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Report to the Chairman, Subcommittee on Water and Power, Committee on Energy and Natural Resources, U.S. Senate

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WATER RESOURCES

Bonneville's Irrigation and Drainage System Is Not Economically Justified

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The Honorable Bill Bradley
Chairman, Subcommittee on Water
and Power
Committee on Energy and Natural Resources
United States Senate

Dear Mr. Chairman:

This report responds to your March 30, 1990, letter and subsequent discussions with your office regarding construction of the Irrigation and Drainage (I&D) system of the Bonneville Unit, which is part of the Central Utah Project (CUP). Construction of the I&D system has not begun. Because some Bonneville Unit facilities were designed and constructed to convey water to the I&D system, some construction costs associated with the system's water supply have already been spent or contractually obligated (sunk costs). According to estimates by the Department of the Interior's Bureau of Reclamation, the currently authorized CUP cost ceiling will be insufficient by fiscal year 1992 to complete construction of all irrigation facilities.

As you requested, we prepared a benefit-cost analysis of the I&D system in terms of its impact on the U.S. economy—including all costs and benefits to federal, state, and local governments, project irrigators, downstream water users, and consumers—to determine whether its completion is economically justified. We testified on our benefit-cost analysis at a September 18, 1990, hearing before your Subcommittee.[1]

As you also requested, we subsequently prepared a separate financial impacts analysis measuring the federal cost of not completing the system as compared with the cost of completing the system, in accordance with the changes proposed in S. 2969—the CUP Completion Act. This bill, introduced but not passed in the 101st Congress, would have (1) eliminated one irrigation area within the system, reducing the total I&D water supply; (2) provided an additional $150 million in federal funds for the completion of the system; and (3) required the Bureau's cost-sharing partners to fund the system's remaining construction costs. Committee staff have told us that S. 2969 will be reintroduced in the 102nd Congress.

[1] Bonneville Unit's Irrigation and Drainage System Is Not Economically Justified (GAO/T-RCED-90-108, Sept. 18, 1990).

This report presents the results of our (1) benefit-cost analysis to the U.S. economy in accordance with the provisions of S. 2969 and (2) financial impacts analysis to the federal government of not completing the I&D system.

Results in Brief

For every $1 of costs associated with the system, the U.S. economy would realize a benefit of only 28 cents. Thus, from the perspective of all benefits and costs incurred anywhere in the U.S. economy, completion of the I&D system is not economically justified.

The financial impacts on the federal government of not completing the I&D system, which could range from a savings of $133 million to a cost of $54 million, depend on how the Congress addresses the repayment of sunk costs associated with this system. If the Congress should decide not to complete the system and reallocate sunk costs in accordance with the Bureau's regulations, the federal government would save an estimated $133 million. However, if the Congress should forgive the repayment of sunk costs associated with the system, the federal government could incur additional net costs of $54 million.

In the final analysis, we recognize that a decision to approve the system is a policy judgment for the Congress, and other factors, such as the system's impact on regional economic development, may have to be considered along with the national economic and federal financial impacts presented in this report.

Background

The Colorado River Storage Project (CRSP) Act of 1956 (43 U.S.C. 620-620o) authorized the Bureau of Reclamation to construct the CUP. The CUP consists of five separate units, the largest of which is the Bonneville Unit. Construction of two of these units has been deferred, two have been completed, and the Bonneville Unit is presently under construction.

The Bonneville Unit is divided into six systems designed to collect water from the Uintah Basin drainage area and transport it through the Wasatch Mountains to the Bonneville Basin area through a complex network of aqueducts, tunnels, and canals. The Bonneville Unit is designed to provide irrigation, municipal and industrial (M&I) water, flood control, recreation, and fish and wildlife enhancement. Construction began in 1966 and is expected to be completed in 1996.

