at other times has decried the methods utilized by the State Parties' soil expert who used standards that were either ill-defined or unverifiable, the United States, at this point, appears to be undertaking just the sort of analysis it otherwise has criticized. I remain persuaded by the soils expert who testified for the United States. The State Parties correctly would reduce the area of the irrigation units by deleting the excessive inclusions of non-arable lands on the margins of the units.

But I believe that the State Parties have not gone far enough in their argument. In my view the relevant inquiry with regard to these lands is whether each identifiable portion of reservation land is practicably irrigable. Both sides have approached this question as if it were a matter of which lands would a farmer include in a farming unit. But that is not the proper inquiry in this case. When a soils expert classifies a parcel as non-arable or non-irrigable, ordinarily the land will not be further considered for farming because that land by itself cannot profitably produce crops. If that land is cultivated it would only be done in order to farm the higher quality land adjacent to such poorer

179. United States' Post-Trial Opening Brief 88-90 (May 1981). *See* Tr. 503-07.

land. That fact alone does not justify a grant of additional water rights to the non-arable land. In this light, the Master in the prior proceedings did not recommend water rights for lands classified as non-irrigable or non-arable under the BIA standards even if they were within the irrigation units.[180]

All land classified as non-irrigable or non-arable should now be excluded from consideration for water rights. The State Parties' figures are not designed to accomplish that result because they have sought to reduce the non-arable inclusions to a reasonable level. The United States' figures are the only ones which contain all non-arable acres included in its proposed irrigation units. In addition, I have already found the United States' soils expert to be the more reliable classifier. For these reasons I find that the 1,199 gross acres within the proposed irrigation units found non-arable or non-irrigable by the United States' soils expert should not be awarded water rights.[181]

E. *General Cost Differences*

The State Parties also dispute the United States' projected cost figures for the construction and operation of the proposed irrigation systems. Previously discussed cost disputes have focused upon the costs associated with different types of lands, but this dispute involves costs relevant to all parcels. If their figures are adopted, the State Parties calculate that various

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180. The exhibits seem to incorporate this approach. *Compare* Pr. U.S. Exh. 1207 *and* Pr. U.S. Exh. 1208 *with* Pr. U.S. Exh. 1210. The discussions in the earlier proceedings confirm this conclusion. Pr. Tr. 12779-82, 12807-08, 13103-15.

181. *See* U.S. Exhs. 3, 6, 14, 17.

amounts of acreage on several parcels are not practicably irrigable.[182]

The difference in the parties' estimates occur in three areas: capital costs; operation and maintenance costs; and power costs. Each area of dispute invites separate inquiry.

1. *Capital Cost*

The first area of dispute concerns the capital cost of building the irrigation systems. The State Parties title their discussion of this area "Debt Service."[183] This label was adopted apparently because of the differences which appear in figures shown as annual amortized costs. But the parties substantially agree upon the appropriate figures to be used in converting costs to an annual basis. Both use a 40-year repayment period.[184] The State Parties use a 7⅛% interest rate while the United States uses a 7% interest rate. The State Parties acknowledge that the real differences between the parties do not lie in the minor difference in the rate of interest used.[185] The significant differences

182. The exact figures are:
1) 120 acres on FM-3
2) 106 acres on FM-5
3) 95 acres on Quail Hollow
4) 231 acres on Calada
5) 43 acres on FY-4
6) 19 acres on FY-10
7) 11 acres on FY-11

State Parties' Post-Trial Opening Brief 58 (May 1981); S.P. Exh. 110, Tables B-1, B-5.

183. State Parties' Post-Trial Opening Brief 64 (May 1981).

184. *Id.*

185. *Id.* at 64-65.

occur in the cost figures used for the hardware needed to construct a system.[186]

The major reason for this difference, according to the State Parties, is the failure of the United States to design irrigation systems that would "comply with federal standards in order to be eligible for federal financing."[187] Although the State Parties imply that the United States' engineers erred in designing a system that does not meet those standards, the State Parties offer no reason for meeting such standards other than the implied availability of federal financing.[188] The State Parties by their lack of supporting reasoning

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186. For example, the State Parties note that they estimated the cost of a 40 horsepower pumping plant to be $40,000, while the United States estimated the cost of a 50 horsepower pumping plant to be $20,000. *Id.* at 65-66. *See* S.P. Exh. 26, at IV-8; U.S. Exh. 42, at A-7.

187. State Parties' Post-Trial Opening Brief 66 (May 1981). *See* Tr. 660-61, 3668. The State Parties also note that the United States' cost figures include no amount for fish screens. *See* Tr. 5708. Such screens are allegedly required by the Environment Protection Act and accompanying regulations. State Parties' Post-Trial Opening Brief 65-66 (May 1981); Tr. 3731. The State Parties in their brief and cited testimony do not indicate the cost of fish screens. They thus give me no rational basis upon which to adjust the cost estimates of the United States even if such screens are required. Absent some quantification by the State Parties, I will not consider this factor. In addition, the State Parties have failed to cite the relevant law which they claim requires these screens. Such action confirms my belief that the United States' expert was correct that the screens are not required because recent projects in the area do not have such screens. Tr. 5709. Furthermore, this expert presented evidence that if the cost of these screens were translated into a "per acre" cost the amount would be almost insignificant, between 80 cents to one dollar. Tr. 5714.

188. Even the State Parties' analysis does not consistently follow this approach. Although they assert that "an interest rate of seven per cent [is] typical of federally funded projects," State Parties' Post-Trial Opening Brief 64 (May 1981), they cite no authority for that proposition and their own expert testified that "[t]ypically in Bureau of Reclamation projects that portion of the project allocable to irrigation service does not bear interest." Tr. 5364.

have failed to convince me that the projects under consideration must meet federal financing standards. There is thus no reason to reject the United States' capital cost figures.

This conclusion does not mean that the United States erred in using a 7% interest rate in its economic analysis. The State Parties apparently believe that the 7% rate was chosen as the federal financing rate. The United States' economist, however, chose that rate because an economic analysis will commonly employ a rate such as the federal discount rate which, during the relevant time period, was approximately 7%.[189] Because this was an economic analysis, the goal was not to determine the interest rate at which money could actually be borrowed.[190] The United States, I believe, chose the correct approach, because the question of practicable irrigability turns upon econmic rather than financial feasibility.[191]

2. *Indirect Costs*

The State Parties' discussion on "debt service" also refers to the parties' differences on indirect costs.[192] These costs include such costs as engineering services and contingencies. Both parties have treated these costs as percentages of the capital cost. But they differ over the percentage used, with the United States using a total of 18%[193] and the State Parties using a total of 40%.[194] These gross percentages consist of various

189. Tr. 996-97.
190. *Id.*
191. *See* Part One at III.B. *supra.*
192. State Parties' Post-Trial Opening Brief 66-69 (May 1981).
193. *See* Tr. 497, 601-02; U.S. Exh. 42, app. B.
194. Tr. 3674, 3733; S.P. Exh. 26, at IV-7.

smaller figures where the parties' specific differences appear.

The first component is the engineering fee. The State Parties used an allowance of 15% for this item which covered administration, legal, and engineering services.[195] The cost of engineering service projected by the State Parties, if stated separately, comes to 10% of the total capital cost.[196] The United States used a total figure of 8% for this first component.[197] The State Parties contend that the United States' figure is flawed for two reasons. They first claim that it ignores project administration expenses associated with such matters as minimum wage laws and OSHA regulations.[198] This claim slights the testimony of the United States' expert who merely stated the amount of such work would be small based on his experience on other farming projects.[199] Second, the State Parties claim that the United States should have used an engineering allowance of 10-12% because such a figure would be used on federal reclamation projects.[200] Apparently, they reason again that the proposed irrigation systems must comply with federal standards to be eligible for federal financing.[201] I have already rejected a similar argument because there is no need to meet such conditions.[202] On the whole I find the United States' cost estimates for this item to be reasonable.

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195. Tr. 3674, 3733.

196. Tr. 4146.

197. *See* U.S. Exh. 42, app. B.

198. State Parties' Post-Trial Opening Brief 67 (May 1981).

199. Tr. 497.

200. State Parties' Post-Trial Opening Brief 67-68 (May 1981).

201. *Id.*

202. *See* notes 187-91 and accompanying text *supra*.

The second component consists of contingency expenses and perhaps interest expenses during construction. The State Parties used a 25% figure for this category with 20% attributable solely to contingency.[203] The United States used a 10% figure for contingency costs.[204] Again I believe the United States' estimate to be reasonable. The amount allocated to contingency might easily be lower for the United States because its expert conducted a thorough investigation to reduce the surprises which otherwise would justify a higher contingency factor.[205] The State Parties also very briefly note that the United States' contingency factor is not coupled with an allowance for interest during construction.[206] But they do not provide any support from the record for their assertion that this was an error and thus I am unable to discover which approach is theoretically correct or whether the United States in some manner accounted for this factor elsewhere in its calculations. In sum, I find that the United States' contingency factor is accurate.

Before advancing to another subject, one other comment might be useful. The dispute over the magnitude of indirect costs, particularly the contingency cost

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203. *See* S.P. Exh. 26, at IV-8; Tr. 3733.

204. *See* U.S. Exh. 42, app. B; Tr. 494-96.

205. *See* Tr. 475-80; 3984-86. The State Parties' engineer admitted that these circumstances would justify a lower contingency factor. Tr. 3985. The State Parties note that this witness also stated that engineering costs would increase in order to account for the greater investigation needed to reduce the number of surprises. Tr. 3984. But that investigation was already done for purposes of this litigation and the State Parties do not explain the reason for adding such a cost to this evaluation. Perhaps the State Parties' argument would have had some validity before the investigation was concluded. After the investigation there seems to be no reason for ignoring the knowledge gained from it or allocating its costs to the body of costs considered in this economic feasibility analysis.

206. State Parties' Post-Trial Opening Brief 67 (May 1981).

question, never sufficiently crystallized to the extent that I could ascertain the actual differences between the parties. The parties certainly attached quantitative tags to their positions but much of the evidence simply indicated that each side felt the other was simply too high or too low without accounting for the differences in the nature of the investigation conducted. For example, although the United States' experts conducted a thorough study to justify a lower contingency factor, there is really no evidence regarding how one determines the magnitude of the appropriate reduction.[207] Two experts have given conflicting opinions and there appears to be no precise method of analyzing their differences. In such a situation, I believe the best course is simply to adopt the opinion of the experts who consistently appear to apply the more theoretically correct approach.

3. *Operation, Maintenance, and Replacement Costs*

These parties also differ over operation, maintenance, and replacement costs for the irrigation sys-

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207. In addition I might add an observation that I did not find sufficiently explained in either brief. The United States' indirect costs are computed by multiplying the percentage factors by the total of "on farm costs as well as distribution system costs." This computation necessarily produces a different result than multiplying these factors by the distribution system costs alone as the State Parties have done. *See* U.S. Exh. 42, at 33, app. B; S.P. Exh. 26, at IV-1 to -14. *See also* Tr. 5343-44. This situation was made possible by the different presentation formats adopted by the parties. The United States groups on-farm irrigation costs with those attributable to the distribution system while the State Parties account for those costs as deductions from payment capacity. *See* U.S. Exh. 42, at 33; S.P. Exh. 26, at V-2. Perhaps there is some further explanation for this matter. But in any event this discussion illustrates the problems in simply comparing a 10% figure attributable to contingency with a 20% figure with a similar label.

tems. The State Parties, based on information gathered from managers of irrigation projects and the Water and Power Resources Service, estimated such annual costs at $21 per acre.[208] The United States estimated annual costs to be two percent of the total capital cost of the system.[209] The State Parties criticize the United States' estimate for two reasons.

First, they state that their own costs "represent real data" while the United States' cost figure is "merely a generalized percentage figure."[210] The State Parties, however, indicate no evidence in the record which demonstrates that the United States' method was incorrect or even less preferable than their own. The United States argues that the State Parties never articulated this criticism in the hearings either through cross-examination or the introduction of positive evidence.[211] I find unpersuasive and unfounded

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208. Tr. 3677; S.P. Exh. 26, at IV-13.

209. Tr. 499; U.S. Exh. 42, app. C.

210. State Parties' Post-Trial Opening Brief 70 (May 1981).

211. United States' Post-Trial Closing Brief 31 (June 1981). The United States at this point, *id.* at 31 n.25, also answers the State Parties' argument that the latter's experts have greater experience in water projects and that I should resolve any disagreement in favor of the State Parties. *See* State Parties' Post-Trial Opening Brief 59 n.8 (May 1981). The State Parties claim that their water resource engineers employ as many persons as does the United States' engineering firm which has only one division concentrating on water resources. *Id.* (citing Tr. 70, 2364). In addition, they claim that the United States' expert engineer only cited one project which his firm actually designed. *Id.* (citing Tr. 70). Assuming that such a comparison would yield useful results, the State Parties' representation of the record is misleading. The United States' engineer testified that his firm has "designed a number of irrigation systems which have been built." Tr. 69. He further gave *three* examples of projects designed by his firm under the Small Project Loan Fund. Tr. 69-70. He listed his clients as the "State of Montana, private individuals, the United States, the federal government, irrigation districts and irrigation associations." Tr. 70. He stated that the water resources division of

the State Parties' assertion that their figures represent real data while the United States' figure is only a generalization. Both parties used generalized figures. The State Parties' uniform assumption that these costs would be $21 per acre is hardly a site specific figure. I find this criticism by the State Parties to be without basis.

The State Parties also claim that the United States' operation and maintenance figures are understated because the capital cost per acre used by the United States is understated. This argument, in its general form, can be rejected because I believe the United States' capital cost figures generally to be accurate.

4. *Power and Energy Costs*

The parties have a significant factual dispute over the cost of power needed to pump water to the proposed irrigation units. This dispute consists of two separate disagreements. One concerns the proper power rate and the other concerns the amount of power required.

(a) *Power Rates*

The United States based its calculations on a power rate of 30 mils per kilowatt hour.[212] The State

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his firm employs between 40 to 50 persons in professional and technical positions. *Id.* One of the State Parties' experts testified that the staff of his firm is composed of 40 to 50 persons, over 20 of whom are registered professionals. Tr. 2364. These engineers have been involved with numerous irrigation projects. *See* Tr. 3599-625. Neither group of engineers enjoys an obvious advantage over the other in terms of size, experience or specialization.

212. U.S. Exh. 42, at 34.

Parties used various rates of between 36 and 53 mils (or 3.6 and 5.3 cents) per kilowatt hour,[213] rates which reflect the commercial rates in the separate areas of the five individual Reservations. They claim that the 30 mil rate used by the United States is unrealistically low.[214]

I believe that the United States' estimate is fair and that the State Parties' criticisms are unfounded. The 30 mil power rate resulted from the joint study by the United States' engineers and economist. That study considered various power rates in the vicinity of the Reservations. Among the rates considered were: the 23 or 24 mil rate available to preference power[215] customers such as the Colorado River Indian Reservation, the draft contract rate of 40 mil,[216] proposed in the preference power negotiations underway regarding the Fort Mojave Indian Reservation, and the 28 to 29 mil rate offered as recently as 1979 by Arizona Public Service to water projects with which the economist was associated.[217]

The State Parties raise some questions regarding the accuracy of several aspects of this study. First, they note that the United States' engineer is not an expert on power rates.[218] Second, they point out that the power rate available on the Colorado River Indian Reservation was not shown to be available on the other Reservations. In addition, they state that there was no evidence of the cost of wheeling or transporting

213. Tr. 3731.
214. State Parties' Post-Trial Opening Brief 71-74 (May 1981).
215. *See* 43 U.S.C. § 485g, h(c) (1976).
216. *See* Tr. 5220.
217. Tr. 502-03, 587-93, 733, 780-81.
218. Tr. 5888.

the power to the Reservations.[219] Some of these same criticisms might also be leveled against the State Parties' experts. In addition, the State Parties do not direct my attention to evidence demonstrating that the United States' expert erred in such particulars as failing to account for the cost of "wheeling" the power. Finally, the availability of a certain power rate at one location does not lose its generally useful value as proof simply because it is not demonstrated to exist at all relevant locations. The goal of the United States' study was to determine a general rate for the lower Colorado River area. The several sources considered by the United States were combined to form an estimate which seems a fair and accurate figure for general use on any of the five Reservations.

More major problems also concern the State Parties. They argue that rates available from preference power sources should not be considered in an economic analysis because such rates are subsidized rates.[220] I agree that subsidies are not appropriate factors in the present economic analysis.[221] On the other hand, I do not agree that these rates are subsidized because such rates fully cover the cost of producing that power.[222] By the testimony of the only professional economist to testify in this case, such an arrangement does not create a subsidy in an economic sense.[223] This preference power is not limited to use by Indian tribes. Munici-

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219. State Parties' Post-Trial Opening Brief 71-72 (May 1981).

220. This conclusion derives from their belief that the preference power rates are not the market rates and hence not sufficiently certain to serve as a basis of an analysis. *See* Tr. 3731-33.

221. *See* Part One at II.B.(1) *supra*.

222. 43 U.S.C. § 485h(c) (1976); Tr. 6055. *See also* Tr. 5503.

223. Tr. 6055-56. He stated that economists sometimes use the term subsidy "loosely" to mean a rate that is less than the market rate. Tr. 6110.

palities and irrigation districts may receive it as well.[224] Beyond that point, the Court of Appeals for the Ninth Circuit has also made it clear that: "The preference clause requires only that public entities be given a preference over private entities in the marketing of power generated by federal reclamation projects."[225] The possibility that the Tribes might receive such power thus seems an appropriate consideration in this analysis. Finally, I should note that the "preference power" rate was merely one of several considered by the United States' experts in estimating an appropriate power rate.[226] Some rates considered were less than and some rates considered were greater than the 30 mil rate eventually adopted.[227] On balance I believe that projection to be reasonable based on all the evidence.

This conclusion is further supported by my perception that the State Parties' estimates bear a fatal flaw. Although both sides have submitted analyses that purport to show revenues and costs relevant for July, 1979,[228] the commercial rate schedules[229] consulted by the State Parties' experts actually reflect rates in effect after rate adjustments in October or November of

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224. Tr. 5493-94.

225. City of Santa Clara v. Andrus, 572 F.2d 660, 667 (9th Cir. 1978). *See also* Arizona Power Pooling Ass'n v. Morton, 527 F.2d 721, 727 (9th Cir. 1975), *cert. denied*, 425 U.S. 911 (1976).

226. *See* Tr. 502-03, 587-96, 733, 780-81.

227. *See id.*

228. Tr. 503; State Parties' Post-Trial Opening Brief 74 (May 1981). The State Parties' brief actually states that costs should be taken from "mid-1979." *Id.* And their expert merely stated that his power costs were taken from power rates in effect when the United States' data was assembled. Tr. 3977. These statements can only be taken to mean that all parties used the July, 1979 period as the reference point.

229. Tr. 3731.

1979.[230] The State Parties' expert did testify that it was proper to use November, 1979 power costs in an analysis designed to be referenced otherwise to July, 1979.[231] But common sense and persuasive evidence would hold to the contrary. Obviously, costs and revenues should be taken from the same time period.[232] In the context of agricultural needs, power costs should be taken from the growing season,[233] and the greatest power use is in the spring and summer.[234] This consideration is particularly important in light of testimony of the State Parties' expert that the schedule he used reflected a rate increase that took effect in November, 1979.[235] If such increased power rates were considered, the evidence reflects that crop prices also increased in the 1980 season.[236]

For these reasons, I find the United States' position to be more persuasive and believe that its experts did not err in estimating power rates applicable to the economic analysis in this case.

(b) *Power Requirements*

The State Parties contend that the United States' estimates of power cost are low also because in several instances those figures reflect too low an amount of power usage.[237] Two reasons are advanced for such an error. First, on several parcels the United States' esti-

230. Tr. 5357-60, 3940-44; U.S. Exhs. 97-102.
231. Tr. 5357-59.
232. Tr. 6014-15.
233. *Id.*
234. Tr. 6009-14.
235. Tr. 5357-59.
236. Tr. 6023; U.S. Exh. 147. The evidence shows that these price increases would more than offset any power rate increases. Tr. 6024-25.
237. *See* State Parties' Post-Trial Opening Brief 74-76 (May 1981).

mate allegedly does not provide for sufficient pressure in the proposed sprinkler systems. On those units the United States' estimated annual power cost has been increased by $7 per acre by the State Parties.[238] In addition, on one unit, FM-3, the State Parties contend that the United States underestimated the power required to lift water to the height of the unit's land. This adjustment resulted in an annual power cost increase of approximately $27 per acre.[239] Neither criticism is persuasive.

The first issue, regarding sprinkler system pressure, appears to be a fairly close question. The United States utilized a general case estimate of pressure of 15 pounds per square inch (psi) for its sprinkler projections.[240] The State Parties' experts and the Tribes' experts estimated sprinkler costs based on 40 to 80 psi.[241] The United States' expert recognized that even among low pressure systems his projected sprinkler pressure was low. He described center pivot sprinkler systems with 40 psi at the pivot and 10 psi at "the end of the sprinkler arm."[242] His projection in his center pivot general cost estimate for 15 psi "at the end of a 300 foot long line and at the pivot bar"[243] was obviously at the low end of that range. But the United States' expert was aware that he had chosen a low figure which he felt after investigation was well-suited for the lands under consideration.[244]

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238. *See* S.P. Exh. 154. The units concerned are FM-2, FM-3, FM-5, FM-6, FM-7, FM-11, Calada, CH-3, and CH-4.

239. *See* S.P. Exh. 154.

240. Tr. 613-14.

241. *See* Tr. 5214; F.M. Exh. 2, app. C; C.R. Exh. 1, app. B.

242. *See* Tr. 5666-68.

243. *See* Tr. 5731.

244. *See* Tr. 5663-74.

The State Parties presented potentially convincing evidence showing that the 15 psi figure was entirely unrealistic. Their expert testified that his research showed that 30 psi was the absolute minimum feasible pressure at the pivot for a center pivot sprinkler system and that more pressure would actually be needed to "get out to the pivot."[245] If this testimony had remained firm it might have been convincing, given that the United States' expert was obviously basing his estimates on a minimum pressure. Instead, the State Parties' expert later gave further testimony showing that his earlier representations of his study on pressure were incorrect and misleading. In this later testimony, he revealed that his information source had stated that the minimum acceptable pressure "at the end of the pipe" would be 10 psi and the notes he used in his testimony revealed that the 30 psi figure represented a "typical" pressure at pivot rather than a minimum.[246] He thus admitted that there is a range of possible sprinkler pressures.[247]

This state of the evidence leaves the factfinder in something of a dilemma. On the one hand the United States' expert used a low pressure estimate of 15 psi at the pivot while existing sprinkler systems can use as low as 10 psi at the end of the sprinkler arm. Obviously, the pressure is to some extent lost in between the pivot and the end of the sprinkler arm,[248] but neither side has directed my attention to any evidence showing the method for translating pressure at the pivot into pressure at the end of the arm. On the other hand, the State Parties' expert does not appear to be

245. Tr. 5214-15.
246. *See* Tr. 5331-34; U.S. Exh. 104.
247. *See* Tr. 5334.
248. *See* Tr. 5669 (United States' expert).

particularly reliable on this issue. Under these circumstances, I find the United States' expert to be more credible. The United States has the burden of proof on this issue and introduced competent evidence supporting its position. Some of the links in the rationale behind its position do not appear in my review of the testimony. But the conclusions were offered by an expert witness whose testimony was never revealed to be seriously in error or misleading. His opinion appears to be the more sound.

In addition to the debate over the theoretical minimum sprinkler pressure, the United States introduced several exhibits demonstrating that when a specific estimate is performed on the disputed parcels, the costs are not significantly increased even if a higher sprinkler pressure is assumed.[249] These exhibits and the accompanying testimony do not represent some form of correction of the general case analysis in light of the State Parties' criticisms. Rather, they are earlier confirmations of the validity of the general case used by the United States' engineers.[250] But the only fair approach would be to adopt the specific cost estimates as overriding the cost figures assumed in the general case.[251]

The last issue concerns only Unit FM-3 on the Fort Mojave Reservation. The State Parties claim that insufficient power was included in the general case esti-

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249. *See* U.S. Exhs. 132, 133, 134, 137, 138, 140. The annual costs for FM-7 were significantly less in this specific estimate than in the general case analysis. *See* U.S. Exh. 138; U.S. Exh. 60, at 18. *See also* Tr. 5767-69.

250. Tr. 5723-75. *See* U.S. Exhs. 132, 133, 134, 137, 138, 140.

251. *See* U.S. Exhs. 42, 60. In one case, FM-7, the annual costs decreased significantly in the specific analysis such that its annual benefits are greater than its annual costs. *See* U.S. Exh. 138; U.S. Exh. 60, at 18.

mate to raise water to this more highly elevated unit. The State Parties thus estimate that $27 annual cost per acre should be added to the annual cost of serving this unit.[252] This conclusion is unfounded. The original estimate by the United States was a general case estimate for this parcel. If the State Parties sought to demonstrate how this parcel differs from the general case, they should have accounted for all such differences. As the United States' expert testified, his general case estimate for this parcel was confirmed in his trial preparation work with a specific estimate.[253] In that estimate he calculated that his general estimate understated annual costs by only $2 per acre when all differences from the general case are considered.[254] This evidence convinces me that the United States did not significantly understate the annual power costs on FM-3.

In sum, I find the United States' evidence regarding power requirements to be persuasive.

F. *Size of Irrigation Units as Claimed and as Proved*

The engineering expert for the United States gave rather lengthy rebuttal testimony regarding specific confirmation estimates on several parcels for which he had projected a general case system.[255] In such testimony he described his conclusions based on the system outlined in the several exhibits that were then introduced.[256] These exhibits frequently outlined systems containing acreage in amounts different from

252. *See* S.P. Exhs. 154, 155.
253. Tr. 5746-48; U.S. Exh. 133.
254. *See* Tr. 5747-48.
255. Tr. 5731-75.
256. *See* U.S. Exhs. 132, 133, 134, 137, 138, 140, 142, 145.

those claimed. The State Parties contend that the United States claims should be adjusted accordingly in a finding of practicable irrigability.[257] The United States disagrees.

The most prevalent concern articulated by the State Parties regarding these units involves those units where the United States' specific estimate was planned for less acreage than was claimed.[258] They state that there was no showing by the United States that the remaining acres could receive water service and that the claims should be reduced by that amount.[259] This rather remarkable line of thought completely ignores the explanation for this "discrepancy" that was elicited by the counsel for the State of Nevada. The United States' expert explained thoroughly that his specific estimates included a given number of acres and the remaining acres of the claimed area would be serviced by equipment to reach the ostensibly uncovered areas of the unit, also known as the "corners" of the field.[260] This is apparently a common procedure and the United States' expert testified that it would not increase the cost per acre because as total costs would rise so also would the total number of areas served.[261] Contrary to the State Parties' contentions, the United States' position is not unsupported by the evidence. Instead, it is the State Parties who do not

257. *See* State Parties' Post-Trial Opening Brief 69-70, a-5, -7, -8, -10, -13, -35, -39 (May 1981). The parcels concerned are FM-2, FM-3, FM-5, FM-6, Quail Hollow, FY-2, and FY-8. *See* U.S. Exhs. 132, 133, 134, 137, 138, 140, 142, 145.

258. *See* U.S. Exhs. 42, 132, 133, 134, 135, 142, 145.

259. *See, e.g.*, State Parties' Post-Trial Opening Brief a-5 (May 1981).

260. Tr. 5904-08. The plans for FM-7 specifically note that systems with "corner watering equipment" would be used. U.S. Exh. 138, at 3.

261. *See* Tr. 5905-06.

cite any evidence demonstrating that the system envisioned by the United States' expert is infeasible.

The other concern by the State Parties relates only to one parcel, Quail Hollow. The United States' projection for this parcel is a 125-acre design for the 95 acres claimed.[262] The United States' engineer confirmed this fact when he testified about the specific design for the parcel.[263] The State Parties claim that the per acre cost of irrigating this unit is distorted because total costs were divided by the higher figure of 125 acres rather than the lower claimed figure of 95 acres.[264] The United States simply states, without offering any support from the record, that the per acre cost would not change even if a larger unit design was used to determine the cost of serving a smaller number of claimed acres.[265]

Without any evidence in the record supporting the United States' position on this issue, I must agree with the State Parties' position. If the unit size is reduced, obviously the total costs will also be reduced to some extent. The United States is correct up to that point. The difficulty comes from the lack of evidence that

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262. *See* U.S. Exh. 42, app. B.

