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CENTRAL ARIZONA WATER CONTROL STUDY

TABLE OF CONTENTS

	<u>Page</u>
ALTERNATIVE DEVELOPMENT.....	1
PUBLIC INVOLVEMENT.....	4
STAGE III PLAN DEVELOPMENT.....	7
Hydrology.....	11
Sizing.....	12
Design and Cost Estimates.....	15
Economics.....	15
Financial Analysis.....	16
Recreation.....	16
SRP Re-regulation and Other Nonstructural Measures.....	17
Environmental and Social Assessment.....	18
DESCRIPTION OF PLANS.....	23
COMPARATIVE EVALUATION OF PLANS.....	35
DESCRIPTION OF EVALUATION FACTORS.....	55
DETAILED PLAN INFORMATION.....	69

LIST OF TABLES

<u>Table</u>		<u>Page</u>
1	Comparative Evaluation of Plans	36
2	Design and Cost - Plan 1	71
3	Benefit/Cost Summary - Plan 1	72
4	Design and Cost - Plan 2	73
5	Benefit/Cost Summary - Plan 2	74
6	Design and Cost - Plan 3	75
7	Benefit/Cost Summary - Plan 3	76
8	Design and Cost - Plan 4	77
9	Benefit/ Cost Summary - Plan 4	78
10	Design and Cost - Plan 5	79
11	Benefit/Cost Summary - Plan 5	80
12	Design and Cost - Plan 6	81
13	Benefit/Cost Summary - Plan 6	82
14	Design and Cost - Plan 7	83
15	Benefit/Cost Summary - Plan 7	84
16	Environmental Impacts and Effects of Plan 1	85
17	Environmental Impacts and Effects of Plan 2	92
18	Environmental Impacts and Effects of Plan 3	99
19	Environmental Impacts and Effects of Plans 4 and 5	107
20	Environmental Impacts and Effects of Plan 6	115
21	Environmental Impacts and Effects of Plan 7	122
22	Environmental Conditions in Future Without Project Plan 8	129

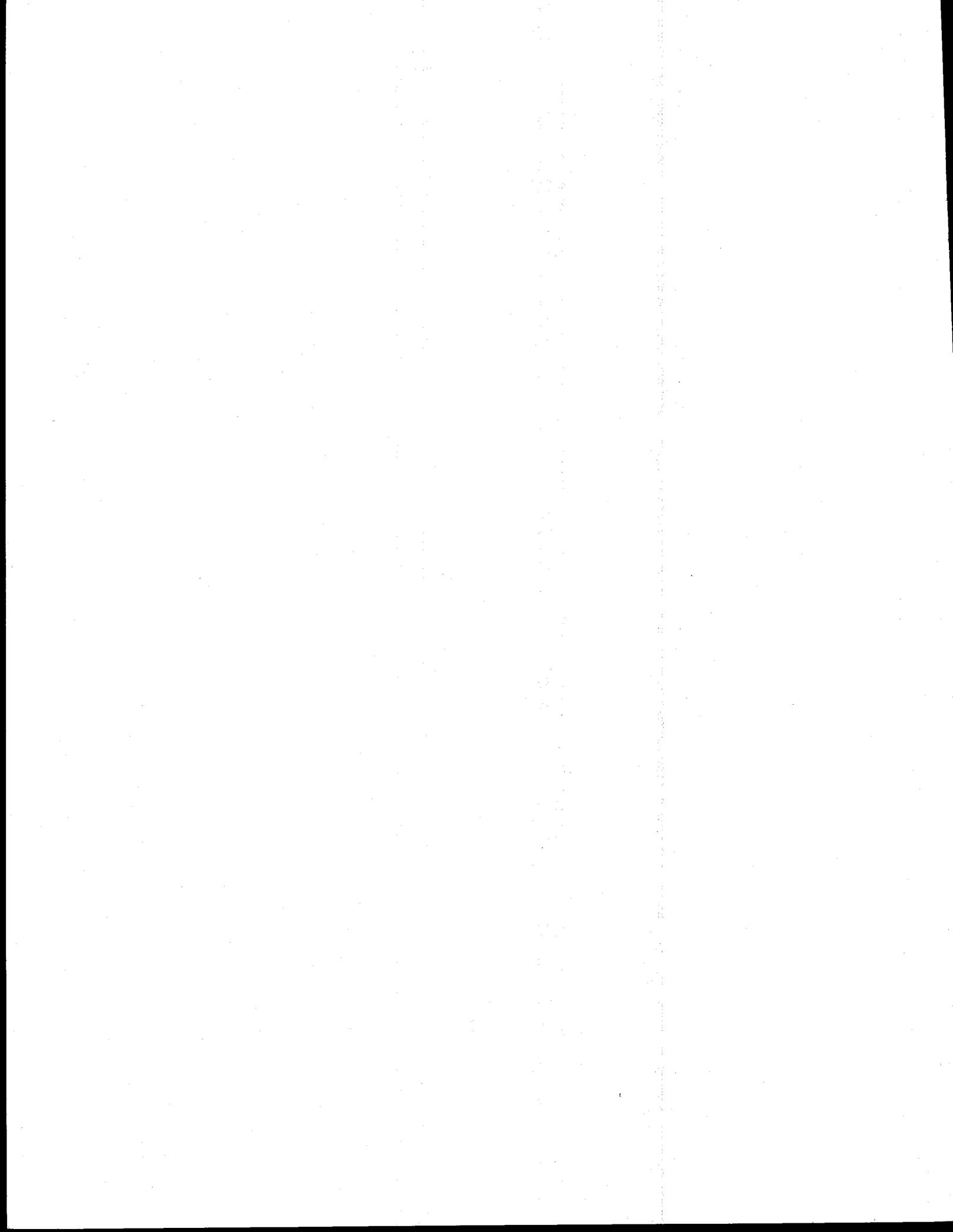
LIST OF TABLES (Cont'd)

<u>Table</u>	<u>Page</u>
23	HEP Evaluation Procedure 140
24	Indian Relocations - Plans 1,2,6, and 7 141
25	Indian Relocations - Plans 3,4, and 5 142
26	Indian Relocations - Plan 8 143
27	Non-Indian Relocations (Roosevelt Lake Area) Plans 1,3,6, and 7 144
28	Non-Indian Relocations (Roosevelt Lake Area) Plans 2,4, and 5 145
29	Non-Indian Relocations (Roosevelt Lake Area) Plan 8 .. 146
30	Non-Indian Relocations (K-A Ranch) Plans 1,2,3,4,5,6, and 7 147
31	Non-Indian Relocations (K-A Ranch) - Plan 8 148
32	Social Impacts of Recreation - Plans 1 through 8 149
33	Social Impacts and Effects of Flooding Plans 1,3,4,5,6 and 7 151
34	Social Impacts and Effects of Flooding - Plan 2 152
35	200-year Flooding Conditions in Future without Project 154

LIST OF FIGURES AND CHARTS

<u>Figures</u>	<u>Page</u>
1 CAWCS Study Area.....	2
2 CAWCS Planning Process.....	3
3 Storage Allocations.....	14

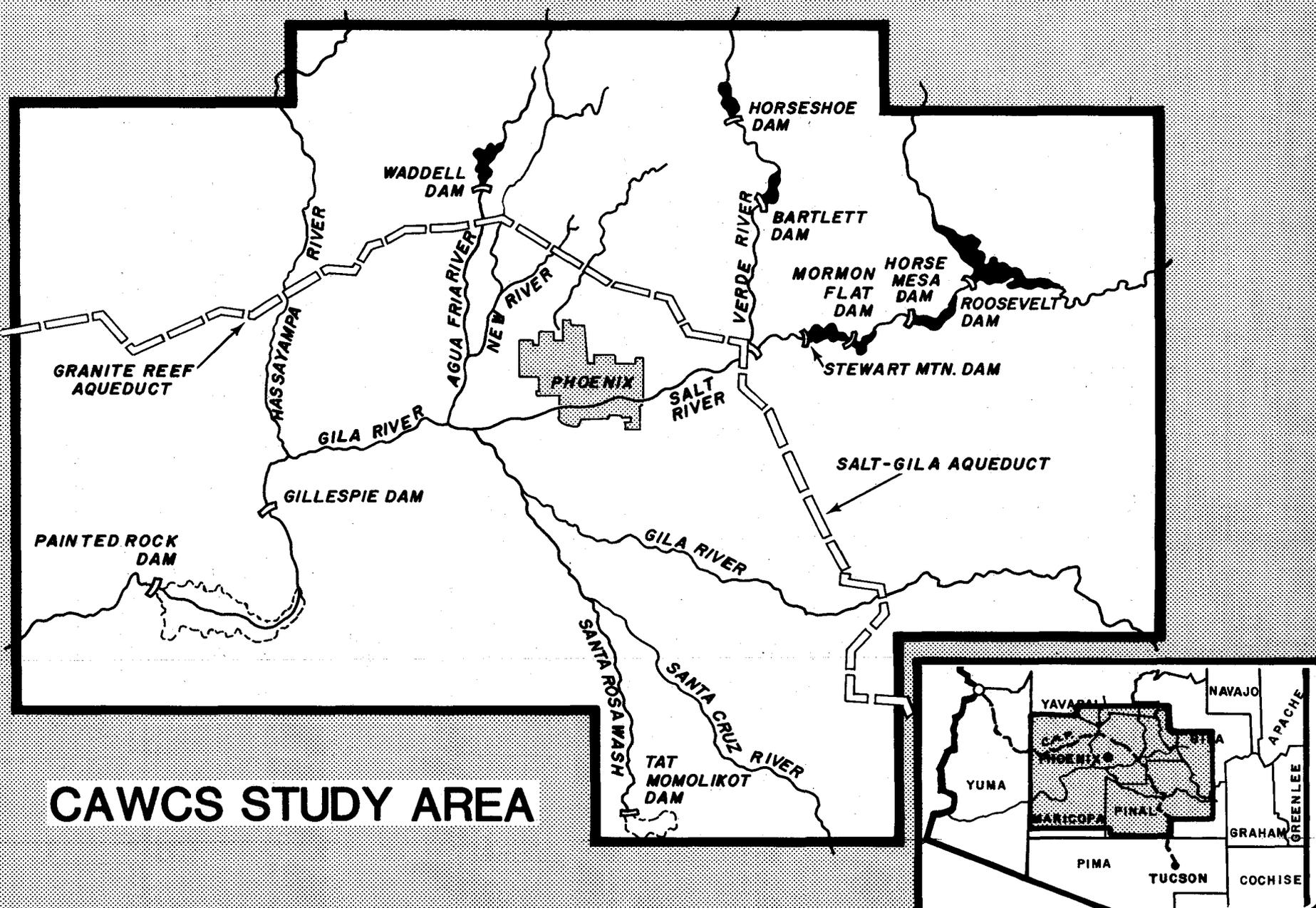
<u>Charts</u>	
1 Plan 1: Cliff + New/Enlarged Roosevelt + Reconstructed Stewart Mountain.....	25
2 Plan 2: Cliff + New/Enlarged Roosevelt + Reconstructed Stewart Mountain + Nonstructural (limited structural).....	26
3 Plan 3: Confluence + Cliff + New/Enlarged Roosevelt + Reconstructed Stewart Mountain.....	27
4 Plan 4: Confluence (large spillway) + Cliff + New/Enlarged Roosevelt + Reconstructed Stewart Mountain.....	28
5 Plan 5: Confluence (small spillway and auxiliary spillway) + Cliff + New/Enlarged Roosevelt + Reconstructed Stewart Mountain.....	29
6 Plan 6: New Waddell + Cliff + New/Enlarged Roosevelt + Reconstructed Stewart Mountain.....	30
7 Plan 7: New Waddell + Cliff + New/Enlarged Roosevelt + Reconstructed Stewart Mountain (environmental enhancement).....	31
8 Plan 8: CAWCS No Action.....	32



In 1968, the U.S. Congress authorized construction of Orme Dam, or a suitable alternative, as part of the Central Arizona Project. A draft Environmental Impact Statement was prepared for Orme Dam in 1976. Public response to the statement indicated substantial environmental, economic and social concerns regarding inundation of a major portion of the Fort McDowell Indian Reservation and riparian habitats, the impacts on flowing stream recreation, as well as impacts upon the endangered bald eagle and other wildlife. These and other concerns caused the Bureau of Reclamation to reassess the merits of Orme Dam and identify several alternatives for further study. The Central Arizona Water Control Study (CAWCS) was initiated in July 1978 to develop and evaluate alternatives, including a dam at the confluence of the Salt and Verde Rivers, for flood control in the Phoenix metropolitan area and regulatory storage of CAP water in central Arizona. (see Figure 1)

ALTERNATIVE DEVELOPMENT

The CAWCS has been conducted in three stages (see Figure 2). The development of alternatives has been a process of transition from a wide array of possible solutions to the recommendation of a single proposed action. The first stage of the study was exploratory, and planning was conducted at a preliminary level of detail. Issues were addressed and a wide array of possible solutions, called "elements", were identified. After preliminary assessment, unsuitable alternatives were eliminated from further

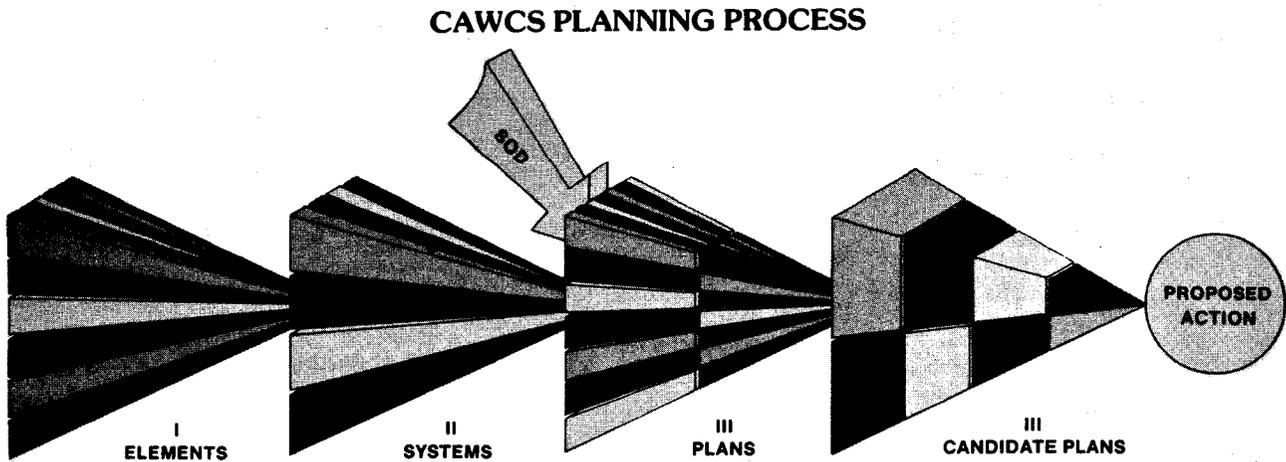


CAWCS STUDY AREA

Figure 1

study. Stage I was completed in May 1979, and a Plan of Study (January 1980) was prepared which documented alternatives for further study and set a course for the remainder of the study.

Figure 2



During Stage II, the planning focus shifted from problem identification to actual formulation and evaluation of alternatives. We analyzed and screened the elements in more detail and combined the best into "systems". Based on more detailed technical analysis and environmental and social impact assessment, a number of actions were recommended for further detailed study in the third and last stage of the CAWCS. Stage II was completed in January 1981, and results were documented in detail in the Stage II Report (March 1981).