The primary purpose of the Bonneville Unit's I&D system is to supply irrigation water to farmland in central and southern Utah. The system will also provide a small amount of M&I water to cities in Juab and Utah Counties. According to the Bureau, about 40 percent of the system's water will provide supplemental irrigation to presently irrigated land to stabilize existing agricultural production. Most of the remaining system's water will be used to irrigate presently unirrigated land to compensate for land being taken out of agricultural production by urbanization and industrialization. (App. I shows the I&D system's geographic layout.)

The Bureau allocates the construction costs of multipurpose water development projects among the purposes served. The costs allocated to I&D and M&I water are repaid to the U.S. Treasury by users, while costs allocated to other purposes, such as flood control, recreation, and fish and wildlife enhancement, are nonreimbursable. The Bureau assigns costs it determines the irrigators cannot pay to the Department of Energy's power marketing administrations for repayment to the federal government through revenues generated by the sale of electric power produced at many of the multipurpose water projects. Power revenues used to repay irrigation costs are referred to as irrigation assistance.

Some of the Bonneville Unit facilities were designed and constructed to convey water for the I&D system, as well as other purposes. For example, the Strawberry Reservoir was designed and constructed to hold water for I&D system users, in addition to water stored for other purposes. The Diamond Fork system was designed and partially constructed to convey the I&D system's water, as well as M&I water. Therefore, although construction of the I&D system has not begun, a portion of the costs of these facilities is associated with the system's water supply and is allocated to irrigation.

The I&D System Is Not Economically Justified

From a benefit-cost perspective to the U.S. economy, completion of the system is not justified because its costs to the nation exceed its benefits. For every $1 of project costs, the U.S. economy would realize a benefit of only 28 cents.

In our September 18, 1990, testimony before your Subcommittee, we presented the results of our analysis, which showed that for every $1 of project costs the U.S. economy would realize a benefit of only 30 cents. Our modifications of this analysis according to the provisions of S. 2969 reduced the benefits to the U.S. economy to 28 cents.

Our benefit-cost analysis applied the 1983 Economic and Environmental Principles and Guidelines for Water and Related Land Resources Implementation Studies (P&Gs). These P&Gs were developed by the Water Resources Council to guide formulation and evaluation studies by the major federal water resource development agencies, including the Bureau of Reclamation.[2]

The P&Gs summarize methods for calculating the benefits and costs of water resource development alternatives. They require, for example, that water resource planning be evaluated on the basis of contributions to national economic development consistent with protecting the nation's environment. Where the P&Gs were vague or did not explicitly address the treatment of specific aspects of benefits and costs, we supplemented them with standard economic principles.

According to the P&Gs, a separate benefit-cost analysis should be calculated for each increment or major segment of a project. The Bureau performed such an analysis, for example, for the irrigation component expansion of the Columbia Basin Project. The Bureau chose the Bonneville Unit as its benefit-cost unit of analysis, and therefore, did not calculate a separate benefit-cost ratio for the I&D system. To calculate this ratio, we extracted from the Bureau's 1988 benefit-cost analysis of the entire Bonneville Unit only those benefits and those costs associated with the I&D system as outlined in the proposed CUP Completion Act. Relying on the Bureau's data and methodology, we identified annual benefits of $7.6 million and annual costs of $9.9 million for a benefit-cost ratio of 0.77 to 1.

We adjusted this ratio to bring the Bureau's analysis in line with the P&Gs and standard economic principles. We evaluated all benefits and costs from a national economic development perspective. Consequently, we had to make adjustments for indirect profits, farmers' labor, taxes, and salinity costs, which resulted in a $3.6 million annual decrease in benefits, and a $4.5 million annual increase in costs.

Excluding indirect profits resulted in a $1.8 million annual reduction in I&D system benefits. The Bureau defines these profits as those earned by food processors, transporters, and retailers for delivering increased

[2]The Water Resources Council, now inactive, consisted of the Secretaries of Agriculture, Army, Commerce, Energy, Housing and Urban Development, Interior, and Transportation; and the Administrator of the Environmental Protection Agency.

farm production to final consumers. Profits, however, should be considered a benefit only if they would not have been earned elsewhere in the economy during the 100-year life of the I&D system. Standard economic principles assume that over a long period labor and capital will find employment elsewhere in the U.S. economy. We assumed, therefore, that the labor and capital used to prepare and deliver these farm products to the consumer would have been otherwise employed.