263. *See* Tr. 5775-79; U.S. Exh. 140.

264. State Parties' Post-Trial Opening Brief a-13 (May 1981); *see also id.* at 69-70. This same argument might be relevant with regard to FM-7. The United States introduced a claim for 583 acres. *See* U.S. Exh. 42, Table 7. On the other hand, the United States introduced a specific design of an irrigation system to serve this unit and the design called for a 980-acre system. *See* U.S. Exh. 138. This issue does not merit the same consideration given the issue regarding the Quail Hollow Unit for two reasons. First, the State Parties in their discussion of FM-7 do not raise this point. *See* State Parties' Post-Trial Opening Brief a-11 (May 1981). Second, the 980-acre design also included some lands covered by the 1964 Decree and, thus, the per acre cost is very possibly perfectly correct. U.S. Exh. 138, at 3.

265. United States' Post-Trial Closing Brief 32-33 (June 1981).

there are no economies of scale with respect to this unit. Obviously, some variable costs and even some capital costs will decrease in such a way that per acre costs would not increase to that extent. But I cannot find that all costs would decrease at the same rate, if at all. For example, the design for this unit specified two pumps costing $21,000. For the cost per acre to remain the same after the reduction in the unit's size from 125 to 95 acres, all revised costs must be no greater than 76% (95/125) of the original higher costs. Yet the United States does not indicate if such smaller pumps costing only that amount can be obtained and would adequately serve the unit. This matter is crucially important because of the United States' estimate that annual benefits exceed annual costs by only one dollar. If the cost of these pumps fails by only a small amount to decrease in a direct proportion with the number of acres served, then costs will exceed benefits without considering the behavior of any other costs. I conclude that the 95 acres in the Quail Hollow Unit have not been proven to be practicably irrigable.

The United States claimed this parcel could be feasibly irrigated. A showing that a greater-sized parcel can be irrigated does not prove the point in issue because not all costs will necessarily vary in direct proportion to the size of the parcel. If the United States had called my attention to any evidence showing that all costs would vary directly with the acreage farmed, after the State Parties raised the point in their brief, I might have concluded that the United States proved its point. Instead, the initial evidence offered by the United States[266] and the confirmation calculations[267]

266. *See* U.S. Exh. 42, app. B.
267. *See* U.S. Exh. 140.

show only that a 125-acre parcel would have a particular annual cost. There is really no evidence that a 95-acre parcel could be farmed at that same per acre cost, except for the United States' engineer's adoption, for the 95-acre unit, of the figure based on a 125-acre parcel. Where the benefits only barely exceed costs, I am persuaded that economies of scale would apply to this marginal situation and thus I do not find it feasible in the absence of specific proof to the contrary.

Other than the claim for the Calada Unit, I believe that the United States adequately proved that the irrigation units as sized in its expert report can be feasibly irrigated.

G. *Nevada's Claim Regarding Use of Wells*

One combined issue of law and fact is raised by the State of Nevada touching upon the United States' claim of practicable irrigability of the area known as FM-3. This is an area of 180 acres in the most northwesterly portion of the Fort Mojave Reservation within the State of Nevada. It lies west, at a distance of less than 1,000 feet, from the northwestern boundary of lands already found by the Court's 1964 Decree to be practicably irrigable.[268]

This issue was raised by Nevada's contention that the evidence of irrigability introduced by the United States requires that I hold that: irrigation is to be supplied on this tract from wells; that the Court's earlier Decree has established that it intended to include as practicably irrigable acres only those lands which would receive their water from the mainstream of the River; and that there was a failure of proof by the

268. This information is apparent from a review of the map attached to U.S. Exh. 42.

United States and Tribes that the ground water produced from the wells in the area would be part of the mainstream water.[269]

The first comment on this criticism of the Government's proof is that the claim of irrigability of FM-3 is not necessarily based on the use of wells. The HKM Report, introduced by the United States and received per stipulation on the third day of oral testimony, states with respect to these lands: "Could either use wells or incorporate [the unit] in lands previously determined to be irrigable."[270] The annual cost of providing water service on these lands is given as $130 per acre without reference to whether the water is to come from wells or from an extension of another system. Thus, it is clear that if connection with an irrigation system designed for the closely adjacent lands (already found by the Court's 1964 Decree to be irrigable) is possible within the economic standards discussed elsewhere, it makes no difference whether wells that might be devised on that land would be supplied by aquifers deriving water from the River or by some other source of groundwater.

The second comment on Nevada's contention is that I find substantial evidence in the record to support the claim of the United States that the well water is from the mainstream of the River. This finding disposes of Nevada's entire argument. As noted, the HKM Report, the basis of the Government's claim for these lands, was admitted in evidence the third day of the trial. Mr. Al Kersich, the qualified witness who was responsible for the Report, testified in support of his

269. Trial Brief of the State of Nevada on Proposed Ground Water Use (May 1981).

270. U.S. Exh. 42, at 43.

report. He limited his oral testimony generally to matters that were put in issue by one or all of the State Parties. No party at that time raised the novel claim that Nevada made for the first time during the Government's rebuttal evidence some six months later. The HKM Report, which is considered by me in the same light as I would consider oral opinion evidence, stated as follows:

> The groundwater potential is described in Geological Survey Professional Paper 486-J "Geohydrology of the Needles Area, Arizona, California and Nevada". Most of the Fort Mojave Indian Reservation is underlain by thick deposits of alluvial sands, gravel and silt. Where the gravels exist, the aquifer will yield large amounts of water and the sand will yield moderate supplies. The groundwater system is hydraulically connected to the Colorado River; irrigation return flows to the Colorado River are the primary source of recharge. When the area to be irrigated is a considerable distance from the river or not close to the source of any existing irrigation supply system, groundwater may be utilized as an alternate source of supply for irrigation.[271]

The witness was available for cross-examination on any matters dealt with in the Report, but, until the rebuttal stage of the case, Nevada did not seek to question this statement which it now says is too general for me to accept. This complaint comes too late.[272]

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271. *Id.* at 20.

272. It is not correct, as Nevada now claims, that the question of the use of wells surfaced for the first time during the rebuttal period. As the above recitation shows, it was presented as an alternative basis of the claim for FM-3 from the very start of the case.

Nevada also seeks to support its contention of lack of evidence of the connection of any prospective wells with the River by pointing to cross-examination of Kersich, six months later, when he testified in rebuttal of the State Parties' case. He testified that the elevation of such a well would be 600 feet; that the elevation of the River was 484 feet; that some water would be found at 75 feet down; but, that the planned well would take water from a 450 foot elevation.[273] Thus, the source of the water would be some 34 feet below the River. I find that his testimony that this water would be mainstream water was correct.

H. *Miscellaneous Problems Associated with Individual Parcels*

In addition to the concerns which apply to a large number of irrigation units, the State Parties raise a number of concerns that each relate to only one or two parcels claimed by the United States.[274] These matters are discussed in the parties' briefs along with the attributes of each individual disputed parcel. The general concerns also raised in those portions of the briefs are adequately addressed elsewhere, and only limited matters merit further discussion at this point.

First, the State Parties claim that an area of 42 gross acres of Unit WC-2 on the Cocopah Indian Res-

273. Tr. 5912-14.

274. The State Parties do not raise any significant individualized concerns with respect to the Tribes' claims. The only possibility is the isolated criticism of the Tribes' estimated water costs relating to Unit CH-100 on the Chemehuevi Reservation and the Calada Unit on the Fort Mojave Reservation. State Parties' Post-Trial Opening Brief a-15, a-28 (May 1981). These statements fail to show that the State Parties' experts prepared evidence demonstrating that the Tribes' experts erred in this regard.

ervation "appears" to encroach on the channel of the Colorado River.[275] The United States' engineering expert stated that this assertion was not true and that through the use of aerial photography he had taken particular care to avoid such a problem by restricting this unit's boundary to the land where surface vegetation existed along the River.[276] On this issue, I find the position of the United States to be well-supported and convincing when compared to the rather tentative contrary evidence.

Regarding Unit FY-7 on the Fort Yuma Indian Reservation the State Parties claim that the United States included a seven-acre lake within this parcel.[277] The United States answered with expert testimony that the lake was not within the measured acreage.[278] That answer, I find, is sufficient.

With respect to two parcels the State Parties argue that the United States' agricultural economist used too high a payment capacity because certain small portions of those units have sandy soils.[279] The answer to the assertion regarding FM-11 on the Fort Mojave Indian Reservation is simple because I have earlier found that no such lands exist on this parcel based on my

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275. S.P. Exh. 158 BB; State Parties' Post-Trial Opening Brief a-34 (May 1981).

276. Tr. 5794-98; U.S. Exh. 141.

277. S.P. Exh. 158 FF; State Parties' Post-Trial Opening Brief a-38 (May 1981).

278. Tr. 5816-18; U.S. Exh. 144. The United States' expert testified that a one-acre pond was within the parcel's measured acreage, but that this pond fit within the 4% of the tract not planned for direct cultivation. Either that statement is true or this one-acre matter is de minimis because the State Parties do not discuss the matter in their brief.

279. State Parties' Post-Trial Opening Brief a-12, -33 (May 1981). The Tribe no longer asserts a claim for FM-201. F.M. Supp. Exh. (Sept. 1981), record item no. 192. *See also* S.P. Exhs. 110, 158G, 158AA.

general adoption of the analysis of the United States' soils expert.[280] The claim in the State Parties' brief regarding Unit EC-1 on the Cocopah Reservation is unaccompanied by any reference to evidence indicating that nine acres of sandy lands in an 81-acre parcel make appropriate a different payment capacity than the one used by the United States' expert. That expert specifically examined each parcel[281] before projecting a payment capacity for each parcel.[282] Given this background, I find the State Parties' position to be misguided.

Regarding the United States' claims on the Fort Yuma Indian Reservation, the State Parties assert that three parcels (FY-4, FY-10, and FY-11) are, at least in part, too small, irregular, or isolated to cultivate.[283] I find that with respect to these parcels the United States' engineering expert correctly stated that this issue is essentially a matter of judgment where a specific cost per acre cannot definitely be estimated.[284] Furthermore, I find that he correctly stated that over time such parcels would be cultivated.

Next, with respect to Unit CH-3 on the Chemehuevi Indian Reservation, the State Parties raise a question with potentially broader significance. They note that the "unit water costs . . . were based on a 185-acre service area which if scaled down to serve only the arable portion of the parcel would increase significantly."[285] This argument, made without

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280. U.S. Exh. 3. *See* Tr. 5775.

281. Tr. 764.

282. U.S. Exh. 60.

283. S.P. Exhs. 158 EE, 158 II, 158 KK. *See* State Parties' Post-Trial Opening Brief a-37, -41, -42 (May 1981).

284. Tr. 520, 5809-10, 5820-22.

285. State Parties' Post-Trial Opening Brief a-26 (May 1981).

reference to any record evidence, would logically apply to all parcels with varying degrees of significance depending upon the amount of non-arable inclusions in any particular irrigation unit and if followed would result in the exclusion of all acreage on such parcels when such higher costs exceed the benefits of farming the parcel. On the other hand, there is no justification for consideration of such higher costs, because the United States argues that although its soils expert considers this land to be so poor as to be classified as "non-irrigable," the land can be improved to the extent that it would be more profitable to cultivate the land than to exclude it from the irrigation units.[286] Thus, this question is not one involving a difference between the size of the irrigation units as claimed and as proved. I find that the United States' explanation resolves persuasively this issue. The State Parties' arguments regarding the inappropriateness of awarding water rights to non-arable or non-irrigable land has been accepted. The State Parties do not, then, undertake to inform me of any rational means related to record evidence which indicates at what point farming of an entire unit may be rendered infeasible because of a too-high percentage of non-arable land. I believe that I should not perform such analysis on an ad hoc basis and, thus, find the United States' position more tenable.

The State Parties also note a potential problem with the United States' cost calculations on CH-4 on

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286. *See, e.g.*, Tr. 793-94, 972, 5782-84. *See also* Tr. 3480. Because the United States' agricultural economist had studied the productivity of lands with similar non-arable inclusions, his payment capacity analyses already accounted for this effect. *See* Tr. 901-03, 5995-97. But I was unpersuaded that water rights should be given to land which the soils expert had classified as non-irrigable.

the Chemehuevi Indian Reservation.[287] They claim that the United States has understated power costs for pumping water to this parcel by averaging those costs with the costs associated with pumping water to the adjoining and lower-lying decreed lands which are yet undeveloped. The particular costs of pumping to CH-4 is, according to the State Parties' expert, $12 per acre more than the average cost of serving the entire unit including CH-4 and the decreed lands.[288] This argument is unpersuasive, because it gives a misleading view of the marginal cost of including the additional lands of CH-4 within a unit that also includes the decreed lands which do not yet have water service. The State Parties' expert admitted on cross-examination that the average costs would decrease because of economies of scale when the larger unit (including CH-4) is considered as opposed to a unit consisting only of decreed lands.[289] But the State Parties' expert made no attempt to determine the economies of scale for the entire cost structure of serving this area.[290] The United States' expert, on the other hand, acknowledged that pumping costs would be greater for CH-4, but stated that the overall effect of economies of scale on other costs would offset the increase in pumping costs.[291] I find that the State Parties' criticism is unwarranted and should not be considered in an analysis of practicable irrigability.

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287. State Parties' Post-Trial Opening Brief a-27 (May 1981).

288. Tr. 5210-12; S.P. Exh. 154.

289. Tr. 5350-55.

290. *Id.*

291. Tr. 5785-90. His opinion was quantified in part for illustrative purposes.

I. *Conclusions Regarding the Practicable Irrigability of Lands in the United States Claims*

The United States claims may be sustained upon a comparison of economic costs and benefits for the irrigable lands in the designated irrigation units for which the United States has made an adequate showing of both costs and benefits.

In table form these claims for the Fort Mojave Indian Reservations are:

Unit	Land Type	Annual Water Costs (per acre)	Annual Benefits (per acre)	Gross Acres
FM-2	Arizona Omitted	$130	$140	488
FM-3	Nevada Omitted	$130	$149	180
FM-4	Nevada Omitted	$178	$185	2
	California Omitted	$178	$185	15
FM-5	Arizona Omitted	$130	$149	898
FM-6	California Omitted	$130	$140	308
FM-7	Arizona Omitted	$134[292]	$140	583
FM-8	California Boundary	$178	$185	13
FM-9	California Boundary	$178	$185	1,848
FM-10	Arizona Boundary	$140	$185	514
FM-11	Arizona Boundary	$140	$185	137
FM-12	Arizona Boundary	$178	$185	151
FM-13	Arizona Omitted Arizona	$178	$185	160

292. *See* U.S. Exh. 138; Tr. 5768-69.

	Boundary	$178		$185	442
Calada	Arizona Omitted	$136		$149	756
			Totals		6,495[292]

Totals	Gross Acres
Arizona Omitted	2,885
Arizona Boundary	1,244
California Omitted	323
California Boundary	1,861
Nevada Omitted	182
	6,495

Of this total, 1,075 gross acres lie in areas of indefinite boundaries and may not receive water rights.[294] The reduced totals are:

Arizona Omitted	2,767
Arizona Boundary	487
California Omitted	123
California Boundary	1,861
Nevada Omitted	182
	5,420

Within this reduced total there exist 776 gross non-irrigable acres,[295] thus, leaving 4,644 practicably irrigable gross acres. The annual water rights to be added to this Reservation may thus be computed:

4,644 x .95 = 4,412 net irrigable acres

4,412 x 6.46 A.F./acre = 28,502 acre-feet

In table form the water rights claims for the Fort Yuma Indian Reservation are:

Unit	Land Type	Annual Water Costs (per acre)	Annual Benefits (per acre)	Gross Acres
FY-1	California Boundary	$178	$280	41
FY-2	California			

293. *See* U.S. Exh. 42, Table 7; U.S. Exh. 60, at 18.

294. *See* S.P. Exh. 160.

295. *See* U.S. Exh. 3.

	Boundary	$194	$220[296]		75
FY-3	California				
	Boundary	$178	$280		202
FY-4	California				
	Omitted	$178	$280		216
	California				
	Boundary	$178	$280		550
FY-5	California				
	Boundary	$178	$280		400
FY-6	California				
	Boundary	$178	$220		455
FY-7	California				
	Boundary	$178	$220		807
	Arizona				
	Boundary	$178	$220		335
FY-8	California				
	Boundary	$140	$220		28
	Arizona				
	Boundary	$140	$220		631
FY-9	California				
	Boundary	$178	$248		649
	Arizona				
	Boundary	$178	$248		551
FY-10	California				
	Boundary	$194	$280		19
FY-11	California				
	Boundary	$198	$280		831
FY-12	California				
	Boundary	$194	$220		160
				Total	5,950[297]

Totals	Gross Acres
California Omitted	216
California Boundary	4,217
Arizona Boundary	1,517
	5,950

296. *See* Tr. 977-79, 2293-94, 6038-43.

297. U.S. Exh. 42, Table 10; U.S. Exh. 60, at 18-19. *See* State Parties' Post-Trial Closing Brief 7-13 (June 1981); Letter to all parties (Sept. 8, 1981), record item no. 182; Letter from Scott McElroy (Sept. 28, 1981), record item no. 188.

Of this total, there are 84 non-irrigable gross acres.[298] This consideration leaves 5,866 practicably irrigable gross acres. The annual water rights to be added to this Reservation may thus be computed:

5,866 x .95 = 5,573 net irrigable acres

5,573 x 6.67 = 37,172 acre-feet

In table form the water rights claims for the Chemehuevi Indian Reservation are:

Unit	Land Type	Annual Water Cost (per acre)	Annual Benefits (per acre)	Gross Acres
CH-3	California Omitted	$108	$179	185
CH-4	California Omitted	$172	$179	1,230
				1,415[299]

Of this total, 329 gross acres are non-irrigable.[300] Thus, there are 1,086 practicably irrigable gross acres on this Reservation. The annual water rights to be added to this Reservation may be computed as:

1,086 x .95 = 1,032 net irrigable acres

1,032 x 5.97 = 6,161 acre-feet

In table form the water rights claims for the Cocopah Indian Reservation are:

Unit	Land Type	Annual Water Cost (per acre)	Annual Benefits (per acre)	Gross Acres
WC-1	Arizona Boundary	$178	$202	465
WC-2	Arizona Boundary	$178	$202	696
EC-1	Arizona Omitted	$194	$202	81
				1,242[301]

298. U.S. Exh. 14.
299. U.S. Exh. 42, Table 9; U.S. Exh. 60, at 18.
300. U.S. Exh. 6.
301. U.S. Exh. 42, Table 9; U.S. Exh. 60, at 19.

Of this total there are 10 non-irrigable gross acres in EC-1.[302] Thus, there are 1,232 gross irrigable acres on this Reservation. The annual water rights to be added to this Reservation may be computed as:

1,232 x .95 = 1,170 net irrigable acres

1,170 x 6.37 = 7,453 acre-feet

The United States claims on the Colorado River Indian Reservation are subject to a stipulation. The gross irrigable acreage on that Reservation is stipulated to be:

Land Type	Gross Acres
Arizona Omitted	16,180.5
California Omitted	1,853.5
California Boundary	3,600
	21,634[303]

The additional net irrigable acres are:

21,634 x .95 = 20,552 net irrigable acres

But that increase must be partially offset by a correction of 218 net acres, giving a total of 20,334 net irrigable acres. The annual water rights to be added are 135,628 acre-feet in diversion (20,334 x 6.67 (A.F./ac.)).

Thus the following represent the successful United States claims for the five Reservations:

Reservation	Net Irrigable Acres		Unit Diversion Quantity (A.F./ac.)		Annual Diversion Right
Ft. Mojave	4,412	x	6.46	=	28,502
Ft. Yuma	5,573	x	6.67	=	37,172
Chemehuevi	1,032	x	5.97	=	6,161
Cocopah	1,170	x	6.37	=	7,453
Colorado River	20,334	x	6.67	=	135,628

The 1964 Decree should be modified accordingly.

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302. *See* U.S. Exh. 17.

303. Stipulation of September 8, 1980, record item no. 91.

II. Claims Asserted by the Indian Tribes

The State Parties dispute almost all the acreage claimed separately by the Tribes to be practicably irrigable. The nature of this dispute differs somewhat from that regarding the United States claims. Although a similar soils dispute is involved, the primary issue concerns the suitability of the permanent crops projected by the Tribes for the Reservation lands. In this regard the dispute centers over the correctness of the prices and yields used by the Tribes' experts.[1] On the other hand, the off-farm water delivery costs[2] and the production costs[3] used by the Tribes' experts were generally unrebutted by any specific evidence.[4] The primary issue that is dispositive of most of the Tribes' claims is crop suitability.

A. Crop Suitability

The question of crop suitability becomes relevant because of the lack of large-scale, long-term, commercial production in the lower Colorado River Valley of any of the four permanent crops projected by the Tribes' experts. Those crops, as projected by the experts of the Fort Mojave, Chemeheuvi, and Colorado River Tribes, are pistachios, almonds, figs, and table grapes. The Quechan Tribe produced evidence relating to many crops, but placed a special emphasis on grapes. Only grapes have a tangible history of produc-

1. *See* State Parties' Post-Trial Opening Brief 77-80 (May 1981).
2. Tr. 5430.
3. Tr. 4009.
4. The State Parties later challenged some of the Quechan Tribe's expert evidence regarding the cost per acre calculations for the water delivery system designed for that Reservation. *See* notes 197-220 and accompanying text *infra*. *See also* Tr. 5462.

tion in the immediate vicinity of any of the Reservations, and even that history is not very extensive. Contrary to the State Parties' argument, I believe that I should not strike the possibility of successful production of permanent crops on the Reservations simply because of a lack of historical production of such crops in the area. In many regions new and untested crops have been introduced upon the advice of experts of the sort who counsel the parties in this case. The proper course, I believe, is to weigh the various opinions regarding the positive and negative factors with respect to each particular crop.

1. Pistachios

The primary question regarding the suitability of pistachios to the lower Colorado River Valley concerns the sufficiency of the number of "chilling hours" in the winter months. In order for the pistachio trees to produce an acceptable yield, the trees must receive in the months of November to March, a necessary amount of hours of weather in temperatures of less than 45° F.[5] The parties raise numerous sub-issues such as whether it is proper to subtract those hours in November to March when the temperature exceeds a certain temperature such as 70° F.[6] Resolution of these minor disputes is unnecessary here because I believe that the Tribes claims must fail on the more fundamental issue regarding the proper range of chilling hours necessary for the growing of a commercial pistachio crop.

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5. *See* Tr. 936, 1224, 3739-40, 3742-43, 4029, 4359, 4558, 4580-81, 4632-33, 6923.

6. Tr. 3740-49, 4089-92, 4416-22; C.R. Exh. 9, 28, 30. *See also* 4039, 4567, 4633-34, 4672-76, 4709-10, 4852-56. *Compare* Tr. 6299-301, 6316-17, 6918-28, 6935-36, 6997, 7016; S.P. Exh. 167; C.R. Exh. 37.

At the outset, I recognize that this issue represents an uncertain question. The farming of pistachios represents a new proposition for American agriculturists, and as stated by one of the Tribes' experts, the best estimates regarding the requisite chilling hours generally are given in a broad range with perhaps two or three hundred hours difference between the minimum and maximum ends of that range.[7] The Tribes assert that a minimum of 600 chilling hours in the winter months is sufficient for the growing of pistachios.[8] They contend that this assertion is bolstered by evidence that the same number of chilling hours occurs in the winter months at Parker, Arizona (Colorado River Indian Reservation) as in the vicinity of Bakersfield, California (the location of Superior Farms pistachio groves).[9] This evidence simply fails to convince me when the evidence to the contrary is considered.

The Tribes' evidence as just discussed was first introduced in the rebuttal phase of the Tribes' case. The principal witness for the Tribes testified unequivocally that between 850 to 950 chilling hours were required for the growing of pistachios.[10] This estimate orginally confirmed the State Parties' estimate that 800 to 1,000 chilling hours were required.[11] The rebuttal testimony, that 600 chilling hours is sufficient, entered the case only after the Tribes realized that their estimate of the number of chilling hours was flawed for the lands in question. The estimate was originally taken from data

7. Tr. 6931-38, 6971-79.

8. Tr. 6931.

9. C.R. Exh. 37; Tr. 4555. *See also* Tr. 4760.

10. Tr. 1069, 1224, 1265. The United States' expert also testified that 1,000 chilling hours are required to grow pistachios. Tr. 936.

11. Tr. 3740-43, 4088-94.

measured at Poston, Arizona rather than Parker,[12] a distinction which is significant because Poston in the valley can expect nearly 400 more chilling hours than Parker on the mesa.[13] Upon reflection the Tribes have acknowledged that, although Poston may average 1,028 chilling hours annually, Parker may expect only 631 chilling hours annually.[14] The Tribes' conclusion, that pistachios may yield an acceptable crop on these Reservations, remains unchanged only because they produced a rebuttal witness who testified that 600 chilling hours represents a minimum figure, in contrast to the Tribes' previous witness.[15]

This sequence of events fully convinces me that the range for acceptable commercial growth of pistachios extends approximately from 800 chilling hours to 1,000 chilling hours. The Tribes' rebuttal witness certainly presented substantial evidence supporting a lower figure, but when all the evidence is considered, the higher figures appear more correct. Numerous sources other than the State Parties' experts confirm that this higher estimate is needed for a good crop.[16] Considering this evidence, in addition to the State Parties' proof, I find that pistachios cannot be feasibly grown in the Reservation areas projected by the Tribes.

Several minor points might bear some discussion in relation to this issue. First, the Tribes claim that the number of chilling hours at Parker is nearly identical

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12. Tr. 1224-25; F.M. Exh. 2, at 15; C.R. Exh. 1, at 13.

13. Tr. 3746-51, 5035-36, 6264, 6564-65; S.P. Exh. 118.

14. C.R. Exh. 37.

15. I recognize the Tribes' claim that the previous witness was not an expert in this specific area. *See, e.g.*, Tr. 1226. But such an argument aids the Tribes very little because that first witness purported to offer the collective professional judgment of his engineering firm on a variety of subjects which undoubtedly exceeded his personal expertise.

16. *See* Tr. 936, 1069, 1224, 1265; C.R. Exhs. 15, 27, 30.

to the number at Bakersfield.[17] If the pistachio trees yield good crops at Bakersfield, any location having the same chilling hours as Bakersfield, ought, barring any further difficulties, to have sufficient chilling hours. But I question the accuracy of the Tribes' evidence on this point. The records for Superior Farms near Bakersfield indicate that for the crop years 1977 to 1979 the chilling hours annually totalled between 694 and 1,233.[18] In the year (1977-78) having the lowest number of chilling hours (694), the farm suffered a decrease in yield amounting to 25 to 35%.[19] Such facts belie the accuracy of the average figure of 629 chilling hours for the Bakersfield pistachio growing area.

Without question there is evidence in the record indicating a lower minimum number of chilling hours for pistachos. One expert estimated 400 to 500 hours constituted the minimum range.[20] But that same expert indicated that 800 chilling hours were required for a good year[21] and that he believed the Colorado River area to have less than the 400 hour minimum.[22] This background indicates that when the State Parties' chief expert witness on the subject stated that 600 chilling hours was a minimum figure, he meant that it was a minimum before any appreciable crop would be produced.[23]

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17. *See* C.R. Exh. 37.

18. *See* S.P. Exh. 126. The 1980 figures were not considered here because this collection of data was terminated at an early stage in that year. Tr. 4838-40.

19. *See* Tr. 4568-69, 4579-80, 4836-44.

20. *See* C.R. Exh. 16; Tr. 4424.

21. C.R. Exh. 30.

22. C.R. Exh. 16.

23. *See* Tr. 4561, 4632.