We are now well into Stage III, the final step in alternative development. Final alternatives, called "plans", which solve flood control, regulatory storage, and safety of dams (SOD) problems, have been developed

and evaluated at a more detailed level of analysis. In October 1981, a proposed action will be identified from among the candidate plans presented in this Factbook. This proposed action will be presented with the other candidate plans in a draft Environmental Impact Statement to be released in April 1982.

More detailed information on Stages I and II of the CAWCS is contained in the Plan of Study, the Stage II Report, and the Factbook, Public Forums, November-December 1980, which can be obtained through the CAWCS office. A more detailed description of Stage III is contained in the following sections of this Factbook.

PUBLIC INVOLVEMENT

Due to recent flooding problems in the CAWCS study area and a history of controversy over Orme Dam, a great deal of public interest exists in this planning study. It was essential that the CAWCS be conducted both with extreme political sensitivity and openness. Public involvement, therefore, has been a critical component of the CAWCS. The CAWCS program was designed to involve various publics in the planning process and to make the process responsive to public needs and preferences. This has been accomplished through various types of activities and techniques.

In Stage I, Governor Babbitt organized the Citizens' Advisory Committee. The Committee, which represents the interests of environmental groups, business groups, Indian tribes, media, and citizens, provides a link between the CAWCS and the public and has met monthly since the start of the study. At the end of Stage III and prior to identification of a

proposed action, the Committee will make a recommendation to the Governor and the Bureau of Reclamation. The Committee's recommendation will be considered by the Bureau in the selection of the proposed action.

A Technical Agency Group (TAG) was also organized in Stage I, representing local, state, and federal agencies which have an interest in the CAWCS. The TAG, which interacts with the Bureau and Corps on a continuing basis, assists in the collection of information and development of new data, reviews and analyzes data, and assists in alternative plan development. In addition, numerous presentations were made to special interest groups, community groups and organizations. Local, state, and federal legislators were briefed periodically to keep them abreast of the CAWCS.

Public workshops and meetings were held at key decision points in the study. At the end of Stage I, three public meetings were held to discuss issues, alternatives, and the planning process.

Two rounds of community meetings were held in Stage II. Midway, when systems had been developed, a series of public workshops were held to familiarize the public with the alternatives and obtain their opinions on their adequacy. Toward the end of Stage II, when systems were evaluated, a series of public forums were held to ask participants to evaluate and respond to Stage II study results and indicate their preferences. Results of these forums were ultimately integrated into the Stage II recommendations.

During Stage III, a series of meetings were held with involved groups with a stake in the outcome of the study. The aim of the meetings was to identify and assess public values and determine how well each plan matched the values of the various stakeholders. The results of this "value

assessment" will be used in the evaluation of plans. At the end of Stage III, a final series of public meetings is scheduled to provide the general public an opportunity to review plans and results of the public value assessment. Again, the results of these meetings will be used in evaluating plans and identifying a proposed action.

Regular monthly newsletters, "Extra's", and periodic brochures keep the public informed of CAWCS progress. Other techniques include slide-tape presentations to community groups and organizations, news releases, bulletins and flyers, newspaper and magazine articles, and television and radio coverage.

A more detailed description of public involvement to date is contained in Public Involvement Plan, June 1980; Summary of CAWCS Public Involvement Activities, January 1981; and Evaluation of Stage II Public Involvement Program, March 1981.

STAGE III PLAN DEVELOPMENT

Concurrent with the CAWCS but under separate authorization, the Bureau has been conducting a Safety of Dams (SOD) study of existing dams on the Salt and Verde Rivers. Hydrologic analysis performed as part of the study indicated that the six dams on the Salt and Verde Rivers had inadequate storage capacity and/or spillway capacity to withstand the Maximum Probable Flood (MPF) without overtopping. (The MPF is a flood which has virtually no chance of being exceeded.) The MPF was selected as the Inflow Design Flood (the flood used to design a specific dam) since failure of any of the structures would likely cause loss of life and wide-spread property damage downstream. Consequently, the Bureau has been developing and evaluating alternative ways to insure the structural safety of the dams. The two studies have been closely coordinated and SOD considerations have become increasingly important in plan development. But as the CAWCS schedule tightened and the need to arrive at a timely decision increased, it became apparent that waiting for separate SOD and CAWCS solutions was no longer feasible. So, the Bureau widened the focus of the CAWCS to include SOD as a major objective, and all plans developed for Stage III analysis would now consider SOD and CAWCS purposes for the best solution to both problems.

At the start of Stage III, only those elements considered best for combination into plans remained. With the inclusion of SOD it was possible to combine the remaining elements into over 100 possible plans. Because CAWCS and SOD are under separate authorization and either portion of a plan could be delayed due to funding or authorizations problems, plans were developed in which 1) a joint solution could be implemented, 2) a CAWCS

solution could be implemented first with SOD delayed, or 3) there was no CAWCS action and SOD studies continue. No plans were developed for a CAWCS delay because a CAWCS delay would have no impact on plan design.

It would have been impractical to evaluate over 100 plans in detail, so the first task in Stage III was to reduce the number of alternative plans to the most reasonable or "candidate" plans. A ranking of alternatives was conducted. The plans were compared on eight aspects considered critical in selecting the candidate plans: flood control, water supply, safety of dams, cost, environmental impact, social impact, hydro-power, and energy management.

Three important decisions resulted from the ranking process:

1. Among the options considered in the SOD study were larger spillways, raised existing dams, new dams, and revised dam operating criteria. The analysis showed that, when a SOD solution and CAWCS solution were combined, Cliff Dam on the Verde River and New/Enlarged Roosevelt Dam on the Salt River should be used to solve the SOD problems because: 1) large upstream structures could suppress flows to a level which limited the need for major modifications at downstream structures, i.e., Bartlett Dam on the Verde River and Horse Mesa, Mormon Flat and Stewart Mountain Dams on the Salt River; and 2) flood control or regulatory storage space could be combined with a safety solution in one structure. Cliff Dam and New/Enlarged Roosevelt Dam are therefore included in all candidate plans for Safety of Dams purposes.

2. At the beginning of Stage III, construction of a New Stewart Mountain Dam was still under consideration for CAWCS purposes and, therefore, was included in the formulation of plans. However, during Stage III, further analysis showed that, while it had the advantage of low environmental and social impacts, it was too expensive to be considered further as a viable option. Therefore, New Stewart Mountain Dam was eliminated as a CAWCS alternative. Reconstruction of the existing Stewart Mountain Dam (enlarging the size of the spillway) for safety reasons, however, was determined to be a reasonable Safety of Dams solution and is included in candidate plans, along with Cliff and New/Enlarged Roosevelt Dams, for SOD purposes.
3. When evaluating the possibility of delays in plan implementation, it was determined that only the design of a Confluence structure would be affected. This situation is discussed under the description of plans in this Factbook.

Based on the results of the ranking, the "best" plans were identified, and then reexamined to insure that they represented the best range of possible solutions. Eight candidate plans, including a CAWCS "No Action" alternative, were identified at that time:

- | | |
|--------|---|
| Plan 1 | Cliff + New/Enlarged Roosevelt + Reconstructed Stewart Mountain |
| Plan 2 | Cliff + New/Enlarged Roosevelt + Reconstructed Stewart Mountain + SRP Re-regulation + Nonstructural |
| Plan 3 | Confluence + Cliff + New/Enlarged Roosevelt + Reconstructed Stewart Mountain |

- Plan 4 Confluence with Large Spillway + Cliff + New/Enlarged Roosevelt + Reconstructed Stewart Mountain
- Plan 5 Confluence with Small Service Spillway and Auxiliary Spillway + Cliff + New/Enlarged Roosevelt + Reconstructed Stewart Mountain
- Plan 6 New Waddell + Cliff + New/Enlarged Roosevelt + Reconstructed Stewart Mountain
- Plan 7 Same as Plan 6, but with emphasis on opportunities for environmental enhancement
- Plan 8 CAWCS No Action and continued SOD studies

Stage III technical studies refined existing data and included new information as a result of the addition of SOD in plan development. Stage III technical studies included:

- Hydrology
- Reservoir Sizing
- Designs and Cost Estimates
- Economics
- Financial Analysis
- Environmental and Social Impacts Assessment
- Recreation
- SRP Re-regulation and Other Nonstructural Measures

These studies resulted in changes in plans, and information on each of the plans may be different than in previous stages. Before actually describing the plans, additional background material on these analyses may help you evaluate the plans.

Hydrology

In Stage III, flood control hydrology studies focused on determining local flows below Cliff, Roosevelt, and Confluence Dams to better differentiate between levels of protection provided by candidate plans. Local flows include all inflows to rivers from tributaries and washes located below a dam (intermediate drainages). Local flows were determined by analyzing the drainage areas below the dams, and it was then possible to estimate the actual flows through Phoenix for a particular plan. Because local flows are now included, the discharges shown for each plan may be higher than shown in previous stages.

Also, to evaluate the flood control performance of a plan, it is necessary to characterize the water discharge at some geographical location-- either at the confluence of the Salt and Verde Rivers or at some point along the Salt River. To date, flood control performance has been characterized as the reduction in the Standard Project Flood (SPF) to some target discharge at the Salt-Verde confluence. However, because the frequency of the SPF varies with each structure, it is difficult to compare the performance of different structures on that basis. Also, flows at the confluence would be affected as they travel downstream. This is due to such factors as infiltration, evaporation, and inflows from Indian Bend Wash, the last major drainage upstream of metropolitan Phoenix. Therefore, for Stage III, the flood control performance is characterized as the reduction in the 200-year flood event (similar in frequency to SPF) to a flow at the airport, which is one of the first areas for high potential damage below Indian Bend Wash. The 200-year flood

event is 275,000 cfs at the airport. The reduction in the 100-year event (215,000 cfs at the airport) is also identified, as the 100-year floodplain is the basis for land use regulations and is important in determining flood control benefits.

Stage III regulatory storage hydrology studies focused on two areas:

- The IDF's were routed through the Salt River Project Dams to the Salt-Verde confluence. The results of this analysis determined the magnitude of the IDF by the time it reaches the confluence. The IDF at the confluence varies in magnitude depending on whether a dam safety solution is implemented concurrently or delayed.
- During Stage III, the regulatory storage yields (increase in CAP water supply) were refined and the yield for each plan was determined, rather than for each element as in previous stages.

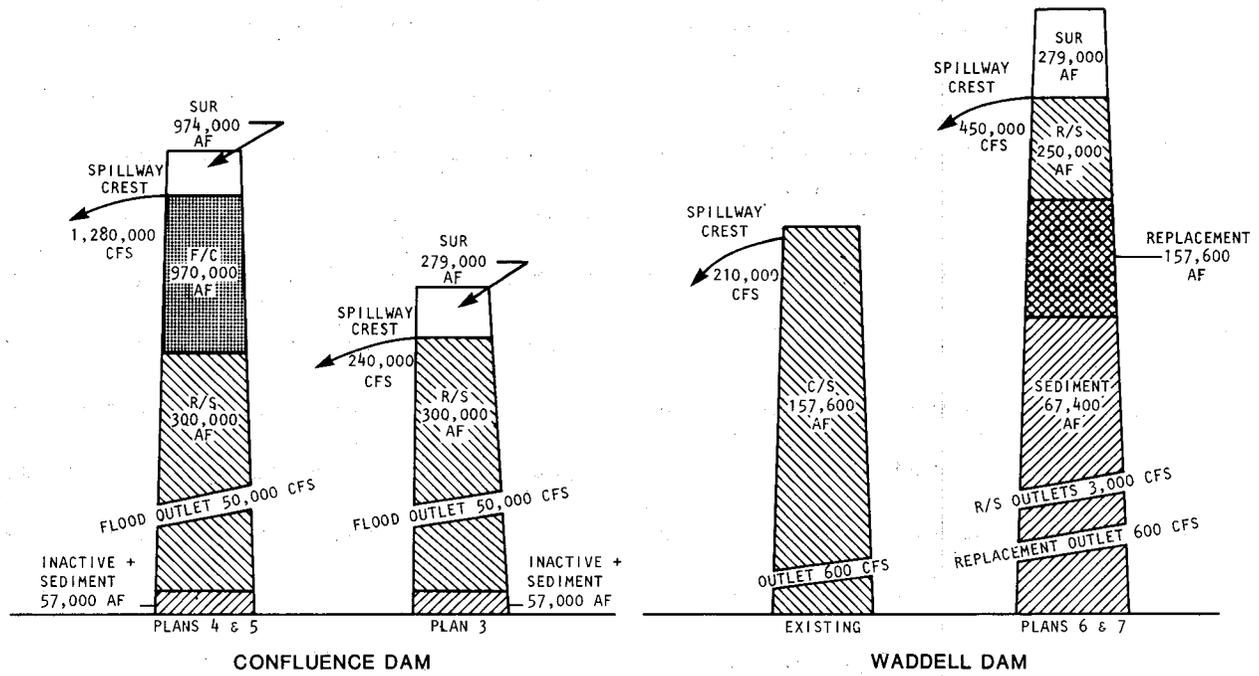
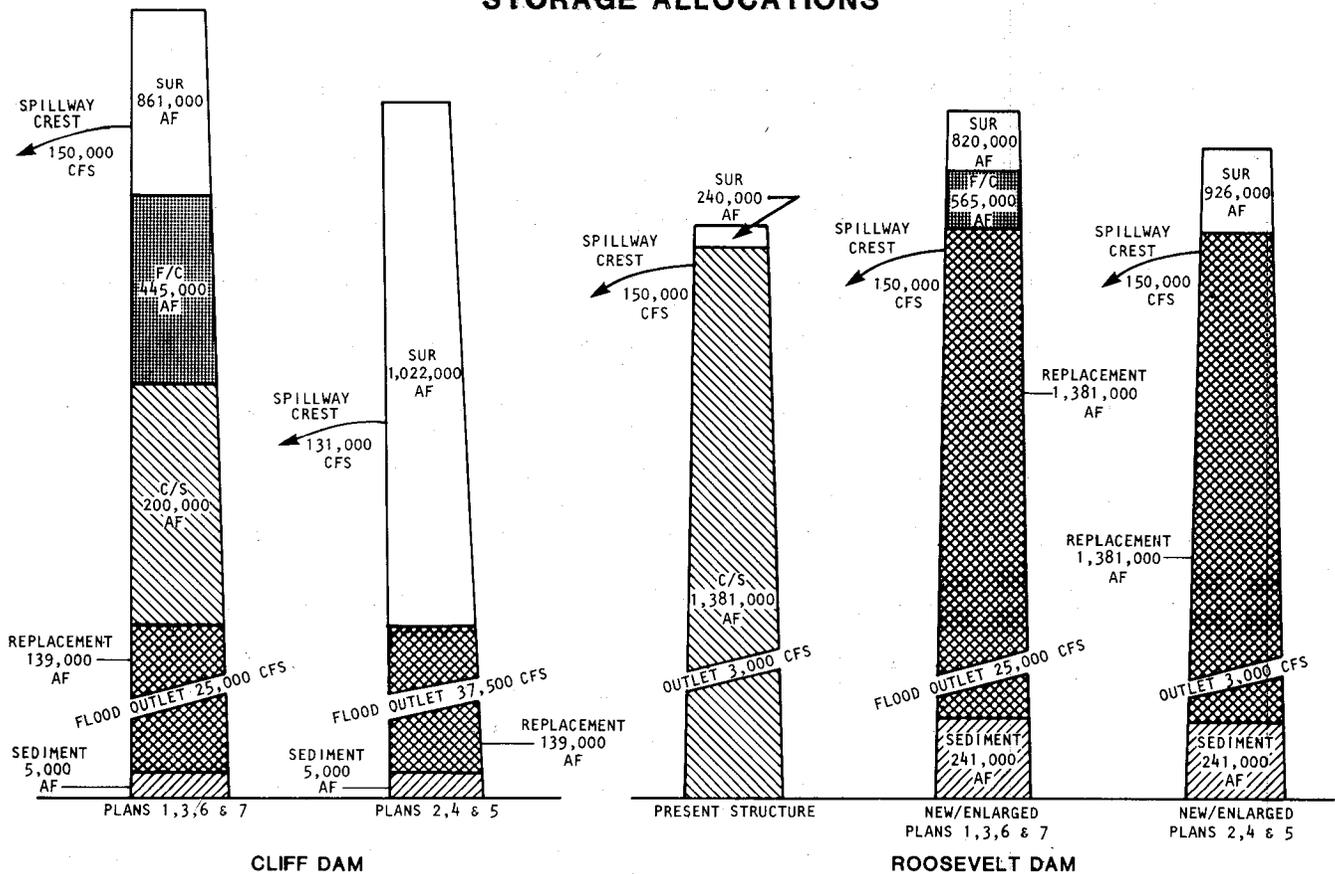
Sizing