Including farmers' labor costs resulted in a $2.1 million annual decrease in benefits. Bureau calculations of farm profits omitted these costs. Assigning no cost to farmers' labor overestimates farm profits because it assumes that farmers could not be productive elsewhere in the U.S. economy. In other words, it assumes that they would be unemployed and earn no income for the duration of the I&D system's 100-year life.

Including increased revenues to federal, state, and local governments resulting from taxing farm output increased benefits by $0.3 million annually. The Bureau counted taxes only as a cost to farmers but not as a benefit to the government. Taxes simply transfer part of the benefits realized by the farmers to the government.

Lastly, recognizing that the water diverted from the Colorado River for the I&D system increases downstream salinity by concentrating salts, thereby reducing agricultural yields and raising farm costs, project costs increased by $4.5 million. The Bureau excluded these costs because under the Colorado River Compact of 1922, Utah has the legal right to deplete the river. These costs, however, are still a project cost.

As a result of these adjustments, the annual benefits decreased to $4.0 million and annual costs rose to $14.4 million. Accordingly, the benefit-cost ratio was reduced to 0.28 to 1. In other words, the U.S. economy would realize a benefit of only 28 cents for every $1 of project costs. Table 1 details our benefit-cost analysis.

Table 1: Estimated Remaining Benefits and Costs for the CUP Bonneville Unit's I&D System

Dollars in millions

	Adjustments	Benefits/costs
Annual benefits		$7.6
GAO adjustments:		
Indirect profits	(1.8)	
Farmers' labor	(2.1)	
Farm tax expenses	0.3	
Subtotal	**(3.6)**	**(3.6)**
Adjusted annual benefits		**$4.0**
Annual costs[a]		$9.0
Other costs[b]		0.9
Subtotal		**$9.9**
GAO adjustment:		
Salinity costs	4.5	4.5
Adjusted annual costs		**$14.4**
I&D system benefit-cost ratio		
Before GAO adjustment	0.77 to 1 [$7.6/$9.9]	
After GAO adjustment	0.28 to 1 [$4.0/$14.4]	

[a]Investment costs annualized by the Bureau at 3-1/8 percent for 100 years. A real interest rate (adjusted for inflation) is used because costs are real.

[b]Includes annual operating, maintenance, and replacement costs, as well as assigned Colorado River Storage Project regulatory facilities' costs.

Source: GAO's analysis based on Bureau of Reclamation 1988 data and the changes outlined in S. 2969.

I&D System's Financial Impacts to the Federal Government

If the Congress decides not to fund the completion of the I&D system water supply and sunk costs are reallocated to irrigation in accordance with Bureau regulations, the financial impact to the federal government would be a savings of $133 million. However, if the Congress should forgive the repayment of these costs, the federal government would incur additional costs of $54 million. This analysis is presented in table 2.

Table 2: Federal Financial Impacts of Not Completing the I&D System Water Supply

Dollars in millions

System costs and repayments	System completed	System not completed: Costs repaid	System not completed: Costs forgiven
Federal system costs			
Sunk costs	$320	$320	$320
Incremental costs	$178	0	0
Total	**$498**	**$320**	**$320**
Present value repayments:[a]			
Irrigation repayments	($28)	($32)[b]	$0
Delayed apportioned revenue repayments[c]	0	$49	$204
Total	**($28)**	**$17**	**$204**
Net cost	$470	$337	$524
Net savings	$133 [$470–$337]		
Net costs	$ 54 [$524–$470]		

Note: Assumes decision to complete or not complete I&D system is made in October 1991. All costs, present values, and savings are reported in 1989 dollars.

[a]A nominal interest rate of 8.5 percent (with no inflation adjustment), based on the recent average yield on outstanding marketable long-term U.S. Treasury obligations, is used because the repayment schedules are nominal.