One final matter remains. The Fort Mojave Tribe asserts that the 490 hour figure indicated for Needles[24] should be adjusted upwards because this data was recorded on mesa land and the pistachios will be planted on valley lands.[25] This conclusion stems from expert testimony that the valley lands would have substantially higher chilling hours than shown for Needles and that the effect would be similar to that noticed between Poston and Parker.[26] A careful reading of the transcript reveals, however, that this expert's opinion does not extend to projecting sufficient chilling hours measured either by the Tribes' asserted minimum or the minimum which I find correct. That witness, instead, stated that he could not estimate the specific magnitude of the expected increase in the Fort Mojave valley lands because he lacked "sufficient data to make such a calculation."[27] Without that data, the best he could state was that "there could be a significant difference in chilling" between Needles and the valley lands but he was not certain enough to project the magnitude of the difference.[28] If the Tribe's expert cannot undertake such a task, I cannot make such a projection. Given the importance of this issue, the Fort Mojave Tribe should have provided the evidence sufficient to make a reasonably quantified projection such that firm conclusions would be possible. With only generalities in evidence on an issue which was specifically and vigorously debated, the Tribe's evidence simply fails to prove sufficiently this part of their case.

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24. *See* C.R. Exh. 37.
25. Four Tribes' Opening Post-Trial Brief 63 n.* (May 1981).
26. *See* Tr. 6276-78; C.R. Exh. 37.
27. Tr. 6265-66.
28. *Id.*

Given my conclusion that approximately 800 to 1,000 chilling hours are required to grow pistachios, I need not analyze the specific effect of the various degrees of inadequate chilling. The evidence establishes that the climate of these Reservations is such that pistachios may be discarded as a potential crop without a specific analysis of the various degrees of chilling. Even the Tribes' original expert would find that pistachios are not even marginally viable in this area when the corrected climate data introduced by the Tribes is considered. I find that pistachios should not be considered as a potential crop in determining the irrigability of the Reservation lands.

2. Almonds

The farming of pistachios in the lower Colorado River area presented such an impracticability that the prospect could be discarded without a detailed analysis. The dispute over the farming of almonds presents a much closer question. The problems raised by the State Parties are to some extent legitimate concerns, but none appears dispositive.[29] A general discussion of these concerns will highlight their relative importance prior to a more specific calculation demonstrating the economic feasibility of the crop for this region.

The State Parties are concerned that the Tribes' plans for the growing of almond trees includes the use of drip irrigation. The Tribes have offered evidence that the use of drip irrigation does not result in reduced yields as claimed by the State Parties.[30] I find that the State Parties' evidence to the contrary is more persuasive and that the yields must be reduced. The

29. *See* State Parties' Post-Trial Opening Brief 127-49 (May, 1981).
30. *See* C.R. Exh. 13.

State Parties' expert witness had specifically studied this situation with an especially keen interest and concluded that almond yields decrease under drip irrigation.[31] It is unclear to what extent this yield reduction overlaps the yield reduction expected on sandy lands.[32] But some reduction appears in order. Such a position appears much more plausible because of the Tribes' refusal to confront the issue. Faced with this expert's testimony, the Tribes resort to a claim that yield reductions do not occur under sprinkler irrigation.[33] This assertion, even if true, departs from the proof offered by the Tribes which had projected their almond payment capacities based on drip irrigation.[34] The Tribes raise other arguments challenging a yield reduction under drip. None of these other arguments is persuasive.[35] The almond yields projected must accordingly be reduced by some amount.

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31. Tr. 4622-23, 4666-72. *See also* C.R. Exh. 10.

32. *See* Tr. 4709, 4734; C.R. Exh. 10.

33. Four Tribes' Post-Trial Opening Brief 42 (May 1981). The Tribes also state that the reduction cannot be quantified. But the testimony cited indicates only that it was not quantified rather than could not be quantified. *See* Tr. 4064, 4066, 4623, 4708-09.

34. *See, e.g.*, F.M. Exh. 2, Table C-1 n.7; C.R. Exh. 1, Table B-1 n.7. In fact, the Tribes' expert testified that he projected drip rather than sprinkler because sprinkler irrigation was unacceptable for the concerned lands for a variety of reasons. Moreover, he indicated that energy costs would double or triple under sprinklers. Tr. 6453-54. A switch to sprinklers to avoid the problems of drip irrigation now simply makes no sense.

35. The primary reason for loss of yield apparently relates to the lack of distribution of water across the root zone. Tr. 2529, 4062-66, 6549. The Tribes presented evidence that this problem might be cured by adding additional drip emitters, Tr. 2529-30, 6450, at minimal cost. Tr. 6451-52. If the answer were so simple the problem would not exist. The State Parties' witness claimed to have used more emitters than anyone else, without solving the problem. Tr. 4741. To solve the problem an entire second drip system would need to be installed to deliver water between the rows of trees as well as at the base of the tree. Tr. 4065-66. The cost

In addition, the State Parties question the viability of almonds in the Colorado River area because of an increased danger of frost. The evidence presented by the State Parties showed that almond trees would bloom between one to three weeks earlier in the Colorado River area than in the San Joaquin Valley because of early warmer temperatures.[36] On the other hand, the times of the average last critical frosts are approximately the same for the two areas,[37] and would fall within the blooming period if that period occurs one to three weeks earlier in the Colorado River area.[38] The almonds in the San Joaquin Valley face this danger in February and March and with earlier bloom dates the danger would simply be increased. In fact, there is another additional danger because the fog, which lessens the frost danger in the San Joaquin Valley, is not present in the Colorado River area.[39] The undisputed evidence shows that the average temperatures in the relevant months are warmer in the Colorado River area than those in the San Joaquin Val-

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estimated by the Tribes for a drip system was $1,135 per acre. *See* F.M. Exh. 2, Table C-1. Even the Tribes' expert admitted that sometimes additional emitters will not solve the problem. Tr. 6549-50. The Tribes also argue that the yield reduction in the San Joaquin Valley relates to the tight soils of that area and that the sandier soils of the Reservations are better suited to drip. Tr. 6472. Once again this presents too simple a solution. The problems related to tight soils are not the spreading problem; rather the Tribes' expert mentioned other problems such as ponding and crustation of the soil. Tr. 6472. In any event, the Tribes' expert admitted that the spreading problem applies to sandy soils as well. Tr. 6549.

36. *See* Tr. 4653; S.P. Exh. 175.

37. *See* C.R. Exh. 36; Tr. 6195-97, 6294. *See also* Tr. 4609-10; C.R. Exh. 24, at 5.

38. *See* Tr. 4609, 6617-18; S.P. Exh. 129, 175.

39. *See* Tr. 4609.

ley.[40] The conclusion that almond trees in the Colorado River area will bloom earlier than those in the San Joaquin Valley seems, in light of this evidence, not only reasonable but also compelling. The State Parties are thus correct that the increased threat of frost damage on the Reservations should adversely affect almond yields in some amount.

A related question concerns the number of chilling hours required for the growth of an almond crop. The same basic question arose in regard to pistachios. The State Parties contend that between 400 and 500 such chilling hours below 45°F. are required in November through February before an adequate almond crop will be produced.[41] The Tribes do not explicitly assert any lower figure as correct.[42] I find the State Parties' estimate to be correct.

The State Parties argue that the chilling hours in the Colorado River area is marginal because they believe that Parker and Needles receive respectively only 373 and 394 such hours annually.[43] This assertion of inadequacy is countered by evidence offered by the Tribes which contend that the relevant figures are 631 and 490 respectively.[44]

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40. *See* C.R. Exh. 34; S.P. Exh. 181.

41. *See* Tr. 3740, 4063, 4068-70, 4132-33. The Tribes' expert originally testified that between 600-800 such chilling hours were required. Tr. 1069, 1265. The Tribes' present position appears to be less clear with respect to almonds, *see* Four Tribes' Opening Post-Trial Brief 26-27 (May 1981), but in light of the State Parties' concession I see no reason to hold the Tribes to this earlier range.

42. *Cf.* Tr. 6938 (almonds requires less chilling hours than pistachios).

43. Tr. 4356-57; S.P. Exh. 117.

44. The 490 figure for Needles is undoubtedly somewhat understated for reasons discussed above regarding pistachios. The specific adjustment appropriate is apparently not in evidence. *See* notes 24-28 and accompanying text *supra*.

Neither side appears to be completely correct. The parties differ for two basic reasons. The State Parties contend that the total of chilling hours must be reduced by the number of hours when the temperature rises above 60° or 70° offsetting the hours on the same day when temperatures drop below 45°.[45] Although the Tribes assert that no such offset should enter the calculations,[46] their own witnesses acknowledged that such a phenomenon occurred.[47] Other evidence indicates that some offset is appropriate especially for regions other than the San Joaquin Valley.[48] The Tribes' reluctance to use this offset lies in the divergent expert views regarding the appropriate formula to reflect this adjustment.[49] The Tribes' estimate of chilling hours thus appears to be overstated. On the other hand, there is evidence that the State Parties' estimate possibly understates the chilling hour total. The State Parties estimated the total from minimum - maximum temperature records[50] rather than using the admittedly more accurate method of taking readings from a

45. Tr. 3745-49.

46. The reason, apparently, is that standard practice does not incorporate such an offset. *See* Tr. 4567, 6300-01, 6927-30.

47. Tr. 6316-17, 6935, 6997.

48. *See* Tr. 3743-44, 4039, 4089-94, 4416-22, 4567, 4633-34, 4672, 4676, 4709-10, 4852-56; C.R. Exhs. 9, 28, 30.

49. Tr. 6299-303. The Tribes' expert performed some study of the magnitude of this difference and apparently concluded that the actual number of such hours above 70° is minimal. *See* Tr. 6316-17. This testimony is unpersuasive not only because of its lack of clarity but also because it appears directed only at two of the four months under consideration.

50. Tr. 3741.

thermograph[51] as did the Tribes' experts.[52] Each side's presentation has minor flaws.

The truth, I believe, lies between the figures advocated by the litigants. The question involves considerable uncertainty but I believe that the State Parties are more nearly correct on this estimate of chilling hours. Their own experts' admission that the effect of warmer temperatures exists greatly weakens the Tribes' case. The standard use of the Tribes' method in the San Joaquin Valley[53] does not necessarily make it appropriate for use in another region.[54] This observation seems particularly true as the San Joaquin almond growing region experiences minimal amounts of these warmer temperatures[55] while the experts for the Tribes neither clearly nor fully demonstrated that the same is true in the area of the Reservations.[56] Given this state of the record the warmer temperatures must be accounted for in some manner. The State Parties have used a system that at least constitutes an attempt to quantify that which the Tribes' experts claimed could not be quantified. Allowing for the uncertainty of this process as well as the potential measurement errors arising from the State Parties' failure to use a thermograph, I find that the appropriate chilling hours figures for Parker and Needles are in the mid-400's. This average figure is sufficient for the growth of almond crops but because there will be be-

51. *See* Tr. 4744-45, 4760-61. The State Parties did offer evidence that the expected error was only 2% from the method they adopted. Tr. 3744.

52. *See* C.R. Exh. 37.

53. Tr. 4567, 6300, 6927.

54. Tr. 4672, 4676.

55. *See* S.P. Exh. 126.

56. *See* Tr. 6317.

low average years, some yield reduction seems appropriate.

The State Parties also raise a number of concerns which I find either irrelevant or de minimis with respect to almonds. A brief discussion will dispose of these claims.

The State Parties first claim that the incidence of summer rains in the lower Colorado River Valley[57] will adversely affect almond yields.[58] Any analysis of the record would indicate that summer rain was not considered by the State Parties' experts to be the most serious problem with almonds. This alleged problem was in fact given rather little weight.[59] The Tribes presented credible evidence that almond crops are grown with minimum losses in areas such as Northern California, which experience rain during harvest season.[60] The State Parties assert that rain damages almond hulls.[61] The Tribes never assumed that the hulls would be sold, so the possible damage to the hulls is irrelevant.[62] The State Parties' only other specific

57. For a comparison to the San Joaquin Valley, *see* S.P. Exh. 127, 170; C.R. Exh. 32A.

58. Tr. 3754, 4630-31, 4845-47.

59. *See* Tr. 3754.

60. Tr. 6947-48. The State Parties' answer to this testimony is almost totally misguided. First, they criticize the witness' experience in the Colorado River area. Second, they note that the exhibits he used show averages rather than frequency or intensity of storms. State Parties' Post-Trial Opening Brief 141-42 (May 1981). These criticisms, of course, have no bearing upon this witness' testimony that other regions with summer rains successfully grow almond crops. The State Parties' final criticism of this witness, that rain damages almond crops, upon reference to the record, Tr. 4630, 4847, narrows to a belief that almond hulls are damaged by rain. This criticism is discussed more fully later. But this criticism has no independent significance if almonds are successfully grown in the areas with summer rains.

61. *See* Tr. 4630-31.

62. *See* F.M. Exh. 2.

claim[63] was a brief mention of mildew in the nuts but that difficulty was minimized by the State Parties' expert.[64] Given this state of the record I can only conclude that rain losses to an almond crop would be minimal.[65]

Similarly, the State Parties' concern with tree stress due to lack of irrigation during harvest is illusory. The harvest period for almonds takes from 45 to 60 days in August and September and the State Parties claim that the farmer cannot irrigate during this period because of water damage to the crop on the ground.[66] Lack of irrigation for such a period will stress the trees and reduce production in subsequent years.[67] The evidence, however, shows that almond orchards are routinely irrigated during harvest under drip or furrow irrigation. The common practice during harvest is to alternate the irrigation among the almond varities that are not yet ready for harvest.[68] Faced with this testimony the State Parties resort to criticism of drip irrigation and sandy lands.[69] To the extent that the Tribes' experts projected drip irrigation on sandy lands these projections are subject to attack, but those weaknesses in other parts of the case are not transformed into an independent weakness under the heading of tree stress.

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63. There was a general claim that rains cause great losses in almonds as well as other crops but the reason was never fully specified. Tr. 4845-46.

64. *See* Tr. 3754.

65. *See* Tr. 6947-48.

66. Tr. 4617-18.

67. Tr. 4618-19, 4625-26, 4653. The Tribes' expert agrees that such lack of irrigation would be a serious problem. Tr. 6318-19.

68. Tr. 6942-45.

69. *See* State Parties' Post-Trial Opening Brief 145-46 (May 1981).

The State Parties also consider that almond crops cannot be harvested on gravelly or cobbly soil because even a small rock will damage the harvesting machinery.[70] This concern was once believed by the State Parties to be the major problem for almond growing on the Reservation.[71] The Tribes have partially avoided the problem by planning to plant more almond trees on sandy lands rather than gravelly/cobbly lands.[72] This solution is only one of several proposed by the Tribes' experts.[73] The problems associated with rocks simply do not exist to the extent that the State Parties' expert claimed at trial.[74] To the extent that the Tribes plan to use the sandy lands of the Reservations for almonds, the problems associated with sandy lands should be addressed elsewhere.[75]

Salinity also concerns the State Parties. The Tribes' experts admit that salinity of irrigation water is a concern and that the water from the Colorado River to some degree has this characteristic.[76] On the other hand, the Tribes' experts claim that the level of salinity of the water, as represented by the State Parties, is lower than water which would significantly af-

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70. Tr. 4357, 4614-15, 4736-37, 4831, 4848-49.

71. Tr. 3754.

72. Tr. 6296.

73. *See* Tr. 6205-06.

74. This conclusion seems fully supported by the testimony of the Tribes' expert. It is additionally bolstered by evidence of existing almond orchards on gravelly soil. *See* C.R. Exh. 49 (photographs nos. 50-53).

75. In connection with their argument at this point, the State Parties also raise a minor point regarding the importance of stabilizing sandy soils and the advantage of using sprinkler irrigation for this process. *See* Tr. 4625-26. This difficulty should be subsumed within their claims regarding the disadvantages of drip irrigation and sandy soils.

76. Tr. 6202-05; F.M. Exh. 2, at 17; C.R. Exh. 1, at 16.

fect almond yields.[77] The evidence thus does not indicate that this factor should make almonds an unsuitable crop for the areas of the Reservations.

Given that a yield reduction is in order, the State Parties contend that a yield of 2,000 pounds of almonds (in shell) per acre is more reasonable than the 2,750 pounds projected by the Tribes.[78] This reduction in yield would result, the State Parties claim, because of a combination of poor, sandy soils, use of drip irrigation, and marginal chilling hours.[79] Mature almond trees will yield on average between 2,700 and 3,600 pounds.[80] The Tribes originally claimed that current production ranged from 3,000 to 3,300 pounds per acre.[81] Against this background the Tribes' estimate of 2,750 pounds seems reasonable and conservative, until the problems associated with the Tribes' plans are considered.

The State Parties reduced the almond yield projections primarily because they understood that the almond crop would be grown on sandy soils[82] under drip

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77. Tr. 6296-97; 6326-30. At most there would be a 1 to 1½% yield reduction for the almonds grown on the Chemehuevi Reservation. *See* Tr. 6330.

78. *See* Tr. 3761-63; S.P. Exh. 119; F.M. Exh. 2, Table C-1; C.R. Exh. 1, Table B-1.

79. Tr. 3757-58, 4061-72.

80. C.R. Exhs. 10, 12, 13, 14, 24, 26, 27, 38; S.P. Exh. 172; Tr. 1105, 4067, 4683, 6214-22.

81. Tr. 1105.

82. Tr. 6292. The reference of the Tribes' expert to sandy lands is explained by the Tribes as meaning that the Colorado River area soils are generally more sandy than the soils in the San Joaquin Valley. They claim it was not intended to mean that the Tribes project all their almond plantings on sandy soils, as that phrase has been used in this case. Four Tribes' Post-Trial Reply Brief 23 (June 1981). For purposes of this discussion, I will assume the Tribes correctly interpreted this testimony.

irrigation.[83] The State Parties presented a very credible expert who testified that almond trees grown on sandy loam will yield 30% less.[84] This figure translated into a loss in yield of between approximately 900 to 1,100 pounds (in shell) per acre.[85] This same witness also credibly testified that drip irrigation results in a reduction in almond yield.[86] As the State Parties note, the yield reductions related to lands and drip irrigation are, to some extent, overlapping.[87] This conclusion appears sensible because sandier land would be a natural place for anyone, including the State Parties' expert, to install a drip irrigation system. This combined reduction must be 1,100 pounds in shell.[88]

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83. F.M. Exh. 2, Table C-1 n.7; C.R. Exh. 1, Table B-1 n.7.

84. Tr. 4734.

85. *Id.* This witness gave the range of between 500 to 600 pounds per acre without specifying if his figures included the shell or just the almond meat. This failure to specify is understandable since he earlier stated that he always refers to meat pounds because the shell is worthless. Tr. 4670. The conversion is made by dividing the meat pounds by .55 to give in-shell pounds. C.R. Exh. 38, at n.1; C.R. Exh. 27.

86. Tr. 4622-23, 4666-72.

87. State Parties' Post-Trial Opening Brief 193 (May 1981).

88. The Tribes attack this calculation of the loss. First, they argue that the reduction in evidence was 600 pounds, not 1,100. Second, they contend that the State Parties have double-counted the reduction for sandy soils and drip irrigation because the evidence shows only one such reduction is appropriate. Four Tribes' Post-Trial Reply Brief 34-35 (May 1981). The State Parties acknowledged that while the reductions were overlapping, they did not reduce yields twice for the same factor. On the other point, there is some confusion based on the difference between in-shell and meat weights. The initial testimony compared the 600 pound reduction with the 2,000 pound in-shell yield figure. Tr. 4062-66. This is misleading because the original source for this reduction apparently meant the 600 pound figure to be in meat weight terms. *See* C.R. Exh. 10. Otherwise, other information supplied by him makes little sense in the context of this case. In any event, the State Parties' other expert witness clearly meant the yield reduction for sandy soils to be in meat pounds. *See* note 85 and accompanying text *supra*.

If the original Tribes' yield range is used (3,000 to 3,300 pounds in shell per acre)[89] a representative figure of 3,150 pounds in shell seems a realistic starting point. A reduction of 1,100 pounds leaves 2,050 pounds. The State Parties' estimate was 2,000 pounds. That figure also included a reduction for lack of chilling hours, but did not account for the increased danger of frost damage. I have found both factors to be significant in reducing expected yields. The remaining 50 pounds of reduction appears to be fully supported in the evidence.[90] In short, the State Parties' estimated yield of 2,000 pounds in shell per acre appears much more realistic than the Tribes' estimate of 2,750 pounds. I find that figure to be correct.

Given a yield estimated at 2,000 pounds per acre, the price factor becomes vitally important. The State Parties presented evidence that an almond yield of 2,000 in-shell pounds per acre combined with the prices and costs initially used by the Tribes results in negative payment capacity,[91] which means that no

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89. Tr. 1105.

90. Tr. 3757-58, 4063, 4068, 4071-72, 4772; S.P. Exh. 117. I understand the Tribes' evidence that the effect of insufficient chilling is not readily quantifiable. Tr. 6300-01, 6936-38. The Tribes imply that the State Parties reduced almond yields by 25% because of inadequate chilling hours alone. Four Tribes' Opening Post-Trial Brief 31 (May 1981). Regardless of the merit that argument contains in theory, it has no basis in the facts of this case. The yield reduction of 25% was the result of a variety of factors. I do not consider a final reduction of 50 pounds per acre excessive when there will definitely be a sizable portion of years without adequate chilling hours, even if the yearly total *on average* is sufficient. Moreover the possibility of frost damage should also be considered. The possibility of a further yield reduction to a level below 2,000 pounds per acre appears foreclosed only by the lack of a convincing assertion of such a position by the State Parties in either their experts' testimony or their briefs.

91. S.P. Exh. 119.

money would be generated to pay for water distribution facilities to bring water to the farm parcels. The Tribes counter with evidence that if 1980 almond prices are considered as a part of the five-year average almond price, the gross revenues will increase and a positive payment capacity will result.[92]

The Tribes originally projected payment capacities based upon costs and prices taken from different years. The cost data was from 1979, updated by an inflation factor to 1980 levels.[93] The almond price data was a five-year average with the last year's data from 1978. The State Parties' expert agreed that theoretically if 1980 costs are used then 1980 prices should also be considered as a part of the five-year average.[94]

The original theoretical mistake was made by the Tribes when they used 1980 costs without considering 1980 prices simply because they were satisfied that they had proved the feasibility of growing these crops without considering more favorable 1980 prices. They accuse the State Parties of selectivity in reducing yields but not increasing prices.[95] The Tribes' counsel and experts appear remarkably naive to expect that their adversaries would not attack the Tribes' yield projections and therefore prices would never be a crucial issue.

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92. C.R. Exhs. 56-58.

93. Tr. 7094; C.R. Exh. 1, Table B-1 nn. 6, 8; F.M. Exh. 2, Table C-1 nn. 6, 8.

94. Tr. 7236. The State Parties' expert quite correctly claimed that 1980 prices alone should not be compared to the 1980 costs, because the 1980 prices might not be representative. Later he appeared to acknowledge that theoretically the 1980 prices should be included in the five-year average if that average is compared to 1980 costs. *See* Tr. 7235-36.

95. Tr. 7095; Four Tribes' Opening Post-Trial Brief 47-48 (May 1981).

Nevertheless, I conclude that the theoretically correct approach is to use a specific year's cost with an average price including as the last price of the average the year at which the costs are pegged. The Tribes' approach as evidenced by its experts[96] includes the 1980 price in its average. The cost figures purport to be from 1980.[97] But the costs are not 1980 actual costs but rather 1979 costs increased by six percent to allow for inflation.[98] If the Tribes' theory of matching prices and costs as outlined above is accepted, then 1980 actual costs, as well as 1980 prices should also be considered. This information is not in the record, or at least the Tribes do not note it. The only figures in the record which I believe can be matched are the 1979 figures.

The Tribes' original computations are based upon a five-year average of almond prices with the latest price in the five-year average being the 1978 price.[99] Therefore, a new payment capacity based on 1979 costs and an average price with 1979 as the last year must be computed from the figures in evidence. Because the almond prices have experienced a rapid rise in recent years, I find that a three-year average price should be adopted from the data for the years 1977-79; this new payment capacity is $347 per acre per year.[100] A com-

96. C.R. Exhs. 56-58.

97. *See* Four Tribes' Opening Post-Trial Brief 47 (May 1981); Tr. 1105.

98. *See* Tr. 7094; F.M. Exh. 2, Table C-1 nn. 6, 8; C.R. Exh., Table B-1 nn. 6, 8.

99. C.R. Exh. 56.

100. *See* Tr. 4083; Appendix 2. This computation is based upon the following assumptions that have been discussed in text:

1) Yield = 2000 lbs. per acre (S.P. Exh. 119)

2) Price = 76¢ per lb. in shell (3 yr. avg. 1977-79) (C.R. Exh. 56)

parison of this revenue analysis with the cost of the water distribution system will determine the irrigability of a large portion of the Tribes' claims.

The claims relating to almonds generally appear viable when those figures are used. On the Chemeheuvi Reservation the area with the highest water cost per acre is Service Area A-2 with an annual cost of $171.[101] This is the only additional area claimed to be irrigable by the Chemehuevi Tribe. Thus, the Chemehuevi claims regarding almonds are factually sustained. The claims on the Colorado River Indian Reservation are sustainable because, of the 8,662 gross acres under consideration, none have an annual water cost per acre

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3) Costs = 1979 level with pre-harvest and harvest costs in S.P. Exh. 119 reduced by 6% amount noted in F.M. Exh. 2, Table C-1 nn. 6, 8

4) Interest - 10%

In addition, it also accounts for the present value of the net income stream in the manner advocated by the State Parties. *See* S.P. Exh. 157; C.R. Exh. 7A. *See also* C.R. Exh. 6. This method provides the most theoretically correct treatment of the problem because the Tribes' method of simply dividing the accumulated net income among the 30 years under analysis fails to recognize that the income is received in the later years while the water distribution system costs and associated costs would be accumulating in even annual amounts throughout the 30 years including the years before there is any income. The State Parties' method is simply an attempt to put all the revenues and expenses on a similar present value basis. To the extent that any party in any other anslysis has failed to account for this factor, that analysis is theoretically inaccurate even though it bears the imprimatur of an expert. Perhaps the inaccuracy is deliberate in order to offset other factors that are not otherwise satisfactorily factored into the computation. But the Tribes do not make that argument. *See* Four Tribes' Opening Post-Trial Brief 53-55 (May 1981). Although it may be possible to construct a present value analysis that is structured in a manner that is better still, I will only make the adjustment now urged.

101. *See* CH. Exh. 1, Table 11.

greater than the $347 payment capacity.[102] On the Fort Mojave Reservation none of the projected parcels has a cost of water exceeding this payment capacity, so almonds would be a financially suitable crop there as well.[103]

3. Figs

The Tribes' claim that the Reservation lands can profitably produce a fig crop can be easily dismissed. This claim rests primarily upon the uncertain premise that fig trees on the Reservations will yield annually 2.9 tons of dried figs per acre.[104] This figure derives from a survey of fig production conducted by the Tribes' experts.[105] Compared to some of the figures in the survey, the Tribes' estimate appears reasonable and moderate, as a base figure for fig yields. But such a conclusion would be ill-founded, because those numbers in the survey exceeding the Tribes' estimate are actually *estimates* of *expected* fig yields in new high-density plantings.[106] The figures for yields actually achieved appear from the Tribes' evidence to range from 1.5 to 2.5 tons per acre.[107] Indeed, one of the Tribes' experts opined that 2.25 tons per acre was the maximum average yield under optimum conditions.[108]

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102. *See* C.R. Exh. 1, at 31. The cropping pattern on this Reservation projects one sixth of the acreage for permanent crops to be planted with almonds. *See* C.R. Exh. 57 n.3. This amounts to approximately 1,444 gross acres.

103. F.M. Exh. 2, at 32.

104. *See* F.M. Exh. 2, Table C-2; C.R. Exh. 1, Table B-2; CH. Exh. 1, Table B-2.

105. *See* C.R. Exh. 38.

106. Tr. 6219-21, 6312-13; C.R. Exh. 38, n.5.

107. *See* Tr. 6219-21; C.R. Exh. 38. This conclusion is supported by the State Parties' data as well. *See* C.R. Exh. 28; F.Y. Exh. 46.

108. *See* C.R. Exh. 28; F.Y. Exh. 46.

The figures relied upon by the Tribes' experts are untested. Future experience may support the Tribes' position but the hard, convincing facts available in this case do not support an expected yield of 2.9 tons.[109] This figure must fall and with it the Tribes' claims regarding figs.

