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UNITED STATES RECLAMATION POLICY AND INDIAN WATER RIGHTS

H. S. BURNES, R. G. CUMMINGS,
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I. INTRODUCTION

A major issue in the many suits concerning Indian water rights is the meaning of the expression "practicably irrigable acreage." In 1908 the landmark case of *Winters v. United States*¹ held that there was an implied reservation of water with every reservation of Indian land. The practicably irrigable acreage rule was established in *Arizona v. California*² in 1963 when the United States Supreme Court decided that the water reserved to an Indian tribe be quantified by the amount of the practicably irrigable acreage on the reservation. Unfortunately, neither case specifies how practicably irrigable acreage might be quantified. The definition of irrigable acreage is clear enough but "practicably" can mean different things to different people.

In the evaluation of water reclamation projects, a concept suggestive of practicality has been widely used for several decades. This concept is referred to as "feasibility," and an appreciation for the evolution of the feasibility concept, as well as the evolution of methods used for demonstrating the feasibility of a water reclamation project, may be of interest to legal experts and other scholars in their search for ways to make the practicably irrigable acreage criterion operational.

This paper traces the evolution of United States reclamation policy since its inception in the late 1800s and the ramifications of these policies for the determination of feasibility for proposed reclamation projects. We wish to make clear that no pretense is intended

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1. 207 U.S. 564 (1908).

2. 373 U.S. 546, 601 (1963). The evidentiary trial before the special master was concluded on August 28, 1958, and the master's report was received by the Court on January 16, 1961. 373 U.S. at 551.

here for defining practicably irrigable acreage. If the courts should equate practicability with feasibility, however, we are suggesting how practicability would be demonstrated consistent with the methods used by agencies of the federal government in demonstrating project feasibility.

II. THE FORMULATION OF UNITED STATES RECLAMATION POLICY: 1877-1939³

Water reclamation policy in the United States, particularly as it relates to irrigated agriculture, may be viewed as beginning with the Desert Land Act passed by Congress in 1877.⁴ In passing this act, the intent of Congress was to encourage the development of irrigated agriculture by providing water rights and land at a modest price (25 cents per acre).⁵ Such development proceeded very slowly, however, apparently due to the relatively high cost involved in establishing irrigation systems. Congress passed the Reclamation Act of 1902⁶ wherein a reclamation fund was established through the sale of public lands. This fund was to be used as a source for loans to farmers primarily for irrigation development. The loans were to be repaid by farmers in annual interest-free installments, with repayments in turn being used to finance future projects. Costs were to be borne by those who benefited, and the initial repayment period was set at 10 years. Thus, in the early stages of U.S. reclamation history, a feasible project was one wherein all project costs were paid by beneficiaries of the project.

The Reclamation Act of 1902 became the legislative cornerstone for the nation's reclamation objectives; it unambiguously emphasized the primary congressional objective of encouraging development of arid western land.⁷ To administer the act, the Reclamation Service

3. As will be apparent in the pages that follow, our goal is to develop this review around the theme of agricultural repayment of reclamation "loans" and farmers' "ability to pay." An excellent and more general treatise developed along social, economic, and political lines, as well as national objectives, appears in A. Dickerman, G. Radosevich, & K. Mobe, *Foundations of Federal Reclamation Policy: An Historical Review of Changing Goals and Perspectives* (January 1970) (Department of Economics Report No. NRE-B, Colorado State University, Fort Collins, Colo.) [hereinafter cited as CSU Rep., 1970]. We wish to acknowledge an intellectual debt to these individuals and highly recommend their pioneering work to interested readers.

4. 43 U.S.C. § 321-323 (1976) (originally enacted as Act of March 3, 1877, ch. 107, § 1, 19 Stat. 377). The Act specifically requires as a condition for acquiring water rights that such water is "necessarily used for the purpose of irrigation." 43 U.S.C. § 321 (1976).

5. *Id.*

6. Act of June 17, 1902, ch. 1093, 32 Stat. 388 (codified in scattered sections of 43 U.S.C.).

7. *Id.* § 1 (codified at 43 U.S.C. § 391 (1976)).

was established within the Department of Interior in July 1902, with the implied objective of fostering water reclamation in order to raise income and standards of living for citizens in the West.⁸

Nonetheless, reclamation proceeded slowly in the post-1902 period, partly because of jurisdictional problems and shortage of funds, but largely because farmers could not repay loans for water reclamation. The Reclamation Extension Act of 1914⁹ extended repayment periods for reclamation loans to 20 years, ostensibly because of construction cost overruns, to "create an irrigated empire in the West, providing homes for thousands of citizens."¹⁰

The 1914 act introduced the provision for congressional appropriations to finance reclamation projects.¹¹ Unable to continue construction for water reclamation because of lack of money in the Reclamation Fund, the Reclamation Service received its first annual appropriation from Congress in 1915—an appropriation of \$13,530,000.¹²

The notion that agriculture could pay its own way persisted. However, agricultural development was limited as the funds available for reclamation were insufficient to meet the high capital costs involved; moreover, repayment periods were too short. But these problems were to be alleviated by the 1914 act. Even though the act failed to stimulate the anticipated level of reclamation activity, it served to tie water reclamation in the West to national interest and policy criteria.