[b]Under current Bureau regulations, the timing of the repayment schedules changes if the system is not completed. This explains why the present value of irrigation repayments on sunk costs—$32 million—is greater than the present value of irrigation repayments on sunk costs plus incremental costs—$28 million.

[c]A lower federal power rate delays repayment to the U.S. Treasury. The amount is a cost to the government due to the difference in the timing of the repayments.

Source: GAO's analysis based on Bureau of Reclamation 1988 data, repayment schedules, and changes outlined in S. 2969.

Federal Cost to Construct the I&D System

We estimated the federal sunk costs—the funds spent or contractually obligated to develop the I&D system's water supply—at $320 million. We assumed that the system would be constructed as described in the Bureau's 1988 Definite Plan Report—the Bureau's project planning document—as adjusted by S. 2969. The federal incremental construction costs—which are the $150 million construction costs provided in S. 2969 plus the $28 million federal costs allocable to irrigation to complete the Diamond Fork system—plus the sunk costs totaled $498 million. This is the total federal cost of constructing the completed system.

We reduced this cost to account for irrigation repayments to the federal government on the sunk plus incremental costs. Because the Bureau schedules repayments over 50 years using a 0-percent interest rate and

does not adjust for inflation, the present value of the repayment obligation is only $28 million. The net federal cost of the completed system—the total federal cost less the repayments—is $470 million.

Financial Impact Scenarios of Not Completing the System

If the Congress decides not to complete the system, the financial impact to the federal government will depend on how the Congress addresses the repayment of the $320 million federal sunk costs. We considered three repayment scenarios: (1) allocating all sunk costs to irrigation in accordance with Bureau regulations, (2) forgiving all repayment obligations, and (3) selling the unused water in Strawberry Reservoir as M&I water.

Sunk costs reallocated according to Bureau regulations

If the system is not completed and the Congress takes no action regarding the repayment of sunk costs, the federal government would save an estimated $133 million. The savings represent the net federal cost of the completed system less the net federal cost of not completing the system, given that the Bureau would reallocate the sunk costs associated with the system to the remaining irrigation components of the Bonneville Unit. Irrigation repayments would be made on the $320 million in sunk costs. The present value of these irrigation repayments is $32 million.

Also, not incurring the incremental costs of $178 million would reduce federal power rates and thus cost the federal government an additional $49 million by slowing the repayment of existing Bureau projects in Colorado, New Mexico, and Wyoming. Almost all irrigation costs are repaid with revenues from Colorado River Storage Project power sales, with power rates established to cover these costs. In accordance with Bureau procedures, a fixed percentage of these power revenues—called apportioned revenues—goes to each of the four states. Therefore, power rates must be set so that when Utah's apportioned power revenues increase to repay the irrigation investment, other states' power revenues must go up by the same percentage. The increased power revenues to the other three states would accelerate the repayment on the irrigation component of their existing projects. Conversely, forgiving the repayment from Utah would reduce power revenues for the other states and delay their repayments to the U.S. Treasury on the irrigation component of existing

projects. The $49 million is the present value of the delayed repayment, which we calculated from the Bureau's repayment schedules.[3]

The net federal cost if the system is not completed and sunk costs are repaid, therefore, is $337 million. The net federal savings, which is the net federal cost of completing the system less the net costs if the system is not completed and sunk costs are repaid, is $133 million.

Forgiving all repayment obligations

Alternatively, the Congress could forgive repayment of the $320 million in sunk costs. Under this alternative, irrigation repayments are $0. Because power assistance to irrigation would not be required, future power rates would be lower, resulting in delayed apportioned revenue repayment to the U.S. Treasury. The present value of the delayed apportioned revenue repayment is $204 million. The net federal cost of this alternative, therefore, is $524 million. Not completing the system and forgiving all repayment obligations would cost the federal government $54 million more than completing the system.