The appropriate payment capacity supporting this conclusion is somewhat uncertain because of the lack of precision in the evidence. The State Parties urge a payment capacity based upon a yield figure of 1.7 tons per acre because that is the historical average.[110] That figure appears somewhat low and in any event a composite of the Tribes' historical figures produces a figure of roughly 1.9 tons per acre.[111] If a figure of 1.94 tons per acre is taken as the ultimate yield, a payment capacity of approximately $72 results.[112] This calculation appears fairly generous to the Tribes but even under

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109. The Tribes note that farmers are relying upon the higher expected yields by planting more figs in the high density grove. Four Tribes' Opening Post-Trial Brief 45-46 (May 1981). The farmers may hope to achieve these higher yields but it is not clear that a failure to achieve the yields will be crucial. Such farmers may not lose money with yields closer to the traditional level. Rather they may only make less money than such higher yields would have given them. In any event, I believe such estimates based on untested figures to border on the speculative when compared to the proven historical figures. These higher estimates may ultimately be correct but in the meantime there is really no means to test their validity. The uncertainty of these figures is well illustrated by the projections offered by a farm advisor named Levitt who on one occasion estimated a 3.5 ton production per acre, Tr. 6221, and at another time indicated that 3.0 tons should be expected. C.R. Exh. 38.

110. *See* S.P. Exh. 120; Tr. 3758-63, 4077-78, 4416-17. *See also* S.P. Exh. 178; CH. Exh. 25; C.R. Exhs. 28, 38; F.Y. Exh. 46.

111. *See* C.R. Exh. 38.

112. *See* Appendix 2. This calculation is based upon: the price initially used by the Tribes, which appears to be an average of the fig prices in years 1975-79; the harvest and pre-harvest costs adjusted to the 1979 level; and a 10% interest rate. *See also* note 100 *supra*.

this analysis the majority of the Tribes claims fail because the annual water costs exceed this figure.[113] Some acres in the Fort Mojave Reservation have water costs lower than this figure; but that figure does not include any allowance for additional costs appropriate for the region. All parties agree that the lower Colorado River region has greater rainfall during fig harvest than the other regions in which figs are grown.[114] Similarly, all parties agree that at some level of rainfall, certain costs must be incurred to preserve the fig crop. But it is not clear from the testimony, cited by the parties, what fraction of the annual fig crop would be affected on average by the instances of rainfall[115] that occur in this area. These expenses for handpicking and drying total approximately seven cents per pound.[116] And the Tribes note that the worst case, not to be expected, would occur if all the crops were subjected to these corrective measures.[117] Nevertheless, the evidence supports a finding that such significant rains (greater than .2" in one day)[118] occur perhaps one to two times per year in the harvest season.[119] One might realistically conclude that as much as a quarter of the crop would require this treatment each year. And a payment capacity analysis, including such a factor, yields an annual figure of $34 available for water costs.[120] Because water costs for all claimed parcels ex-

113. F.M. Exh. 2, at 32; C.R. Exh. 1, at 31; CH. Exh. 1, Table 11.

114. C.R. Exhs. 32A; 33; S.P. Exh. 171.

115. *See* C.R. Exh. 33.

116. Tr. 6885. Such expenses apparently must be concurrent. *See* Tr. 6813. Raking would cost an additional cent a pound. Tr. 6885.

117. Four Tribes' Post-Trial Reply Brief 25-26 (June 1981).

118. Tr. 6884.

119. *See* C.R. Exh. 33; Tr. 6302-11.

120. *See* Appendix 2.

ceed this figure, I find that none of the Reservation lands will yield a profitable fig crop.

Upon reflection this conclusion might first appear unusual. It holds that under traditional practices fig farming generates a relatively small positive cash flow and will not be profitable even when considering moderate water costs. Such a result might ordinarily be questionable with respect to a common crop, but it seems justified with respect to this crop. Neither expert witness who testified regarding fig farming has consistently made money on his fig farm operations.[121] Given this background my findings appear fully supported.

4. Table Grapes

Table grapes present the most clearly feasible of the five permanent crops projected in the Tribes' claims. Even the State Parties' experts spoke highly of grapes as a generally profitable crop.[122] The State Parties, however, do not concede that grapes can be grown economically on the Reservation lands. Rather they estimate that grapes will produce a maximum of $58 per year to pay water costs[123] and that when certain extra costs associated with some of the parcels are considered, none of the parcels is practicably irrigable under a claim supported by a projection of a grape crop.[124] The Tribes' evidence amply supports a finding that grapes should be suitable and profitable crops on the Reservations, as elsewhere. The State Parties do not agree but, rather than demonstrating simply why this

121. Tr. 4682-87, 6868-71.
122. Tr. 4592.
123. S.P. Exh. 121.
124. State Parties' Post-Trial Opening Brief 198 (May 1981).

area is significantly different from other areas, they have produced evidence of a quantitative nature that inferentially would prove that grapes cannot be economically grown in places where they are currently grown. Given the unacceptability of that conclusion, coupled with the strength of the Tribes' evidence, I find that the facts show table grapes are an economically viable crop which can be grown on the Reservations.

The State Parties' economic analysis of grapes as a crop for the Reservations should begin to raise doubts in an observer's mind. The projected payment capacity provides only $58/year/acre for annual water costs associated with a water distribution system.[125] This analysis seems dubious because the State Parties' experts projected that the Reservation lands would yield a grape harvest identical to the yield obtained generally in Arizona; no specific yield reduction was made for climate or soils reasons[126] because the experts felt no justification existed for such a reduction.

These experts determined the representative yield for Reservation lands to be 4.4 tons (or 400 22-pound boxes called lugs)[127] which they believed to be the typical Arizona yield. This estimate was made with the knowledge that a yield of 3.85 tons (or 350 lugs) has been sufficient to be profitable throughout the state of Arizona.[128] The State Parties' dismissal of this fact as applicable only to lands with lower water costs[129] seems not only unsupported by the record but also an incomplete response. The statement in question, al-

125. S.P. Exh. 121.
126. Tr. 4074-76; S.P. Exh. 121; *See* Tr. 3712-13, 4086, 4289.
127. Tr. 4074-76, 4086, 4289; S.P. Exh. 121.
128. F.Y. Exh. 43. *See also* F.Y. Exh. 38.
129. State Parties' Post-Trial Opening Brief 201 (May 1981).

though brief, presents an unqualified assertion from an agricultural extension agent in Phoenix contacted by the experts who desired to tap his knowledge. As the Tribes note, the State Parties' explanation of this evidence[130] creates severe doubt about the correctness of the State Parties' analysis.[131] The 4.4 ton yield projected by the State Parties exceeds the 3.85 ton yield by .55 tons. This excess would, at the State Parties' estimated price of $680/ton, generate an additional $374 per acre per year. According to the State Parties' analysis, the grape vineyards will be at full production in years 5 to 25. If the increased revenue from these

130. In their reply brief the State Parties attack this evidence on other grounds which are unpersuasive. The response that this observation of profitability concerns only lands for which the development costs were incurred in the past (State Parties' Post-Trial Closing Brief 45 (June 1981)), seems inevitably true, but not important, because any intelligent observation should be based on historical data rather than unfounded speculation. To be sure the statement does not purport to compare current capital costs with expected revenue. But the State Parties draw a distinction which is too fine to be made absent some other proof. In the absence of evidence to the contrary, one would expect the change in both figures to be proportional. The State Parties do not specifically demonstrate in their response how capital costs would have grown at a rate significantly greater than revenues. Moreoever, there is good reason to suspect revenues have grown at least as much as costs since the price for grapes has doubled in the last several years reflecting increasing popularity of the product as well as inflation. C.R. Exh. 56. In any event, the State Parties fail to support the speculation in their brief regarding increased development costs with any reference to the record. Curiously, they state that there is no evidence to support this statement of profitability of grapes with a yield of only 3.85 tons per acre but fail to note that the opinion itself is evidence, F.Y. Exh. 43, while their speculative comments are not. The State Parties might have demonstrated with evidentiary facts the contrary position, but they do not. Absent such evidentiary impeachment the admitted statement stands as competent and unrebutted evidence of the proposition asserted and presumably based upon the declarant's experience which supports it.

131. Four Tribes' Post-Trial Reply Brief 37 (June 1981).

years alone is considered as an annuity at 10% interest, the present value of the increased cash flow is sufficient to support an additional expenditure for water of approximately $243 in each of the 25 years in the analysis. Those vineyards which show a profit at a yield of 3.85 tons must incur substantial water costs, yet the 4.4 ton yield will pay substantially more. The State Parties' projection of a payment capacity of $58 at a yield of 4.4 tons appears questionable in light of the State Parties' explanation of the profitability of farms with lower yields. Moreover, the State Parties' reading of this statement appears strained since the statement phrased in a broad, unqualified manner implies at least that lands with average water costs are still profitable with that lower yield. In the absence of a more persuasive explanation, the only logical conclusion to be drawn from the evidence is that grapes are more profitable than the State Parties admit.

The key to unravelling this dispute must be price. The Tribes originally proposed a grape price of $680 per ton[132] knowing that recent prices were significantly higher.[133] The State Parties accepted the Tribes prices and costs as reasonable.[134] When the State Parties attacked the Tribes' yield figures, the Tribes responded by urging that current prices represented by a five year (1975-80) average of $869/ton be considered.[135]

The State Parties were aware that the Tribes' experts had used older prices and that the newer prices were considerably higher.[136] The grape prices accepted by the State Parties' experts in fact represented an av-

132. *See e.g.*, F.M. Exh. 2, Table C-6.
133. Tr. 1105.
134. Tr. 4020-21, 4082-85.
135. C.R. Exh. 56.
136. Tr. 4277-80; F.Y. Exh. 44.

erage of eight years stretching from 1971 to 1978.[137] These prices were compared by the State Parties to 1980 estimated costs when their expert admitted that with rapidly rising prices a two or three year average should be used.[138] Such a three year average would be $867 if 1977 to 1979 prices are considered.[139] Clearly this set of additional facts explains why the State Parties show a minimal payment capacity for grapes while Arizona growers generally may profitably cultivate vineyards yielding .55 tons per acre less than that projected by the State Parties.

The State Parties respond in two ways. First, they question whether the Arizona price would be achieved by grapes grown on the Reservations. Second, they attempt to demonstrate through S.P. Exh. 184 that the gross revenues (rather than prices or yields separately) they used are reasonable. These arguments can be dismissed.

The confusion injected into this case by S.P. Exh. 184 should be addressed first. The exhibit purports to show that gross revenues actually received by growers from an acre of grapes nearly matches that estimated by the State Parties' expert. The State Parties originally projected gross revenue per acre of $2,992.[140] This exhibit shows the actual gross revenue per acre to be $2,881 for 1977.[141] Ostensibly this evidence confirms the State Parties' original estimate, but upon closer examination it appears to be virtually meaningless in the context of this case as well as being based upon assumptions not fairly supported by the record.

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137. C.R. Exh. 56.
138. Tr. 4082-83.
139. C.R. Exh. 56. *See* F.Y. Exh. 44; Tr. 4277-80.
140. S.P. Exh. 121.
141. S.P. Exh. 184.

First, the data from which this exhibit derives, concern yield and prices in Kern County, California rather than Arizona.[142] The State Parties feel that Kern County yields are too high[143] but their estimates necessarily incorporate these high yields in this exhibit. This fact may simply be explained as giving the Tribes the benefit of the doubt on this issue but it really exposes the irrelevance of this exhibit. The State Parties calculate the fresh grape gross revenue for 1977 as:

Total Revenue (fresh grapes)		Harvested Acres		Marketing Charge		Revenue per acre
($30,770,000	÷	9,826)	×	.92	=	$2,881[144]

This analysis assumes nearly one-half of the grape yield becomes lower-priced crushed grapes. The above calculation offered by the State Parties fails to include the revenues from crushed grapes which increase the total by 15% to $3,300/acre.[145] This calculation is based upon Kern County yields of 8.4 tons per acre. Since the State Parties claims that Arizona yields, as

142. Id.; C.R. Exh. 61.

143. State Parties' Post-Trial Closing Brief 30-31 (June 1981).

144. *Id.* at 31.

145. Although S.P. Exh. 184 holds out the $2,881 figure as correct without qualification, upon examining the background data (C.R. Exh. 61), the State Parties were forced to admit that actual total revenue per acre for grapes was 15% higher than $2,881. This calculation would be:

Total Revenue		Revenue		
(Grapes)		(Fresh)		(Crushed)
$35,250,000	=	$30,770,000	+	$4,480,000

$$\frac{\$35,250,000}{82,500 \text{ (tons)}} = \$427/\text{ton overall}$$

$427/ton x 8.4 tons/acre x .92 marketing charge = $3,300.
(revenue per acre)

See C.R. Exh. 61; State Parties' Post-Trial Closing Brief 32 (June 1981).

well as Colorado River area yields, are 4.4 tons, the calculation should be adjusted with the proportional division between crushed and fresh grapes treated as constant:

Yields	Fresh (52%)	Crushed (48%)
4.4 tons	2.288 tons	2.112 tons

Fresh Revenues per acre

2.288 tons × $724.00 = $1,656.51

Crushed Revenues per acre

2.112 tons × $112 = $236.54

Total Revenues per acre

$1,656.51 + $236.54 = $1,893.05

That figure of $1,893.05 per acre represents the expected revenues for the Reservations if the entire methodology of the State Parties and S.P. Exh. 184 is adopted. Rather than confirming the State Parties' estimates it shows them to be overly generous, an unlikely situation. Moreoever, the State Parties' use of S.P. Exh. 184 proves too much, for if the 1977 Arizona price for fresh grapes ($955/ton x .92 = $879, C.R. Exh. 56) is substituted in the above formula, the States Parties have proved that Arizona gross revenues are $2,248 per acre. If this figure is used the grapes will never produce a positive payment capacity to pay for water costs.[146] This observation counsels against the soundness of the method behind S.P. Exh. 184.

Second, the assumption behind this exhibit seems fatally lacking in support. Although the exhibit purports merely to show gross revenues per acre, the crucial element is the assumed sale of nearly 50% of the grape yield in the lower-priced crushed grape market.

146. Even assuming the higher 1977 price, the first few years of costs at the 1979 level would appear as:

The expert, whose testimony supported the exhibit, apparently sought to prove that almost 50% of all grape yields on every acre became crushed grapes, as this apparently happens to the total Kern County table grape production. In fact, under astute cross-examination, he admitted that he did not know whether the Coachella Valley grapes go entirely to the fresh market with none to the crushed market.[147] The State Parties do not offer any evidence on this point which should have been the focus on their proof regarding grapes and S.P. Exh. 184, since that is the element of the figures which most significantly differs from the Tribes' analysis. I find this exhibit unpersuasive for lack of a showing that approximately half of all grape yields go to the crushed market. Moreover, any other conclusion would make absolute nonsense of the testimony of the grape growers who typically stated their yields in lugs and gave a price per lug without referring to a distinction regarding crushed grapes.[148] In fact, one of the State Parties' expert grape growers stated that he harvested a total of 500,000 lugs on

Year	1	2	3	4	5
Revenue	-	-	1226	1635	2248
Pre-Harvest Cost	1226	1025	897	1016	1016
Depreciation	113	113	113	113	113
Interest (10%)	85	227	364	441	516
Harvest	-	-	618	821	1132
Annual Cost	1424	1365	1992	2391	2777
Net Cost	1424	1365	766	756	529
Accumulated Net Cost	1424	2789	3555	4311	4840

Thus, even when the higher 1977 prices are matched to 1979 costs, grapes would yield a negative payment capacity under the Arizona analysis prepared by the State Parties.

147. Tr. 7238.

148. *See* Tr. 1842-60, 5528-30.

1,090 acres and received an average of $14.70 per lug "across the board."[149] This sort of confusion is much more likely when one seeks to focus on a factor such as gross revenue rather than on the individual elements which are of primary interest as well as being easier to verify or refute when separately identified. Because of the undue confusion generated by this exhibit I will not consider it further for any aspect of this case. The State Parties' use of such an exhibit creates serious doubt about the credibility of their position regarding grapes.

Of course, the State Parties' economic analysis[150] might still be otherwise basically sound if the estimated prices can be supported without regard to S.P. Exh. 184. This conclusion would be feasible if, for example, the Colorado River area grapes would be harvested significantly later than the Arizona grapes, and, thus command a lower price. The State Parties, of course, urge that the lower price applies, but I find that a grape harvest in the lower Colorado River Valley would begin approximately one week after the grape harvest in the Coachella Valley. Because the Coachella harvest season lasts from mid-May to mid- or late-July,[151] the substantial majority of the grape harvest will be in direct competition with the Coachella Valley and nearby Arizona vineyards such as the White Wing Ranch. This earlier harvest will enable these grapes to sell for the higher Arizona price.[152]

The early harvest is clearly supported by the evidence. The State Parties note S.P. Exh. 166 which in-

149. Tr. 5519, 5528-30.

150. S.P. Exh. 121.

151. Tr. 5569. There is also testimony that the Coachella harvest usually ends by the fourth of July. Tr. 4769.

152. *See, e.g.* Tr. 4602.

dicates that grape harvests at the Fort Mojave Reservation will begin approximately one and a half weeks after the harvest in the Coachella Valley. Rather than support their own expert's somewhat uncertain estimate of a two week to one month delay, this exhibit shows that, as with other portions of his testimony, this expert's estimate on harvest time is unduly critical of the Tribes' position.[153] Moreover, the other evidence also demonstrates that the Reservations further south from Fort Mojave are warmer still.[154]

The final blow is dealt to the State Parties' advocacy of a late harvest by a heat-unit analysis prepared by the Tribes' expert.[155] The late-harvest argument and the assorted problems it evoked arose in the State Parties' defense. The Tribes responded in part by a heat-unit analysis showing that the Reservations were

153. The oft-cited testimony that the harvest would be 2 to 4 weeks later than Coachella's harvest draws the most attention. Tr. 4702. The same witness earlier predicted that grapes in Yuma would be harvested beginning probably the last week in June, Tr. 4602, which is one and a half months after the beginning of the Coachella harvest in mid-May. Tr. 4769, 5569. Not only does this testimony add further imprecision to the witness' later testimony, the variability of the testimony casts some doubt about its reliability.

In fact, all of this witness' testimony regarding harvest time is somewhat confusing. His estimates have the Colorado River area beginning harvest 2 to 4 or 4 to 6 weeks after Coachella. Tr. 4702, 4602. He also stated that Bakersfield in the San Joaquin Valley begins harvest three weeks after Coachella. Tr. 4770. Yet the evidence in the case shows that the Colorado River areas are warmer than Bakersfield in the relevant months, C.R. Exh. 34, and this witness also stated that grape harvests on the Reservations would begin between the Coachella and San Joaquin harvests. Tr. 4765. In fact, if average maximum temperatures are considered the sole relevant criterion, Parker and Yuma harvests should be much closer to Coachella harvests than Bakersfield harvests. C.R. Exh. 34.

154. C.R. Exh. 34.

155. C.R. Exh. 35.

substantially as warm as the Coachella Valley and that grape harvests on the Reservations would follow that of the Coachella Valley by only three days.[156] The analysis backing this conclusion was said to be in accordance with widely accepted procedures. This analysis, taken in conjunction with S.P. Exh. 166, convinces me that the grape harvests on the Reservations will follow those of the Coachella Valley by approximately one week, enabling such grapes to attain the Arizona prices.[157]

Rather than present any study quantifying their position, the State Parties rely only on the rather broad opinions of its expert grape grower. The criticisms at the Tribes' heat-unit analysis exceed the scope of the record. If the State Parties believed that the method used was not widely accepted or improperly applied they might have introduced evidence demonstrating that fact, or at least directed cross-examination to that area of the testimony of the Tribes' expert. Having failed to do so, the State Parties must content themselves to raising speculative doubts concerning this testimony.

When the Tribes' heat-unit analysis is compared to the testimony by the State Parties' expert grape grower, the result is obvious. The estimate by the State Parties' expert that there would be a two week to one month delay in harvest on the Reservations constitutes little more than an imprecise guess when the testimony is carefully read.[158] On the other hand, the Tribes' analysis stands unrebutted as to either

156. Tr. 6194-95, 6291.

157. C.R. Exh. 56.

158. Tr. 4702. *See also* Tr. 4602, 4765, 4769-70.

methodology or application. The Tribes' evidence is, thus, more persuasive.

Given the harvests on the Reservations will be slightly later than the Coachella Valley harvest, it is reasonable to believe that to some extent these harvests will:

> 1) avoid substantially the summer rains and heat problems posed by the State Parties; and,
>
> 2) enjoy a higher price more like the early-harvested Arizona grapes[159] than the later-harvested grapes of the San Joaquin Valley.

The factors will thus favor a finding of feasibility.

The weather problems associated with a late harvest were much discussed at trial. The State Parties firmly established that summer rains begin to occur in the Colorado River area sometime in July.[160] Experts for both sides generally agree that rain in amounts as low as .1 to .15 inches in a storm can cause problems with grapes.[161] The Coachella Valley harvest, ending in mid to late July, generally precedes the July rains in that area.[162] The tail end of the Colorado River harvest would be somewhat more exposed to the threat of July rains because that harvest would follow the Coachella Valley harvest by approximately one week. There is

159. After admitting that the time of harvest was usually considered the determining factor for price, the State Parties' expert avoided directly answering questions on cross-examination regarding whether the higher Arizona price was due to an early harvest. Tr. 7240-42. In any event, the State Parties' reply brief clearly attributes this higher Arizona price to an early harvest such as enjoyed by the Coachella Valley growers. State Parties' Post-Trial Closing Brief 44 (June 1981). *See also* Tr. 4602.

160. C.R. Exh. 32A, 33; S.P. Exhs. 127, 163, 164, 170, 171.

161. Tr. 4845-46, 6961-62.

162. Tr. 4702, 4769, 5524, 5531, 5546, 5569.

really no evidence, noted by the parties, which shows when in July the rains come to the Colorado River area. Because the end of the Coachella harvest occurs between the 15th and 25th of July,[163] there is a good chance that some of the Colorado River harvest about one week later would coincide with the July rains. The total effect really is uncertain because the rains at most would affect only a fraction of the crop. The State Parties' primary experts had some doubts regarding the rain but did not quantify those beliefs into any estimate.[164] The effect would in any event be less than the State Parties contend because the harvest will not extend into August as the State Parties contend. In fact, the existence of other grapes in Yuma County significantly undercuts the view that July rains in Yuma makes grapes there infeasible.[165] Similarly, July rains in the other areas cannot be dispositive.

According to the State Parties' experts, rain may possibly cause mold or mildew on the grape bunches.[166] But the State Parties' expert who organized much of their case simply could not positively state that this would be a severe problem or that it would preclude successful grape cultivation in this area.[167] In light of my finding that the "problem" is substantially less troublesome than predicted by the State Parties because the harvest will be significantly earlier than predicted, the remaining step is easy. The uncertain effect of late harvest rain on the overall grape crop harvested in this area cannot be considered to be an absolute deterrent. This conclusion accords

163. Tr. 5569.
164. Tr. 3754.
165. Tr. 1843; C.R. Exh. 25.
166. Tr. 2391, 3754.
167. Tr. 3754.

with other evidence in this case. For example, there is evidence that grapes formerly grown at Yuma performed well and matured early, only to be removed for marketing reasons.[168] Obviously these grapes either arrived before the July rains or the rain did not seriously affect them. Moreover, the evidence also shows that a neutral farm adviser informed experts for each side that grapes would do well in the area,[169] and that there is no reason to reduce yields due to climate.[170] Finally, the grapes grown in the Phoenix area belie the assertion that July rain is an insurmountable problem for grapes that will be harvested at the same time as the Arizona grapes, because the Phoenix area received more July rain than any Reservation.[171] The July rains simply cannot be a deciding factor on this issue with

168. F.Y. Exh. 47.

169. F.Y. Exh. 38.

170. F.Y. Exh. 42.

171. Tr. 6294-95; C.R. Exh. 31A. The grapes were said to be in Mesa, or in other words, the Phoenix-Tempe area. The State Parties argue that there is no evidence of the harvest date of these grapes. State Parties' Post-Trial Opening Brief 176 (May 1981). This statement ignores the testimony of the State Parties' own grape grower-expert who stated that a small planting of grapes in the Phoenix area is harvested between the Coachella and San Joaquin harvest. Tr. 4703. This fact means that those grapes must somehow either avoid or withstand the high July-August rains in the Phoenix-Tempe area. C.R. Exh. 32A.

The State Parties also claim that those grapes are not shown to be economic. Given that approximately 2,200 such acres are under cultivation, a conclusion of profitability seems much more logical than the opposite conclusion. In addition, this experience with rains in the Phoenix area more readily explains the advice of advisors from the Phoenix area who informed the experts that the climate of the Colorado River area was suitable for grapes. *See* F.Y. Exhs. 38, 43, 44. Growers in areas of scant July rainfall may consider the rain more of a problem or more difficult to overcome than do those persons who live in areas with greater rainfall in July and August.

respect to the Reservations. The same conclusion applies to the alleged summer heat problems.[172]

The last significant factor to consider is price. I have already rejected as misleading S.P. Exh. 184 and the inferences to be drawn from it. Arizona prices should be used because the Colorado River harvest will definitely occur at least as early as the Arizona harvest.[173] The older prices used in the Tribes' original analysis are also misleading because of the increase in

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172. When pressed, the State Parties' grower-expert gave rather inconclusive testimony on this subject. Asked if his opinion regarding two week's difference in harvest time would be a substantial difference because of summer heat, he stated that it would have "an effect" but "couldn't say that it would be a deterring factor." Tr. 4705. This conclusive analysis substantially undercuts the State Parties' position that summer heat makes this area unsuitable for grapes. This witness only would state that a would-be grower should "consider it as a factor" to be dealt with in growing table grapes in this area. *Id.*

173. The State Parties' grape grower-expert believed that in the Yuma and Parker areas the grape harvest would occur between the Coachella and San Joaquin harvests, somewhat similar to the Phoenix area harvest. Tr. 4703-04. That witness stated that Yuma area grapes would be harvested in June, July and August and in reference to the question of whether these grapes would enjoy the marketing competitiveness of early production as in the Coachella Valley the witness stated:

> They would enjoy the full effect of earliness. I think it would be toward the tailend of that early harvest.

Tr. 4602. Even under this witness' assumption that the harvest would begin approximately one month after the Coachella harvest, he still felt that the grapes would command a premium for early harvest. The current Arizona grapes fill the marketing slot between Coachella and San Joaquin. Tr. 4703. Thus, the argument that there is no marketing slot for the Colorado River grapes to fit between the Coachella and San Joaquin harvests is misleading. *See generally* Tr. 4355-56. The Colorado River grapes, harvested after Coachella but simultaneous with Arizona, should command on average the price which Arizona grapes command. This seems particularly true since, if the gap between Coachella and San Joaquin is only three weeks, then all these harvests must overlap to some extent. Tr. 4770.

price over the last few years.[174] Because the State Parties sought out this data regarding Arizona prices for the years 1977-79, I believe that even their experts considered such prices relevant to the present case.[175] Because they discovered such prices, found them to be higher than the Tribes' prices, and would normally use a three-year average price in rising prices, I consider it all the more correct to take the average of the years 1977-79 as those prices were revealed during cross-examination of the State Parties' expert.[176] I find that that average, $867 per ton,[177] represents a realistic price for use in the present analysis.

The State Parties argue that the Arizona prices should not be used because the Arizona acreage constitutes only a small sample in terms of the number of acres and thus price data from those acres are less reliable than the California data.[178] The State Parties' expert apparently does not dispute the statistical reliability of this Arizona price, because this situation is not truly a statistical sampling problem despite the choice of words. In any event, he did not dispute the accuracy of the price data produced by the Tribes.[179] The real objection appears to be that the production

174. C.R. Exh. 56.

175. *See* F.Y. Exh. 44.

176. *See* Tr. 4277-80; F.Y. Exh. 44. *See also* C.R. Exh. 56. The State Parties' expert stated that with continually increasing figures a two or three year average would be justified. Tr. 4083. I will use this three-year average at least in part because the figures upon which it was based entered the case through the State Parties' expert and his files, and his papers indicate that the Tribes' experts originally used a seriously outdated average (1971-78) in the context of a significantly rising price level for grapes.

177. (955 + 943 + 930) x .92 x ⅓ = $867.