The 1915 congressional appropriation notwithstanding, the fund of the Reclamation Service remained inadequate to meet the demand for reclamation projects in the West. Efforts to promote reclamation activities were confounded because farmers failed to meet their contractual obligations. Farmers' inability to pay irrigation charges became particularly serious during the post-World War I depression. At first, Congress attempted to deal with the problem piecemeal, by extending relief for project costs allocated to irrigation in specific reclamation projects.¹³ In May, 1921, a resolution was passed by Congress to allow water to be made available to farmers who were more than one year in arrears for payments of operation and maintenance and allocated construction costs:

In view of the financial stringency and low price of agricultural

8. CSU Rep., 1970, *supra* note 3, at 21.

9. Act of August 13, 1914, ch. 247, 38 Stat. 686 (codified in scattered sections of 43 U.S.C.).

10. See 51 CONG. REC. 13,453 (1915) (Remarks of Rep. Hayden).

11. 43 U.S.C. § 414 (1976).

12. DEP'T OF INTERIOR, 14 ANNUAL REPORT OF THE RECLAMATION SERVICE 333-35 (1915).

13. See, e.g., Act of June 5, 1920, ch. 31, 41 Stat. 1054 (cancelling contracts and releasing liens in the Garden City project in Kansas).

products, the Secretary of the Interior is authorized . . . to furnish irrigation water on Federal irrigation projects during the irrigation season of 1921 to water right . . . entrymen who are in arrears for more than one calendar year. . . .¹⁴

Following this precedent-setting congressional action in 1921, relief to users of irrigation water for reclamation project charges became a pattern. Acts for "Relief of Water Users" continued in 1922, with an act stating that "where an individual water user under a Federal irrigation project . . . is unable to pay a construction charge due . . . in the year 1922 or *prior thereto*, the Secretary of the Interior is authorized to extend the date of payment . . . for a period not to exceed one year. . . ."¹⁵ This act was only one of a number of pieces of legislation, all intended to provide agricultural repayment relief.¹⁶

Thus, from 1919 to 1939, legislation repeatedly refuted the premise seemingly underlying U.S. reclamation policy, namely that irrigated agriculture could pay the full share of the reclamation projects costs allocated to it. In addition to these relief acts, a number of other developments occurred in response to depressed conditions in the agricultural sector and that sector's apparent inability to repay reclamation charges:

14. Pub. Res. of May 17, 1921, ch. 7, 42 Stat. 4.

15. Act of March 31, 1922, ch. 119, 42 Stat. 489 (emphasis added).

16. Others included:

- Act of February 28, 1923, ch. 145, 42 Stat. 1324 (amending the Act of March 31, 1922, *supra* note 15, to allow a two-year extension of payment date);
- Act of May 9, 1924, ch. 150, 43 Stat. 116 (authorizing the Secretary of the Interior to defer payments as may, in his judgment, be necessary);
- Act of May 25, 1926, ch. 383, 44 Stat. 636 (authorizing the Secretary of the Interior to make adjustment of water-right charges in specified projects);
- Act of February 6, 1931, ch. 111, 46 Stat. 1064 (suspending for two years the annual payments required to be made from the reclamation fund to the general funds in the Treasury);
- Act of April 1, 1932, ch. 95, 47 Stat. 75 (one-year moratorium on construction charges payable under Act of June 17, 1902, *supra* note 6);
- Act of March 3, 1933, ch. 200, 47 Stat. 1427 (extending for two more years the moratorium imposed by Act of April 1, 1932);
- Act of March 27, 1934, ch. 92, 48 Stat. 500 (further extension of the moratorium imposed by Act of April 1, 1932);
- Act of June 13, 1935, ch. 219, 49 Stat. 337 (further extension of the moratorium imposed by Act of April 1, 1932);
- Act of April 14, 1936, ch. 215, 49 Stat. 1206 (creation of a commission to investigate financial condition of reclamation projects and further extension of moratorium on construction costs);
- Act of May 31, 1939, ch. 97, 53 Stat. 792 (authorizing further relief to water users on U.S. reclamation projects).

- a) In the early 1920s, the Reclamation Service was expanded into the Bureau of Reclamation;
- b) A fact finders commission in 1924 emphasized the inability of farmers to meet repayment obligations;¹⁷
- c) The Omnibus Adjustment Act of 1926¹⁸ provided, in addition to relief to water users, for the extension of farmers' repayment periods to 40 years;
- d) The objectives of reclamation projects were extended to include hydroelectric power in the Boulder Canyon Project Act of 1928¹⁹ and flood control in the Flood Control Act of 1936.²⁰ The notion of multiple-purpose projects emerged;
- e) The precedent for assessing general benefits and costs for reclamation projects was established in the Flood Control Act of 1936—non-reimbursable costs (for flood control, fish and wildlife preservation) were introduced as relevant for assessing project feasibility.²¹