Through Stage II, a range of structure sizes was used in evaluating alternatives. In Stage III, a specific size has been identified for each of the structures that are combined into a plan. Regulatory storage capacity in Plans 3 through 7 was sized to provide the opportunity for energy management. In Plan 1, it was sized to provide the optimum amount of available water supply. Plans were developed assuming that all water supply and hydropower

benefits derived from those plans accrued to the CAP. Flood control capacity was sized based on operating constraints (evacuation of flood pool within 10 days). The flood control sizing analysis did show that the benefits of additional capacity increased faster than the costs of providing additional capacity for all sizes considered. However, the operating constraints made it impossible to provide the additional capacity and at the same time reduce releases to below 50,000 cfs. Therefore, it was infeasible to include additional capacity. The sizing analysis also determined the amount of capacity allocated to surcharge, sediment, replacement, and minimum pool. Storage allocations for Cliff, Roosevelt, Confluence, and Waddell Dams are illustrated in Figure 3. Some things to note include:

- In addition to SOD purposes, some of the plans include new water conservation space for regulatory storage purposes in Cliff and Roosevelt Dams to increase the CAP water supply. At Roosevelt, the sediment space required for the 100-year life of the dam is 241,000 acre-feet. Depending on the way in which the sediment would be deposited and the design of the structure, it was assumed that a portion of the space would be available on a joint-use basis to store water which could be used to increase the CAP water supply. In the winter, some of the waters that would normally have been spilled would be stored in the new conservation space and in the summer would be delivered, when needed, to the Salt-Gila Aqueduct. In some plans CAP aqueduct water would also be exchanged with Salt River Project (SRP) on a seasonal basis (Plans 1 and 7). In other plans (2 and 6), CAP water supply is developed and delivered to CAP users on demand.

**Figure 3
STORAGE ALLOCATIONS**



Design and Cost Estimates

Design and cost estimates developed during Stage II were refined in Stage III based on the following:

- During Stage III, inflow design floods (IDF) were calculated for each structure on the Salt and Verde Rivers. The IDFs were a major factor in refinement of design and cost estimates.
- Safety of Dams (SOD) solutions were incorporated into all candidate plans.
- Determination of specific structure sizes and reservoir operation criteria contributed significantly to refinement of design and cost estimates.
- Estimated construction costs of plans include the cost of land acquisition and relocation. No recreational development and mitigation costs are included at this time.

Economics

Each plan was subjected to an economic analysis to determine its economic efficiency. Two measures of economic efficiency are used to analyze each plan: benefit/cost ratio and net economic benefits. Either measure indicates whether a given proposal would return more in benefits than it would cost and is used to screen alternatives for general investment acceptability. Net economic benefits are the difference between annual benefits and annual costs. Benefits of each plan are included in the description of plans, as are the benefit/cost ratio and net economic benefits.

Financial Analysis

During Stage III, an analysis of the financial aspects of the plan resulted in identification of the allocation of cost to various functions (regulatory storage, flood control, SOD). Two of these functions, flood control and Safety of Dams, are non-reimbursable, which means they are paid for by the federal government and do not have to be repaid by the project users. The other function, regulatory storage, is reimbursable. Reimbursable costs are those additional CAP costs which would be repaid by the user of the project through property taxes, water charges, and power sales. These costs are the difference between the reimbursable portion of the CAP with and without any regulatory storage. Cost allocations and repayment analysis are shown in the "Detailed Plan Information" section of this Factbook.

Recreation

Conceptual recreation plans have been developed for Cliff, Roosevelt, Confluence, and New Waddell Reservoirs and have been aggregated to reflect the types and amounts of recreational opportunities provided by each of the candidate plans. These recreation plans reflect the specific recreational needs as identified by the Maricopa County Parks and Recreation Department, the U.S. Forest Service, the Salt River Indian Community, and the Fort McDowell Indian Community. In addition, the policy developed by each entity toward recreation development on their lands was clarified and cost-sharing arrangements inherent in the recreation plans identified. Some things to note are:

- No conceptual recreation plans were developed for Cliff and Roosevelt when the dams are constructed for SOD only (Plans 4 and 5) or in plans featuring minimal development to minimize impacts (Plan 2).
- The conceptual recreation plan developed for Confluence includes facilities on Salt River Pima Indian Community lands and within the boundaries of the Tonto National Forest. No new recreation facilities are currently planned for Fort McDowell Indian Community lands because of the low quality of water-related recreational opportunities as a result of reservoir fluctuation.
- Conceptual plans feature mainly daytime activities at New Waddell and Confluence, while overnight and weekend facilities are provided at Cliff and Roosevelt, due to their distance from the Phoenix metropolitan area.
- No stream-oriented recreation was included at New Waddell as there were found to be no streams of recreational value in the site area.

SRP Re-regulation and Other Nonstructural Measures

During Stage III several nonstructural (flood damage reduction) measures were studied in more detail than Stage II. These were:

- SRP Re-regulation - reoperation of SRP dams for flood control.
- SPF Bridge - analysis of the ability of Mill Avenue, I-10, and Central Avenue bridges to pass the SPF. If these bridges cannot pass the SPF, design of a bridge that could safely pass the 200-year flood (295,000 cfs at the Salt-Verde confluence), was analyzed for emergency use only during floods.

- Limited Levees - smaller levees intended as substitutes for floodproofing measures and to prevent major breakouts of flows.
- Sand and Gravel Reoperation - alteration of existing floodplain excavation practices to increase channel capacity and thereby decrease flood damages.

During Stage III, these measures were used to develop a plan which met the objectives of the CAWCS while requiring limited construction and resulting in minimal impacts on people (Plan 2).

- With the addition of SOD as a CAWCS objective, however, it was determined that a purely nonstructural plan could not meet completely the objectives of the CAWCS, and therefore was not included in the set of candidate plans.
- Further detailed analysis of SRP Re-regulation, taking advantage of Cliff and Roosevelt as the CAWCS Safety of Dams solution, showed that by operating the dams for SOD only (with no dedicated flood control space), incidental flood control at a level comparable to that of re-regulation could be obtained. While a higher level of flood control could still be obtained with other approaches to re-regulation, it was determined that operating for SOD only met the objectives of providing an intermediate level of flood control with limited construction and minimal impact on people, and without the institutional problems and water loss associated with dedicating flood control space in existing SRP dams. On this basis, SRP Re-regulation is no longer considered as a CAWCS nonstructural measure. Implementation of some nonstructural measures, such as preparedness planning and floodproofing, could be beneficial regardless of the selected proposed action and could be combined with SOD in a plan. These nonstructural measures would be a local responsibility.

- On the basis of this analysis, Plan 2 was modified to include Cliff and Roosevelt for SOD only (which provides incidental flood control) together with nonstructural measures downstream, and reconstruction of Stewart Mountain Dam for SOD. This plan is described in more detail in the next section of this Factbook.
- In the event of a SOD-only solution, nonstructural alternatives could be implemented to reduce residual flood damages.

Environmental and Social Assessment

All of the plans have environmental and social consequences associated with them. During Stage III these impacts have been identified, quantified, and evaluated based on refined data (revised IDFs, specific sizing) for each plan.

While environmental studies were mainly a refinement of Stage II data, some additional work was completed:

- The scope of the cultural resource analysis was increased during Stage III to encompass a larger geographic area. Also a larger sample of cultural resources was analyzed in Stage III than in Stage II.
- An "instream flow analysis" was conducted to determine the amount of water which must remain in a flowing stream in order to maintain a self-sustaining fishery in that stream. In addition, the Habitat Evaluation Procedure (HEP) was adapted for use in CAWCS to quantify the value of habitat that would be lost as a result of a project action. Results of HEP will be considered in developing recommendations for mitigation of lost fish and wildlife due to the proposed action.

In the social assessment during Stage III, each candidate plan was examined to determine its contribution to the social well-being of people who would be affected by its implementation. Extensive field work was completed at each potentially affected site to provide information on community values, history, and personal life-style. Community profiles were developed based on this field work, and used to determine changes in social conditions that would occur as a result of each plan (impacts). The effects, or outcomes, of these social impacts were then evaluated for each plan.

The level of an impact is expressed in one of five ways: no change, slight, moderate, substantial, extreme. Many factors, some (unique) to each impact, were calculated in determining the impact level. The following criteria were used in ascertaining the level of impact:

- 1) probability of occurrence of the impact
- 2) duration of the impact
- 3) reversability of the impact
- 4) number of people affected
- 5) extent to which impact affects other areas of life

For example, an extreme level impact would have the following characteristics: it is very likely to occur, would last for a long time, would be difficult to reverse and would affect many people in many areas of their lives. In contrast, a slight level impact may be irreversable, but may affect only a few people or reduce something that was not very important to the people, or that existed in small quantities. It is the combination of these characteristics that determines the level of impact.

Recommendations were made for mitigation for each plan. Mitigation is the action taken to reduce or eliminate the environmental and social impacts of a project action. Results of the environmental and social assessment (impacts and effects) and mitigation recommendations are summarized in the "Comparative Evaluation of Plans" section of this Factbook.

DESCRIPTION OF PLANS

The eight candidate plans are:

- CLIFF + NEW/ENLARGED ROOSEVELT + STEWART MOUNTAIN

Plan 1: Cliff + New/Enlarged Roosevelt + Reconstructed Stewart Mountain

Plan 2: Cliff + New/Enlarged Roosevelt + Reconstructed Stewart Mountain
+ Nonstructural

- CONFLUENCE + CLIFF + NEW/ENLARGED ROOSEVELT + STEWART MOUNTAIN

Plan 3: Confluence + Cliff + New/Enlarged Roosevelt + Reconstructed
Stewart Mountain

Plan 4: Confluence with a Large Spillway + Cliff + New/Enlarged Roosevelt
+ Reconstructed Stewart Mountain

Plan 5: Confluence with Small Service Spillway and Auxiliary Spillway +
Cliff + New/Enlarged Roosevelt + Reconstructed Stewart Mountain

- NEW WADDELL + CLIFF + NEW/ENLARGED ROOSEVELT + STEWART MOUNTAIN

Plan 6: New Waddell + Cliff + New/Enlarged Roosevelt + Reconstructed
Stewart Mountain

Plan 7: New Waddell + Cliff + New/Enlarged Roosevelt + Reconstructed
Stewart Mountain (environmental emphasis)

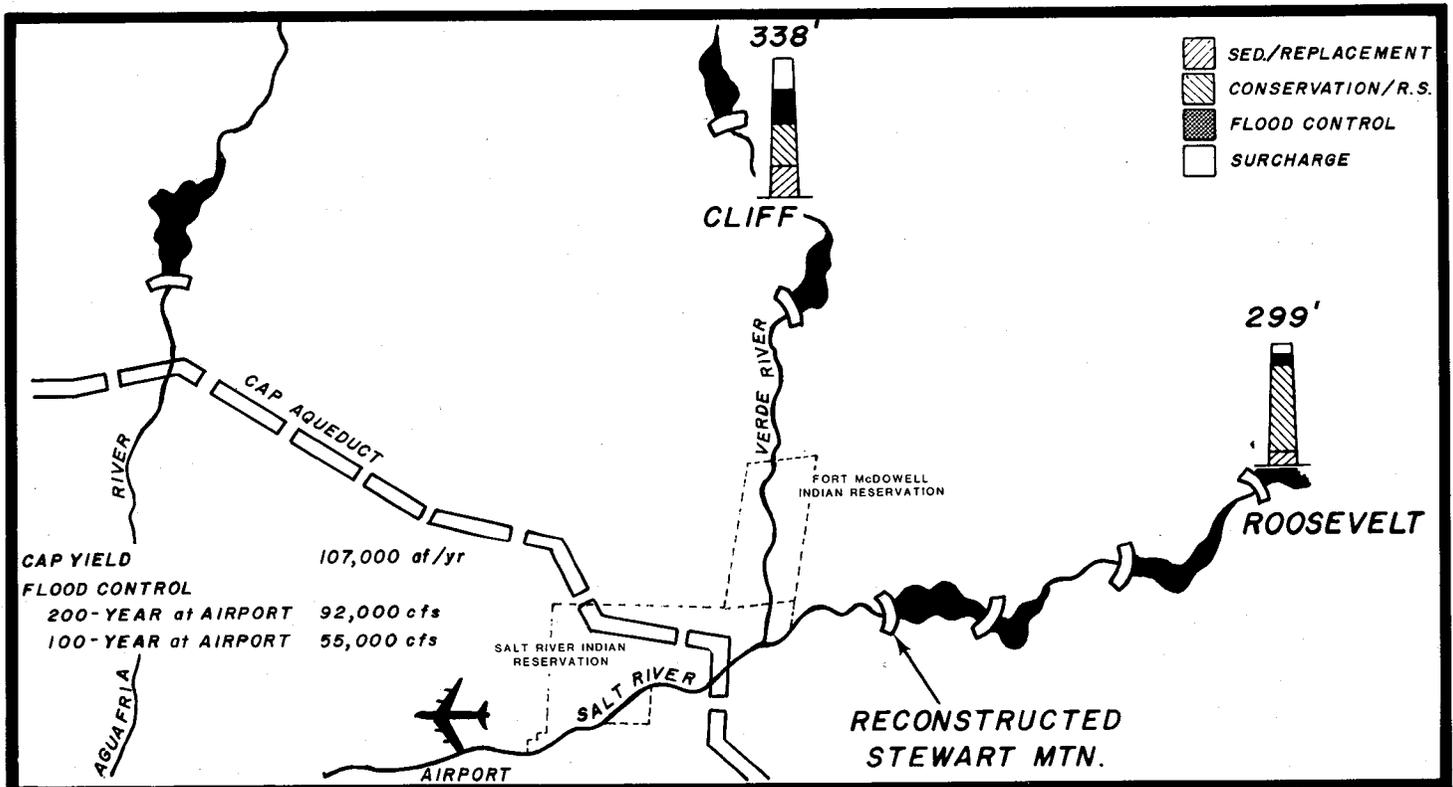
- CAWCS NO ACTION

Plan 8: No CAWCS project; SOD studies continue to select a preferred dam
safety solution

Each plan is described (Charts 1 through 8), including a graphic illustration of the plan and a description of the purposes, physical features, and performance of the plan. To facilitate comparison of all plans against each evaluation factor considered critical to selection of a proposed action, a comparative evaluation table is presented in the next section of this Factbook. Other factors were assessed in the evaluation of plans, such as visual quality, noise, effects on future and existing land use, and geological resources. However, these factors were determined not to be critical to the selection of a proposed action and, therefore, are not included in the comparative table.