178. Tr. 7242.

179. *Id.*

of Arizona grapes is so small (3,200 acres), that additional plantings of several thousand acres might bring down the historic price.[180] This consideration does not persuade me to discard the Arizona price. The evidence shows that the grapes for these lands will compete with the Arizona *and* Coachella harvests,[181] as well as with San Joaquin in the later stages of the harvest. The Arizona price is the most relevant price to consider in this analysis. In addition, the inclusion of the Coachella production increases the size of the existing market beyond that which the State Parties consider. This argument fails first because it lacks any support other than a casual observation. The State Parties' experts did no formal market studies to prove this point[182] and even if they had, I am not certain they were sufficiently qualified to do so. Moreover, I do not feel that this market inquiry is appropriate in the present context. The Tribes may not plant such extensive vineyards as their claims indicate; they might turn to other crops as their experience grows. The limit of the scope of fact-finding in this case must occur at some point, and I draw that line at this issue.[183]

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180. Tr. 7192.

181. Tr. 4602, 4703-04, 5545. This conclusion was supported by the testimony of one of the grape grower-experts of the State Parties when he responded to a question regarding the performance of Arizona grapes by citing his experience with grapes grown in Yuma. Tr. 5537.

182. State Parties' Post-Trial Closing Brief 44 (June 1981). *See* Tr. 7243-44.

183. In addition I reject similar arguments that are tangentially related to the practicability of growing grapes on the Reservations. For example, I do not consider the absence of migrant workers or processing equipment from the Reservations' areas to be fatal to the Tribes claims. Nor do the absences of such factors as an established reputation and marketing connections seem relevant. Similarly, I do not consider the present lack of nearby cooling facilities to be fatal to the Tribes claims regarding grapes.

These considerations when used to modify the State Parties' analysis show that grapes may be feasibly grown on the Reservations. The price adjustment means that $187/ton more will be received for the grapes ($867 - $680 = $187), increasing gross revenue by $823 per acre (4.4 tons/acre x $187 = $823) annually in years 5 through 25 of the analysis.[184] This increased cash flow for only the 21 years of full production, would increase the present value of the expected cash flow to the extent that an additional $535 might be paid for water costs each year.[185] Certainly this exceeds the water costs for all tracts for which the Tribes have claimed water rights.[186] The one possible exception concerns the Fort Yuma Reservation because the State Parties have attacked aspects of the design of the irrigation systems on that Reservation. Such criti-

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184. *See generally* S.P. Exh. 121.

185. $823 x B (21, 10%)
$823 x 8.6487 = $7,118
$7,118 x A (4, 10%)
$7,118 x .6830 = $4,860

$$\frac{\$4,860}{B\ (25,\ 10\%)}$$

$$\frac{\$4,860}{9.0770} = \$535$$

186. *See* F.M. Exh. 2, Table 12; C.R. Exh. 1, Table 12; CH. Exh. 1, Table 11. This conclusion makes unnecessary extended consideration of the correctness of the State Parties' estimate of grape yields of 4.4 tons (400 lugs) per acre. *See* S.P. Exh. 121. The true yield figure, I believe, is somewhat higher. The 400 lugs per acre figure derives primarily from a conversation with an extension agent named Lowell True. Tr. 4076-77. That agent originally gave an estimate of 500 lugs for a current yield. Eventually he stated that the 500 lug figure was an optimum figure while the realistic figure over the last ten years was "closer to 400 lugs/acre." F.Y. Exh. 42. The manner in which this information came into evidence convinces me that the current realistic yield is higher, at least as high as 450 lugs per acre and possibly higher. *See* Tr. 4257-60, 4266-95. *See also* F.Y. Exhs. 43, 44, 45, 46, 47.

cisms should be considered in connection with the claims made on that Reservation. Except for that local problem, grapes appear to be a generally suitable and feasible crop for the five Reservations.

B. Claims Asserted by the Individual Indian Tribes

Aside from the general concern of crop suitability, the State Parties raise other concerns which challenge the specific claims of the four Tribes which have pressed such claims. Those allegations involve such matters as engineering designs and cost and soil classification of the land within the separate parcels. Because these matters are somewhat unique for each Reservation, those concerns should be addressed in connection with the individual Reservations. Furthermore, the results of such an inquiry serve as preparation for a finding of the number of practicably irrigable acres within each such Reservation.

1. Fort Yuma Indian Reservation

The Quechan Tribe of the Fort Yuma Indian Reservation claims lands in two general areas. The All-American Canal cuts this Reservation into northern and southern parts. In the southern area the Tribe supplements the claims of the United States by asserting that approximately 445 additional gross acres are practicably irrigable. These claims would add the following acres to the United States claims on the respective units:

FY-3	
Cal. Boundary	103
FY-9	
Ariz. Boundary	76

FY-10A	
Ariz. Boundary	142
FY-12	
Cal. Boundary	124[187]

The State Parties concede that 65 additional acres associated with Unit FY-3 and 33 additional acres associated with Unit FY-12 are practicably irrigable, but otherwise they concede no more than they did with respect to the United States claims.[188] In addition they note that Unit FY-12 contains 11 fewer acres than claimed by the Tribe. This measurement problem relates to the Tribe's other claim for adjacent land. In the northern area, the Tribe has claimed substantial additional irrigable acreage. At one time the Tribe's experts prepared a report supporting a water rights claim for 13,474 gross irrigable acres north of the Canal where the United States made no claim.[189] The Tribe later amended this claim on the basis of a soils survey which mapped 10,755 irrigable acres.[190] The area mapped as irrigable on these exhibits unfortunately combines the area north of the Canal with a small area south of the Canal that apparently overlaps with Unit FY-12.[191] Therefore, together with a reduction of 11 acres on Unit FY-12, I must adopt as the Quechan claim north of the Canal, the area measured by the State Parties which consists of gross acres in the amount of:

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187. *See* F.Y. Exh. 18, at 56; S.P. Exh. 151.

188. *See* S.P. Exhs. 110, 151.

189. F.Y. Exh. 18, at 57-58.

190. *See* F.Y. Exhs. 19, 30; Quechan Opening Brief 78-79 (May 1981).

191. *See* U.S. Exh. 14; F.Y. Exh. 30.

Northern Lands	
Cal. Boundary Land	10,637[192]

The State Parties respond that only 85 acres of this northern area is practicably irrigable.[193] The claims in each of these areas are meritorious in part.

(a) Lands South of the All-American Canal

The lands south of the All-American Canal represent a relatively minor matter. The Tribe expended only a modest effort to prove these claims. The claims are set forth in its expert's report[194] but are supported by only the most conclusional reasons.[195] Absent a more satisfactory explanation, the Quechan Tribe, which has the burden of proof, has failed to present a persuasive case in support of these claims. I find that only those lands conceded by the State Parties to be irrigable are practicably irrigable and thus entitled to water rights. These lands are:

	Gross Acres
FY-3	
Cal. Boundary	65
FY-12	
Cal. Boundary	33[196]

192. S.P. Exh. 151 & n.f.

193. S.P. Exh. 151.

194. F.Y. Exh. 18, at 56.

195. F.Y. Exh. 18, at 30-31. I have been unable to locate any more complete demonstration of irrigability. The Quechan brief, which merely cites the tabulated claims in its expert's report, is unhelpful on this point. *See* Quechan Opening Brief 74-75 (May 1981) (citing F.Y. Exh. 18, at 56).

196. S.P. Exhs. 110, 115.

(b) Lands North of the All-American Canal

The lands north of the All-American Canal were the focus of the Quechan's case. Much supporting evidence was presented regarding the water rights claims for these lands. On the other hand, competent evidence attacked the claims on engineering and soil classification grounds. After considering all the parties' arguments, as supported by the evidence, I find that 6,785 gross acres, or more than one-half of the land claimed by the Tribe to be irrigable, is in fact practicably irrigable. A brief discussion of the engineering and soils segments will reveal the bases of my findings.

(i) Engineering Design and Costs

The Tribe's experts initially proposed an irrigation system serving 13,474 gross acres north of the Canal.[197] As originally constituted the engineering plan met with the general approval of the State Parties' expert.[198] This testimony followed the adoption by the Quechan's experts of a smaller service area limited to 10,755 acres mapped by a soils expert.[199] Nevertheless, the State Parties had second thoughts about this testimony and later presented some evidence in a surrebuttal phase of the case which really addressed the case in chief presented by the Quechan Tribe rather than the rebuttal case presented by the Tribe.[200] In the surre-

197. F.Y. Exh. 18, at 56.

198. *See* Tr. 5462.

199. Tr. 1744, 2056; F.Y. Exh. 19, at i, 5; F.Y. Exh. 30. *See also* Tr. 6719-23, 6736.

200. On July 10, 1981, I issued an order overruling lengthy motion papers filed by the State Parties on the subject of allegedly improper rebuttal evidence presented by the Tribes. I reached that decision because that rebuttal evidence fairly appeared to meet defenses raised by

buttal phase the State Parties attacked certain of the Tribe's assumptions regarding capacity of the water delivery system and the size of the service area. Neither of these criticisms is fatal to the Tribe's claims.

The Quechan's expert gave several cost estimates for serving the area north of the All-American Canal. Each estimate was based upon different assumptions relating to the proper cost items to be considered and various legal arguments. The highest annual cost per acre offered by this expert was $344, the cost for Alternate II which would remove irrigation water directly from the Colorado River and transport the water by tunnel underneath the All-American Canal.[201] Even this figure, as the highest cost per acre, would be exceeded by the payment capacity for grapes as calcu-

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the State Parties. Some of the arguments of the State Parties would have required the Tribes in their case in chief to negate every conceivable defense that might be raised later. In order to avoid a new hearing in the event such rebuttal evidence was later determined by me or by the Court to be improper, I admitted this evidence, and the State Parties' subsequent motion papers failed to demonstrate that exclusion of the evidence was required.

The Quechan Tribe does not formally ask that I now exclude the State Parties' surrebuttal evidence, although they do label it as "improper in surrebuttal." Quechan Opening Brief 82-92 (May 1981). This testimony appears to me to be less proper as surrebuttal evidence than any of the rebuttal evidence which prompted the State Parties' strenuous objections. This surrebuttal engineering evidence contradicts only that portion of the Tribes' case presented on direct and known to the State Parties before presentation of their defense. It does not challenge the rebuttal testimony regarding the feasibility of tunnelling under the Canal which ostensibly prompted the State Parties' demand for surrebutal. Nevertheless, I viewed the admission of this testimony as an exercise of my discretion which I attempted to use in a manner allowing the fullest gathering of relevant facts to aid my decision.

201. F.Y. Exh. 57, at 7; F.Y. Exh. 58a, at 7; Tr. 6651-56.

lated previously.[202] Of course, the questions raised by the State Parties prevent an uncomplicated finding that feasibility is proven by this evidence alone.

There is first some question regarding whether the Quechan's expert designed a system that would provide sufficient water to irrigate the lands. Once the position of the parties is clearly understood, this dispute fades into insignificance. The issue was first raised when the State Parties' expert testified that 6,100 gal-

202. *See* note 177 and accompanying text *supra*. The State Parties have taken the position that the Tribe may not legally take water from the All-American Canal at any point. Tr. 6662. The State Parties contend, therefore, that absent this legal foundation, the Tribe's evidence based on such use of the Canal, resulting in an annual cost of $274 per acre (F.Y. Exh. 18, at 45), fails to demonstrate that the lands can be economically irrigated and farmed. Tr. 6636-49; *see* Coachella Valley Water District's Brief re: All-American Canal (Jan. 1981); State Parties' Post-Trial Opening Brief Vol. II, 37-42 (May 1981); State Parties' Post-Trial Closing Brief Vol. II, 13-72 (June 1981). Because the Tribe has demonstrated a feasible cost using the Colorado River as a direct water source, this precise issue is not determinative and need not be reached. The State Parties assert but do not demonstrate that the Tribe may not tunnel under the Canal; hence, that plan does not suffer from the same alleged problem as does the Tribe's original plan. The findings I have made were based on the assumption that the comtemplated diversion would be from the mainstream of the river.

Even were it necessary to consider the evidence based on use of the Canal, I am unconvinced that the Tribe should be precluded from taking water from the Canal. It is well established as a matter of federal law that the United States, in creating Indian Reservations, impliedly intended to reserve water rights sufficient to irrigate these Reservations. *See* discussion of the *Winters* doctrine, Part One at I.A. (1) *supra*. It is highly likely that a court would find the water contracts, which provide for the construction of the Canal and the allocation of its waters, are subject to this federal law, since all of California's entitlement which has not been delivered to the state at points above Imperial Dam flows through the Canal. *See* Pr. Special Master Exh. 2, items 11-25. This is especially true where, as here, the United States retained ownership of the Canal. *Id.* In the alternative, it is evident that if these lands were to be made part of the existing Yuma Project, the contracts would expressly allow for diversion of Canal water to these lands. *Id.*

lons per acre per day as a peak application rate of water was not sufficient to meet the needs of deciduous crops.[203] This figure became relevant to the case only because the Quechan's expert submitted alternate calculations using the 6,100 gallon figure.[204] The primary figure used by that expert was 7,500 gallons per acre per day based upon advice from an agricultural expert.[205] This latter figure resulted in the $344 annual cost per acre and it does not possess the same alleged flaw that the lower figure does. In fact, because of the design adopted by the Quechan's expert, this irrigation system, as the State Parties' expert admitted, can be operated to deliver a greater peak application rate than 7,500 gallons per acre per day.[206] The State Parties' expert provided no analysis showing that the 7,500 gallon per acre per day design with the capacity to handle additional amounts was inadequate.[207] Although the State Parties contend that some costs calculated by the Quechan's expert are based on unfounded assumptions, they do not fault the other calculations assuming a higher peak application rate on the same basis. This issue is thus not determinative of these claims.

The State Parties' additional contentions regarding the size of the service area present a more complex problem. This issue arose in surrebuttal when the State Parties contended that costs for the Quechan's irrigation system were erroneous because they were

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203. Tr. 7186-89.

204. *See* Tr. 6656-62; F.Y. Exh. 58a, at 7.

205. Tr. 1823, 6655-56; F.Y. Exh. 57, at 7.

206. Tr. 7217-19.

207. *Id.*

based on serving a larger area than actually claimed by the Tribe to be irrigable.[208]

This situation occurred because of the unusual evolution of the Tribe's case. The Tribe's original report contained a claim that 13,474 gross acres in this area were irrigable.[209] Subsequently a soil survey revealed that the Tribe's soils expert found only 10,755 acres irrigable.[210] The engineering expert then testified that with slight modification his design could serve that reduced acreage,[211] and that his calculations would apply to the different service area.[212] The Quechan did in fact adopt that reduced acreage as their claim.[213]

The State Parties' expert contended that the original calculations of the annual cost per acre would not be reliable. The calculations would change because the cost of the system would be spread among 4,300 fewer acres as that number had now been dropped from the Tribe's original service area.[214] With fewer acres the cost per acre allegedly would increase or at least be uncertain.

The annual cost per acre may be somewhat indefinite for the lesser amount of acreage, but the evidence

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208. Of course, this position of the Tribe was perfectly plain from the Tribe's case in chief and a response need not have been delayed until surrebuttal. Tr. 1745-46, 2056.

209. F.Y. Exh. 18, at 59.

210. F.Y. Exh. 19, at i, 5; F.Y. Exh. 30.

211. Tr. 1745-46.

212. Tr. 6719-36.

213. Tr. 2056.

214. Tr. 7177-86. *See* S.P. Exh. 183. An examination reveals that although some areas are now dropped from the irrigation system others have been added. This fact explains, at least in part, why the State Parties may contend that 4,300 formerly claimed gross acres were dropped from a system of 13,474 gross acres and a new system of 11,769 gross acres substituted. *See* F.Y. Exh. 18, at 57-58; F.Y. Exh. 30.

sufficiently shows that the cost approximates that of $344 per acre[215] projected for the larger area. First, there is the calculation of the United States expert that a system of 2,580 gross acres in this general vicinity would have an annual cost of $312 per acre.[216] Second, the Tribe's expert flatly testified that his calculations were equally applicable to the smaller service area delineated on the map prepared by the Tribe's

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215. F.Y. Exh. 58a; Tr. 6656.

216. *See* F.Y. Exh. 53. I understand this set of calculations does not perfectly prove the Tribe's point but it is probative of the nature of costs for serving a similar irrigation system.

First, the State Parties have noted that the design was preliminary and perhaps subject to revision. State Parties' Post-Trial Closing Brief 54 (June 1981). Preliminary or not, the calculations are in evidence and not directly attacked by the State Parties. Moreover, because that expert served the Indian's trustee, the United States, in evaluating the possible claim for the Indians, the inference is strong that he would not evaluate this claim based upon imprecise calculations.

Second, there is implicit in the State Parties' reply brief the criticism that this expert's calculations are too low because he used too low a peak application rate for the consumptive use of water in his system. *Id.* at 53-54. For other purposes, the Tribes have claimed that this expert did use that low application rate. This proposition is not clear because the State Parties' expert indicated that the United States' expert "indicated that the peak consumptive use in his exhibit FY-53" of these lands was .37 inches per day, a figure that the State Parties' expert found acceptable. Tr. 7186-89. Moreover, F.Y. Exh. 53 includes $84 annual cost per acre for the cost of an on-farm irrigation system which does not appear in the $344/acre figure calculated by the Tribe's expert, because the on-farm costs appear in his payment capacity calculations as adopted from other experts. *See* F.Y. Exh. 18, at 48. In fact, the Tribe's expert calculated that if the lower peak application rate of water and the lower power rate and the 1979 costs adopted by the United States were used in his calculations, the annual cost per acre would decrease by $82. *See* F.Y. Exh. 58a; Tr. 6650-62. Although the United States' cost calculations appear possibly understated regarding the peak application rate of water, they are also overstated by a similar amount with regard to on-farm costs which appear elsewhere in the Tribe's calculations. The two sets of calculations thus prove that irrigation systems designed for areas between 2,580 acres and 13,474 will have similar annual water costs per acre.

soil expert.[217] Finally, even the State Parties' expert, after implying that total costs would not decrease with smaller service areas,[218] later amended his position. He first admitted that power costs would decrease but that capital pumping costs might not be reduced.[219] Eventually he admitted that even the capital pumping costs would be reduced for a smaller service area,[220] and he further stated that he did not perform any calculations to test what the effect of serving a smaller area would be on the calculations prepared by the Tribe's expert. Given this state of the record, I find the $344 annual cost per acre approximates the cost for serving an irrigation area in the northern lands whether that system serves from 2,580 acres to 13,474 acres.

(ii) Soil Classification

The Tribe's soils expert mapped 11,769 acres which he claimed to be irrigable and north of the Canal.[221] After allowing for drainage ways in the work areas he calculated that there was a total of 10,755 acres in this area.[222] All areas shaded on his map indicate irrigable

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217. Tr. 6736. When the expert gave this testimony on redirect he did not specifically state that the per acre costs would not change. But the only relevance of his "calculations" is in determining the annual per acre costs. Therefore, his reference to his calculations must have encompassed his annual cost per acre calculations. This seems particularly true in view of the preceding cross-examination, which directed that expert's attention to various cost figures as well as the different service area in the soils map. Tr. 6719-25.

218. *See* Tr. 7186, 7219.

219. *See* Tr. 7221-23.

220. Tr. 7223-24.

221. F.Y. Exh. 30.

222. *Id.*

soil classes II, III and IV.[223] The State Parties have challenged these figures. First, they claim that only 10,637 acres were mapped north of the Canal and that the Tribe's soils expert also included in his total figure areas south of the Canal that are associated with another irrigation unit (FY-12).[224] Even a cursory examination of the Tribe's soils map confirms the State Parties' assertion that the soils expert included lands south of the Canal in his total figures.[225] Yet the Tribe adheres to the 10,755 acres total as representing the claim north of the Canal.[226] The State Parties' figure of 10,637 gross acres north of the Canal thus represents the most reliable figure in evidence regarding the acreage claimed by the Tribe to be irrigable north of the Canal as does their 273 gross acre estimate for Unit FY-12. Second, the State Parties argue that the Tribe has overreached in its claim and that this acreage should be described as:

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223. *Id.*; Tr. 6398.

224. S.P. Exh. 151 n.f.

225. *See* F.Y. Exh. 30. In fact, the soils expert stated in his report that he had classified such lands. F.Y. Exh. 19, at i.

226. *See* Letter from Raymond Simpson with attachments (Nov. 5, 1981), record item no. 199.

	Gross Acres
Arable	
—Practicably irrigable	85
—For permanent crops only and water costs exceed payment capacity	5,540
—For field crops and water costs exceed payment capacity	280
Nonarable	
—Low moisture holding capacity	3,572
—Excess gravel or rough topography	1,160
	10,637[227]

The State Parties thus challenge almost all of this claim. I have already answered the argument that water costs exceed payment capacity and thus address only other concerns.

The Quechan Tribe does not extensively address the issue regarding the 1,160 gross acres classified by the State Parties as nonarable due to allegedly excess gravel and rough topography. The Tribe's expert classified these lands as arable because he classified all lands shaded on his map in this manner.[228] On the other hand, the State Parties treatment of this land is similarly brief.[229] The land depicted in the one piece of photographic evidence submitted by the State Parties on this issue appears no more ill-suited to permanent crops than did other land for field crops claimed by

227. *See* S.P. Exhs. 139, 151.
228. Tr. 6398-416; F.Y. Exh. 30.
229. *See* Tr. 5080-82; S.P. Exhs. 134, 139.

the United States.[230] Moreover, this view is supported by the classification as irrigable of large portions of this area by the United States' soils expert.[231] Under these circumstances, I find that these 1,160 acres are arable.

The other contested areas consist of some 3,852 gross acres considered by the State Parties to have low moisture-holding capacity (3,572 acres) or excessive water costs (280 acres). I recognize that I have previously rejected the majority of the State Parties' arguments relating to the moisture-holding capacity.[232] However, these lands present a fairly speculative claim on other grounds. These areas constitute the bottom of large washes which cross the northern lands.[233] The United States' soils expert classified virtually all of this contested area as non-arable.[234] Even though he revised his opinion to claim as arable Rositas soils with somewhat low moisture-holding capacity, he never revised his opinions regarding these northern lands, because he claimed that no such soils were present in these lands.[235] When this consideration is added to the difficulty of farming in a wash, the Tribe as claimant has failed to persuade me that these 3,852 gross acres

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230. *See* S.P. Exh. 134; Part Two at I.C. *supra.*

231. *Compare* S.P. Exh. 139 *with* U.S. Exh. 13. The State Parties believe that this 1,160 acres includes lands mapped as non-arable by the United States' expert. *See* S.P. Exh. 151 n.c. While that statement is true, a large portion of the lands were apparently classified as arable as well. The evidence as I understand it, will not permit a specific determination of which lands were classed as arable by the United States' expert.

232. *See* Part Two at I.B.(1) *supra.*

233. Tr. 6413-14. This is true for areas colored in yellow on S.P. Exh. 139. The same conclusion seems appropriate with respect to the pink area on S.P. Exh. 139, since it connects two yellow-wash areas.

234. *Compare* S.P. Exh. 139 *with* U.S. Exh. 13.

235. Tr. 210-14.

are practicably irrigable. The State Parties presented competent evidence, if any was needed, showing that flood damage to agricultural equipment can easily occur in active washes.[236] The Tribe's expert, however, stated under cross-examination that there had been no study of the amount of water runoff or possible flood control south of the diversion dike, which is to lie at the north edge of the proposed unit, and north of the All-American Canal.[237] This expert seemed to indicate that he would channel all the runoff water from north of this diversion dike down two natural washes,[238] even though there are several other washes presently carrying runoff water in this area.[239] I fail to understand how this expert has sufficiently planned for the problems associated with floods in the large washes resulting from water runoff from an area of approximately 13 square miles.[240] With respect to the large washes, challenged by the State Parties, I find this combination of factors persuasive of the impracticability of farming this area of 3,852 gross acres.

The remaining 5,625 acres were found by the State Parties to be arable but of that total, 5,540 acres were claimed to be impractical to farm only because water costs allegedly exceeded the benefits from permanent crops on this land.[241] Having disposed of that contention, I may not yet find that the entire 5,625 acres are practicably irrigable because the State Parties have raised a question regarding the boron content of these

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236. *See, e.g.*, Tr. 4909-13.
237. Tr. 1805-06.
238. Tr. 1806-08.
239. *See* S.P. Exh. 139; Tr. 6413-14.
240. Tr. 1810-11.
241. S.P. Exh. 139, 151.

lands which may injure permanent crops.[242] The dubious nature of this "problem" can be seen from the manner in which the State Parties and their soils expert describe it. They state that boron found in "some areas"[243] may be of "some concern,"[244] and that additional field tests need be made before one can ensure successful farming[245] because boron is somewhat more difficult to leach than are other salts.[246] These statements hardly warrant the conclusion that all 5,540 acres are definitely not suited for permanent crops. In addition, the Tribes presented testimony that boron, although a concern, does not preclude farming such lands because boron problems have been successfully remedied elsewhere.[247] This conclusion of the Tribe's expert is supported by the State Parties' expert who classified these lands as arable despite any boron content of the soil.[248] Hence, I find that the evidence respecting boron content of these lands is not of the type which would preclude a finding of arability of these lands.

In short, I find that 6,785 gross acres north of the All-American Canal are arable. Considering the suitability and economic analysis above, these acres are thus, practicably irrigable.

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242. State Parties' Post-Trial Opening Brief 86-87, 92-93 (May 1981).

243. *Id.* at 86.

244. Tr. 3244.

245. Tr. 5084-85.

246. Tr. 5083-84.

247. Tr. 6407-09.

248. S.P. Exhs. 139, 151.

(c) Conclusions Regarding Practicable Irrigability of Fort Yuma Indian Reservation Lands

The gross irrigable acreage consisting entirely of boundary land in California both north and south of the Canal must be converted to net figures. As performed by the Tribe's experts[249] this calculation would be:

California Boundary Lands	Gross Acres		Net Acres
Northern Lands	6785 x .90	=	6107
Southern Lands	98 x .94	=	92
Total			6199

The net acres are thus entitled to diversion rights as follows:

Net Acres		Diversion Rate (A.F.)[250]		Total (A.F.)
6199	×	6.67 (A.F./Ac.)	=	41,347 (A.F.)

The decree should be amended accordingly.

2. Fort Mojave Indian Reservation

The State Parties argue that a substantial amount of acres claimed by the Fort Mojave Tribe as practicably irrigable are non-arable for a variety of reasons.

(a) Arability Questions

(i) Low Moisture-Holding Capacity

The single largest category of disputed lands is labelled as sandy lands. Such lands total approximately 983 gross acres and face the State Parties' contention

249. *See* F.Y. Exh. 18, at 59.
250. 439 U.S. at 422.

that they lack adequate moisture-holding capacity.[251] These lands lie on parcels FM-1, FM-105, FM-107, FM-128, FM-129, and FM-130. As the State Parties note the United States' soils expert classified much of these lands as arable under SCS standards.[252] Yet the lands were not claimed by the United States to be practicably irrigable and, therefore, the Tribe's claim must be examined to some extent on its own merits. Generally, the "sandy" lands fall into two categories.

The first type of land consists of areas from which the Tribe's experts project permanent crops. These lands lie within two contiguous parcels in Nevada, FM-1 and FM-107, and total 567 gross acres.[253] The State Parties' soils expert believes these two parcels are virtually identical in soil character.[254] These lands were not subject to a United States claim for water rights because of the soil's low moisture holding capacity.[255] The United States' experts reasoned that the low moisture-holding capacity of the soils made spinkler irrigation infeasible.[256] Because the United States considered only field and row crops for these lands, this conclusion regarding sprinkler irrigation resulted in a failure to claim water rights for these lands. The crops considered by the United States are not suited to irrigation systems such as drip irrigation which can feasibly deliver water more frequently.[257] The Tribe's experts have found the permanent crops projected for

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251. *See* S.P. Exh. 147 & n.a.

252. *See* Tr. 282-87, 309-14, 324, 337-39; U.S. Exhs. 2, 4; F.M. Exh. 2, Plate No. 2.

253. *Compare* C.R. Exh. 50; F.M. Exh. 2, Plate No. 2; S.P. Exhs. 147, 158A, 158K.

254. *See* Tr. 3150.

255. *See* Tr. 310-11, 337-38, 638.

256. Tr. 719-20.

257. Tr. 719-23.

these lands to be suited for this type of drip irrigation.[258] Those experts believe that drip irrigation can economically satisfy the crop's water requirements.[259] Given that these irrigation systems can provide the water to the crop as needed, the inquiry regarding feasibility should shift to the economic feasibility of such a system as designed.