In view of the circumstances, these events provide evidence that water reclamation in the West was a national program related to national goals and objectives, and that reclamation projects would be viewed as being in the national interest—the criteria for judging a project to be feasible were changing. The apparent inability of farmers to pay their “share”—however defined—continued. The principle of considering repayment ability in the determination of water charges became explicit with the 1937 act creating a commission to investigate reclamation projects:

The Commission is . . . directed to investigate the financial, economic and other conditions of the various . . . reclamation projects, with particular reference to the ability of each . . . project to make payments of water charges *without undue burden on water users* . . . [The Commission is to make recommendations] as to the best, most feasible and practicable comprehensive permanent plan for such water-right payments with due consideration for the *development and carrying on of the reclamation program of the United States, and having particularly in mind the probable ability of such water users . . . to meet such . . . charges* . . .²²

Early reclamation policy was based on the premise that for a project to be feasible, farmers (and other beneficiaries) could and should repay their allocated share of construction costs. In this light, the

17. Act of December 5, 1924, ch. 4, 43 Stat. 672.

18. Act of May 25, 1926, ch. 383, 44 Stat. 636.

19. Act of December 21, 1928, ch. 42, 45 Stat. 1057.

20. Act of June 22, 1936, ch. 688, 49 Stat. 1570.

21. *Id.*

22. Act of August 31, 1937, ch. 725, 50 Stat. 737, § 1 (emphasis added).

1937 legislation might have appeared paradoxical on the basis of events recounted thus far, but subsequent developments removed all doubts as to its intent.

III. UNITED STATES RECLAMATION POLICY: 1939-PRESENT

The 1937 Commission's report²³ was followed by the Reclamation Project Act (RPA) of 1939.²⁴ This act represented an explicit break in the philosophy underlying U.S. reclamation policy, particularly as it related to irrigated agriculture, and established the foundation on which current reclamation policies and the criteria for feasible reports have been built. Until this time, the premise that "beneficiaries should pay" was rigidly defined in principle, if not in practice. Agriculture was to pay the share of construction and operation/maintenance (O & M) costs allocated to it. The abandonment of this principle was evidenced by the major provisions of the RPA of 1939:

- 1) *Proposed reclamation projects require studies of the following issues:*
 - a. engineering feasibility
 - b. estimated costs
 - c. the part of estimated costs which can properly be allocated to irrigation and probably be repaid by water users.²⁵
- 2) *Principal of ability to pay for agriculture is established:*
Agriculture's repayment is based on a variable payment formula which "permits variance . . . in light of economic factors pertinent to the ability of the organization to pay."²⁶
- 3) *Power revenues may be used to aid irrigation:*
This provision is implicit in the required study concerning the "part of . . . costs which can properly be allocated to power. . . ."²⁷

In addition, irrigators were given a 10-year grace period before beginning (interest-free) repayments, which could be extended over 40 years.

23. H.R. DOC. NO. 673, 75th Cong., 3rd Sess. (1938).

24. Act of August 4, 1939, ch. 418, 53 Stat. 1187.

25. *Id.*, § 9(a) (emphasis added).

26. *Id.*, § 9(d).

27. The use of power revenues to aid irrigation had its beginning in the Townsite and Power Act of April 16, 1906, ch. 1631, 34 Stat. 116 (codified in scattered sections of 43 U.S.C. (1976)), and later legislation (e.g., Act of February 24, 1911, ch. 155, 36 Stat. 930 (codified at 43 U.S.C. § 522 (1976))); Act of December 5, 1924, ch. 4, 43 Stat. 672 (1924) (codified in scattered sections of 21, 43, 18, 31, 39 U.S.C. (1976)); and, prior to the 1939 RPA, the Interior Dep't Appropriation Act of May 10, 1939, ch. 119, 53 Stat. 685 (codified in scattered sections of 24, 25, 30, 42, 43, 48 U.S.C. (1976)).

Events culminating in the 1939 act determined the characteristics which came to typify the assessments of project feasibility in reclamation projects; reclamation projects are multiple-purpose in scope; costs are non-reimbursable for "public" aspects of the project; costs allocated to irrigation, power, municipal and industrial and "other miscellaneous purposes" are reimbursable; studies are required to demonstrate feasibility and probable repayment; irrigation repayments are determined by ability to pay; and power revenues may be used to aid irrigation repayment.

The 1939 act, in conjunction with the 1936 Flood Control Act, provided for the use of *benefit-cost* studies as a means of assessing the economic feasibility of proposed reclamation projects. In addition to introducing non-reimbursable costs, the Flood Control Act of 1936 stated "the Federal Government should improve or participate in the improvement of navigable waters . . . for flood control purposes if the benefits to whomsoever they may accrue are in excess of the estimated costs."²⁸ The "benefits to whomsoever they may accrue" provision was extended beyond flood control to encompass *all* benefits generated by a reclamation project. These benefits—*public benefits*—became an integral part of the studies required by the 1939 Reclamation Act.

It may be useful at this point to reflect for a moment on the ability to pay principle which was established in the 1939 act for determining the amount of a reclamation project's costs to be repaid by irrigated agriculture. Full repayment of all actual costs allocated to irrigation is required²⁹; however, power revenues, (whenever received) may be assigned to cover all costs allocated to irrigation which are beyond the farmer's ability to pay.³⁰ That law (and subsequent laws), however, are mute in terms of how one is to *determine* irrigation's ability to pay. Thus, the quantification of ability to pay was left to planners in the Bureau of Reclamation.