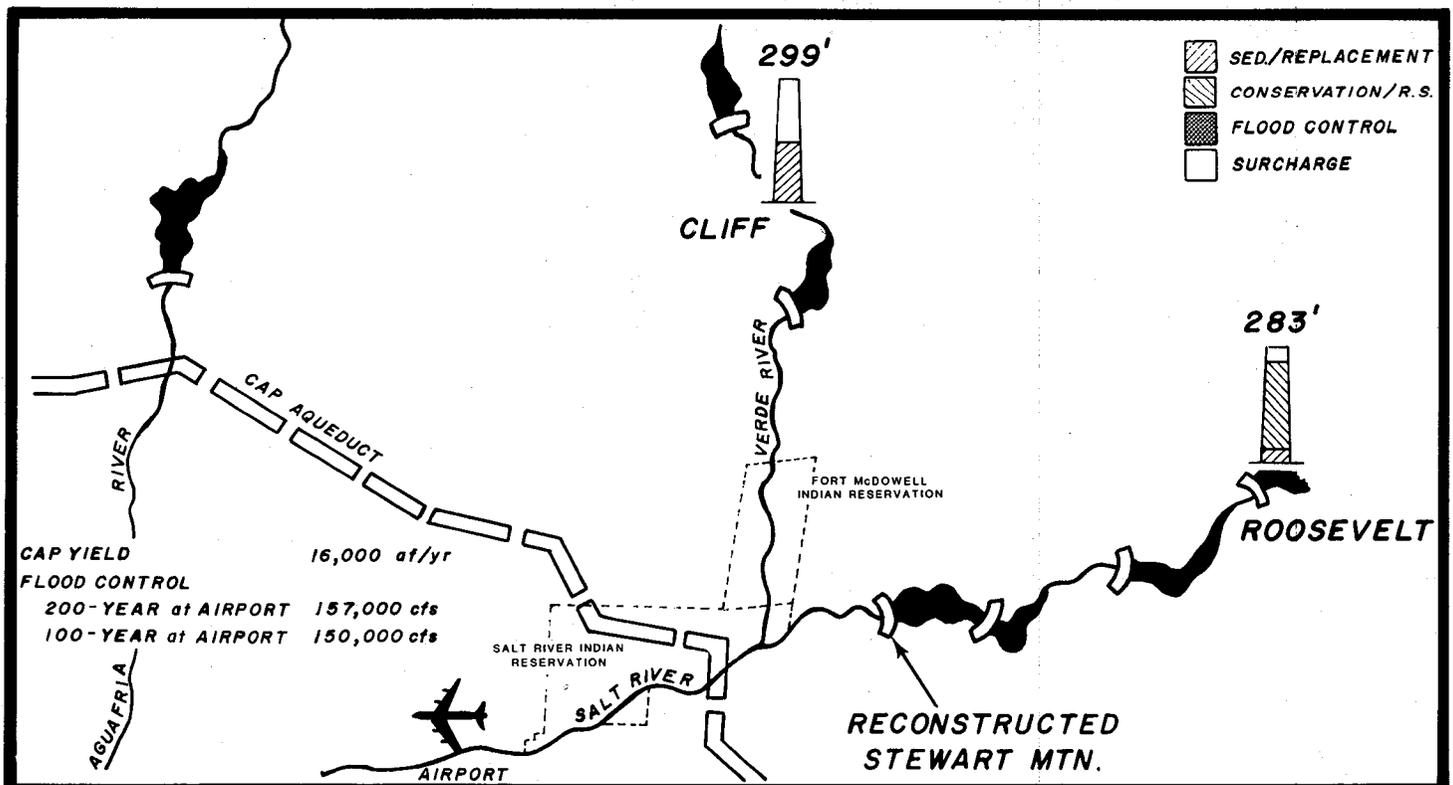
As you read through the evaluation table, we urge you to use the definitions of evaluation factors following the table. These definitions will be helpful in making your evaluation of plans. Also, more detailed design and cost data and environmental and social assessment results for each plan, are provided in the "Detailed Plan Information" section of this Factbook.

Chart 1
Plan 1: Cliff + Roosevelt + Reconstructed Stewart Mtn. Dam



Under this plan, Roosevelt and Cliff would be constructed to provide flood control, regulatory storage and hydropower, in addition to SOD. Stewart Mountain Dam would be reconstructed (enlarging the size of the spillway) for SOD purposes. Because this plan would not connect directly with the CAP, there is no potential for energy management. At Roosevelt, dual use of the sediment pool (241,000 acre-feet) could provide increased water supply for an interim period. This space plus the new conservation space at Cliff Dam would be used for conservation to increase CAP yield through exchange by 107,000 acre-feet per year. A pumping plant would be required at or near the Granite Reef Diversion Dam to deliver water to the Salt-Gila Aqueduct. New hydropower generation plants would be constructed at Cliff and Roosevelt. Dedicated flood control space at Cliff and Roosevelt would reduce the 200-year flood (275,000 cfs) to 92,000 cfs at the airport and the 100-year event to 55,000 cfs at the airport. Conceptual recreation plans for Cliff and Roosevelt feature an increase (18 new sites) in camping and picnicking, with 16 additional reservoir-oriented sites at Cliff and Roosevelt, and two additional (one at each dam) stream-oriented recreation sites for picnicking.

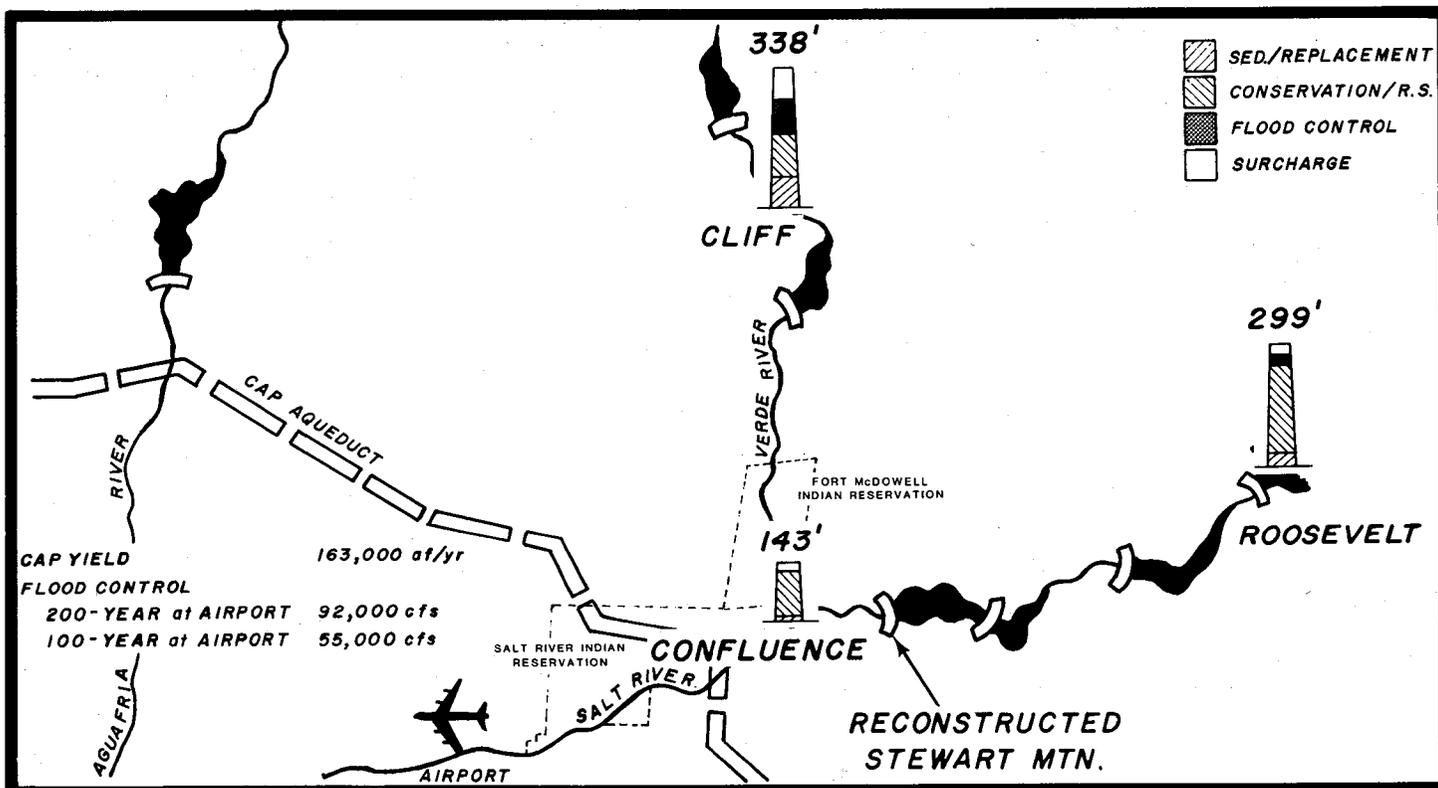
Chart 2
Plan 2: Cliff + Roosevelt + Reconstructed Stewart Mtn. + Nonstructural



This plan was developed with the objective of limited construction and minimizing impact on people. Through Stage II and initially in Stage III, re-regulation was considered for flood control. Further analysis of re-regulation, taking advantage of Cliff and Roosevelt as the CAWCS Safety of Dams solution, showed that by operating the dams for SOD only (no dedicated flood control space), incidental flood control at a level comparable to that of re-regulation could be obtained. Also the institutional problems and water losses associated with re-regulation were avoided. On this basis, SRP Re-regulation was no longer considered as a means of flood control and Plan 2 was modified.

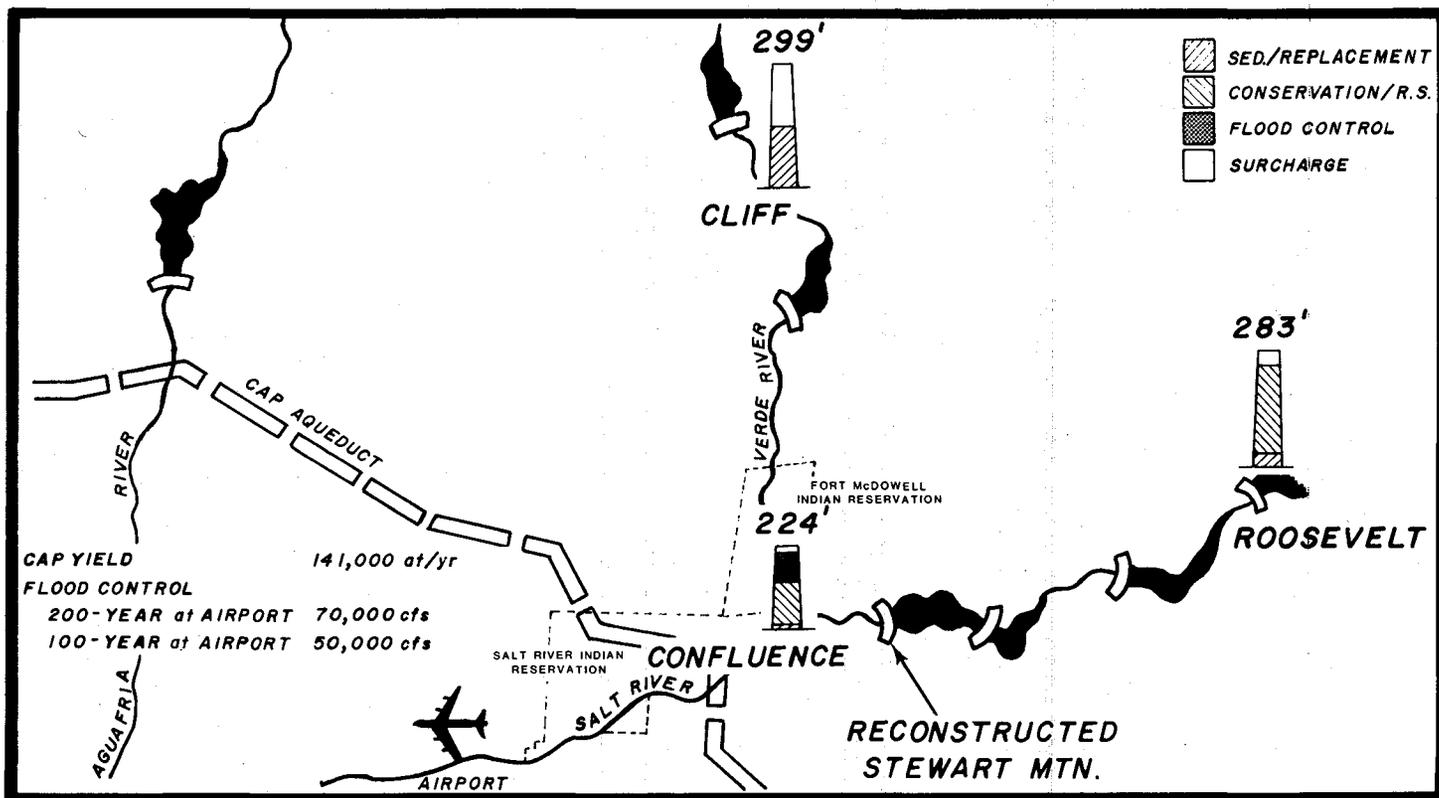
This plan limits construction at Cliff and Roosevelt to that necessary for SOD purposes. Flood control, provided by the use of the surcharge space at Cliff and Roosevelt in combination with nonstructural flood damage reduction measures downstream, would reduce the 200-year flood to 157,000 cfs and the 100-year flood to 150,000 cfs at the airport. Increased water supply for CAP (16,000 acre-feet per year) could be developed through an interim joint use of the sediment space at Roosevelt Dam. A pumping plant would be constructed at the Granite Reef Diversion Dam to deliver water to the Salt-Gila Aqueduct. Because this is a limited structural plan, hydropower and additional recreational facilities are not provided, except for replacement of existing facilities at Roosevelt.