Selling unused water

Unused I&D water held in the Strawberry Reservoir could eventually be converted to M&I and sold for M&I purposes. This scenario is possible, according to the Bureau's Commissioner. The current M&I water supply within the CUP area, including the Bonneville Unit water, is projected to meet Utah's needs only until the year 2010. Converting the irrigation investment to an M&I investment may reduce power rates and thus delay other states' irrigation component repayment to the U.S. Treasury. We did not attempt to quantify the impact of this repayment scenario because of the uncertainty surrounding the future sale of this water.

Conclusions

From a benefit-cost analysis standpoint, completion of the I&D system is not economically justified. Further, the financial impacts of not completing the system could range from a savings to the federal government of $133 million to a cost of $54 million, depending on how the Congress addresses the repayment of costs already incurred.

[3]In prior work, GAO has found that federal power is priced below nonfederal power, Federal Electric Power: Information Concerning the Colorado River Storage Project (GAO/RCED-90-2FS, Oct. 3, 1989).

Matters for Congressional Consideration

In the final analysis, the decision whether to approve the project is a policy judgment for the Congress. In its deliberations on whether to complete the system, the Congress will be considering other factors such as the I&D system's contribution to regional economic development. As part of its decision, the Congress should consider the benefit-cost analysis and the financial implications of not completing the system as discussed in this report.

We conducted our work from April through December 1990, in accordance with generally accepted government auditing standards. We reviewed the legislative history of the CUP, as well as records, documentation, and reports at the Bureau's Salt Lake City Upper Colorado Regional and Provo, Utah, project offices, and met with Bureau officials from these offices. We obtained Bureau data on the benefits and costs, including federal sunk costs associated with the I&D system, but did not conduct a reliability assessment of these data.

As requested, we did not obtain official agency comments on a draft of this report. However, we discussed the factual information in the report with Bureau officials at the Upper Colorado Regional and Utah project offices, who agreed that our information was accurate and concurred with our analysis of the I&D system's benefits and costs. Bureau officials also concurred with our analysis of the financial impacts to the federal government associated with constructing the I&D system, but they believed that we should have included excess apportioned revenues—power revenues that accrue in the future after the total irrigation assistance repayment obligations are satisfied—as a repayment to the U.S. Treasury. Under the CRSP Act, these excess apportioned revenues credited to a state can then only be used within the individual state to assist in the repayment of the irrigation component of future reclamation projects. Because use of these revenues is conditioned on the future construction of reclamation projects, we could not predict whether these funds would be used or would become federal revenues. Also, the Bureau officials did not agree with our assumptions concerning the calculation of the present value of the repayment on the I&D system cost. However, they did agree that changing these assumptions would not affect the final outcome of our analysis.

Unless you publicly announce its contents earlier, we plan no further distribution of this report until 30 days from the date of this letter. At

that time, we will send copies to the Secretary of the Interior, the Commissioner of the Bureau of Reclamation, and other interested parties, and will make copies available to others upon request.

This report was prepared under the direction of James Duffus III, Director for Natural Resources Management Issues, who can be reached at (202) 275-7756 if you or your staff have any questions. Other major contributors are listed in appendix II.