From this point of view, the State Parties' arguments that these lands are not irrigable, due solely to a soils classification showing low moisture-holding capacity, are unpersuasive. In discussing these particular parcels, the State Parties' soils expert virtually proved the Tribe's point by his own statements. He indicated that the moisture-holding capacity of these lands was so low that "you are practically forced into something analogous to drip irrigation or sprinklers."[260] In explaining his findings that these lands were non-arable, he further stated that he considered any irrigation system that would be economical but that with drip or sprinkler irrigation the crop revenues must be higher and that costs would be lower for such crops on contiguous land of a better quality.[261] These comments miss the mark for several reasons. First, the Tribe's experts always projected drip irrigation for these lands, so "forcing" it upon them does not damage their case. Second, the possibility that other land is of better quality and would make a better farm unit is irrelevant. The present inquiry does not concern the relative merits of various parcels of land such as would be important if one were to choose which land to cultivate first. Rather the question is whether any given parcel

258. *See* C.R. Exh. 50; F.M. Exh. 2, app. C. *See also* Tr. 723.
259. Tr. 1111-13, 6453; C.R. Exh. 50; F.M. Ex. 2, app. C.
260. Tr. 3150-51.
261. Tr. 3151-52.

can be cultivated successfully. Third, the reference to higher crop revenues required to pay for a drip irrigation system simply illustrates that the appropriate concern with this technology is a comparison of costs and revenues rather than a bare finding of non-arability for low moisture-holding capacity that is unaccompanied by such analysis.[262]

The second type of "sandy" lands on the Fort Mojave Reservation consists of lands for which the Tribe's experts have projected field and row crops. The lands total 416 gross acres on Units FM-105, FM-128, FM-129, and FM-130.[263] In each instance the State Parties' evidence indicates that the moisture-holding capacity of these lands is very similar to that of lands which I found irrigable in connection with the United States claims.[264] Those other lands were such that their moisture-holding capacity was sufficient to enable them to be served by economical irrigation sys-

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262. The economic analysis that is relevant is considered elsewhere. The State Parties generally did not at the hearings attack the costs proposed by the Tribe's expert, but did dispute various yields and prices profferred by the Tribe. *See* notes 1-4, 78-103 and accompanying text *supra*. The outcome of that analysis should determine whether lands with low moisture-holding capacity are to be further considered rather than the conclusional findings of the State Parties' soils expert.

263. *Compare* C.R. Exh. 50; F.M. Exh. 2, Plate No. 2; S.P. Exhs. 147, 158J, 158Q, 158R, 158S. In addition, Unit FM-126, consisting of 35 gross acres, lying in Arizona near the River, is subject to a dispute which includes its alleged lack of sufficient moisture-holding capacity for field or row crops. *See* S.P. Exh. 158P; C.R. Exh. 50. The State Parties, however, did not classify this parcel as one consisting of "sandy" lands, but rejected it as "other non-arable" land. *See* S.P. Exh. 147. The State Parties' soils expert's testimony and the State Parties' documentary evidence indicate that this parcel is non-arable partially because of "sandy" lands. Tr. 3170-71; S.P. Exh. 158P. The criticism of this parcel regarding moisture-holding capacity can be addressed at the same time that the other sandy lands are discussed.

264. *See* S.P. Exh. 22.

tems for field and row crops.[265] For the sake of consistency the same must be said of these lands. And certainly the Tribe's experts believe that their plans constitute a design of a system which will economically serve field and row crops on these lands which they believe are nearly identical to those lands claimed by the United States to be practicably irrigable.[266]

The State Parties also have raised a number of related deficiencies regarding "sandy" lands.[267] For reasons explained regarding the United States claims, I find these arguments unpersuasive,[268] and merely note that competent evidence supports the contrary position.[269]

A related question concerns the State Parties' contention that grapes will have a negative payment capacity on sandy lands.[270] The State Parties' conclusion regarding grapes grown on sandy lands results from a 10% increase in production costs for the alleged difficulties in farming on such soil.[271] This argument derives from the same analysis, presented by the State Parties, which was intended to show that field and row crops would be subject to a 25% increase in such

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265. *See* Tr. 5684, 5688, 5729-30, 5765-66, 5768, 5791, 5859, 5920.

266. *See* C.R. Exh. 50; F.M. Exh. 2. Given this conclusion I need not reach the Tribe's alternative claim that permanent crops served by drip irrigation are economically feasible for these parcels. *See* C.R. Exh. 50; F.M. Exh. 2, app. A. If such a claim were to be decided, I am confident that the result would support the conclusion I reach here.

267. *See* State Parties' Post-Trial Opening Brief 11-14, 22-37 (May 1981). These related deficiencies are discussed in the context of the United States claims. But similar arguments would necessarily apply to the Tribe's claim regarding sandy lands.

268. *See* Part Two at I.B.(2) *supra*.

269. *See, e.g.*, Tr. 6027-35, 5998, 6454.

270. *See* State Parties' Post-Trial Opening Brief 198-99 (May 1981).

271. *See* Tr. 3712-13, 4085-87. The "sandy" lands costs were specifically tailored for the Fort Mojave Reservation. *See* Tr. 3707-12.

costs.[272] For the specific reasons relating to my earlier rejection of the 25% figure,[273] I find that this 10% increase does not truly reflect the expected costs for these lands.

In short I find that the sandy character of the soil resulting in a lack of moisture-holding capacity or any other alleged related deficiencies fails to justify a finding that any of these lands are not practicably irrigable.

(ii) Other Alleged Soils Deficiencies

Some of the parcels discussed above contain alleged deficiencies other than low moisture-holding capacity. The units are FM-129,[274], FM-130,[275] FM-1 and 107,[276] FM-105,[277] and FM-126.[278] These deficiencies relate to such matters as high water tables, marsh lands and sloughs. Such problems seem likely since these parcels lie fairly close to the River.[279]

These problems constitute serious obstacles to the successful farming of portions of these parcels. The Tribe's expert really had no answer when asked if these sorts of problems exist on the lands.[280] On the other hand, the State Parties' failure to exclude these lands generally on the basis of these problems rather

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272. The percentage difference is attributable to the fact that a far greater portion of the production costs associated with grapes relate to vine care which is not affected by sandy soil. *See* Tr. 3712-13, 4085-87.

273. *See* Part Two at I.B.(3) *supra.*

274. Tr. 3140.

275. Tr. 3145; S.P. Exh. 44.

276. Tr. 3150.

277. Tr. 3153-54.

278. Tr. 3170-71; S.P. Exhs. 147, 158P.

279. *See* F.M. Exh. 2, Plate No. 1.

280. *See* Tr. 1230-32, 1386-89.

than the low moisture-holding capacity problem indicates that these present problems do not occur uniformly throughout these parcels.[281] Indeed, this conclusion is supported by the State Parties' soils expert who described some of these parcels in such a manner that implies that the problems exist on only a portion of a parcel that may be disputed for reasons that also include low moisture-holding capacity.[282] I thus believe that limited portions of these parcels must not be given water rights, but that limitation can only be applied where I can find some rational means of determining which acres are affected.

Fortunately, I believe that with respect to most of these parcels, such evidence came in through the United States' soils expert. Although he did not exclude lands from consideration solely on the basis of low moisture-holding capacity,[283] that expert did attempt to determine other problems with lands that would render them non-arable or non-irrigable.[284] In some instances he gave an estimate of the number of acres he excluded as non-irrigable or non-arable. Those acres I find non-irrigable are:

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281. In the State Parties' primary exhibits, parcels FM-129, FM-130, FM-105, FM-107, and FM-1 were shown to be disputed solely on the basis of low moisture-holding capacity. *See* S.P. Exhs. 147, 158A, 158J, 158K, 158P, 158R, 158S.

282. *See, e.g.*, Tr. 3140-46.

283. *See* Tr. 335-39; U.S. Exhs. 2, 3, 4.

284. *See* Tr. 312.

Unit	Gross Acres
FM-105	50-60
FM-128	90-100
FM-129	0
FM-130	76[285]
Approximate Total	226

Thus, the United States' work confirms these arguments of the State Parties to the extent of 226 gross acres.

The dispute over FM-1 and FM-107 merits separate discussion. The State Parties' expert thought that it was cut up by sloughs.[286] The United States' soil expert indicated that the area of the units with high water table problems was the southern part of the units, involving an area of between 15 to 20 acres.[287] The Unit FM-1 originally consisted of 640 acres but the Tribe's expert excluded 128 acres for groundwater problems,[288] and the final unit does not include the lands along the River or the southernmost part of the

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285. *See* Tr. 283-86. The figure for FM-130 comes from the State Parties' exhibit. S.P. Exh. 158S. Although the United States' soils expert did not specify a particular number of acres, his description of the acres which he found non-irrigable or non-arable generally conforms to that given by the State Parties. *Compare* Tr. 284-85; U.S. Exhs. 2, 3, 4; S.P. Exhs. 41; 158S.

With respect to the disputed parcel, FM-129, the United States' soils analysis supports the Tribe's view that the 21 gross acres in contest are irrigable or arable. *Compare* U.S. Exhs. 2, 3, 4; S.P. Exhs. 41, 158R. This parcel represents something of a curiosity because the State Parties' exhibits refer only to the alleged problem of low moisture-holding capacity and at the hearings the State Parties' soils expert did not mention that alleged problem and simply described the unit as having soils that were "coarse and gravelly and nonarable." Tr. 3140; *see* Tr. 3135-40.

286. Tr. 3150.

287. Tr. 311-12.

288. C.R. Exh. 50 n.1 (FM-1).

area.[289] Therefore, I find that the lands included in the final unit are irrigable or arable.

One further wrinkle must be considered. The Tribe's claim regarding FM-126 does not appear to be based on any soils classification. The unit was not marked on the United States' exhibits as belonging to any soils group.[290] The Tribe's post-trial submission regarding the particulars of its claim acknowledges this fact by the absence of any classification under the heading of soil description,[291] an omission that occurs solely with respect to this tract.[292] This finding is not surprising since the Tribe's experts did not attempt to classify soils[293] and the United States' soils expert did not classify it either. Thus, this disputed claim for 35 gross acres must be denied.

In sum, the lands along the river for which water rights claims have been made cannot be sustained with respect to a total of 261 (226 + 35) gross acres.

(iii) Other Arizona Lands

The State Parties have challenged as non-arable approximately 305 gross acres of lands in Units FM-114, FM-115, FM-116, and FM-119,[294] which lie generally near the eastern boundary of the Reservation in Arizona.[295] Although the United States' exhibits are not particularly clear on this point, its soils expert ap-

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289. *See* Tr. 1285-89; F.M. Exh. 2, Plate No. 1.

290. *Compare* F.M. Exh. 2, Plate 1; U.S. Exhs. 2, 3, 4; S.P. Exh. 41.

291. The Tribe did do some soil tests of its own. C.R. Exh. 50. For a discussion regarding the reasons I find this exhibit unpersuasive, see note 298 *infra*.

292. *See* F.M. Supp. Exh. (Sept. 1981), record item no. 192.

293. *See* Tr. 1250.

294. *See* S.P. Exhs. 147, 158L, 158M, 158N, 158O.

295. *See* F.M. Exh. 2, Plate No. 1.

parently either failed to classify these lands or classified the great majority of them non-irrigable or non-arable.[296] Indeed, the Tribe now claims that the soils in these parcels consist of BIA classes V-VIII soils,[297] which are the non-irrigable or non-arable classes.[298] Absent a presentation by the Tribe of a more favorable soils classification by a qualified expert, I agree with the State Parties that the 305 gross acres under present dispute are non-irrigable or non-arable. The water rights claim will be adjusted accordingly.

(b) Conclusions Regarding Practicable Irrigability of Fort Mojave Indian Reservation Lands

For the Fort Mojave Tribe the outcome of an analysis of the costs and benefits of cropping patterns combined with my findings regarding the arability of soils will determine the quantity of water rights to be received.

Less than one-half of the lands for which the Tribe has asserted water rights claims based on permanent crops are located in those parcels claimed solely by the Tribe; the other such lands, by implication overlap the

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296. *See* Tr. 285-87; U.S. Exhs. 2, 3, 4; F.M. Exh. 2, Plate No. 1.

297. *See* F.M. Supp. Exh. (Sept. 1981), record item no. 192.

298. Despite this statement, the Tribe protests in its reply brief that the BIA standards are outdated and that the soil auger borings, taken by its own experts, should be regarded as more persuasive of the soils' irrigability. *See* Four Tribes' Post-Trial Reply Brief 48 (May 1981). *See also* C.R. Exh. 50. I find this rejoinder of the Tribe to be unpersuasive given that the original purpose of these soils samples taken by its experts was to "supplement" the soils information available through the BIA land classification. F.M. Exh. 2, at 21-22. Moreover, the Tribe's primary expert witness almost completely disqualified his firm from making any soils classification judgments. *See* Tr. 1250.

claim made by the United States. Those lands claimed solely by the Tribe are:

Unit	Gross Acres	Annual Water Cost/Acre
FM-1	512	$51
FM-107	55	$51
FM-114	50	$89
FM-115	112	$116
FM-116	253	$125
FM-119	195	$144
	1177[299]	

In addition, the Tribe asserts a 95 gross acre claim based on permanent crops for the unit called Quail Hollow for which the United States advanced an unsuccessful claim. Together these claims amount to a claim for 1,272 additional gross acres, while the total acreage for which water rights are requested on the Fort Mojave Reservation projected for permanent crops amounts to 2,728 gross acres.[300] I need not consider what crops may be actually planted on the other acres which overlap the United States claims. Almost the entire claim for almonds (455 gross acres)[301] and for grapes (909 gross acres)[302] may be planted on these additional lands which total 1,272 gross acres. The payment capacity for almonds is $347 and the payment capacity for grapes greatly exceeds any of the annual water costs figures stated above. Thus, the entire almonds claim may be economically planted in the sandy lands of FM-1 and the remainder of the lands may be economically planted in grapes, before the en-

299. *See* C.R. Exh. 50; F.M. Exh. 2, Table 9 app. A, Plate No. 2.
300. *See* F.M. Exh. 2, at 26-27.
301. *See* F.M. Exh. 2, at 26-27, Table C-12; C.R. Exh. 57 n.3.
302. *See* F.M. Exh. 2, at 26-27.

tire acreage projected for grapes is exhausted. The Tribe's claims may therefore be sustained at this point without breaking the projected cropping pattern.

Of course, within these units, I have found 305 non-irrigable or non-arable acres.[303] Thus, the water rights granted on the basis of a claim regarding permanent crops should be reduced by that amount in the final analysis.

The Tribe's claims may be sustained depending upon a comparison of economic costs and benefits. Parcels to be included in such an analysis should be parcels claimed solely by the Tribe (totalling 1,739 gross acres), as well as for the Quail Hollow Unit (95 gross acres) for which the United States claim was unsuccessful. In table form these claims[304] would be:

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303. *See* notes 294-98 and accompanying text *supra*. This finding concerned Units FM-114, 115, 116, and 119.

304. The figures in this table may be derived from F.M. Exh. 2, Table 12, apps. C, D, Plate Nos. 1, 2; F.M. Supp. Exh. (Sept. 1981), record item no. 192; S.P. Exh. 147; note 100 and accompanying text *supra*.

Unit	Land Type	Annual Water Costs (per acre)	Annual Payment Capacity (per acre)	Gross Acres	Arable or Irrigable Acres	Practicably Irrigable Gross Acres
FM-1	Nevada Omitted	$51	$347+	512	512	512
FM-105	Calif. Omitted	$42	$136	97	42	42
FM-107	Nevada Omitted	$51	$347+	55	55	55
FM-114	Arizona Omitted	$89	$347+	50	45	45
FM-115	Arizona Omitted	$116	$347+	112	31	31
FM-116	Arizona Omitted	$125	$347+	253	110	110
FM-119	Arizona Omitted	$144	$347+	195	119	119
FM-126	Arizona Omitted	$72	$136	35	0	0
FM-128	Arizona Omitted	$42	$136	222	127	127
FM-129	Arizona Boundary	$42	$136	85	85	85
FM-130	Arizona Boundary	$42	$136	123	47	47
Quail Hollow	Calif. Boundary	$109	$347+	95	95	95
TOTALS				1,834	1,268	1,268

The following water rights should be added to those rights presently held by the Fort Mojave Tribe in addition to those claims successfully advanced by the United States:

	Gross Acres	Net Factor	Net Acres	Diversion Unit (A.F./ Ac.)	Total Water Diversion in A.F.
Ariz. Boundary	132	.95	125	6.46	808
Ariz. Omitted	432	.95	410	6.46	2,649
Calif. Boundary	95	.95	90	6.46	581
Calif. Omitted	42	.95	40	6.46	258
Nevada Omitted	567	.95	539	6.46	3.482
TOTAL	1,268	—	1,204	—	7,778

3. *Colorado River Indian Reservation*

(a) Arability Questions

(i) Tribes Claims

The claims presented by the Colorado River Indian Tribes meet the response from the State Parties that 1,561 gross acres are non-arable and another 175 gross acres lack adequate moisture-holding capacity. The disputed acres are:

Unit	Non-arable	Low Moisture-Holding Capacity
CR-103	375	
CR-107	776	
CR-108	163	
CR-109	247	175
Totals	1,561	175[305]

The State Parties in their briefs and through their expert's testimony described these lands as consisting of such forbidding features as "a mesa top which is extremely sandy and an escarpment with steep, strongly dissected slopes" and "series of 10-20 foot high sand dune ridges mixed with some gravelly/cobbly soils and drainage areas of steep and rough wash land."[306] Yet they conclude that 6,926 gross acres, of the 8,662 gross acres claimed to be irrigable, are in fact arable.[307] When viewed in this perspective, this dispute appears relatively minor.

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305. *See* S.P. Exhs. 148; 158T, 158U, 158V, 158W.

306. *See* State Parties' Post-Trial Opening Brief 82-93 (May 1981); Tr. 3187-200.

307. *See* S.P. Exh. 148.

Indeed for the most part, there is no real dispute at all. Although the Tribes claim that the State Parties' expert did not indicate where in the farming units he found non-arable soils,[308] a comparison of several soils maps generally reveals the location of the disputed acres. The soils experts from the United States as well as the State Parties classified the soils in the several units.[309] The resulting maps reveal a remarkable agreement between those experts regarding the arability of these soils.[310] The treatment of both units CR-103 and CR-108 is generally so identical that I find it appropriate to adopt the State Parties' figures regarding the non-arable areas included within the units simply to square off their boundaries. Thus, I find these units contain the following amounts of non-arable land:

Unit	Gross Acres
CR-103	375
CR-108	163

These acres should not receive water rights.

The State Parties' treatment of units CR-107 and CR-109 is somewhat similar to that of the United States' soils expert, but my findings regarding those parcels merit a discussion regarding each parcel.

Unit CR-107 consists of a large amount of acreage in the northeastern area of the Reservation.[311] It is a long narrow unit extending north to south. The State Parties' soils expert described it as consisting of a series of parallel sand dunes ten to twenty feet high, 100 to 200 feet wide and 600 feet apart.[312] Remarkably he

308. Four Tribes' Opening Post-Trial Brief 95-97 (May 1981).
309. *See* U.S. Exhs. 7, 8, 11, 12; C.R. Exh. 2; S.P. Exh. 52.
310. *See* exhibits cited in note 5 *supra*.
311. C.R. Exh. 2.
312. Tr. 3188-90.

found the dunes to be non-arable, but classified large areas on the unit as arable even though those areas contained the dunes.[313] The areas considered as non-arable were: 1) in the southern portion of the unit "a gravelly wash and some adjoining rough lands";[314] and 2) in the northern portion a large tract of land containing "a far more intricate pattern of much more frequently spaced dunes," of the type which this expert found elsewhere on the tract.[315] The difficulty lies not with the lands found non-arable in the southern area of this unit; to a large extent this finding is confirmed by the finding of the United States' soils expert.[316] Rather I find that the problem lies with the exclusion as non-arable of the large area in the northern end of this unit. This area was excluded because the "non-arable" dunes were more prevalent there. Yet I find unconvincing the State Parties' soils expert's explanation that the dunes are non-arable due to the problems associated with sandy soils and variable topography.[317] My rejection of that reasoning is consistent with my earlier finding regarding sandy lands and is bolstered by the finding of the United States' soils expert that this area is irrigable or arable.[318] This conclusion is further bolstered by the Tribes' presentation of a photograph of this unit.[319] That photograph shows none of the sand dunes which the State Parties' expert described as prevalent throughout this unit.[320] I find no

313. *Id.*; S.P. Exhs. 52, 148, 158U.
314. Tr. 3191; S.P. Exh. 52.
315. Tr. 3190-91; S.P. Exh. 52.
316. *Compare* U.S. Exhs. 7, 11; S.P. Exh. 52.
317. Tr. 3189.
318. *See* U.S. Exh. 11; S.P. Exh. 52.
319. C.R. Exh. 39.
320. The State Parties did introduce a photograph of a large sand dune on Unit CR-108. *See* S.P. Exh. 53. Remarkably this photograph

reason to consider this northern part of Unit CR-107 to be non-arable.

The remaining issue regarding this unit concerns the number of non-arable acres in my finding. The evidence, as I understand it, does not specifically quantify the number of acres designated non-arable by the State Parties in each respective location of this unit.[321] Rather only the total non-arable figure is given at 776 gross acres. Approximately 90% of this land was so classed because of the alleged sand dunes problem.[322] Consistency requires that I find that only 76 acres of this unit may justifiably be classed as non-arable.[323]

The remaining unit is CR-109. The State Parties claim that 247 gross acres of this unit are non-arable as part of an escarpment and the remaining 175 gross acres are sandy lands lacking in moisture-holding capacity.[324] Once again the sandy lands argument of the State Parties is rejected, and the only significant dispute thus centers on the "escarpment" lands described by the State Parties' expert:

> [t]he boundary, *as drawn*, . . . includes some of the side slopes of the mesa, which are very dissected, very strongly dissected, little or no soil material.[325]

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depicts an area classified by the State Parties' expert as arable. *See* Tr. 3192-94; S.P. Exh. 52. In addition, the Tribe also presented a photograph of the center portion of CR-108 which reveals no such lands in the same general area. *See* C.R. Exh. 39.

321. *See* S.P. Exhs. 52, 148, 158U.

322. *See* S.P. Exh. 52.

323. I recognize that this estimation breaks with my usual practice of not attempting to visually estimate the quantity of acreage in any tract. The magnitude of the acreage at issue in this one instance justifies such a limited departure.

324. *See* S.P. Exhs. 148, 158W.

325. Tr. 3200 (emphasis added).

The Tribes dispute this testimony claiming that the unit is "level and regular" and that the State Parties' expert "may have been looking at the wrong land."[326] The Tribes presented a photograph and testimony to support their position.[327] I believe that the State Parties' point is well taken on this issue. The Tribes' map of this unit appears to include a significant amount of land classified by the United States as non-irrigable or non-arable.[328] Although the Tribes' map definition of CR-109 conforms to an extent to a large sandy-arable area in sections 4 and 5 of this general area, the irrigation unit on the Tribes' map lies slightly more to the south than does this sandy area and therefore appears to include excessive non-arable land in the south while excluding arable land in the north. Under these circumstances, I accept the State Parties' estimate that 247 acres of this unit are non-arable.[329]

In conclusion, for the Colorado River Indian Reservation, I find that on the units claimed by the Tribes, the following acres are non-arable:

Unit	Gross Acres
CR-103	375
CR-107	76
CR-108	163
CR-109	247
Total	861

The remaining acres may be practicably irrigable subject to an economic analysis.

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326. Four Tribes' Post-Trial Reply Brief 52 (June 1981).

327. *See* C.R. Exh. 40; Tr. 6226-27.

328. *See* U.S. Exh. 12; C.R. Exh. 2.

329. A visual inspection tends to reveal that fewer acres are in this non-arable area in the southern edge of this unit, but absent a more precise estimate I will use the State Parties' figure.

(ii) State Parties' Argument Regarding Decreed Lands

The State Parties in the course of the hearings argued that if the omitted lands claims are heard, then they should be allowed to dispute the irrigability of Reservation lands with decreed water rights. They produced evidence supporting such a claim regarding approximately 1,200 to 1,600 acres on the Colorado River Indian Reservation.[330] The State Parties' expert described his examination of these lands as a "rough look"[331] and stated that the 1,200 to 1,600 acres resulted when he "just made a figure out of the air."[332] Even absent contradictory evidence,[333] no one would be persuaded by the testimony of the State Parties' soils expert on this issue. I find that none of the disputed decreed lands should be considered non-irrigable.

(b) Conclusions Regarding Practicable Irrigability of Colorado River Indian Reservations Lands

A brief analysis will determine the additional water rights on the Colorado River Indian Reservation. The analysis must differ somewhat in that, of the four permanent crops projected by the Tribes' expert, only almonds and grapes have been shown to be economically feasible on the irrigation units added by the Tribes' claim. The permanent crops were projected for 8,662 gross acres on Units CR-103, CR-107, CR-108, CR-

330. *See* S.P. Exh. 26, at II-10, -12.
331. Tr. 3091.
332. Tr. 3392.
333. *See* Tr. 6228-36; C.R. Exh. 41.

109.[334] The water costs projected by the Tribes for the acres in the respective units are as follows:

Unit	Gross Acres	Annual Water Cost per Acre
CR-103	3,960	$262
CR-107	3,200	$227
CR-108	1,080	$320
CR-109	422	$179[335]

My findings show that of the four permanent crops in evidence almonds and grapes produce greater revenue than costs per acre.[336] The Tribes' initial projected cropping pattern, however, included only one-half the acreage in such crops.[337] The Tribes anticipated this possibility and argued in their brief that they would concentrate plantings in crops found to be economically viable.[338] For present purposes, I believe that response is sufficient. The State Parties responded to a similar argument by the Quechan Tribe by arguing that large plantings of any one crop would ruin the market for the crop.[339] As I indicated earlier,[340] no evidence of any study reaching this conclusion was presented even if the issue is relevant to present proceedings. The lands may be proved to be practicably irrigable on the basis of their ability to support any crop, but the Tribes might ultimately cultivate on these lands a variety of crops or none at all. Therefore,

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334. *See* C.R. Exh. 1, at 31-33, app. C; C.R. Exhs. 2, 50.
335. *See* C.R. Exh. 1, at 31; C.R. Exhs. 2, 50.
336. *See* notes 5-186 and accompanying text *supra*.
337. *See* C.R. Exh. 1, at 26.
338. Four Tribes' Post-Trial Opening Brief 94 (May 1981).
339. State Parties' Post-Trial Closing Brief 42 (June 1981). *See* State Parties' Post-Trial Opening Brief 213-14 (May 1981).
340. *See* notes 178-83 and accompanying text *supra*.

I must now consider the number of acres which may be found to be practicably irrigable on this basis.

The Tribes' claims may be sustained upon a comparison of economic costs and benefits for the irrigable lands in the irrigation units. In table form, the claims asserted only by the Tribes[341] are:

Unit	Land Type	Annual Water Costs (per acre)	Annual Payment Capacity[342] (per acre)	Gross Acres	Arable or Irrigable Acres	Practicably Irrigable Gross Acres
CR-103	Arizona Omitted	$262	$347+	3,960	3,585	3,585
CR-107	Arizona Omitted	$227	$347+	3,200	3,124	3,124
CR-108	Arizona Omitted	$320	$347+	1,080	917	917
CR-109	Arizona Omitted	$179	$347+	422	175	175
			Totals	8,662	7,801	7,801

The following water rights, in addition to those awarded based on the United States claims, should be added to those presently decreed appurtenant to the Colorado River Indian Reservation:

	Gross Acres	Net Factor	Net Acres	Diversion Unit (AF)	Total Water Diversion in AF
Arizona Omitted Lands	7,801	.95	7,411	6.67	49,431

4. *Chemehuevi Indian Reservation*

(a) Arability Questions

The State Parties argue that 1,150 acres of Unit CH-100 claimed by the Chemehuevi Tribe as irrigable

341. C.R. Exhs. 1, 2, 50; Four Tribes' Post-Trial Opening Brief 92 (May 1981).

342. *See* notes 100 & 185 and accompanying text *supra*.

are, in fact, non-arable as proved by soils classification work done by the State Parties' soils expert.[343] The Tribe disputes this assertion.[344]

The State Parties' position is substantially supported by the findings of the United States' soils expert.[345] Although there are minor differences between these experts, this concurrence of opinion is persuasive, and I adopt the State Parties' estimate that 1,150 acres in Unit CH-100 are non-arable and, therefore, cannot be practicably irrigable.[346]

(b) Gross-to-Net Acreage Reduction

The Chemehuevi Tribe argues in its brief that its lands merit a different gross to net acreage reduction percentage, because there will be fewer nonagricultural, but related, uses of lands in the Chemehuevi irrigation units.[347] The United States' experts used a 2%

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343. *See* S.P. Exhs. 140, 149, 158Z.