Chart 3
Plan 3: Confluence+Cliff + Roosevelt + Reconstructed Stewart Mtn. Dam



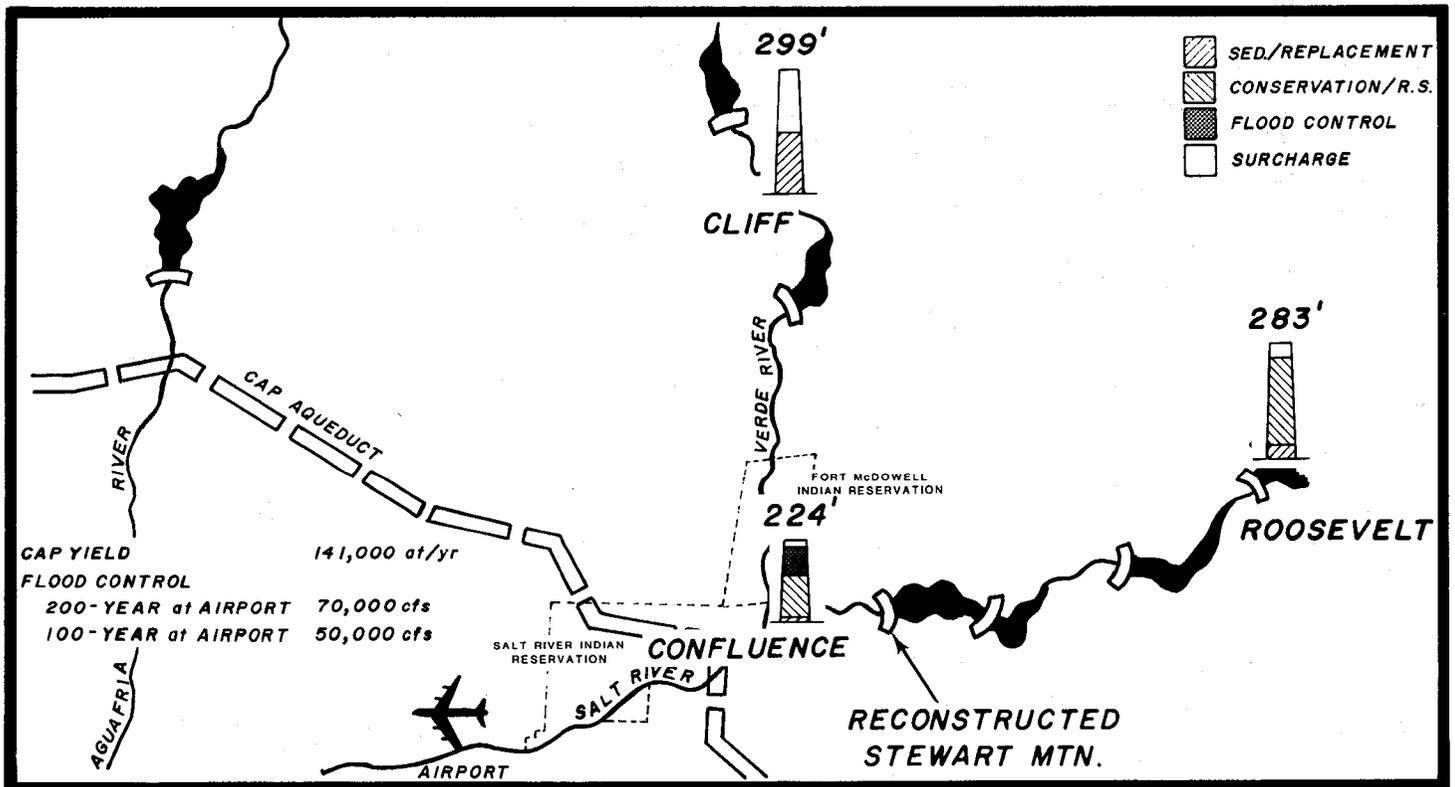
This plan was developed under the assumption that CAWCS and SOD were implemented at the same time. Under the plan, Cliff, Roosevelt, and a low Confluence Dam would be constructed concurrently. Because analysis indicated that it is less expensive to put flood control in upstream structures, Cliff and Roosevelt would provide flood control on the Salt and Verde, new conservation space, hydropower, and SOD. Hydropower facilities are the same as in Plan 1. The low Confluence Dam would be constructed for regulatory purposes. Routing floodwaters through this reservoir may provide some incidental flood damage reduction. Hydropower is developed at the Confluence; because the Confluence Dam would connect directly with the Salt-Gila Aqueduct via a pumping plant and canal, energy management potential could be realized. Under this plan, the 200-year flood would be reduced to 92,000 to 70,000 cfs and the 100-year flood to 55,000 to 50,000 at the airport. The CAP yield would be increased by 163,000 acre-feet per year. Conceptual recreation plans for Confluence, Cliff, and Roosevelt Dams include 26 new recreation sites (23 reservoir-oriented sites and 3 additional stream-oriented sites).

Chart 4
**Plan 4: Confluence (large spillway) + Cliff
 + Roosevelt + Reconstructed Stewart Mtn. Dam**



Plan 4 was developed on the premise that SOD is delayed (assumed to be 10 years delay for purposes of analysis), and therefore, the Confluence Dam, as it is downstream of all other dams, would have to withstand a large Inflow Design Flood until the SOD solution was implemented upstream. The Confluence Dam would be constructed first with a large service spillway (gated) to ensure the safety of the structure, and include flood control storage and regulatory storage capacity and a hydropower facility. The Confluence Dam would connect directly to the Salt-Gila Aqueduct through a pumping plant and canal, and energy management potential could be realized. Cliff and Roosevelt Dams would be constructed later for SOD purposes only. This plan reduced the 200-year flood to 70,000 cfs and the 100-year flood to 50,000 cfs at the airport. The CAP yield would be increased by 141,000 acre-feet per year. This plan includes additional recreation facilities at the Confluence only (7 reservoir-oriented sites; 1 stream-oriented site), as Cliff and Roosevelt are for SOD purposes only. Existing recreation and hydropower facilities are replaced at Roosevelt.

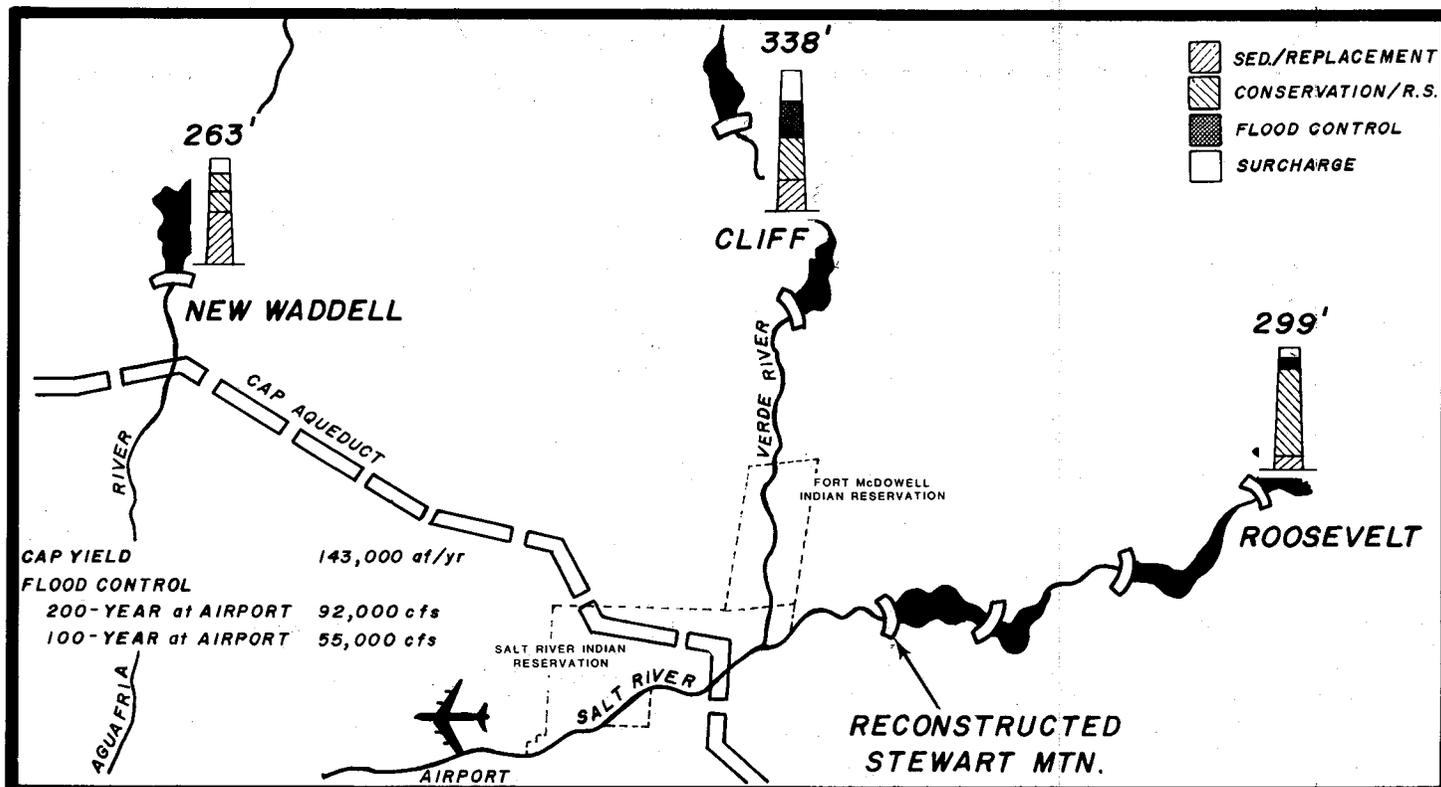
Chart 5
**Plan 5 Confluence (small spillway and emergency spillway) + Cliff
 + Roosevelt + Reconstructed Stewart Mtn. Dam**



Based on the same premise as Plan 4 (SOD delay), the Confluence Dam would be constructed first. However, instead of a large service spillway, the Confluence Dam would include a smaller service spillway (gated) and an auxiliary spillway (ungated) used only in large flooding events to ensure the safety of the structure. It would include regulatory storage, flood control storage, and a hydropower facility and would perform as in Plan 4. Cliff and Roosevelt Dams would be constructed later for SOD purposes only. Recreation plans are the same as Plan 4.

Chart 6

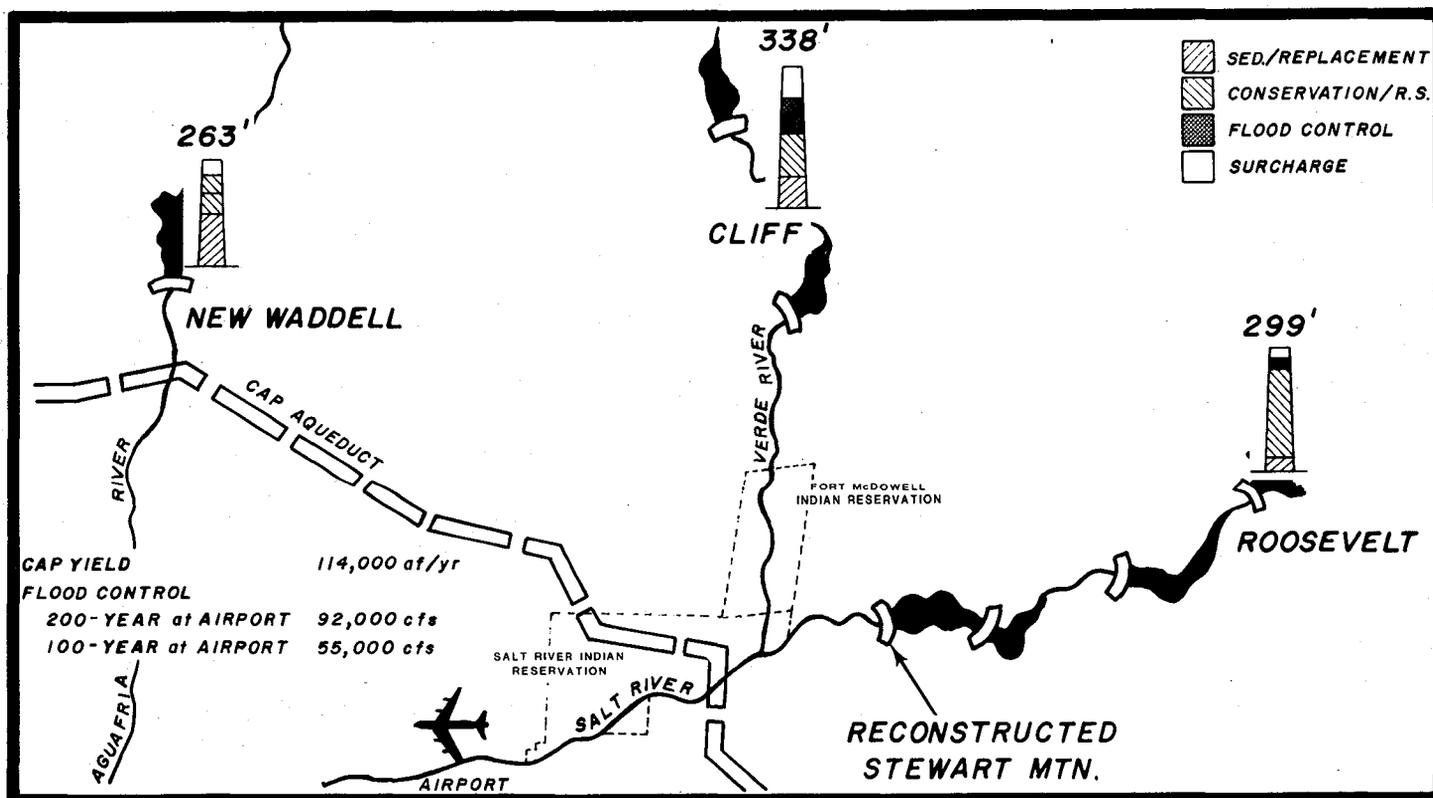
Plan 6: New Waddell+Cliff+Roosevelt+Reconstructed Stewart Mtn. Dam



New Waddell would be constructed for regulatory storage and would include a hydropower generation plant. The dam would be connected to the Granite Reef Aqueduct by a canal with a pumping plant. The CAP water supply would be increased by 143,000 acre-feet per year. Flood control, additional water conservation, hydropower, and SOD would be provided at Cliff and Roosevelt. Facilities would be the same as in Plan 1. This plan would reduce the 200-year flood at the airport to 92,000 cfs and the 100-year flood to 55,000 cfs. Conceptual recreation plans include 19 additional reservoir-oriented sites and 2 stream-oriented sites, one at Cliff and one at Roosevelt. No stream-oriented recreation was proposed at New Waddell because there are no streams of recreation value in the site area.