While calculations of ability to pay differ somewhat from project to project, the essence of the method employed is simple.³¹ The "farm budget" method is used to determine net farm income: retail and wholesale sales of farm products, determined by projections of estimated cropping patterns, crop yields, and product prices, less net of estimated farm production costs (seed, labor, fertilizer, etc.). Net

28. Act of June 22, 1936, ch. 688, § 2, 49 Stat. 1570.

29. *Id.*, § 9.

30. See U.S. DEPT OF INTERIOR, FEDERAL RECLAMATION AND RELATED LAWS ANNOTATED 650 (1972).

31. See, e.g., U.S. Dep't of Interior, Bureau of Reclamation, Fruitgrowers Dam Project Extension (1954) (feasibility report, Region 4, Salt Lake City, Utah).

farm income is then reduced by "farm living allowance," usually a sizeable proportion of net farm income. The adjusted net farm income estimate is further reduced by a farm operation management allowance and an equity allowance sufficient to allow the farm operator to retire a land mortgage over his lifetime. This figure, payment capacity per farm, is then reduced by operations and maintenance (O & M) costs of water in order to determine the amount available for irrigation district debt retirement. This amount is then deflated by about 20-25 percent to allow for production risks and uncertainty, the result being "ability to pay."^{3 2}

Following the 1939 act, U.S. reclamation policy was directed towards formalizing the process of project feasibility assessment in order to establish a consistent, comprehensive framework for evaluating water projects. After a lull in reclamation activities during and after World War II, this process commenced in 1950 with the creation of a Water Resources Commission charged with, among other things, recommending criteria and standards for water project feasibility and priority determination among water programs.^{3 3}

Circular No. A-47, issued by the Bureau of the Budget in late 1952, was intended as a manual for implementing the recommendations of the commission. Of particular importance here is the precedent established. The commission's report and Circular A-47 formalized the already implicit separation of project feasibility from issues related to repayment. Because many project costs were to be borne by the federal government, and irrigated agriculture was to pay only on the basis of financial ability rather than benefits received, it was clear that reimbursement was *not* to be used as a criterion for project feasibility. Specifically, provisions required that municipal and industrial, and electrical power generation pay their full costs, with interest, and irrigation repay according to the established ability to pay principle; "other" costs were to be paid by the participating states on the basis of primary and secondary benefits, and by power revenues; costs that could be related to "general welfare benefits" would be absorbed by the federal government.^{3 4}

In the late 1950s, the criteria for project feasibility were expanded to include effects related to the Colorado River Storage Project Act of 1956, and included both general and specific provisions for the costs of such "quality of life" or environmental amenity benefits to

32. Ability to pay is typically about 33% of estimated direct agricultural benefit as displayed in the benefit-cost analysis; see Section IV, *infra*.

33. Exec. Order No. 10,095, 3 C.F.R. 291 (1950).

34. CSU Rep., 1970, *supra* note 3, at 58.

be considered non-reimbursable³⁵ in the preparation of feasibility studies. Provisions were also made in the act for the inclusion of anticipated future benefits from reclaimed water.

In 1962, President Kennedy charged the newly formed Water Resources Council, which replaced the earlier Water Resources Commission, with establishing standards for the formulation and evaluation of water reclamation projects. The Water Resources Council, consisting of the Secretaries of Interior, Agriculture, Army, and Health, Education and Welfare, submitted their recommendations which were published as Senate Document 97, "Policies, Standards, and Procedures in the Formulation, Evaluation and Review of Plans for Use and Development of Water and Related Land Resources."³⁶ The principles and standards for assessing the feasibility of reclamation projects, as set out in this document, represented a substantial step forward by giving more specific form to the provisions of the 1939 Reclamation Act, as well as in attempting to provide some basis for uniformity and consistency in the preparation of feasibility studies.

Standards in the 1962 document for evaluating benefits and costs were still quite general, however, and few guidelines were presented for measuring them. The need for more precision in conjunction with shifting national priorities resulted in the passage of the Water Resources Planning Act in 1965.³⁷ This act established a permanent Water Resources Commission (WRC) that was charged with the task of reviewing and revising criteria used in evaluating water reclamation projects. Public hearings began in 1969 on a preliminary draft of the new WRC's report on principles and standards, and the final, revised report was published in 1973.³⁸ This lengthy (180 pages) document elaborates broad principles for reclamation planning, standards for uniformity and consistency in defining and measuring benefits and costs, and detailed procedures related to the selection of objectives and measurements. While still another revision of these principles and standards is currently in the draft stage,³⁹ the 1973 document serves as the current "Principles and Standards" (P & S) for planning criteria used for assessing the feasibility of water reclamation projects.

While the demonstration of project feasibility remains an issue

35. Act of April 11, 1956, ch. 203, § 8, 70 Stat. 105 (codified at 43 U.S.C § 620g (1976)). These are the so-called "Section 8" costs.