344. *See* Four Tribes' Post-Trial Opening Brief 83-84 (May 1981).

345. *Compare* S.P. Exh. 140; U.S. Exh. 5; CH. Exh. 2.

346. I have previously noted my belief that the work of United States' soils expert represents a truly reliable set of findings which are instructive in the event of a major dispute. As I did in considering the soils of the Fort Mojave Reservation, I do now find that his opinion is more effectively and convincingly presented than the soils work done by the Tribe's experts. *See* notes 263-65 and Part Two at I. B. & C. *supra*; CH. Exh. 1, Table A-1.

The Tribe also cites numerous photographs of portions of this unit, CH-100, apparently to demonstrate the good quality of this land. *See* CH. Exh. 19. Their value is minimal because they generally depict land that was classified as arable or irrigable by the United States' soils expert. *See* U.S. Exh. 5 and map accompanying CH. Exh. 19. These areas lie very near, if not within, the arable area mapped by the State Parties' expert. *See* S.P. Exh. 140. I find more relevant the pictures offered by the State Parties of lands which are clearly within the disputed area. *See* S.P. Exhs. 136, 137, 138, 140; Tr. 5123.

347. Four Tribes' Post-Trial Opening Brief 85-86 (May 1981).

figure for the Chemehuevi Reservation,[348] while the Tribe's expert used a 5% figure.[349] Because the State Parties also used a basic 5% figure,[350] in connection with the United States claims I found that figure to be well-supported by the concurrence of two out of three experts. I do not hold that the Tribe is bound by its expert's opinion evidence, but I find the abandonment in the brief of that expert's position to be curious. The general 5% reduction percentage still appears most persuasive.[351]

(c) Conclusions Regarding Practicable Irrigability of Chemehuevi Indian Reservation Lands

The Chemehuevi Tribe has advanced a claim for 1,770 gross acres beyond the claim made by the United States.[352] The land and its water costs have been summarized[353] as follows:

Unit	Gross Acres	Annual Water Cost per Acre
CH-100	1,770	$171

The Tribe projected 2,463 net acres to be planted in almonds and grapes, and I have determined that only 620 gross acres of Unit CH-100 are arable or irriga-

348. Tr. 521-23; U.S. Exh. 42.

349. Tr. 1127; CH. Exh. 1, Table 14.

350. Tr. 4098. This basic figure was increased to 6% for reasons I earlier considered unpersuasive.

351. Indeed because the United States did not claim the Unit CH-100, I doubt that there is evidence supporting the position that the 2% reduction applies to that land.

352. CH. Exh. 1, Table 8.

353. *See, id.*, at Table 11; CH. Exh. 2.

ble.[354] Therefore, the almonds and grapes within the cropping pattern might cover the entire amount of irrigable land.[355]

The Tribe's claim may be sustained upon a comparison of economic costs and benefits. In table form the claim asserted by the Tribe[356] is:

Unit	Land Type	Annual Water Cost (per acre)	Annual Payment Capacity (per acre)	Gross Acres	Arable or Irrigable Acres	Practicably Irrigable Acres
CH-100	California Omitted	$171	$347+	1,770	620	620

The following water rights should be added to those presently decreed appurtenant to the Chemehuevi Indian Reservation:

	Gross Acres	Net Factor	Net Acres	Diversion Unit (AF)	Total Water Diversion (AF)
California Omitted Lands	620	.95	589	5.97	3,516

354. *See* Part One at VI *supra*.

355. In addition, my findings regarding these crops could reinforce my findings relating to the United States claims on this Reservation. *See* notes 99-103 and accompanying text *supra*. The water costs for the United States claims amount to between $82 and $116 per acre per year according to the Tribe's expert. CH. Exh. 1, Table 11. The payment capacity for almonds and grapes exceeds those figures and as both are a permanent crop this claim regarding almonds and grapes on the lands claimed by the United States answers the State Parties' objections that this land is suitable only for permanent crops. Of course, to fully cover the United States claim with only two crops, the cropping pattern must be broken, but that possibility is not an insurmountable obstacle.

356. *See* CH. Exhs. 1, 2; CH. Supp. Exh. (Sept. 1981), record item no. 190; Part One at V *supra*.

PART THREE

PART THREE

Recommended Decree

It is ORDERED, ADJUDGED AND DECREED THAT Article II(D)(1)-(5) of the Decree in this case entered on March 9, 1964, is hereby amended to read as follows:

> (1) The Chemehuevi Indian Reservation in annual quantities not to exceed (i) 21,017 acre-feet of diversions from the mainstream or (ii) the quantity of mainstream water necessary to supply the consumptive use required for irrigation of 3,521 acres and for the satisfaction of related uses, whichever of (i) or (ii) is less, with a priority date of February 2, 1907;
>
> (2) The Cocopah Indian Reservation in annual quantities not to exceed (i) 10,197 acre-feet of diversions from the mainstream or (ii) the quantity of mainstream water necessary to supply the consumptive use required for irrigation of 1,601 acres and for the satisfaction of related uses, whichever of (i) or (ii) is less, with priority dates of September 27, 1917, for lands reserved by the Executive Order of said date; June 24, 1974, for lands reserved by the Act of June 24, 1974 (88 Stat. 266, 269);
>
> (3) The Fort Yuma Indian Reservation in annual quantities not to exceed (i) 130,135 acre-feet of diversions from the mainstream or (ii) the quantity of mainstream water necessary to supply the consumptive use required for irrigation of 19,515 acres and for the satisfaction of related uses, whichever of (i) or (ii) is less, with a priority date of January 9, 1884;
>
> (4) The Colorado River Indian Reservation in annual quantities not to exceed (i) 902,207 acre-feet of diversions from the mainstream or

(ii) the quantity of mainstream water necessary to supply the consumptive use required for irrigation of 135,333 acres and for the satisfaction of related uses, whichever of (i) or (ii) is less, with priority dates of March 3, 1865, for lands reserved by the Act of March 3, 1865 (13 Stat. 541, 559); November 22, 1873, for lands reserved by the Executive Order of said date; November 16, 1874, for lands reserved by the Executive Order of said date except as later modified; May 15, 1876, for lands reserved by the Executive Order of said date; November 22, 1915, for lands reserved by the Executive Order of said date;

(5) The Fort Mojave Indian Reservation in annual quantities not to exceed (i) 158,928 acre-feet of diversions from the mainstream or (ii) the quantity of mainstream water necessary to supply the consumptive use required for irrigation of 24,590 acres and for the satisfaction of related uses, whichever of (i) or (ii) is less, and subject to the next succeeding proviso, with priority dates of September 19, 1890, for lands transferred by the Executive Order of said date; February 2, 1911, for lands reserved by the Executive Order of said date; provided that the quantities fixed in this paragraph shall be subject to appropriate adjustment by agreement or decree of this Court in the event that the boundaries of the Reservation are finally determined.

Provided, further, that lands presently determined, for the purpose of this order, to be within the boundaries of the above-named Reservations and which have been or are later conveyed or patented to non-Indians or that lands presently determined for this purpose to be within the boundaries of the above-named Reservations and later determined to be outside the boundaries of the above-named Reservations, as well as any accretions thereto to which the own-

ers of such land may be entitled, should not be included as irrigable acreage within the Reservations and that the above specified diversion requirements of such land that is irrigable shall be reduced by the unit diversion quantities listed in the Decree in this case entered on January 9, 1979 (439 U.S. at 422).

This Report, together with the Findings of Fact and Conclusions of Law therein contained, and the recommended decree thereto annexed are

Respectfully submitted,

ELBERT P. TUTTLE
Special Master

Atlanta, Georgia
February 22, 1982

Elbert P. Tuttle

APPENDIX 1

Indian Reservation Boundary Determinations

[SEAL]

UNITED STATES DEPARTMENT of the INTERIOR

Office of the Secretary
Washington, D.C. 20240

June 3, 1974

Memorandum

To: Director, Bureau of Land Management
Through: Assistant Secretary, Land and Water Resources

From: Secretary of the Interior

Subject: Western Boundary of the Hay and Wood Reserve of the Fort Mojave Indian Reservation, Arizona, California and Nevada

I have this date received a memorandum from the Solicitor regarding the proper location of the western boundary of the Hay and Wood Reserve of the Fort Mojave Indian Reservation. A copy of his memorandum is attached.

Acting upon the conclusions expressed in the Solicitor's memorandum, I have determined that the 1928 resurvey conducted by Sidney Blout under direction of the General Land Office, and the plat representing that resurvey of the above-mentioned western boundary of the Hay and Wood Reserve, approved November 15, 1930, and accepted on January 23, 1931, should be declared null and void and to have no further force or effect.

The western boundary of the "Camp Mojave Reservation for Hay and Wood" is most accurately determined and established in accordance with the intent of the original survey by using the courses, distances and acreage as

described in the plats and notes of survey accompanying the Executive Order of March 30, 1870. I reject as erroneous those portions of that description which make reference to posts "marked U.S. in a mound of earth near the left bank of the Colorado River" used in connection with Corner III and Corner IV appearing on the plat and in the notes of survey accompanying the above mentioned Executive Order of March 30, 1870.

Please take all such actions as may be appropriate to implement the conclusions herein stated, including declaring null and void the above-mentioned 1928 resurvey and the plat respecting that resurvey of the western boundary of the Hay and Wood Reserve accepted January 23, 1931, and resurveying the Reserve to conform to the acreage description of 9114.81 acres. Correct Corner III and Corner IV should be reestablished in accordance with the courses and distances described in the plats and notes of the survey accompanying Executive Order of March 30, 1870, to replace the erroneous and rejected Corner III and Corner IV established by the 1928 resurvey.

It is also requested that a determination be made as to what third-party interests may have been established and that appropriate action be taken to subrogate such interests to the Fort Mojave Tribe in those instances in which it is determined that such third-party interests affect the lands inside the now recognized western boundary of the reservation.

Please note the official records accordingly so that henceforth such records will indicate the proper location of the western boundary of the Hay and Wood Reserve of the Fort Mojave Indian Reservation in the subject area.

/s/ Rogers C. B. Morton

Fort Mojave
LaFollette Tract

LAW OFFICES OF
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Telephone (213) 373-8592

Attorney for Plaintiff

IN THE UNITED STATES DISTRICT COURT

FOR THE DISTRICT OF ARIZONA

THE FORT MOJAVE TRIBE by and through its TRIBAL COUNCIL,

Plaintiff,

vs.

WILLIAM L. LAFOLLETTE and SUSAN H. LAFOLLETTE, his wife; CLESSON W. KERR and LEONA W. KERR, his wife, et al.,

Defendants.

NO. CIV 69-324 MR

DECREE QUIETING TITLE

On September 26, 1974 a Stipulation for settlement of the above entitled cause was submitted to this Court which was thereafter approved on October 22, 1974. Subsequently the settlement Stipulation was implemented by adding parties upon whom service had not previously been made, and by having other adverse claimants of record execute Quit Claim Deeds in favor of plaintiff, thereby relinquishing forever all of their right, title and interest in any of the lands comprising the subject matter of this action.

GOOD CAUSE APPEARING therefore and the Court being fully advised in the premises, and having retained jurisdiction thereof.

NOW, THEREFORE IT IS HEREBY ORDERED, ADJUDGED AND DECREED that the allegations of ownership set forth in plaintiff's complaint are true, and that the hereinafter described real property which is the subject matter involved in this proceeding is a part of the Fort Mojave Indian Reservation with title thereto held in trust by the United States of America for the

benefit of the Fort Mojave Tribe, to wit:

Those portions of Section 4, T. 17 N., R. 22 W., and of Sections 33 and 34, T. 18 N., R. 22 W., G & S. R. B. & M., Mohave County, Arizona, along with those portions of Sections 1 and 12, T. 9 N., R. 22 E., and of Sections 6 and 7, T. 9 N., R. 23 E., San Bernardino Meridian, California, more particularly described as follows:

Beginning at the southeast corner of said Section 33; thence westerly along the south line of said Section 33 approximately 2,650 feet to its intersection with the 1905 GLO meander line; thence southerly along said 1905 GLO meander line to its intersection with the 1883 GLO meander line; thence southerly along said 1883 GLO meander line to its intersection with the south line of said Section 7; thence westerly along the south lines of said Sections 7 & 12 approximately 3,500 feet to the east bank of the present Bureau of Reclamation channel; thence northerly along said east bank of the present Bureau of Reclamation channel approximately 10,800 feet to its intersection with the easterly prolongation of the north line of said Section 1; thence easterly along said easterly prolongation of the north line of Section 1 and the westerly prolongation of said section 34 approximately 5,100 feet to the centerline of the 1912 channel of the Colorado River as surveyed by the Indian Service; thence along said centerline in a southerly direction to its intersection with the south line of Section 34; thence westerly along said south line approximately 400 feet to the southeast corner of Section 33 and the point of beginning.

The total area covered by the above legal description is graphically depicted on Exhibit "1" attached hereto and by reference made a part hereof.

IT IS FURTHER ORDERED, ADJUDGED AND DECREED that the named defendants herein, and all the hereinafter named persons who during the pendency of this cause have executed special agreements in writing or Quit Claim Deeds in favor of the Fort Mojave Tribe, have no estate, title, lien, claim or possessory interest whatsoever in or to the above described property or in or to any part thereof.

IT IS FURTHER ORDERED, ADJUDGED AND DECREED that the said title of said plaintiff to the said property and to each and every part or parcel thereof be, and the same is hereby declared to be good and valid.

IT IS FURTHER ORDERED, ADJUDGED AND DECREED that each of the following named persons and corporations be and they are hereafter forever and perpetually enjoined, restrained and debarred from asserting any estate, right, title, lien, claim or possessory interest in or to said real property, or any part thereof, adverse to plaintiff, and that said title thereto be, and it is hereby established and quieted in favor of plaintiff and against all of the following named persons and coporations:

Clesson W. Kerr and Leona M. Kerr, husband and wife,

John L. Thomas and Leohrah M. Thomas, husband and wife,

Michael P. Wiley and Dilio M. Wiley, husband and wife,

George C. Rasmussen and Jane Doe Rasmussen, husband and wife,

I. A. Hammer,

Arthur B. Sanford and Genevieve B. Sanford, husband and wife,

David Freidenrich and Edith S. Freidenrich, husband and wife,

Helene M. Reynolds, a single woman,

Alice Marguerite Reynolds, a widow,

Charles D. Reed and Blance D. Reed, husband and wife,

The Estate of Zoe Ackerman,

The Estate of Brenda Ackerman,

Colorado River Ranchos, Inc.,

June Knapp,

Cal Nev Ari Corporation,

Frank B. McShan and Maggie L. McShan, husband and wife,

Roy B. Stephens,

Henry Olson,

Monaghan & Murphy Company,

Robert M. Castle and Mary Castle,

Fred H. Almy and Barbara C. Almy,

William LaFollette and Susanne H. LaFollette, husband and wife.

DONE IN OPEN COURT this 2nd day of February, 1976.

31

FILED

MAY 12 1975

W. J. FIESTEIN, CLERK
UNITED STATES DISTRICT COURT
EASTERN DISTRICT OF ARIZONA
DEPUTY CLERK

IN THE UNITED STATES DISTRICT COURT

FOR THE DISTRICT OF ARIZONA

COCOPAH TRIBE OF INDIANS, Plaintiff, vs. ROGERS C. B. MORTON, Secretary of the Interior of the United States of America, Defendant.	NO. CIV-70-573-PHX-WEC FINAL JUDGMENT

This Court granted the motion for summary judgment of plaintiff, the Cocopah Tribe of Indians (hereinafter "the Tribe"), on September 24, 1973. The Tribe was represented by one of its attorneys, Joe P. Sparks. The defendant, Rogers C. B. Morton, as Secretary of the Interior of the United States of America (hereafter "the Secretary"), was represented by the United States Attorney, Richard S. Allemann, Assistant United States Attorney. The Court has reviewed the entire file in this action, as well as the stipulation of counsel that this judgment be executed by the Court.

ACCORDINGLY, IT IS HEREBY ORDERED, ADJUDGED, AND DECLARED AS FOLLOWS:

1. The Cocopah Indian Reservation, as established

by the Executive Order of September 17, 1917, was and is riparian to the Colorado River and includes any land added to its boundaries by accretion from shifts in the course of the River subsequent to said date.

2. The Secretary, in his capacity as agent and officer of the United States of America charged with fulfilling the trust obligations of the United States to the Tribe, holds lands added by accretion to the boundaries of the Cocopah Indian Reservation in trust for the exclusive use and occupancy of the Tribe, such lands being more particularly described as follows:

"Township 9 south, Range 25 west of the Gila and Salt River Meridian, Arizona:

Section 25

Lots 9, 10, 11, 12, 13, 14, 15, 16, 17, 24, 25, 26, 27, 28 and that portion of lot 29 lying north of a westerly extension of the south line of lot 17;

Section 26

Lots 2, 3, 4, 5, 6, 7, 8, 9, 10 and 11;

Section 27

Lots 1 and 2

containing 883.53 acres more or less, plus all accretion to the above described lands.

Excepting from said exclusive use and occupancy by the Tribe, the rights reserved by Presidential Proclamation of May 27, 1907 (35 Stat. 2136) and the rights of the United States of America in its general proprietary and governmental capacity to the non-exclusive use of the lands, as described on drawings Nos. 423-303-1968, 423-303-1969 and 423-303-1972, attached hereto and designated as Exhibit A, for the sole purpose of maintaining and using two existing levees and existing railroad facilities located on said lands. The correlative rights of the United States of America

and the Tribe with respect to the lands described in Exhibit A, apart from those rights arising out of the reservation status of these lands, shall be governed by the law applicable to the dominant and servient estates respectively in the case of easements, the Tribe and its members having the right to use and occupy said lands in any manner and for any purpose authorized by law which does not prevent or interfere with the rights of the United States of America to maintain and use said levees and railroad facilities. Such use and occupancy by the Tribe shall include, but shall not be limited to, agricultural use."

3. The court declares that the Tribe and its members are entitled to occupy, use and enjoy lands added by accretion to the boundaries of the Cocopah Indian Reservation, such lands being more specifically described in paragraph No. 2, above, to the same extent and manner as they are entitled to the use and occupancy of other lands included within the boundaries of the Reservation.

4. The "Yuma Valley Levee", as described in relevant part in the attached Exhibit A, was constructed by the Secretary in approximately 1950. Part of the Yuma Valley Levee was constructed on the accretion land described in Section 2, above. The tribe has received no payments or compensation from the United States or anyone else for the use and occupancy by persons other than the tribe or its members of those lands described in Section 2 above.

Dated this 12th day of May, 1975.

United States District Judge

Colorado River
Benson Line & Riverside Mountain

UNITED STATES
DEPARTMENT OF THE INTERIOR
OFFICE OF THE SECRETARY
WASHINGTON, D.C. 20240

JAN 17 1969

Memorandum

To: Director, Bureau of Land Management
Through: Assistant Secretary, Public Land Management

From: Secretary of the Interior

Subject: Western boundary of the Colorado River Indian Reservation from the top of Riverside Mountain, California, through section 12, T. 5 S., R. 23 E., S.B.M., California

I have this date received a memorandum from the Solicitor regarding the proper location of the boundary of the Colorado River Indian Reservation in the subject reach. A copy of his memorandum is attached. Acting upon the conclusions expressed in the memorandum, I have determined that certain surveys of record in your Bureau should be suspended and other surveys reinstated so as to correctly show the interest of the Colorado River Indian Tribes in certain lands.

The presently monumented boundary of the reservation in the reach between Riverside Mountain and the Colorado River is shown on the plat of survey for T. 2 S., R. 23 E., S.B.M., approved November 20, 1913. I have concluded that this survey did not correctly locate the boundary line in this reach because it did not conform to the call of the Executive Order of May 15, 1876, that the boundary should be a direct line from the top of Riverside Mountain, California, toward the place of beginning to the west bank of the Colorado River. I have determined that the above-mentioned plat of survey should be suspended. The proper position of the reservation boundary should be a line from the highest point on Riverside Mountain to the meander corner common to fractional sections 25 and 36, T. 2 S., R. 23 E., S.B.M., as shown on the plat of survey of this township approved May 22, 1879, and reestablished by the dependent resurvey of the same township reflected on the plat of survey accepted July 22, 1958.

I have also determined that the proper location of the reservation boundary from section 25, T. 2 S., R. 23 E., S.B.M., through section 12, T. 5 S., R. 23 E., S.B.M., is along the meander lines shown on the plats of survey in Tps. 2, 3 and 4 S., R. 23 E., S.B.M., approved May 22, 1879, and T. 5 S., R. 23 E., S.B.M., approved December 28, 1874, all as reestablished by the dependent resurvey of these townships reflected on the plats of survey accepted July 22, 1958.

In 1961, accretion surveys of lands now lying between the aforementioned meander lines of 1874 and 1879 and the west bank of the Colorado River were undertaken in Tps. 3 and 4 S., R. 23 E., S.B.M., and T. 5 S., Rs. 23 and 24 E., S.B.M. Plats thereof were accepted on May 21, 1962. By your letter of January 27, 1964, to the State Director at Sacramento, California, you ordered that the plats of survey in Tps. 3 and 4 S., R. 23 E., S.B.M., be suspended as to the sections 36 in those townships. Thereafter, correction surveys of those sections 36 were undertaken which apportioned to them certain accretion lands. Plats of these correction surveys were accepted on October 28, 1964.

In light of the conclusion that the reservation boundary in the subject reach is along the meander lines established in 1874 and 1879, accretions to this boundary are lands of the United States held in trust for the Colorado River Indian Tribes. Thus the correction surveys, accepted October 28, 1964, apportioning accretion lands to the sections 36 are incorrect and should be suspended. Also the 1962 accretion surveys in Tps. 3 and 4 S., R. 23 E., S.B.M., should be reinstated in their entirety.

Please take such action as may be appropriate to reflect the conclusions herein stated, including suspension and reinstatement of plats. Also please note the official records accordingly so that henceforth such records will indicate the proper location of the boundary of the Colorado River Indian Reservation in the subject

Signed by Steward Udall

Attachment

Fort Yuma Ceded Lands

Office of the Secretary

Quechan Indian Reservation Boundaries; Secretarial Determination and Directives

AGENCY: Department of the Interior.

ACTION: Notice of secretarial determination and directives.

SUMMARY: This is a notice of the determination by the Secretary of the Interior of the boundaries of the Fort Yuma, Quechan Indian Reservation and directives necessitated by that determination.

EFFECTIVE DATE: February 6, 1981.

FOR FURTHER INFORMATION CONTACT: Paul Truesdell, Bureau of Indian Affairs, Trust Protection Unit, Department of the Interior, Room 704, 3030 North Central Avenue, Phoenix, Arizona 85013. Telephone: 241-2310.

SUPPLEMENTARY INFORMATION: On December 20, 1978, the Secretary of the Interior issued a Secretarial decision recognizing the 1884 Executive Order boundary of the Fort Yuma Indian Reservation as modified by the Executive Order of December 19, 1900, as the present reservation boundary. That decision provided for the protection of third-party rights on the Reservation. When the decision was published, a complete list of third-party rights had not been compiled. Third parties were notified and requested to submit claims for valid existing rights. A complete list has now been compiled. The Department of the Interior is, therefore, publishing this Notification of Secretarial Determination and Directives in final form.

Note.—The Department of the Interior has determined that this Notice does not constitute a major federal action significantly affecting the quality of the human environment.

James G. Watt,

Secretary of the Interior.

Secretarial Determination and Directives

Subject: Quechan Indian Reservation Boundaries.

Sec. 1. Solicitor's Opinion

On December 20, 1978 the Solicitor signed an Opinion recognizing that the 1884 Executive Order boundary of the Fort Yuma Indian Reservation, as modified by the Executive Order of December 19, 1900, which revoked the portion of the reservation lying south of the Colorado River in the then Territory of Arizona, still remains the reservation boundary. Said Opinion was approved by the Secretary of the Interior on December 20, 1978. A map entitled "Fort Yuma Indian Reservation 1884-1974, revised September 1974 S.D.T.," depicting the general location of the Reservation boundary today is on file in the office of the Area Director, Arizona Bank Building, 3030 N. Central Avenue, Phoenix, Arizona 85013. The exact location of the Reservation boundary shall be determined hereafter by survey in accordance with the boundaries recognized by this Notice of Secretarial Determination and Directives (Notice).

Sec. 2. Recognition of Trust Status of Lands

Except as hereinafter stated, all lands which prior to December 20, 1978, were managed under the jurisdiction of the Bureau of Land Management or the Bureau of Reclamation [1] and which the map referrd to in Section 1 indicates are within the Fort Yuma Indian Reservation (hereafter referred to as "such lands") are hereby recognized as being held in trust by the United States for the Quechan Tribe of the Fort Yuma Indian Reservation as of January 9, 1884.

Sec. 3. Exceptions and Conditions

The Solicitor's Opinion holds that an 1893 Agreement ratified by an 1894 statute providing for allotment of certain lands on the Fort Yuma Reservation and cession to the United States of other reservation lands was subject to conditions that were never carried out. Although the Solicitor's Opinion holds

[1] In order to maintain consistency with the Secretarial order of December 20, 1978, the Water and Power Resources Service is referred to as the Bureau of Reclamation throughout this notice.

that the cession provided for in the Agreement and statute did not take place, and that Reservation lands which would have been ceded in that statute and which were not later taken pursuant to the 1904 statute, remain in tribal ownership, the Solicitor's Opinion also holds that (1) pursuant to statutes predating 1884, certain valid rights were acquired by third parties that are protected by the Executive Order; (2) pursuant to later statutes, various Reclamation project works were validly constructed on the Reservation; and (3) other valid grants and grants which would have been valid had the lands been public lands were made by agencies of the United States to third parties. Accordingly, reaffirmation and recognition of the Tribe's title in such lands is subject to the exceptions and conditions set forth in this Section 3.

a. There is hereby excepted from the provisions and effect of Section 2 herein all rights of third parties created by or pursuant to Acts of Congress including but not limited to the Act of July 26, 1866, 14 Stat. 289, and the Act of March 3, 1871, 16 Stat. 573, and predating the Executive Order establishing the Reservation in 1884.

b. All rights of third parties to such lands within the now-recognized reservation boundaries which were established pursuant to law prior to December 20, 1978, including but not limited to existing permits, leases, rights-of-way and other non-fee rights and interests, including those generally described in subparagraphs (1)-(44) following (and more particularly described in the cited instruments):

(1) LDR Contracts Nos. 14-06-303-3736, -3737, -3738, -3739, -3740, -3741, -3742, -3743, -3744, -3745, -3746 and -3747, all dated January 1, 1977, consisting of leases for agricultural purposes to various individuals and corporations.

(2) LDR Contract No. 7-07-34-L0026 dated April 15, 1977, issued to Ned Foss for livestock grazing and feeding purposes.

(3) Bureau of Land Management Agricultural Permits, BLM Serial Nos. 1C-1(A), 1C-2(A), 1C-3(A), 1C-5(A), 2C-3(A), 2C-4(A), 2C-5(A), 2C-6(A), 2C-9(A), 2C-14(A), 2C-15(A), 2C-32(A), 2C-35(A), 2C-37(A).

(4) Bureau of Land Management Temporary Residential Permits, BLM Serial Nos. 1C-9(R), 2C-38(R), 2C-41(R), 2C-42(R), 2C-43(R), 2C-44(R), 2C-45(R), 2C-46(R), 2C-48(R), 2C-51(R), 2C-58(R), 2C-CM-4(R), 2C-CM-5(R), 2C-LD-5.

(5) LDR Contract No. 14-06-300-960 issued to California Electric and Power Company on October 6, 1959, for a transmission line.

(6) LDR Contract No. 14-06-303-1030, executed December 5, 1957, and 14-06-303-1412, executed May 9, 1958, consisting of licenses issued to the Pacific Telephone and Telegraph Company for telephone and telegraph line rights-of-way within and across Bureau of Reclamation levee and canal rights-of-way.