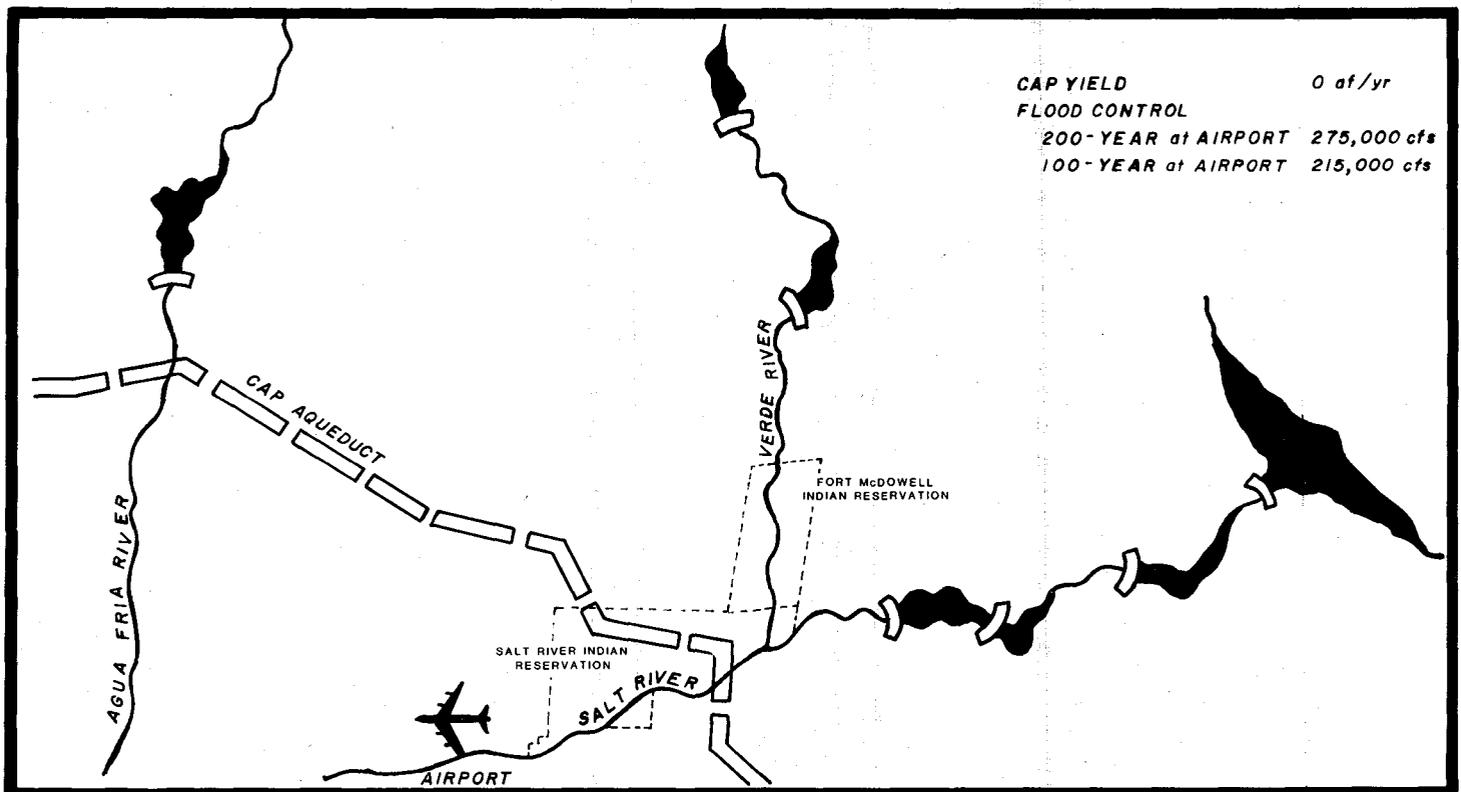
Chart 7

**Plan 7: New Waddell + Cliff + Roosevelt + Reconstructed Stewart Mtn. Dam
(environmental enhancement)**



This plan is the same as Plan 6, but would be operated to emphasize opportunities for environmental enhancement. A portion of the water supply generated by the new conservation space at Cliff and Roosevelt and the regulatory storage at New Waddell would be used for recreation and fish and wildlife conservation. Due to system losses for these purposes, the increase in CAP water supply is 114,000 acre-feet per year, which is less than in Plan 6. Recreation plans are the same as for Plan 6, but enough water is made available to provide minimum flows (enough water to sustain fish populations) on the Salt and Verde Rivers and to provide the potential for recreation and fish and wildlife enhancement on the Salt River through Phoenix. As a means for achieving this, 30,000 acre-feet of water could be made available to Rio Salado. To ensure minimum flows, exchanges with SRP are sometimes required.

Chart 8
Plan 8 CAWCS NO ACTION



The No Action alternative provides the baseline against which all other plans are compared. With this option, CAP would be constructed, but no CAWCS regulatory storage or flood control would be provided. SOD studies would however continue toward selection of a preferred SOD solution. This solution may differ from the Cliff/Roosevelt combination in CAWCS/SOD plans.

With no CAWCS action the following is assumed:

- The Central Arizona Project will deliver Colorado River water to the study area, but there will be no regulatory storage in the system.
- No flood control measures or structures under study by the CAWCS will be implemented by the federal government.
- Under the Dam Safety Act, Salt River Project Dams will be modified, e.g., large spillways to pass flows or, similar to Plan 2, construction of Cliff and Roosevelt to suppress flows on the Salt and Verde Rivers.
- Thirteen bridges will be constructed or modified by state and local governments to withstand flows of 200,000 cfs.
- Buttes Dam, an authorized feature of CAP on the Gila River, will be constructed for development of additional CAP waters, flood control, and sediment control. But, there will be no regulatory storage as proposed by CAWCS. Other CAP features which will be constructed include the Granite Reef Aqueduct, Salt-Gila Aqueduct, the Tucson Aqueduct, and Hooker Dam or a suitable alternative.

- Floodplain management, including enforcement of existing laws and regulations is assumed. No existing structure would be abandoned, but new structures in 100-year flood plain fringes would be floodproofed to protect against a 100-year flood.
- Channelization around existing facilities at the airport will be conducted.
- Limited channel clearing from 91st Avenue to Gillespie Dam will be conducted by the Flood Control District of Maricopa County. Gillespie Dam will not be modified in conjunction with channel clearing.
- There will be an improved flood warning system, under an appropriation of \$400,000.
- Several flood control facilities (New River, Cave Buttes, and Adobe Dams, Soil Conservation Service dams, Indian Bend Wash) will be constructed.
- The U.S. Forest Service Cottonwood Recovery Program on the Verde River, designed to improve wildlife habitat, will be implemented.
- A Tempe Salado Project will be implemented. The overall Rio Salado concept was assumed not to be developed.

COMPARATIVE EVALUATION OF PLANS

Following is a comparative evaluation (Table 1) of all candidate plans plus the No Action alternative. The evaluation factors have been identified by the Bureau as those considered to be critical in selecting a proposed action based on results of technical analyses and public involvement efforts to date. Factors are grouped under major categories. The items listed under each factor are those used to measure the impact. Impacts are the measured difference between future-without and future-with the project conditions. Effects are the interpretation of the significance of the impacts. Mitigation (action to reduce or eliminate environmental and social impacts) recommendations are shown. Mitigated/unmitigated effects are displayed as:

- Insignificant (I): a small change, or one involving a low-quality resource
- Significant Beneficial (SB): major improvement in a condition, usually long-term and affecting high-quality resources
- Significant Adverse (SA): major degradation of a condition, usually long-term and affecting high-quality resources
- Beneficial Flag (BF): extraordinary beneficial change in a unique, protected, or very high-quality resource
- Adverse Flag (AF): extraordinary adverse change in a unique, protected, or very high-quality resource

Detailed definitions of the evaluation factors immediately follow the table. We encourage you to read them as they will prove helpful in making your evaluation of the plans.

TABLE 1
COMPARATIVE EVALUATION OF PLANS

Factors/Measures	Plan 8 CAWCS No Action (Future-Without Project)	Plan 1	Plan 2	Plan 3	Plan 4	Plan 5	Plan 6	Plan 7
PERFORMANCE								
<u>CAP Water yield (af/yr)</u>								
-Total increased over the baseline	0 (1,006,000 af/yr CAP water)	107,000	16,000	163,000	141,000	141,000	143,000	114,000
<u>Energy Management</u>								
-Opportunity available	No	No	No	Yes	Yes	Yes	Yes	Yes
-Additional megawatts available for sale	0 (50) ^a	0	0	86 ^b				
<u>Hydropower</u>								
-Kilowatts produced (KW)	0 (0)	4,130	0	16,350	12,220	12,220	5,530	5,530
<u>Safety of Dams</u>								
-Dam safety requirements for existing dams accomplished	Cont'd SOD studies	Yes	Yes	Yes	Delayed	Delayed	Yes	Yes
<u>Flood Control (cfs)</u>								
-100-yr flood @ airport	215,000 (215,000)	55,000	150,000	50-55,000	50,000	50,000	55,000	55,000
-200-yr flood @ airport	275,000 (275,000)	92,000	157,000	70-92,000	70,000	70,000	92,000	92,000

^aWinter only.
^bYear-round.

TABLE 1 (Continued)

Factors/Measures	Plan 8 CAWCS No Action (Future-Without Project)	Plan 1	Plan 2	Plan 3	Plan 4	Plan 5	Plan 6	Plan 7
BIOLOGICAL RESOURCES								
<u>Threatened/Endangered Plants and Wildlife</u>								
-Loss of acres of preferred habitat/total acres potentially inundated by IDF (bald eagle and Yuma clapper rail)	0 (2,260 acres in site areas)	-280/730	-280/670	-870/1,320		-870/1,600		-280/740
-Number of breeding areas (bald eagle) with disrupted productivity	0 (5 breeding areas in site areas of which 3 most productive are at Confluence; 6 breeding areas in CAWCS area; 13 breeding areas in southwestern U.S.)	1	1	3		3		1
-Mitigation		+280 acres preferred bald eagle habitat	+280 acres preferred bald eagle habitat	+200 acres preferred bald eagle habitat		+200 preferred acres bald eagle habitat		+280 preferred acres bald eagle habitat
-Unmitigated/ Mitigated Effect		SA/I	SA/I	AF/SA		AF/AF		SA/I
<u>Riparian/Wetland Biotic Communities</u>								
-Loss/gain of acres of habitat/total acres potentially inundated by IDF	0 (11,890 acres in site areas)	+1,570/3,490	+2,110/3,390	-220/7,430		-160/9,020	+1,780/3,890	+1,200/3,890
-Mitigation		Enhancement of 2,200 acres	Enhancement of 2,740 acres	Enhancement of 2,680 acres		Enhancement of 2,680 acres	Enhancement of 2,680 acres	Enhancement of 2,200 acres
-Unmitigated/ Mitigated Effect		I/SB	I/SB	SA/I		SA/I	I/SB	I/SB

TABLE 1 (Continued)

Factors/Measures	Plan 8 CAWCS No Action (Future-Without Project)	Plan 1	Plan 2	Plan 3	Plan 4	Plan 5	Plan 6	Plan 7
BIOLOGICAL RESOURCES								
<u>Perennial Stream/ Riverine Community</u>								
-Loss of miles of perennial stream/total stream miles potentially inundated by IDF	0 (68 miles in site areas; 137 miles in CAWCS area)	-2/23	-2/22	-18/44		-19/53	-1/23	-2/23
-Change in flow characteristics of Salt and Verde Rivers	No change (on average, 106 days/year < 50 cfs in Salt, 61 days/year < 50 cfs in Verde)	No change	No change	No change		No change	No change	Guaranteed minimum flows of 200 cfs in Salt and Verde
-Mitigation	----- Stream losses not mitigatable -----							
-Unmitigated/ Mitigated Effect		I/I	I/I	AF/AF		AF/AF	I/I	SB/SB
<u>Reservoir Aquatic Community</u>								
-Gain of surface acres of habitat	0 (13,640 acres in site areas; 30,000 acres in CAWCS area)	+90	0			+2,950	+730	+1,420
-Gain of guaranteed minimum pool(s)	0 (no guaranteed minimum pools at SRP lakes or Lake Pleasant)	0	0		+1 minimum pool at Confluence		+1 minimum pool at New Waddell	+2 minimum pools at New Waddell and Cliff
-Drawdown rates greater than 2 inches/day during spawning season	No change (drawdown rates 3.0 in/day at Roosevelt, 9.2 in/day at Horseshoe, 1.6 in/day at Lake Pleasant)	> 2 in/day at Cliff	> 2 in/day at Cliff		> 2 in/day at Cliff and Confluence		> 2 in/day at Cliff and New Waddell	> 2 in/day at Cliff and New Waddell; < 2 in/day at Roosevelt
-Mitigation	----- Reduction in drawdown rates to < 2 in/day during spawning season -----							
-Unmitigated/ Mitigated Effect		I/SB	I/SB	I/SB		I/SB	I/SB	SB/BF

TABLE 1 (Continued)

Factors/Measures	Plan 8 CAWCS No Action (Future-Without Project)		Plan 1	Plan 2	Plan 3	Plan 4	Plan 5	Plan 6	Plan 7
WATER QUALITY									
<u>Constituents</u>									
	CAP water in local systems at locations and times chosen by users. Local surface water sources maintain quality independent of CAP influence	Average of 70,000 af of SRP (Verde River) water exchanged w/CAP each year		No change from future-without condition	Annual average of 845,000 af of SRP surface water mixed with 250,000 af of CAP water at Confluence site. 30-35% of SRP water treated for M&I use			Annual average of 25,000 af of MCMWCD#1 surface water mixed with 200,000 af of CAP water at Waddell site. None of the MCMWCD#1 water treated for M&I uses	
		<u>Comparison of Water Sources</u> (mg/l)			<u>Changes in Average Verde River Concentrations</u> (mg/l)			<u>Changes in Average MCMWCD#1 Concentrations</u> (mg/l)	
		Verde	CAP		Ca	42.5	to 61.1 (+44%)	Ca	75.0 to 83.9 (+12%)
		42.5	85.0		Cl	18.8	to 51.9 (+176%)	Cl	30.5 to 84.1 (+176%)
		18.8	94.5		Fe	0.021	to 0.081 (+289%)	Fe	0.01 to 0.142 (+1316%)
		0.021	0.158		Hard	212.1	to 267.8 (+26%)	Hard	170.5 to 311.9 (+83%)
		212.1	339.3		Mg	25.7	to 27.9 (+9%)	Mg	30.9 to 30.8 (-1%)
		25.7	30.8		Na	30.4	to 64.1 (+110%)	Na	32.7 to 95.7 (+193%)
		30.4	107.4		Pb	0.003	to 0.020 (+553%)	Pb	0.01 to 0.038 (+276%)
		0.003	0.041		SO ₄	52.9	to 165.2 (+212%)	SO ₄	70.4 to 269.4 (+283%)
		52.9	309.3		TDS	264.0	to 464.7 (+76%)	TDS	265.9 to 650.0 (+142%)
		264.0	722.3		After-mix maximum SRP concentrations reach new highs for numerous constituents. All of SRP surface water degraded and possible increased M&I treatment costs with short-term maximum CAP concentrations. Possible changes in agricultural operation only during period when Verde River water is normally delivered				
		After-exchange maximum concentrations reach new highs for numerous constituents. Degradation of some SRP water during period when only Verde River water is normally delivered. Possible short-term impacts to M&I and agricultural users. Short exchange period affects only 8% of SRP surface water							
-Mitigation		Notify users of exchange period		Not applicable	Aeration of water between reservoir and treatment plants			No mitigation recommended	
-Unmitigated/ Mitigated Effect		I/I		No Effect	SA/SA	SA/SA	SA/SA	I/I	I/I

TABLE 1 (Continued)

Factors/Measures	Plan 8 CAWCS No Action (Future-Without Project)	Plan 1	Plan 2	Plan 3	Plan 4	Plan 5	Plan 6	Plan 7
WATER QUALITY								
<u>Eutrophication</u>								
-Potential for eutrophic conditions to occur	Low potential for SRP and MCMWCD#1 water. High organics in CAP water may produce tri-halomethane in water treatment plants which receive CAP water	No eutrophication problems caused by project implementation. Increased potential for tri-halomethane production at water treatment plants served by SRP during exchange period	No eutrophication problems caused by project implementation		Confluence Reservoir has high potential for eutrophication with high probability for blue-green algal dominance. Probable aesthetic impacts on Verde arm in most years. Increased potential for tri-halomethane production at water treatment plants served by SRP			New Waddell Reservoir has low to moderate potential for eutrophication with no projected problems
-Mitigation		Different disinfection process for SRP M&I water	Not applicable		Downstream impacts mitigatable with aeration and different disinfection process for SRP M&I water			No mitigation recommended
-Unmitigated/ Mitigated Effect		I/I	No Effect	SA/I	SA/I	SA/I	I/I	I/I

TABLE 1 (Continued)