Sincerely yours,

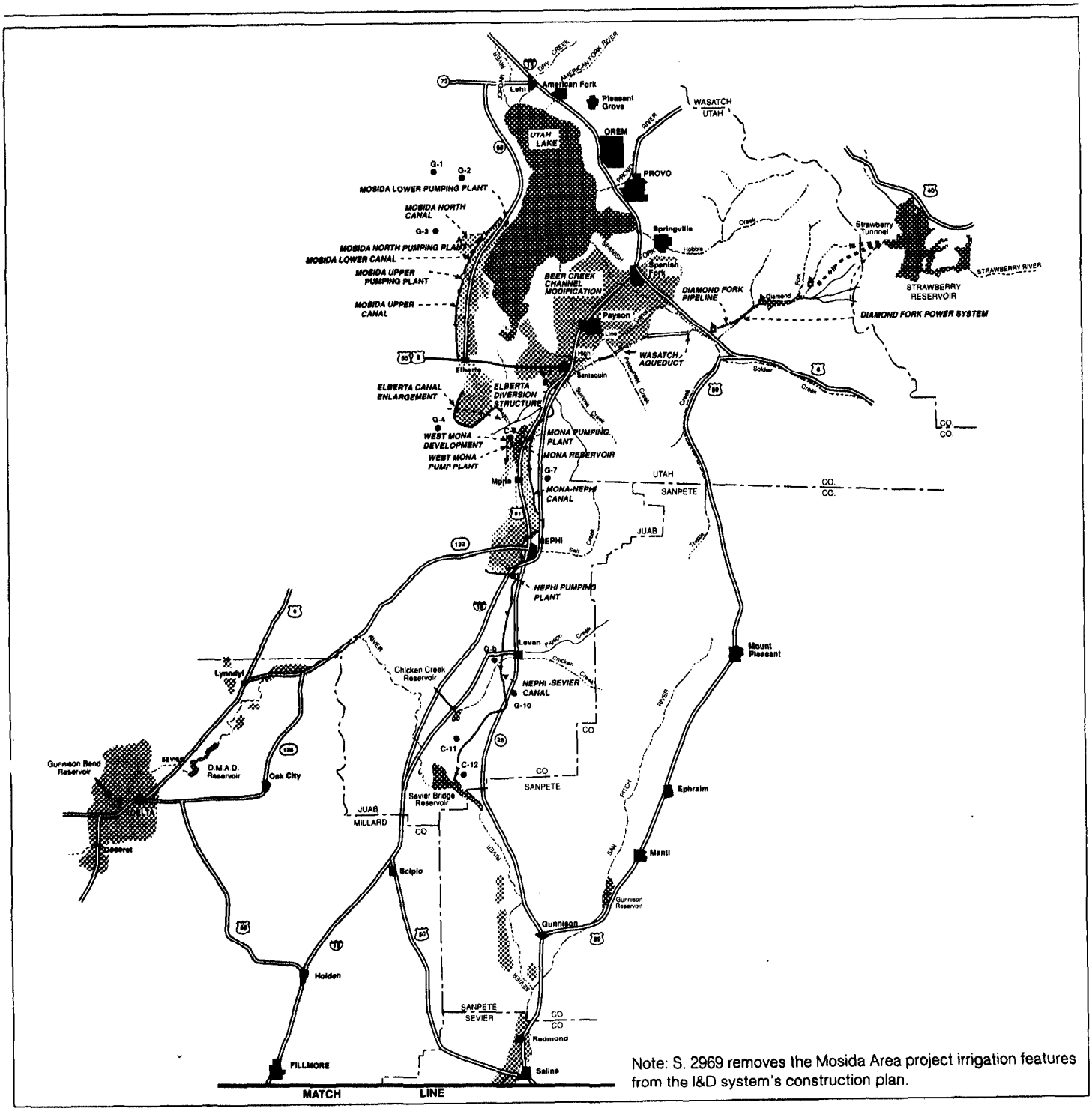
J. Dexter Peach
Assistant Comptroller General