(7) LDR unnumbered contract issued April 5, 1961, for an indefinite period, consisting of license issued to Pacific Telephone and Telegraph for a public phone booth.

(8) LDR Contract Nos. 14-06-303-1119, -1120, -1122, executed July 3, 1956, consisting of licenses issued to Southern Pacific Pipelines, Inc., for a petroleum products pipeline right-of-way within and across Bureau of Reclamation canal lateral and drain rights-of-way.

(9) LDR Contract Nos. I-24-R-635, I-24-R-678, dated June 4, 1951, issued to Imperial County for the removal of sand, gravel and road materials.

(10) LDR No. 7-07-34-L0068, dated September 21, 1977, consisting of a license issued to the County of Imperial, California, for a refuse disposal dump.

(11) LDR Contract No. 14-06-300-2283, issued to the State of Arizona for fish and wildlife management at Mittery Lake.

(12) LDR No. 14-06-303-3748, dated January 1, 1977, consisting of a lease to Gladys Reynolds, for a mobile home park.

(13) BLM Permit No. R03272 for a right-of-way for Upper and Lower Reservation levees, issued May 31, 1963, pursuant to § 4(p) of the Act of December 5, 1924 (43 Stat. 7042; 43 U.S.C. § 417).

(14) BLM Permit No. R1278 for a right-

of-way for a drainage ditch, issued December 19, 1968, pursuant to § 4(p) of the Act of December 5, 1924 (43 Stat. 704).

(15) BLM Serial No. R05051 right-of-way as specified in BLM decision of August 25, 1964, for a transmission line.

(16) BLM Permit No. LA077775 for a right-of-way for the All-American Canal including appurtenant structures and operating telephone line, issued pursuant to § 4(p) of the Act of December 5, 1924 (43 Stat. 704; 43 U.S.C. § 417).

(17) BLM Permit No. LA055165 for a right-of-way for "Gila drop #4" power transmission line and access road, approved July 23, 1942, pursuant to Act of December 5, 1924 (43 Stat. 672); amended May 19, 1971.

(18) BLM Permit Nos. 732756KELV, 75022–07 and 12271–22 issued to various denominations as mission sites by Departmental Authority of June 8, 1921.

(19) BLM Serial No. LA0164553, right-of-way grant to Imperial Irrigation District, as specified in BLM decision of August 13, 1964, for an electrical transmission line.

(20) BLM Serial No. R2331, right-of-way granted to the California Division of Highways, as specified in BLM decision of June 2, 1970, as amended April 25, 1973, and May 29, 1975, for Interstate Route 8.

(21) BLM Serial No. LA0153552, right-of-way granted to Southern Pacific Pipe Lines, Inc., as specified in BLM decision of December 16, 1930, for a highway.

(22) BLM Serial No. LA0164552, right-of-way grant to the Imperial Irrigation District, as specified in BLM decision of November 10, 1960, as amended December 5, 1960, for an electric transmission line.

(23) BLM Serial No. S3484, right-of-way grant to the Southern Pacific Transportation Company, approved February 10, 1910.

(24) BLM Serial No. S3480, right-of-way grant to the Southern Pacific Railroad, approved December 18, 1928, for station grounds.

(25) BLM Serial No. S3450, right-of-way grant to the Southern Pacific Railroad, approved June 18, 1907.

(26) BLM Serial No. S3441, amended right-of-way grant to the California Highway Commission approved October 10, 1927, for a highway.

(27) BLM Serial No. R2704, right-of-way granted to the Supervisors of Imperial County and the State of California, approved on October 24, 1930, noted in General Land Office letter 1396492 "F" HIC of December 16, 1930, for a highway.

(28) BLM Serial No. S3430, right-of-way granted to Southern Pacific Railroad Company by the Act of March 3, 1871, 16 Stat. 573, and confirmed by Section 17 of the Act of August 15, 1894, 28 Stat. 335, for a railroad.

(29) BLM Serial No. R0329, right-of-way grant to the Imperial Irrigation District, as specified in BLM decision of April 9, 1962, for Imperial Laguna Drain No. 2.

(30) BLM Serial No. S3490, right-of-way, approved August 12, 1930, under Act of April 21, 1904 (33 Stat. 224), for transmission line.

(31) BLM Serial No. LA050409, right-of-way, approved July 26, 1932, to the California Highway Commission for relocation of an irrigation canal.

(32) BLM Serial No. CA2720, right-of-way, issued August 1, 1975, to the Imperial Irrigation district for electric distribution line.

(33) BLM Serial No. LA051577, right-of-way, approved March 15, 1934, to the Southern California Telephone and Telegraph Company for a telephone line.

(34) BLM Serial No. R01909, right-of-way, approved October 12, 1955, under Act of February 4, 1948, 25 CFR 250, for Drain Line No. 9.

(35) BLM Serial No. R551, right-of-way, noted on April 17, 1967, under Act of December 5, 1924 (43 Stat. 704; 43 U.S.C. § 417), for Upper Reservation Levee, as amended February 28, 1973.

(36) BLM Serial No. LA039464, approved August 24, 1939, to Imperial Irrigation District for a power transmission facility.

(37) BLM Serial No. R137, right-of-way grant to the State of California, Division of Highways, approved by decision of February 7, 1969, for Interstate Highway 8.

(38) LBR Contract Nos. 14–06–303–623, executed April 16, 1954, and 14–06–303–1435, executed August 18, 1958, consisting of easements granted to the County of Imperial for roadway and bridge rights-of-way across LBR Canal and drain rights-of-way.

(39) LBR Contract No. 14–06–303–2083, executed December 22, 1967, consisting of a license issued to the County of Imperial for use and maintenance of road crossings on certain structures across the All-American Canal.

(40) LBR Contract No. 14–06–303–2788, executed February 26, 1970, granting to the State of California the right to construct, reconstruct, operate and maintain highway bridges and a highway across the right-of-way reserved for the All-American Canal.

(41) LBR Contract No. 14–06–300–149, consisting of an easement granted to the Imperial Irrigation District on February 19, 1954, (BLM Serial No. R 01908) for the Pilot Knob Power Plant.

(42) BLM Serial No. LA046474, right-of-way to the Imperial Irrigation District, approved December 8, 1930, for poles and transmission line.

(43) 60-foot wide easement along the International boundary reserved by Presidential Proclamation of May 27, 1907, for purposes of patrol and inspection by the United States Immigration and Naturalization Service.

(44) Two powerline extensions into Section 29, T.16S., R.22E. SRM authorized by the March 13, 1967, and April 1, 1966 letters from the Lower Colorado River Land Use Office to cover electric distribution lines to pumps on BLM agricultural permits 1C–1(A) and 1C–3(A).

c. There is hereby excepted from the provisions and effect of Section 2 hereof all rights and interests in lands in the so-called Bard area, including non-contiguous parcels, opened to private settlement pursuant to Section 25 of the Act of April 21, 1904 (33 Stat. 189, 224), including all lands in the Bard area heretofore patented prior to December 20, 1970 pursuant to the Reclamation Law of 1902 and acts amendatory and supplementary thereto and the Act of March 31, 1950, 64 Stat. 39.

As to all rights-of-way listed above which are not on lands listed in Paragraph d of this Section as fee lands of the United States not held in trust for the Quechan Tribe and which were issued under the assumption that the lands involved were not Indian lands, I hereby grant a right-of-way pursuant to the authority vested in me by the Acts of February 5, 1948, 62 Stat. 17, 25 U.S.C. 323–28, each such grant being for the unexpired term of the original grant and subject to precisely the same terms and conditions as contained in the original grant. The Tribe has given its consent to these grants in Resolution R–19–77 dated September 29, 1977, and Resolution R–1–81 dated January 13, 1981, and pursuant to 25 CFR 1.2, I hereby waive the requirements of 25 CFR part 161 pertaining to these rights-of-way, since I find that such waiver is in the best interest of the Quechan Tribe.

As to all other permits, leases and other non-fee rights and interests listed above which are not on lands listed in Paragraph d of this Section as fee lands of the United States not held in trust for the Quechan Tribe, and which were issued under the assumption that the lands involved were not Indian lands, the Tribe has authorized and consented to issuance of such permits, leases and other non-fee rights and interests in Tribal Resolution R–19–77 dated September 29, 1977, and Tribal resolution R–1–81 dated January 13, 1981, and I hereby approve the same, pursuant to authority contained in the Act of May 11, 1938, c. 198, Section 1, 52 Stat. 347, 25 U.S.C. 396a, the Act of August 15, 1894, c. 290, Section 1, 28 Stat. 305, 25 U.S.C. § 402, the Act of July 3, 1926, c. 787, 44 Stat. 894, 25 U.S.C. 402a, and the Act of August 9, 1955, c. 615, Section 1, 69 Stat. 539, 25 U.S.C. 415, and each such permit, lease or other right or interest being for the unexpired term and subject to precisely the same terms and conditions specified in the original instrument. Pursuant to 25 CFR 1.2, I hereby waive the requirements of 25 CFR Parts 131, 151 and 171 pertaining to these permits, leases and other rights and interests since I find that such

waiver is in the best interest of the Quechan Tribe.

d. There is hereby excepted from the provisions and effect of Section 2 hereof, fee title in the United States without being held in trust for the Quechan Tribe to the works and appurtenances, including but not limited to the works described in the following subparagraphs 1 through 10, constructed pursuant to Congressional authorization, including the Reclamation Act of June 17, 1902 (32 Stat. 388), acts amendatory and supplementary thereto, and the Boulder Canyon Project Act of December 21, 1928 (45 Stat. 1057), and fee title in the United States, without being held in trust for the Quechan Tribe, to lands occupied by all of said works and appurtenances, and there is also reserved the right of the United States, its licensees and contractors, to operate, maintain, and reconstruct said works and appurtenances, including but not limited to:

(1) *The All-American Canal*, and all appurtenances (including, but not limited to, the Pilot Knob Checkdam and Wasteway back to the Colorado River) as generally shown on Drawing No. 35–300–48 dated February 1968, and Drawing No. 35303–2127 dated June 5, 1967, on file at the Bureau of Indian Affairs, Phoenix Area Realty Property Management Branch and incorporated herein by reference.

(2) *Laguna Dam Protection and Security Zone*, as shown on Drawing No. 423–300–704 dated June 6, 1972, on file at the Bureau of Indian Affairs, Phoenix Area Real Property Management Branch and incorporated herein by reference.

(3) *Laguna Settling Basin, Sediment Disposal Area and Security Zone*, as shown and named as "Channel" and most of the "Wildlife Area" on the above Drawing No. 423–300–704.

(4) *Yuma Main Canal, California Wasteway, and Colorado River Siphon.* The general location of the Yuma Main Canal and California Wasteway as shown and named on the above Drawing No. 35–300–48. The Siphon under the Colorado River is identified as "Siphon" on Drawing No. 212–303–1100, dated March 14, 1944, on file at the Bureau of Indian Affairs, Phoenix Area Real Property Management Branch and incorporated herein by reference.

(5) *Detention Reservoir Opposite Wash Overpasses on All-American Canal.* At present, there is only one area defined as a "Detention Reservoir," that being the Detention Reservoir as shown on the above Drawing No. 35–303–2127, basically existing below the All-American Canal. This reservoir is erroneously depicted as being part of the patented Bard area on the map referred to in Section 1 hereof.

(6) *Upper and Lower Reservation and Levees.* The locations of the Upper and Lower Protective Levees shown on Drawing No. 35–300–48; however, the Upper Levee is denoted only as "Reservation Levee." Both levees are properly denoted on the above Drawing No. 35–303–2127.

(7) *Old Yuma Main Canal.* The general location of this facility, a large portion of which is utilized as an interceptor drain, is shown on the above Drawing No. 212–303–1100.

(8) *Irrigation Canals and Laterals in Reservation Division Yuma Project.* Drawings Nos. 35–3–303–127 and 35–300–48 above show these irrigation facilities.

(9) *All Drainage Channels as Presently Exist.* Drawings Nos. 35–303–2127 and 35–300–48 above, indicate these facilities.

(10) *Siphon Drop and Pilot Knob Power Plants together with existing Related Transmission Lines and Appurtenances.* Both the Siphon Drop and Pilot Knob Power Plant locations as shown on the above Drawing No. 35–300–48, respectively named "Siphon Drop Power Plant" and "Pilot Knob Plant." In both cases, related facilities and appurtenances such as the Pilot Knob Drop, residences, other buildings, and related transmission lines and communication lines are not identified on any drawing.

(11) *Well Clusters.* Several well clusters are placed along the Colorado River Flood Plain in conjunction with the U.S. Geological Survey, the purpose of which is a study to measure return flows. There is no reproducible drawing that would show as a composite the

locations. The general locations are shown by "blue" lines on the above Drawing No. 35–300–48.

(12) *Parker-Davis 161-Kv Transmission Line.* This line traverses the area from its crossing of the Colorado River westerly to the Pilot Knob Substation. The location is shown on the above Drawing No. 35–300–48.

(13) *Boundary Pumping Plant 34.5-Kv Transmission Line.* This line interties the Valley Division's boundary pumping plant, the Yuma County Water Users' Association Headquarters Building, California Wasteway, Siphon Drop, and Imperial Dam, and is shown on the above Drawing No. 35–300–48.

(14) *Interconnecting Telephone Electrical, and Remote Control Lines to Project Features.* These features, which are appurtenances to other project facilities, are not contained on any drawings but are largely within rights-of-way of other project features.

(15) *Senator Wash Dam 69-Kv Transmission Line.* Location shown on the above Drawing No. 35–300–38.

(16) *Collector Line (South Gila Drainage).* Location shown on Drawing No. 35–300–48 by "blue" pencil line extending from the Colorado River to South Gila Levee.

(17) *South Gila Levee (including Main Outlet Drain Extension).* Location shown by Drawing No. 35–300–48 as revised in ink to show now existing conditions resulting from installation of a siphon to replace the earlier flume.

(18) *Gauging Station.* Location shown by "blue" pencil mark below the letters "ol" in the word "seminole" on Drawing No. 35–300–48, below the Winterhaven townsite, including access road to cable gauging station in Section 27, T.16S, R 22 E. SBM California.

Provided, however, that should any of the above works and rights-of-way (excepting the works described in subparagraphs (1), (4), and (10) hereto), be abandoned or cease to be used in connection with authorized Reclamation projects by the United States as determined in writing by the Secretary of the Interior equitable title thereto shall revert to the Tribe. In all instances where the Tribe owns equitable title to all lands immediately adjoining said works. A survey of the locations and extent of the areas occupied by the works and rights-of-way referred to above and the material sites referred to in paragraph 7 below will be made as promptly as possible by the United States without cost to the Tribe, and the results of that survey shall be reported to the Tribe, with any dispute referred to the Secretary for resolution.

e. There is hereby reserved to the United States, its officers, agents, employees, contractors, patentees, licensees, and holders of other rights, the right of ingress to, passage over and egress from such lands over existing or relocated roadways at all times for the purpose of exercising the rights specified in this Order and for all lawful purposes in connection with the maintenance and operation of all Reclamation works: *Provided, however,* That new roadways will not be constructed on reservation lands without consent of the Tribe, and that existing roadways may be relocated by the Tribe at its own expense so long as their adequacy for the purpose served by the original roadway is approved by the agency or organization using the roadway to the relocation of the roadway.

f. The Tribe's equitable title to such lands within the flood plain of the Colorado River, including Laguna Dam South Recreational Area, shall be subject to the rights of the United States under the Act of June 28, 1948, 60 Stat 336. The Tribe shall not construct or install or permit the construction or installation of any permanent improvements of such lands within the flood plain or floodway, as shown by "red" coloring on Drawing No. 423–300–1036 (Bureau of Reclamation, Flood Plain Information—Colorado River-Imperial Dam to San Luis, Plate 3 (August 1973)), on file at the Bureau of Indian Affairs, Phoenix Area Branch of Real Property Management and incorporated herein by reference, nor will the Tribe permit said lands to be used in any manner inconsistent, with or contrary to, the purpose or intent of Executive Order No. 11908.

g. There is hereby reserved to the United States the right to continue in

exclusive possession of all presently used material sites located within the now recognized reservation boundaries, of sand, gravel, fill, clay and rock to the extent reasonably necessary for operation and maintenance of its project works; *Provided, however,* That the sites are abandoned or the use thereof is changed in any substantial manner by the United States, possession shall revert to the Tribe at its option. *Provided, further,* That the United States shall pay to the Tribe fair market value of any and all materials removed from these sites from and after the date of this Order, and shall make regular periodic reports to the Tribe concerning the value of all materials removed.

Sec. 4. Miscellaneous Provisions

a. Nothing contained herein shall prevent the Tribe from recovering whatever compensation it may be determined is appropriate in any proceeding now pending or hereafter brought against the United States for past use of such lands.

b. The Quechan Tribe has agreed, pursuant to Tribal Resolution #R-1-81 dated January 13, 1981, to relinquish any claim for damages it might have for trespass against third parties who acquired rights-of-way across such lands from the United States under the assumption that such lands were not Indian lands.

c. Any claim for water rights in addition to that amount presently enjoyed under *Arizona* v. *California*, asserted in relation to such lands, will be predicated only upon the criteria heretofore employed in *Arizona* v. *California*.

c. The Order determines the respective interests to such lands of the United States and the Quechan Tribe, subject to the provisions of Section 3 of this Order. This Order does not affect any claim of the State of Arizona or the State of California or any successor of interest thereof may have to such lands.

d. All agencies of the Department are hereby directed promptly to take all necessary steps to implement the Opinion of the Solicitor and the terms of this Notice of Secretarial Determination and Directives.

Dated: January 30, 1981.

James G. Watt,

Secretary of the Interior.

[FR Doc. 81-4128 Filed 2-3-81; 8:45 am]

BILLING CODE 4310-02-M

APPENDIX 2

Payment Capacity Analyses

TABLE I

ALMONDS

Yield = 2000 lbs/acre (in shell)
Price = 76¢ lb. (in shell)
(1977-1979 Average)
Pre-Harvest and Harvest Costs reduced to 1979 level
Interest = 10%

Year	1	2	3	4	5	6	7	8	9	10
Yield - lbs. per acres	-	-	-	800	1310	1600	1850	2000	2000	2000
Gross Income at 76¢/lb.	-	-	-	608	996	1216	1406	1520	1520	1520
Pre-Harvest Cost	745	173	261	374	392	392	392	392	392	392
Depreciation	76	76	76	76	76	76	76	76	76	76
Interest on Investment at 10%										
Irrigation System	57	57	57	57	57	57	57	57	57	57
Building, Equipment & Tractor	10	10	10	10	10	10	10	10	10	10
Interest on Accumulated Net Cost	-	124	202	298	361	399	420	425	420	414
Total Interest	67	191	269	365	428	466	487	492	487	481
Harvest Cost	-	-	-	79	130	151	157	160	160	160
Payment Capacity	347	347	347	347	347	347	347	347	347	347
Total Annual Cost	1235	787	953	1241	1373	1432	1459	1467	1462	1456
Net Annual Cost or (Profit)	1235	787	953	633	377	216	53	(53)	(58)	(64)
Accumulated Net Cost or (Profit)	1235	2022	2975	3608	3985	4201	4254	4201	4143	4079

11	12	13	14	15	16	17	18	19	20
2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
1520	1520	1520	1520	1520	1520	1520	1520	1520	1520
392	392	392	392	392	392	392	392	392	392
76	76	76	76	76	76	76	76	76	76
57	57	57	57	57	57	57	57	57	57
10	10	10	10	10	10	10	10	10	10
408	401	393	385	375	365	354	341	328	313
475	468	460	452	442	432	421	408	395	380
160	160	160	160	160	160	160	160	160	160
347	347	347	347	347	347	347	347	347	347
1450	1443	1435	1427	1417	1407	1396	1383	1370	1355
(70)	(77)	(85)	(93)	(103)	(113)	(124)	(137)	(150)	(165)
4009	3932	3847	3754	3651	3538	3414	3277	3127	2962

21	22	23	24	25	26	27	28	29	30
2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
1520	1520	1520	1520	1520	1520	1520	1520	1520	1520
392	392	392	392	392	392	392	392	392	392
76	76	76	76	76	76	76	76	76	76
57	57	57	57	57	57	57	57	57	57
10	10	10	10	10	10	10	10	10	10
296	278	258	236	212	185	156	124	88	49
363	345	325	303	279	252	223	191	155	116
160	160	160	160	160	160	160	160	160	160
347	347	347	347	347	347	347	347	347	347
1338	1320	1300	1278	1254	1227	1198	1166	1130	1091
(182)	(200)	(220)	(242)	(266)	(293)	(322)	(354)	(390)	(429)
2780	2580	2360	2118	1852	1559	1237	883	493	64

TABLE 2

ALMONDS

Different method of computation.
Reaches same payment capacity as
in Table 1

Year	1	2	3	4	5	6	7	8	9	10
Yield - lbs, per acre	-	-	-	800	1310	1600	1850	2000	2000	2000
Gross Income at 76¢/lb.	-	-	-	608	996	1216	1406	1520	1520	1520
Pre-Harvest Cost	745	173	261	374	392	392	392	392	392	392
Depreciation	76	76	76	76	76	76	76	76	76	76
Increase on investment at 10%										
Irrigation System	57	57	57	57	57	57	57	57	57	57
Building, Equipment & Tractor	10	10	10	10	10	10	10	10	10	10
Interest on Accumulated Net Cost	-	89	129	183	200	187	152	96	23	-
Total Interest	67	156	196	250	267	254	219	163	90	67
Harvest Cost	-	-	-	79	130	151	157	160	160	160
Total Annual Cost	888	405	533	779	865	873	844	791	718	695
Net Annual Cost or (Profit)	888	405	533	171	(131)	(343)	(562)	(729)	(802)	(825)
Accumulated Net Cost or (Profit)	888	1293	1826	1997	1866	1523	961	232	(570)	(1395)

		30
	. . .	2000
	. . .	1520
	. . .	392
	. . .	76
	. . .	57
	. . .	10
	. . .	-
		67
	. . .	160
	. . .	695
	. . .	(825)
	. . .	(17895)

Net Cash Flows:

Year 9 = $570

Years 10-30 = $825/yr

Present Value of $825 received in years 10-30 is:

$825 x 8.6487 x .4241 = $3026

Present Value of $570 received in year 9 is:

$570 x .4241 = $241.74

Present Value of All Cash Flows is:

$3026 + $242 = $3268

Annualized Amount over 30 years $\frac{\$3268}{9.4269} = \$\ 347$

Annual Payment Capacity $ 347

TABLE 3

FIGS

Yield = 1.94 tons/acre
Price = $730 (1975-79)
Pre-Harvest and Harvest Costs Reduced to 1979 Level and
Harvest Costs Prorated Based on Yield
Interest = 10%

Year	1	2	3	4	5	6	7	8	9	10
Yield - tons per acre (dry)	-	-	-	.2	.5	.8	1.3	1.7	1.94	1.94
Gross Income - $730 per ton (dry)	-	-	-	146	365	584	949	1241	1416	1416
Pre-Harvest Cost	970	185	236	303	332	332	332	332	332	332
Depreciation	93	93	93	93	93	93	93	93	93	93
Interest on Investment at 10%										
Irrigation System	57	57	57	57	57	57	57	57	57	57
Building, Equipment & Tractor	18	18	18	18	18	18	18	18	18	18
Interest on Accumulated Net Cost	-	114	161	217	275	324	361	375	367	346
Total Interest	75	189	236	292	350	399	436	450	442	421
Harvest Cost	-	-	-	34	80	137	229	286	332	332
Total Annual Cost	1138	467	565	722	855	961	1090	1161	1199	1178
Net Annual Cost or (Profit)	1138	467	565	576	490	377	141	(80)	(217)	(238)
Accumulated Net Cost or (Profit)	1138	1605	2170	2746	3236	3613	3754	3674	3457	3219

11	12	13	14	15	16	17	18	19	20	. . .	30
1.94	1.94	1.94	1.94	1.94	1.94	1.94	1.94	1.94	1.94	. . .	1.94
1416	1416	1416	1416	1416	1416	1416	1416	1416	1416	. . .	1416
332	332	332	332	332	332	332	332	332	332	. . .	332
93	93	93	93	93	93	93	93	93	93	. . .	93
57	57	57	57	57	57	57	57	57	57	. . .	57
18	18	18	18	18	18	18	18	18	18	. . .	18
322	296	267	235	200	162	120	73	22	-	. . .	-
397	370	342	310	275	237	195	148	97	75	. . .	75
332	332	332	332	332	332	332	332	332	332	. . .	332
1154	1127	1099	1067	1032	994	952	905	854	832	. . .	832
(262)	(289)	(317)	(349)	(384)	(422)	(464)	(511)	(562)	(584)	. . .	(584)
2957	2668	2351	2002	1618	1196	732	221	(341)	(925)	. . .	(6765)

Cash Flows:

$341 in year 19
$584 in each of years 20-30

Present Value of $341 received in year 19 is:

$341 x .1635 = $56

Present Value of $584 received in years 20-30 is:

$584 x 6.4951 x .1635 = $620

Present value of both cash flows is:

$676 = $620 + $56

Annualized Amount over 30 years:

$$\frac{\$676}{9.4269} = \$71.7$$

TABLE 4

FIGS WITH 1/4 YIELD EXPOSED TO RAIN
(at 7¢ per lb.)

Year	1	2	3	4	5	6	7	8	9	10
Yield - tons per acre (dry)	-	-	-	.2	.5	.8	1.3	1.7	1.94	1.94
Gross Income - $730 per ton (dry)	-	-	-	146	365	584	949	1241	1416	1416
Rain Expenses	-	-	-	7	17	28	45	59	68	68
Revenue	-	-	-	139	348	556	904	1182	1348	1348
Pre-Harvest Cost	970	185	236	303	332	332	332	332	332	332
Depreciation	93	93	93	93	93	93	93	93	93	93
Interest on Investment at 10%										
Irrigation System	57	57	57	57	57	57	57	57	57	57
Building, Equipment & Tractor	18	18	18	18	18	18	18	18	18	18
Interest on Accumulated Net Cost	-	114	161	217	275	326	367	386	385	372
Total Interest	75	189	236	292	350	401	442	461	460	447
Harvest Cost	-	-	-	34	80	137	229	286	332	332
Total Annual Cost	1138	467	565	722	855	963	1096	1172	1217	1204
Net Annual Cost or (Profit)	1138	467	565	583	507	407	192	(10)	(131)	(144)
Accumulated Net Cost or (Profit)	1138	1605	2170	2753	3260	3667	3859	3849	3718	3574

11	12	13	14	15	16	17	18	19	20
1.94	1.94	1.94	1.94	1.94	1.94	1.94	1.94	1.94	1.94
1416	1416	1416	1416	1416	1416	1416	1416	1416	1416
68	68	68	68	68	68	68	68	68	68
1348	1348	1348	1348	1348	1348	1348	1348	1348	1348
332	332	332	332	332	332	332	332	332	332
93	93	93	93	93	93	93	93	93	93
57	57	57	57	57	57	57	57	57	57
18	18	18	18	18	18	18	18	18	18
357	342	324	305	284	260	235	207	176	142
432	417	399	380	359	335	310	282	251	217
332	332	332	332	332	332	332	332	332	332
1189	1174	1156	1137	1116	1092	1067	1039	1008	974
(159)	(174)	(192)	(211)	(232)	(256)	(281)	(309)	(340)	(374)
3415	3241	3049	2838	2606	2350	2069	1760	1420	1046

21	22	23	24	. . .	30
1.94	1.94	1.94	1.94	. . .	1.94
1416	1416	1416	1416	. . .	1416
68	68	68	68	. . .	68
1348	1348	1348	1348	. . .	1348
332	332	332	332	. . .	332
93	93	93	93	. . .	93
57	57	57	57	. . .	57
18	18	18	18	. . .	18
105	64	18	-	. . .	-
180	139	93	75	. . .	75
332	332	332	332	. . .	332
937	896	850	832	. . .	832
(411)	(452)	(498)	(516)	. . .	(516)
635	183	(315)	(831)	. . .	(3927)

Cash Flows:

$315 in year 23
$516 in each of years 24-30

Present Value of $319 received in year 23 is:

$315 x 0.1117 = $35

Present Value of $516 received in years 25-30 is:

$516 x 4.8684 x 0.1117 = $281

Present Value of All Cash Flows:

$35 + 281 = $316

Annualized Amount over 30 years:

$\frac{\$316}{9.4269} = \$34$