Factors/Measures	Plan 8 CAWCS No Action (Future-Without Project)	Plan 1	Plan 2	Plan 3	Plan 4	Plan 5	Plan 6	Plan 7
CULTURAL RESOURCES								
<u>Prehistoric Cultural Resources</u>								
-Number of sites destroyed/total number of sites potentially affected	0 (3,296 sites in site areas)	134/2,906	57/2,906	158/3,151	77/3,169		160/3,033	
-Acres of archaeological deposits affected	0 (15,668 acres of deposits in site areas)	7,808	7,808	13,754	15,551		7,925	
-Effects Factor		-8,984	-8,210	-15,650	-19,600		-9,194	
-Mitigation		Avoiding resource; partial data recovery (e.g., mapping sites, collection of surface artifacts, use of remote sensing techniques, test excavations, partial site excavations); site protection (e.g., fencing around site, policing, site monitoring, enforcement of laws against vandalism). Complete mitigation of impacts not possible.						
-Unmitigated/ Mitigated Effect		AF/AF	AF/AF	AF/AF	AF/AF	AF/AF	AF/AF	AF/AF
<u>Historic Cultural Resources</u>								
-Number of sites destroyed/total number of sites potentially affected	0 (175 sites in site areas)	21/44	21/38	66/116	64/127		33/44	
-Effects Factor		-260	-213	-698	-753		-260	
-Mitigation		Avoiding resource; partial data recovery (e.g., mapping sites, collection of surface artifacts, use of remote sensing techniques, test excavations, partial site excavations); site protection (e.g., fencing around site, policing, site monitoring, enforcement of laws against vandalism); site documentation (e.g., recording surface architecture or structural features); additional historical research.						
		Roosevelt Dam impacts not mitigatable		Fort McDowell and Roosevelt Dam impacts not mitigatable		Roosevelt Dam impacts not mitigatable		Roosevelt Dam impacts not mitigatable
-Unmitigated/ Mitigated Effect		AF/AF	AF/AF	AF/AF	AF/AF	AF/AF	AF/AF	AF/AF

TABLE 1 (Continued)

Factors/Measures	Plan 8 CAWCS No Action (Future-Without Project)	Plan 1	Plan 2	Plan 3	Plan 4	Plan 5	Plan 6	Plan 7
RECREATION								
<u>Stream-Oriented Recreation</u>								
-Net loss of miles of perennial stream/loss of tubing miles	0 (68 stream miles in site areas; 986 miles in 5-county region)	-2/0	-2/0	-18/16.8	-19/16.8	-19/16.8	-1/0	-2/0
-Net loss/gain in maximum recreation days per year for stream-oriented activities	0 (2,210,000 stream-oriented recreation days in site areas; 8,236,000 5-county region)	+43,000	-1,000	-1,469,000	-1,514,000	-1,514,000	+43,000	+43,000
-Mitigation		----- Loss of stream miles not mitigatable -----						
-Unmitigated/Mitigated Effect		I/I	I/I	AF/AF	AF/AF	AF/AF	I/I	I/I
-Regional stream-oriented recreation needs met/intensified	Most needs not met except tubing	Negligible change	Negligible change	Tubing needs intensified by 94%			Negligible change	Negligible change
<u>Reservoir-Oriented Recreation</u>								
-Net gain in usable surface acres	0 (15,755 acres in site areas; 34,774 in 5-county region)	+845	0	+5,320	+5,320	+5,320	+1,781	+1,991
-Net loss/gain in maximum recreation days per year for reservoir-oriented recreation	0 (752,000 reservoir-oriented recreation days for site areas; 6,479,000 for 5-county region)	1,152,000	-9,000	+4,359,000	+2,875,000	+2,875,000	+1,564,000	+1,587,000

TABLE 1 (Continued)

Factors/Measures	Plan 8 CAWCS No Action (Future-Without Project)	Plan 1	Plan 2	Plan 3	Plan 4	Plan 5	Plan 6	Plan 7
RECREATION								
<u>Reservoir-Oriented Recreation</u>								
-Regional reservoir-oriented recreation needs met/intensified	Most needs not met	Meets needs for swimming by 46%, developed camping by 190%	Insignificant intensification of lake boating needs	Meets needs for swimming by 343%, developed camping by 192%, picnicking by 37%	Meets needs for swimming by 256%, powerboating by 17%, picnicking by 32%	Meets needs for swimming by 61%, developed camping by 200%, picnicking by 28%	Meets needs for swimming by 61%, developed camping by 200%, picnicking by 28%. Potential for development of Rio Salado increased by provision of water supply for the project	
-Mitigation		----- Not required for this factor -----						
-Unmitigated/ Mitigated Effect		SB	I	SB	SB	SB	SB	BF

TABLE 1 (Continued)

Factors/Measures	Plan 8 CAWCS No Action (Future-Without Project)	Plan 1	Plan 2	Plan 3	Plan 4	Plan 5	Plan 6	Plan 7
SOCIAL IMPACTS								
<u>Indian Relocations</u> (Fort McDowell Indian Community)								
-Changes affecting individuals	<ol style="list-style-type: none"> 1. Normal mortality and illness rates given the age distribution of the population 2. High levels of personal autonomy 3. High satisfaction with way of life 4. High potential for increased financial self-sufficiency 	No change from without project condition		<ol style="list-style-type: none"> 1. Substantial increase in illness and mortality rates 2. Extreme decline in levels of personal autonomy 3. Extreme decrease in satisfaction with way of life 4. Substantial decrease in potential for sustained financial self-sufficiency 			No change from without project condition	
-Changes affecting families and small groups (INTERPERSONAL)	<ol style="list-style-type: none"> 1. High levels of extended family ties; highly integrated support systems within the family 2. Normal incidence of family problems such as divorce, child abuse and neglect, and drug abuse; moderate incidence of alcohol abuse 	No change from without project condition		<ol style="list-style-type: none"> 1. Substantial decrease in extended family ties and family support systems 2. Substantial increase in incidence of family problems such as alcohol and drug abuse, divorce, child abuse and neglect 			No change from without project condition	
-Changes affecting the community	<ol style="list-style-type: none"> 1. High community cohesion; high levels of informal support networks 2. High community viability (significant increase from present condition); strong community leadership; high potential for tribal autonomy 3. High potential for increased tribal economic self-sufficiency; moderate levels of unemployment 4. High potential for sustaining Yavapai culture 	No change from without project condition		<ol style="list-style-type: none"> 1. Extreme decrease in community cohesion; substantial decline in number and efficacy of informal support networks 2. Extreme decrease in community viability; substantial decline in autonomy (ability to control the direction of the community) and in efficacy of tribal leadership; elimination of trend toward self-determination 3. Substantial decrease in potential for tribal economic self-sufficiency (increased dependency on government services); substantial increase in unemployment 4. Extreme decrease in potential to sustain Yavapai culture 			No change from without project condition	

TABLE 1 (Continued)

Factors/Measures	Plan 8 CAWCS No Action (Future-Without Project)	Plan 1	Plan 2	Plan 3	Plan 4	Plan 5	Plan 6	Plan 7
SOCIAL IMPACTS								
<u>Indian Relocations</u> (Cont'd)								
-Number of people relocated	0 (350 people in community)	0	0	290	350	350	0	0
-Mitigation		Not Applicable	Not Applicable	<ol style="list-style-type: none"> 1. Relocate the entire community together; do not relocate on individual basis 2. Provide the tribe with additional land equal to or greater in size than that purchased and of the highest quality available which is contiguous to the reservation boundaries 3. Monetary compensation should cover all expenditures and new expenses incurred by the residents as a result of relocation and should be distributed according to the tribe's wishes 4. Provide special services to meet needs that are unique to this area 5. Initiate a plan that ensures the participation of the entire community in all decisions and plans relevant to the relocation 6. Provide an accurate, reliable system for disseminating information to residents so that they are constantly informed about the relocation proceedings 7. Guarantee that the land and water rights provided the tribe will never be revoked 			Not Applicable	Not Applicable
-Unmitigated/ Mitigated Effect		No Effect	No Effect	AF/AF	AF/AF	AF/AF	No Effect	No Effect

TABLE 1 (Continued)

Factors/Measures	Plan 8 CAWCS No Action (Future-Without Project)	Plan 1	Plan 2	Plan 3	Plan 4	Plan 5	Plan 6	Plan 7
SOCIAL IMPACTS								
<u>Non-Indian Relocations</u> (Roosevelt Lake)								
-Changes affecting individuals	<ol style="list-style-type: none"> 1. Normal mortality and illness rates given age distribution of population 2. High levels of personal autonomy 3. High satisfaction with way of life 4. High potential for financial self-sufficiency 							
				<ol style="list-style-type: none"> 1. Slight increase in mortality rates and increased illness rates 2. Substantial decrease in personal autonomy 3. Substantial decrease in satisfaction with way of life 4. Moderately reduced financial capacity 				
-Changes affecting families and small groups (INTERPERSONAL)	<ol style="list-style-type: none"> 1. Low levels of informal support networks in all communities except Roosevelt Gardens; at Roosevelt Gardens, moderately developed informal support networks. Family interactions primarily within nuclear family at all locations 2. Incidence of family problems such as divorce, child abuse and neglect, alcohol and drug abuse 			<ol style="list-style-type: none"> 1. Slight decrease in informal support networks 2. No change 				

TABLE 1 (Continued)

Factors/Measures	Plan 8 CAWCS No Action (Future-Without Project)	Plan 1	Plan 2	Plan 3	Plan 4	Plan 5	Plan 6	Plan 7
SOCIAL IMPACTS								
<u>Non-Indian Relocations</u> (Cont'd)								
-Changes affecting the community	<ol style="list-style-type: none"> 1. Low to moderate community cohesion in all communities except Roosevelt Gardens; high community cohesion at Roosevelt Gardens 2. Community development likely to remain at present low level, which is adequate to sustain viability. (Formal social organization emerges on temporary basis to meet needs and respond to immediate problems.) Low level community organization on day-to-day basis. (Emphasis on individuality more than community) 							
		<ol style="list-style-type: none"> 1. Slight decrease in community cohesion and social organization 2. Slight decrease in community viability 						
-Number of people relocated	0 (650 people in affected communities)	325	275	325	275	275	325	325
-Mitigation		<p>Mitigation for Plans 2, 4, and 5: 1. Relocate only those people who live within the area likely to be inundated more than once in 200 years, but not within the larger IDF area; provision of low-cost flood insurance to people residing in the IDF area.</p> <p>Mitigation for Plans 1, 3, 6, and 7: 1. Relocate only those people who live within the confines of the SPF take-line, with no relocation of people in the IDF area 2. Provision of low-cost flood insurance to people in the IDF area 3. Provision of Forest Service land in the Roosevelt Lake area for relocations, allowing enough space so neighbors may relocate near each other if they wish 4. Monetary compensation for all relocation expenses incurred by residents 5. Provide special services to meet needs that are unique to this area</p>						
-Unmitigated/ Mitigated Effect		SA/I	SA/I	SA/I	SA/I	SA/I	SA/I	SA/I

47

TABLE 1 (Continued)

Factors/Measures	Plan 8 CAWCS No Action (Future-Without Project)	Plan 1	Plan 2	Plan 3	Plan 4	Plan 5	Plan 6	Plan 7
SOCIAL IMPACTS (Cont'd)								
<u>Flooding</u>	Future-without project: 200-year flood (275,000 cfs at airport)	Impact of reduction of 200-year flood (275,000 cfs at airport) to 70-92,000 cfs at airport	Impact of reduction of 200-year flood (275,000 cfs at airport) to 157,000 cfs at airport	Impact of reduction of 200-year flood (275,000 cfs at airport) to 70-92,000 cfs at airport				
(The conditions described have a probability of occurring approximately once every 200 years or one chance in 200 of occurring in any given year. In a flood of lesser magnitude, the conditions described in all plans would be less severe)								
-Individual Impacts								
Quality of life	Slight increase in mortality rates. Extensive health problems resulting from sewage and debris in inundated areas. High levels of stress and anxiety resulting from disruptions due to flooding. Substantial financial losses which could not be recovered, i.e., loss of businesses and employment oppor- tunities, lost wages during extended clean-up period, property damages. Inconveniences and major disruptions in home and work routines	Normal mortality rates. Elimina- tion of health problems result- ing from sewage and debris in inundated areas. Elimination of high stress and anxiety levels and financial losses asso- ciated with flooding. Sub- stantial reduc- tion in inconveniences and disruptions to home and work routines	Holly Acres: No impact, i.e. continued wide- spread health problems result- ing from flood- ing debris. High levels of stress and anxiety result- ing from dis- ruptions due to flooding and evacuation. Substantial financial losses which could not be recovered. Continued incon- veniences and major disrupt- ions in home and work routines. <u>Other areas:</u> Normal mortality rates. Substantial reduction in problems resulting from sewage and debris in inundated areas. Elimination of high stress and anxiety levels and financial losses associated with flooding. Substantial reduction in incon- veniences and disruptions to home and work routines	Normal mortality rates. Elimination of health problems result- ing from sewage and debris in inundated areas. Elimination of high stress and anxiety levels and financial losses associated with flooding. Substantial reduction in inconveniences and disruptions to home and work routines				

TABLE 1 (Continued)

Factors/Measures	Plan 8 CAWCS No Action (Future-Without Project)	Plan 1	Plan 2	Plan 3	Plan 4	Plan 5	Plan 6	Plan 7
<u>Flooding (Cont'd)</u>								
- Regional Impacts								
Change in number of communities with residential properties likely to sustain floodwater damage and requiring evacuation	Inundation and massive evacuations in communities of Mesa, Tempe, Phoenix, Salt River Indian Community, Gila River Indian Community, Holly Acres and Buckeye areas during 200-year flood (200-year floodplain population in year 2000 projected to be 44,800)	Elimination of inundation and evacuations in downstream communities of Mesa, Tempe, Phoenix, Salt River Indian Community, Holly Acres and Buckeye areas during 200-year flood (projected population of 200-year floodplain in year 2000 is 44,800)	Inundation of Holly Acres area and evacuation of 525 residents (year 2000 projected population.) Elimination of inundation and evacuations in downstream communities of Mesa, Tempe, Phoenix, Salt River Indian Community, and Buckeye area during 200-year flood (projected population of 200-year floodplain in year 2000 is 44,800)					Elimination of inundation and evacuations in downstream communities of Mesa, Tempe, Phoenix, Salt River Indian Community, Holly Acres and Buckeye areas during 200-year flood (projected population of 200-year floodplain in year 2000 is 44,800)
Number of automobile river crossings closed	Closing of all but one (Mill Avenue) of 29 crossings in total future crossing stock (Southern Pacific Railroad bridge would be open for rail transport)	Closing of 15 crossings: 14 of 29 in total future crossing stock remain open up to 200-year flood condition; 15 of 29 remain open in 100-year flood condition	Closing of 16 crossings: 13 of 29 in total future crossing stock remain open in 200-year and 100-year condition					Closing of 15 crossings: 14 of 29 in total future crossings stock remain open up to 200-year flood condition; 15 of 29 remain open in 100-year flood condition

TABLE 1 (Continued)