36. *Joint Hearings on S. 2246 before the Committee on Interior and Insular Affairs and the Committee on Public Works*, 87 Cong., 1st Sess. 17 (July 26, 1961).

37. Act of July 22, 1965, Pub. L. No. 89-80, 79 Stat. 244.

38. 38 Fed. Reg. 24,777 (1973).

39. U.S. Water Resources Council, *Manual of Procedures for Evaluating Benefits and Costs of Federal Water Resources Projects* (Feb. 1979) (advance draft).

separate from repayment consideration, one must show how reimbursable costs are to be paid and, in particular, the role that excess power revenues have played in paying those costs allocated to irrigation that exceed agriculture's ability to pay. A sharper focus on the manner in which power revenues are so used may thus be of interest to the reader.

Provisions for the use of power revenues to aid agriculture appeared as early as 1906 in the Townsite and Power Act⁴⁰ and were further emphasized in the 1939 Reclamation Project Act.⁴¹ However, the full implication of these provisions was not to be realized until the passage of the Colorado River Storage Project Act in 1956.⁴² In this 1956 act, the provisions for the use of power revenues to aid irrigation were both innocuous in appearance and ingenious in effect. Section 5 of the Act established the "Upper Colorado River Basin Fund [hereinafter referred to as the Basin Fund], which shall remain available until expended, as hereafter provided, for carrying out the provisions of the Act. . . ."⁴³ Superficially, the authorization of the Basin Fund appeared merely as an accounting mechanism established to facilitate the repayment of reimbursable project costs. But ultimately, its effects were much more far-reaching as it provided the financial basis for spawning myriad projects in the Upper Colorado River Basin.

The force and flexibility that the Basin Fund lent to reclamation efforts resulted from the structure of benefit calculations and cost repayments in reclamation projects. Benefits were calculated over the estimated or assumed 100-year project life, while project costs would be repaid over the initial 50 years. As a consequence, after 50 years costs would have been repaid, power revenues would still accrue, and would then be viewed as "excess revenues." Excess revenues could then be applied towards the construction costs of other projects, in particular, the portion of other project costs allocated to agriculture which agriculture was unable to repay. While such a concept seemed acceptable in principle, its application in practice was somewhat curious.

This curiosity stems from an inconsistent treatment of project revenues and costs. For example, suppose that a power project and an irrigation project are constructed in 1950. Excess revenues begin to accrue to the power project in the year 2000. These revenues are

40. Act of April 16, 1906, ch. 1631, 34 Stat. 116.

41. Act of August 4, 1939, ch. 418, 53 Stat. 1187.

42. Act of April 11, 1956, ch. 203, 70 Stat. 105 (codified in scattered sections of 43 U.S.C.).

43. *Id.*, § 5(a) (codified at 43 U.S.C. § 620d).

then applied towards the repayment of construction costs for the irrigation project, those in excess of agriculture's ability to pay. Thus, excess revenues received in 2000 are applied to costs incurred in 1950. The point is, in this case, that dollars borrowed in 1950 are being repaid in the year 2000 on a one-to-one basis. While the accounts balance, such a procedure fails to stand the test of economic logic: a rational economic entity would not lend X dollars in 1950 only to be repaid in the year 2000 with no allowance for interest or inflation. Under these terms, it is not surprising that the Basin Fund has had a significant role in expanding the effect of reclamation activity in the recent past.

IV. IMPLEMENTATION OF UNITED STATES RECLAMATION POLICY: EMPIRICAL ANALYSES

While an appreciation of policy trends discussed above is helpful in understanding the evolution of U.S. reclamation policies as they relate to criteria used in judging the feasibility of water projects, the manner in which such policies have been implemented is also of primary interest if one is to gain a full appreciation of the character of feasibility analyses. In looking to the implementation of U.S. reclamation policies, sixty-two feasibility studies, prepared for proposed reclamation projects in the West from 1947 to 1977,⁴⁴ were analyzed.⁴⁵ More than half of these projects were in the Colorado River Basin, and the balance were in the Missouri and the Columbia River Basins. Comparable data for *all* measures of concern were not available in each project; thus, the sample size for the various measures varied from 62 to 40. A list of the projects reviewed is given in Appendix A.

The basic issues to be addressed here concern the roles of public benefits, agricultural repayment and the use of excess power revenues in reclamation project feasibility analyses. In this regard several

44. This refers to the date of the report that was reviewed. Since most reports reviewed were Definite Plan reports, the report date is later than the date the project was authorized by Congress. See Appendix A, *infra*.

45. All Bureau of Reclamation projects analyzed here were prepared with pre-1973 principles and standards (P & S). The authors were able to acquire only one or two feasibility studies prepared under the 1973 P & S. The major differences between feasibility studies prepared under pre-1973 P & S and post-1973 P & S in that, in the latter studies, the benefit-cost ratio is drawn solely from the National Economic Development (NED) account, with benefits and costs associated with environmental quality, social welfare benefits, and regional development displayed in separate "accounts" (many times in descriptive terms). An analysis of the real significance, in terms of implementation, of changes in water development policies introduced by the 1973 P & S must await its application to a number of projects.

measures will be of interest. The first group of measures is related to project benefits, the typical structure for which is displayed in Table 1. The specific measures are (1) total agricultural benefits divided by total project benefits; (2) direct agricultural benefits divided by total agricultural benefits; and (3) total public benefits divided by total project benefits.