Contents

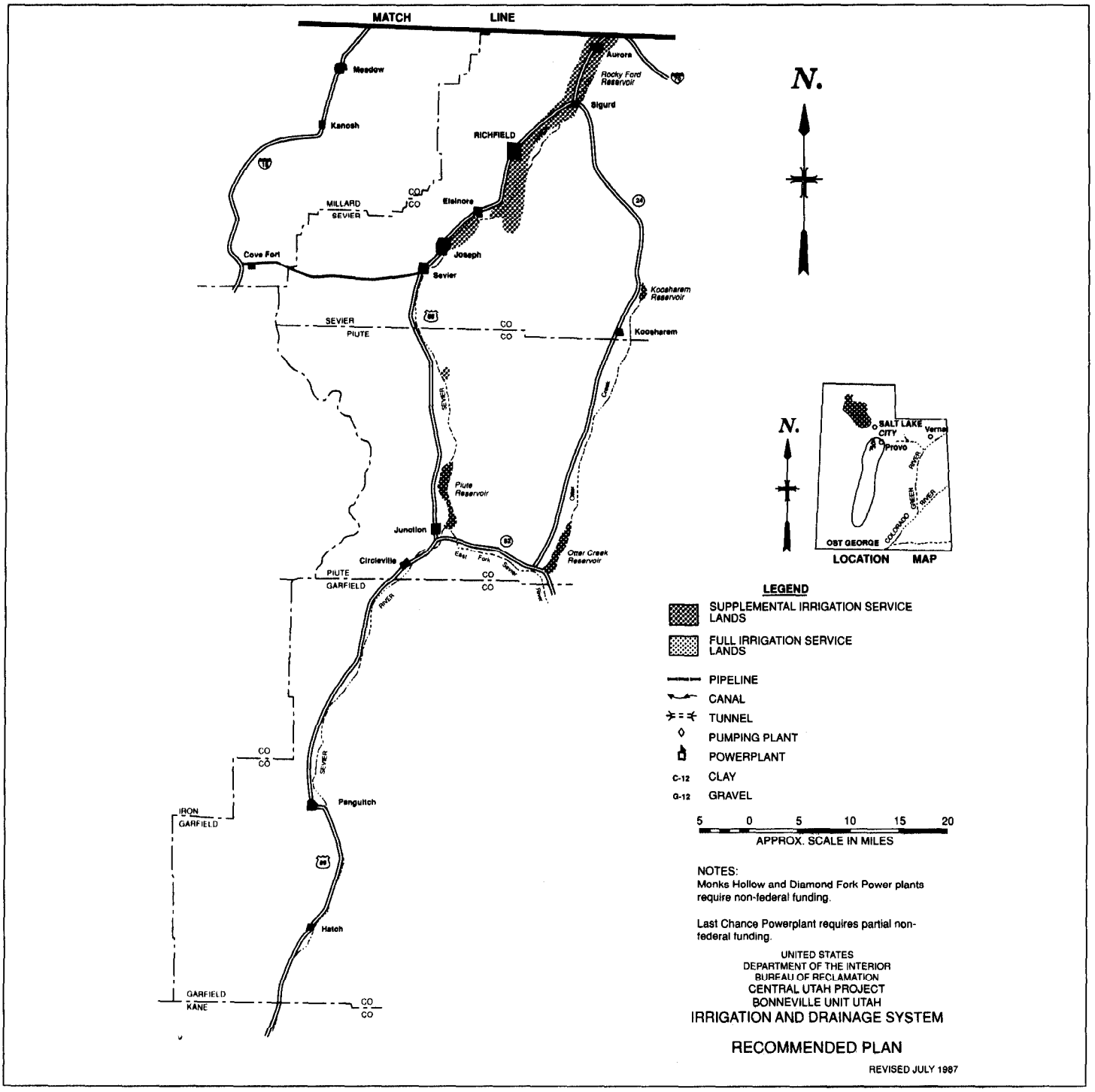
Abbreviations

CRSP	Colorado River Storage Project
CUP	Central Utah Project
I&D	Irrigation and Drainage
M&I	Municipal and Industrial
P&Gs	1983 Economic and Environmental Principles and Guidelines for Water and Related Land Resources Implementation Studies

Map of the Bonneville Unit's I&D System



Note: S. 2969 removes the Mosida Area project irrigation features from the I&D system's construction plan.



Source: Bureau of Reclamation

Major Contributors to This Report

Resources, Community and Economic Development Division, Washington, D.C.	Leo E. Ganster, Assistant Director Caroline C. Vernet, Assignment Manager Amy Mathews Amos, Staff Member
Denver Regional Office	Sue Naiberk, Regional Advisor Dawn Shorey, Evaluator-in-Charge W. Stephen Lowrey, Staff Member Richard Horiuchi, Staff Member
Office of the Chief Economist, Washington, D.C.	James R. White, Economist

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