A weighted average (weights were project size in dollars) for these measures drawn from 62 projects is given for each of several years between 1947 and 1977 in Table 2. With few exceptions, these projects are agriculture-oriented with agricultural benefits accounting for a high percentage of total project benefits. Total agricultural benefits generally account for some 70 percent of total project benefits. *Direct* agricultural benefits have generally accounted for some 60

TABLE 1
TYPICAL STRUCTURE OF PROJECT BENEFITS

AGRICULTURAL BENEFITS

DIRECT BENEFITS Private: arising from changes in net farm income; presumably to be captured by the farm owner.

INDIRECT BENEFITS Public: private benefits for which the recipient cannot be identified; arising from additional marketing, transportation, etc., of agricultural products.

PUBLIC BENEFITS Public: no identifiable recipient; reduced soil erosion, improvements in general welfare, etc.

MUNICIPAL AND INDUSTRIAL BENEFITS

Private: increased supplies of M & I water; measured by opportunity cost of provision from an alternative source.

RECREATION BENEFITS

Public: boating, camping, parks, etc.; measured by \$\$/visitor day x estimated increase in visitor days.

FISH AND WILDLIFE BENEFITS

Public: fishing and hunting, by type, \$\$/visitor day x estimated increase in visitor days; enhancement valued at cost.

FLOOD CONTROL BENEFITS

Public: expected average reduction in agricultural, residential and business flood damages.

POWER BENEFITS

Private: net value of sales.

OTHER BENEFITS

Usually public: area redevelopment, externalities, unemployment reduction, etc.

TABLE 2
DISTRIBUTION OF RECLAMATION PROJECT BENEFITS:
1947-1977

Year of Feasibility Study	Number of Projects	Weighted (by project size) Average Measures for:		
		Agricultural Benefits/ Total Benefits	Direct Agricultural Benefits/ Agricultural Benefits	Public Benefits/ Total Project Benefits
-----percent-----				
1947	1	*	97	18
1949	3	97	61	40
1950	2	*	45	60
1952	2	*	60	25
1953	4	99	45	55
1954	4	100	35	65
1955	1	76	33	72
1956	3	32	45	83
1957	1	83	66	46
1958	3	75	60	42
1959	5	68	43	72
1961	3	37	67	69
1962	3	67	61	59
1963	2	53	52	32
1964	1	48	51	76
1965	2	69	41	46
1966	1	73	51	39
1967	3	79	63	45
1968	1	98	56	45
1969	4	83	67	40
1970	2	89	81	25
1971	1	24	76	17
1972	2	31	86	73
1975	4	59	74	36
1976	3	70	27	75
1977	1	99	86	15
-----	-----	-----	-----	-----
Average	—	70	60	48

*Comparable data not available.

percent of total agricultural benefits, or 42 percent of total project benefits.

All public benefits, which include indirect and public agricultural benefits as well as public benefits accounted for by such things as fish, wildlife, recreation enhancement, flood control, and area development, have consistently represented a large proportion of project benefits. In only six of the 62 projects were public benefits less than one-third of project benefits; public benefits accounted for two-thirds or more of project benefits in 18 of the 62 projects. As an

average, 48 percent of the total project benefits were of a public nature.

The second group of measures considered relates to the allocation of costs to irrigated agriculture and the percent of such costs they are to repay. The percentages of project construction costs allocated to irrigation and total, non-Indian irrigation repayment as a percentage of allocated costs are given for 49 feasibility studies from 1949 to 1977 in Table 3. Referring to Table 3, irrigation was typically allocated a fairly high percentage of project costs—a percentage that roughly parallels the agricultural sector's (direct plus public) contribution to project benefits.⁴⁶ Total agricultural benefits averaged

TABLE 3
COST ALLOCATIONS TO AND REPAYMENT BY THE
IRRIGATION SECTOR

Year of Feasibility Study	Number of Projects	Weighted (by project size) Average Measures for:	
		Construction Costs Allocated to Irrigation / Total Construction Costs	Repayment by non-Indian Irrigation Construction Costs Allocated to Irrigation
-----percent-----			
1949	2	100	23
1953	4	97	35
1954	2	62	55
1955	2	44	50
1956	3	18	37
1957	1	89	24
1958	2	60	65
1959	4	75	17
1961	4	39	35
1962	2	67	25
1963	2	51	9
1965	2	67	17
1966	1	68	13
1967	3	79	12
1968	1	93	17
1969	4	86	29
1970	1	99	13
1971	1	18	60
1972	1	29	100
1975	4	68	8
1976	2	77	24
1977	1	97	20
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Average	—	70	31

46. This is not surprising, given the method for allocating costs. In particular, a feature's "justifiable expenditure" is the minimum of "alternative cost" and feature benefits.

some 70 percent of total project benefits, and irrigation was allocated, on the average, almost 70 percent of project costs.

Consistent with current principles and standards for evaluating reclamation projects, repayment schedules are *not* linked to cost allocations; indeed, repayment for irrigation is determined by ability to pay. This principle is clearly reflected in the data provided in Table 3: irrigation repayment is less than one-third of allocated costs in more than 75 percent of the studies reviewed. Here particularly, however, average measures reflect distortions related to substantive differences in cost allocations across projects. For example, when repayment as a percentage of allocated cost was high (*e.g.*, the projects in 1971 and 1972), costs allocated to irrigation were low and effective repayment may have been much lower. Meaningful details may be hidden in the ratios.

Due to the lack of correspondence between costs and water allocated to agriculture, more meaningful measures of cost allocations and repayment may be provided in terms of the dollar value of project water allocated for use in irrigation. Cost allocations and repayment per acre foot of project water allocated to irrigation are given in Table 4.⁴⁷

Based on acre-foot measures, the cost allocation-repayment picture changes dramatically. Repayment as a percentage of allocated costs for irrigation averages some 20 percent rather than the 31.3 percent shown in Table 3. Since repayment and, implicitly, allocated costs are set at the time of the project study, *current-year* dollars are the appropriate values for these measures. Thus, the impact of inflation between 1949 and 1977 can be observed in terms of allocated costs per acre-foot in Table 4; average cost allocations per acre-foot between 1949-1958, 1959-1968 and 1969-1977 are \$6.28, \$10.62, and \$16.03, respectively. The impacts of inflation are much less apparent in terms of irrigation repayment. Given that average prices received by farmers for agricultural products in 1977 were about 189 percent higher than those received in 1949, the relatively unchanged repayment charges (with the notable exception of those in studies for 1971 and 1976) between 1949 and 1977 are curious.

The third group of measures of interest here is related to the use of power revenues (the Basin Fund). The role of power revenues in aiding agriculture is best seen by viewing western reclamation proj-

47. Annual measures for cost allocations and repayment are derived by simply apportioning these values over a 50-year repayment period, a procedure which is justifiable only in the case where such values are, by established law, interest-free. Of course, such measures abstract from any notion of social opportunity costs.

ects in the aggregate. To this end, consider the following data which are taken from feasibility studies for 40 non-power-producing reclamation projects from 1949 to 1977; of these projects, 20 were in the Colorado, Wyoming, Utah, Arizona, and New Mexico regions, 13 were in the Missouri River Basin and seven were in the Columbia River Basin. Total construction costs for these 40 projects were \$2,107.7 million, of which \$1,804.6 million (86 percent) were reimbursable. These reimbursable costs were paid in the following manner:

M & I	1.0%
Non-Indian Agriculture	26.6%
Other (including Leavitt Act ⁴⁸ deferred)	4.0%
Power Revenues	68.4%
Colorado River Basin Fund	24.3%
Missouri River Basin Fund	35.0%
Columbia River Basin Fund	.1%
Other Power Revenues	9.0%

Of the \$1,804.6 million reimbursable costs for these projects, irrigation was allocated 71 percent. Based on ability to pay, repayment by irrigation was about 26 percent of allocated costs (18 percent of project costs). Power revenues account for the bulk of repayment of reimbursable costs in irrigation projects.

V. SUMMARY AND CONCLUSION

Legislation and institutional changes pertinent to U.S. reclamation policy suggest that water resources development in the West was a sustained national goal. Early reclamation policy, based on the premise that beneficiaries should pay a fair share of project costs, was unsuccessful because of agriculture's seeming inability to pay. Financial respite was provided by a number of relief acts, and reclamation in the West became firmly entwined with national goals with passage of the Reclamation Act of 1939. In this act, reclamation benefits were broadly defined; public benefits were recognized in the introduction of non-reimbursable costs; and, while agriculture was allocated its costs, agriculture *repayment* was now guided by the principle of ability to pay; excess power revenues (from *other* projects) would pick up any deficit. Subsequent guidelines were aimed at designing uniform methods for determining primary and indirect as well as public benefits, refining costs allocations, and, in general, providing uniform bases for benefit-cost studies used for feasibility analyses.

48. Act of July 1, 1932, ch. 369, 47 Stat. 564. This act and subsequent extensions deferred payment of construction costs allocated to Indian projects or parts of projects on Indian lands.

TABLE 4
IRRIGATION COST ALLOCATIONS AND REPAYMENTS
PER ACRE FOOT OF PROJECT WATER

<i>Year of Feasibility Study</i>	<i>Number of Projects</i>	<i>Weighted (by project size) Average Measure for:</i>	
		<i>Cost Allocations to Irrigation per Acre Foot of Project Water</i>	<i>Repayment by non- Indian Irrigation per Acre Foot of Project Water</i>
-----dollars-----			
1949	2	6.50	1.46
1953	3	7.03	2.47
1954	1	1.84	1.00
1955	1	5.19	2.45
1956	2	12.07	1.72
1958	1	5.02	3.43
1959	4	7.05	1.26
1961	4	4.90	2.06
1962	2	11.30	.83
1963	2	15.42	1.43
1965	2	11.58	2.00
1966	1	8.36	1.10
1967	2	15.72	1.31
1969	4	8.54	2.50
1970	1	10.05	1.29
1971	1	7.39	4.47
1975	4	28.50	2.27
1976	2	29.31	6.88
1977	1	12.40	2.50

Feasibility studies are used by Congress to justify water reclamation projects, and thus have provided a basis for the determination and quantification of water rights in many cases, often implicitly through the establishment of water delivery contracts. As revealed by 62 Bureau of Reclamation feasibility studies, a data set is provided for parameters that might be thought of as critical in determining the feasibility of a project, particularly for multiple-purpose projects involving public benefits and, hence, federal financial assistance. Based on averages from 62 projects, the structure of a typical or composite feasibility study is as follows:

- | | |
|---|-----|
| a) Irrigation benefits as a percentage of total benefits; | 70% |
| Reimbursable project costs allocated to irrigation; | 70% |
| b) Direct irrigation benefits as a percentage of total irrigation benefits; | 60% |
| c) All public benefits as a percentage of total benefits; | 48% |

- | | |
|--|-----|
| d) Non-Indian irrigation repayment as a percentage of costs allocated to irrigation; | 26% |
| e) Percent of reimbursed costs paid by excess power revenues. | 68% |

One can only speculate as to the rationale for the special master's choice of the words "practicably irrigable acreage" in *Arizona v. California*. To the extent, however, that quantification of practicably irrigable acreage requires an evaluation of potential Indian irrigation projects along the lines that have been used in determining the feasibility of the (primarily non-Indian) water reclamation projects by the U.S. Government, the following rules, drawn from discussions above, would seem to apply. First, one evaluates benefits within a very broad context wherein benefits "to whomsoever they may accrue" are the relevant guideline. Second, one determines project feasibility by the relationship between *social* benefits (direct benefits plus indirect and public benefits) and costs; such assessment is independent of repayment considerations. Finally, issues concerning the repayment by irrigation of federal funds used for constructing the project—based on ability to pay in non-Indian projects—are issues *separate* from the demonstration of project feasibility. If project feasibility has been demonstrated, one then looks to repayment. In the case of Indian projects, capital costs forgiven or deferred by the Leavitt Act may be viewed as essentially the Indian projects' counterpart to these costs forgiven irrigators in non-Indian projects by the assignment to power revenues of costs in excess of ability to pay.

APPENDIX A

LIST OF FEASIBILITY STUDIES INCLUDED IN REVIEW OF BUREAU OF RECLAMATION PROJECTS

<i>Date of Study</i>	<i>Name of Study</i>	<i>Authorization Date</i>
1947.	Valley Gravity Project . . . . .	.1941
1949.	Colbran Project. . . . .	.1952
	Goosebury Project.	*
	Smith Fork Project . . . . .	.1956
1950.	Angostura Unit Project. . . . .	.1941
	Buttes Reservoir Project	*
1952.	Humbolt . . . . .	.1935
	Colorado Big Thomson Project. . . . .	.1937
1953.	Crescent Lake Dam Project. . . . .	.1954
	Ainsworth Unit Project. . . . .	.1956
	Fruitgrowers Dam Project. . . . .	.1938
	Hanover Unit Project . . . . .	.1944

<i>Date of Study</i>	<i>Name of Study</i>	<i>Authorization Date</i>
1954	White Swan Project	*
	Navajo Project	1962
	Avondale Irrigation Project	1953
	Kennewick Division Project	1969
1955	Brewster Unit Project	1955
1956	Yakima Project	1905
	Almena Unit Project	1946
	Crooked River Project	1956
1957	Vernal Unit Project	1956
1958	Little Wood River Project	1956
	Baker Project	1931
	Weber Basin Project	1949
1959	Northside Pumping Division	
	Minnidoka Project	1904
	Florida Project	1956
1959	Hardin Unit Project	1960
	Webster Unit Project	1960
	Kanopolis Unit	1961
1961	South Gila Unit Project	1947
	Emery County Project	1956
	Talent Division Project	1954
1962	Glen Elder Unit Project	1946
	Shadehill Unit Project	1948
	Vale Project	1926
1963	Bonneville Unit Project	1956
	Agate Dam and Reservoir Project	1962
1964	Bostwick Park Project	1964
1965	Washoe Project	1956
	West Divide Project	1968
1966	Animas—LaPlata Project	1968
1967	Dixie Project	1964
	Fruitland Mesa Project	1964
	Upalco Unit Central Utah Project	1956
1968	Manson Unit Project	1963
1969	Main Weiser Unit Project	*
	Maris—Milk Unit Project	1966
	Council Unit Project	*
	Tualatin Project	1966
1970	Paskenta—Newville Unit Project	*
	OAHE Unit Project	1966
1971	Yellow Jacket Project	*
1972	Roque River Basin Project	1954
	Narrows Unit Project	1970
1975	Lyman Unit Project	1956
	Unitah Unit Project	1956
	Jenson Unit Project	1956

<i>Date of Study</i>	<i>Name of Study</i>	<i>Authorization Date</i>
1976.	Willametta River Project (Carlten Division).	*
	Dallas Creek Project.	1968
	O'Neil Project.	1972
1977.	North Loop Division Project	1972
	Dolores Project	1968

*Not Authorized.