Factors/Measures	Plan 8 CAWCS No Action (Future-Without Project)	Plan 1	Plan 2	Plan 3	Plan 4	Plan 5	Plan 6	Plan 7
<u>Flooding (Cont'd)</u>								
-Regional Impacts (Cont'd)								
Incidence of transportation disruptions	Severe disruptions to transportation and affected services-- probable limitation of the one remaining crossing to emergency use only. Separation of communities north and south of river for extended period. (If Mill Avenue and Southern Pacific Railroad Bridges were available for work-related crossings, of 125,000 commuters normally crossing per day, only 72,000 would be able to do so)	Elimination of major disruptions to transportation. (Bridges remaining open during 200-year flood are expected to carry 75 to 80 percent of all traffic crossing on a <u>normal</u> day.) Some slowing of traffic due to adjustments to new routes and added driving distance to open crossings						
Incidence of health and safety problems related to flooding	Severe health hazards due to potential for raw sewage in river. Extensive inundation potential in large sector of the community. Hazards from down power lines. Greatly overburdened emergency and medical care facilities with some areas cut off from direct access to any emergency and medical services	Elimination of health and safety hazards due to damages to power lines and sewer lines. Substantial reduction in delays in delivery of emergency services	Substantial reduction in health and safety hazards due to damages to major power lines and breaks in sewer lines. Substantial reduction in delays in delivery of emergency services	Elimination of health and safety hazards due to damages to power lines and sewer lines. Substantial reduction in delays in delivery of emergency services				
Effect		BF	SB	BF	BF	BF	BF	BF

TABLE 1 (Continued)

Factors/Measures	Plan 8 CAWCS No Action (Future-Without Project)	Plan 1	Plan 2	Plan 3	Plan 4	Plan 5	Plan 6	Plan 7
ECONOMIC								
<u>Cost (\$) @ 7 3/8%</u>								
-Total Construction Cost (including IDC)	0 (2,500,000,000)	476,140,000	408,550,000	764,640,000	1,173,810,000	1,083,810,000	746,150,000	746,150,000
-Total Annual Cost	0 (185,000,000)	41,110,000	31,840,000	66,650,000	95,930,000	89,280,000	64,320,000	62,890,000
<u>Benefits (\$)</u>								
-Regulatory Storage								
Energy management	0	0	0	17,170,000	16,160,000	16,160,000	16,160,000	16,160,000
Hydropower	0	700,000	0	3,600,000	2,900,000	2,900,000	940,000	940,000
Water Supply Benefits		8,660,000	1,200,000	13,920,000	11,700,000	11,700,000	11,880,000	6,200,000
Total Regulatory Storage Benefits		9,360,000	1,200,000	34,690,000	30,760,000	30,760,000	28,980,000	23,300,000
-Flood Control								
Inundation Reduction		10,580,000	5,373,000	10,580,000	9,560,000	9,560,000	10,580,000	10,580,000
Location and Intensification		16,460,000	4,873,000	16,460,000	17,400,000	17,400,000	16,460,000	16,460,000
Total Flood Control Benefits		27,040,000	10,246,000	27,040,000	26,960,000	26,960,000	27,040,000	27,040,000
-Safety of Dams		29,530,000	29,530,000	29,530,000	14,500,000	14,500,000	29,530,000	29,530,000
-Recreation		Not Available						
-Fish and Wildlife		Not Available						
<u>Total Annual Benefit^a</u>		65,930,000	40,970,000	91,260,000	72,220,000	72,220,000	85,550,000	79,870,000
-Net Economic Benefit		24,830,000	9,136,000	24,610,000	-23,710,000	-17,060,000	21,230,000	16,980,000
-Benefit/Cost Ratio		1.60	1.29	1.37	0.75	0.81	1.33	1.27

^aSee following page for a descriptive note on the computational procedure used for benefits.

TABLE 1 (Continued)

Factors/Measures	Plan 8 CAWCS No Action (Future-Without Project)	Plan 1	Plan 2	Plan 3	Plan 4	Plan 5	Plan 6	Plan 7
ECONOMIC								
Note:								
During initial plan formulation, it was assumed that the plans would be operated so as to deliver as much water from the Colorado River as possible subject to such constraints as aqueduct capacity, demand, and ability to exchange water. Analyzing the regulatory storage benefits obtained using this operation indicated that by operating the plans differently the potential to significantly increase the regulatory storage benefits existed. To verify this, the benefits for the plans were quickly reevaluated using different operating criteria. With these criteria the plans would be operated to develop additional water only from within Arizona and energy management potential would be maximized. If this second assumption is used, the net benefits for all plans with direct-connected regulatory storage will increase. The following table shows the benefits and yield for the plans under this assumption. Discussions will continue in an effort to define what the operating goals of regulatory storage will be. Based on the results of these discussions, some plan or plans will be refined and perhaps re-sized.								
<u>Cost (\$)</u>								
-Total Construction Cost		476,140,000	408,550,000	764,640,000	1,173,810,000	1,083,810,000	746,150,000	746,150,000
-Total Annual Cost		41,060,000	31,840,000	64,990,000	95,298,000	88,646,000	61,940,000	60,440,000
<u>Benefits (\$)</u>								
-Total Annual Benefits		65,815,000	40,976,000	102,183,000	84,976,000	84,967,000	94,652,000	86,645,000
Net Benefits		24,755,000	9,136,000	37,193,000	-10,322,000	-3,670,000	32,712,000	26,205,000
Benefit/Cost Ratio		1.60	1.29	1.57	.89	.96	1.53	1.43
-Yield (acre-feet)		100,000	16,000	130,000	130,000	130,000	95,000	65,000

TABLE 1 (Continued)

Factors/Measures	Plan 8 CAWCS No Action (Future-Without Project)	Plan 1	Plan 2	Plan 3	Plan 4	Plan 5	Plan 6	Plan 7
FINANCIAL*(\$) @ 3½%								
<u>Non-Reimbursable</u>								
SOD	0 (0)	201,360,000		225,600,000	370,770,000	370,770,000	210,950,000	
CAWCS	0 (67,948,000)	189,328,000		270,696,000	328,502,000	282,051,000	205,100,000	
<u>CAWCD Net Repayment Obligation</u>	0 (833,829,000)	37,021,000		-427,002,000	-260,319,000	-322,908,000	-365,522,000	

* The financial analysis is based on preliminary data. It is applicable only for planning purposes, and is subject to policy and legal review.

DESCRIPTION OF PLAN EVALUATION FACTORS

Following is a definition of all factors used in evaluating plans. Those considered critical in selection of a proposed action are marked by an asterisk (*). These factors, which correspond to the comparative evaluation (Table 1), were identified by the Bureau to be used in decision-making based on results of technical studies and public involvement efforts carried out during the CAWCS. More detailed design and cost tables and environmental and social impact assessments for all evaluation factors are contained in "Detailed Plan Information" in this Factbook.

PERFORMANCE

*YIELD: The annual increase in the amount of available CAP water associated with a plan as a result of the addition of regulatory storage. The total increase over the baseline is the total amount of water available to CAP as a result of regulatory storage (Colorado River plus Salt and Verde Rivers).

*ENERGY MANAGEMENT: With regulatory storage at the Confluence or New Waddell (direct connection), the CAP can use its allocation of Navajo Generating Station power to pump water in off-peak periods such as in the winter or at night and store it for later delivery (measured in megawatts available for sale). The high-value electricity which would otherwise have to be used to pump water can be sold by CAP to other users, producing increased revenue to CAP.

*HYDROPOWER: The amount of power produced through the construction and operation of new hydropower generating facilities in the structural facilities within the various plans (measured in kilowatts produced).

*SAFETY OF DAMS: Six existing dams on the Salt and Verde Rivers were found to be inadequate to pass the Inflow Design Flood without overtopping. With the inclusion of SOD in all candidate plans, dam safety requirements for existing dams are accomplished by all plans; however, they would be delayed in Plans 4 and 5. SOD requirements would be met with the CAWCS No Action alternative, as SOD studies would continue toward a solution.

*FLOOD CONTROL: The level of flood protection a plan provides is characterized by the reduction of the 200-year flood event (275,000 cfs at the airport) and the 100-year flood event (215,000 cfs at the airport). Different levels of flood control are provided by different plans.

BIOLOGICAL RESOURCES

*THREATENED/ENDANGERED PLANTS AND WILDLIFE: Species of plants and animals designated as endangered by authority of the Endangered Species Act receive special protection because of their rarity and susceptibility to extinction. No endangered plants exist in the site areas. The bald eagle and Yuma clapper rail are endangered bird species found in the site areas. The bald eagle is of particular concern because 6 of 13 breeding areas in the Southwestern United States are located in the CAWCS area. Plan impacts are

measured in terms of the loss of acres of bald eagle and Yuma clapper rail preferred habitat, the total number of acres of preferred habitat potentially inundated at the highest pool elevation (those acres not necessarily lost, but could be affected), and the number of bald eagle breeding areas where productivity will be disrupted.

*RIPARIAN/WETLAND BIOTIC COMMUNITY: The riparian/wetland community consists of vegetation and associated wildlife that depend on streams and lakes for a source of water, rather than on rainfall. In the CAWCS area, most riparian vegetation is found along streams that flow year-round. Impacts of plans for this factor are measured by the gain or loss in acres of riparian vegetation (habitat) and the total number of acres potentially inundated as a result of a plan.

*PERENNIAL STREAM/RIVERINE COMMUNITY: Perennial streams are streams which characteristically flow all year long. The perennial stream community includes plants and animals that live and grow in the flowing water and pools of the streams. River fish provide an important prey base for the endangered bald eagle, which prefers to prey primarily from rivers rather than lakes. Impacts of plans are measured by the number of stream miles lost, the total stream miles potentially inundated as well as the change in stream flow characteristics (increase or decrease in time when there is low or no flow in the Salt and Verde Rivers).

*RESERVOIR AQUATIC COMMUNITY: The reservoir aquatic community primarily includes sport fish such as large-mouth bass, crappie, and blue gill that live in well-managed reservoirs in Central Arizona. In addition, there are other types of fish that provide a food source for waterfowl and

wildlife. The fish breed in the reservoirs and also inhabit the streams that feed the reservoirs. The reservoirs sustain the fish populations during periods when stream flow is low. Good fisheries management calls for the reservoir pools to be of sufficient size to provide suitable habitat for viable fish populations (assured minimum pools) and for water levels to be stable during the spawning season (spring to summer) to optimize fish reproduction. Impacts of a plan are measured by the gain in surface acres of habitat, whether or not a plan provides guaranteed minimum pools, and by the amount of drawdown in a reservoir during spawning season.

WATER QUALITY

*CONSTITUENTS: One measure of the water quality impact of a plan is the increase or decrease in concentrations of total dissolved solids (TDS), nitrates, fluorides, and other constituents in water as a result of regulatory storage of CAP water. Concentrations would change because of mixing CAP water from the Colorado River with water from local sources, such as the Salt, Verde, or Agua Fria Rivers, or because of water exchanges. The impacts are measured in terms of the amount of local water affected and the changes in concentrations of constituents.

*EUTROPHICATION: Eutrophication is a process of nutrient enrichment in a lake or reservoir. When a reservoir is rich in nutrients (nitrogen and phosphorus) and other physical and chemical parameters are supportive, algae are likely to grow in the reservoir. Nutrient enrichment is usually beneficial for fisheries, but algal growth can affect water quality adversely in terms of aesthetics (color, odor, taste) and can increase concentrations

of dissolved organic material in the water. The potential (high, moderate, low, none) for eutrophic conditions to occur is estimated for each plan.

CULTURAL RESOURCES

*PREHISTORIC CULTURAL RESOURCES: Prehistoric resources are sites and associated artifacts that date from before the time of written records in the area, generally before the time of initial Spanish contact. These resources represent Native American cultures and societies, and their importance lies in their potential to yield valuable information about the pre-recorded history of the area and the development of human cultures. Many of the sites in the study area are considered significant and some are unique. Significant prehistoric sites are afforded special status under the National Historic Preservation Act, and other guidelines for protection of cultural properties. Impacts to these resources are measured by the number of sites destroyed; the total number of sites potentially affected due to construction, inundation, or such activities as vandalism or pothunting; and by an "effects factor", which is a number that represents the degree of impact. The effects factor takes into consideration the number of sites affected, the significance of the sites, and the severity of the impact. Larger effects-factor numbers indicate greater impacts and smaller numbers indicate lesser impacts.

*HISTORIC CULTURAL RESOURCES: Historic resources are sites or properties which were occupied after the time when written records became available for an area. The majority of sites within the CAWCS area were

occupied after 1860 and consist of towns, farms and ranches, mines, transportation and water supply facilities, military establishments, and commercial and industrial facilities. These sites are represented by standing buildings or structures and by the subsurface remains of buildings, structures, artifact deposits, etc. The importance of such resources lies in their potential to yield important historic information. Additionally, historic sites are valuable for the educational and recreational opportunities which they provide. Impacts of a plan are measured by the number of sites destroyed, the total number of sites potentially affected, and by an "effects factor", all of which are described above in the section on prehistoric cultural resources.

RECREATION

*STREAM-ORIENTED RECREATION: Stream-oriented recreation includes recreational resources and activities associated with flowing water. Stream-oriented recreation includes activities such as tubing, swimming, stream fishing, camping and picnicking. The Salt and Verde Rivers near their confluence provide the opportunity for flowing-water recreation, particularly tubing, close to the urban area. Impacts of a plan are characterized by the loss of perennial stream miles, the loss of tubing miles, the net loss or gain in maximum annual recreation days per year (for selected activities), and the percentage of regional needs met or intensified for the selected stream-oriented activities.

*RESERVOIR-ORIENTED RECREATION: Reservoir-oriented recreation is recreation associated with lakes behind dams and includes activities such as

boating, boat fishing, water skiing, swimming, camping and picnicking. Impacts of a plan are characterized by the net gain in usable surface acres, the net loss or gain of maximum reservoir-oriented recreation days per year (for selected activities), and the percentage of regional needs met or intensified for the selected reservoir-oriented activities.

SOCIAL IMPACTS

*INDIAN RELOCATIONS: Some of the alternative plans would require relocation of residents of the Fort McDowell Indian Community. The impact of relocation is assessed on three levels: individual, interpersonal, and community. These three categories overlap; however, impacts are attributed to that category which is most directly affected.

Individual Level

1. Changes in mortality and illness rates
2. Changes in personal autonomy: the degree to which individuals believe they have freedom and power to control their lives
3. Satisfaction with way of life
4. The potential for financial self-sufficiency

Interpersonal Level

1. The nature and extensiveness of family ties and informal support networks
2. Responses to stress and change, resulting in family problems such as increases in divorce rates, child abuse and neglect, alcohol and drug abuse

Community Level

1. Community cohesiveness: the extent to which a community is unified, with individuals mutually depending on each other for

support. A cohesive community is characterized by extensive informal support networks, frequent personal interaction, and by strong identification of members with the community as a whole.

2. Community viability: the ability of a community to sustain itself.

Community leadership: the degree to which leaders are capable of protecting the interests of the community.

Community autonomy: the degree to which residents believe they have the freedom and power to control the direction of their community.

3. Economic self-sufficiency: the degree to which a community is or is not reliant on outside agencies for economic support. This is partly determined by the unemployment rate.
4. Potential for sustaining the Yavapai culture: how relocation affects the transmission of a unique culture.

*NON-INDIAN RELOCATIONS: Some of the alternative plans would require relocation of residents residing near Roosevelt Lake and at the Cliff site. Where applicable, the impacts of relocation at these locations are assessed using the same variables for analysis as with Indian relocations, with the exception of the variable pertaining to the transmission of Yavapai culture. With Plans 4 and 5, the potential exists for relocation of some businesses and residences at Fountain Hills. As of this writing, no assessment of the impacts of these relocations has been made, but an assessment will be completed before the end of the study.

*FLOODING: Flooding does more than destroy property; it directly affects people's lives. The impacts to people associated with plans 1-7 all show a beneficial change from the future without (plan 8) condition. Since project actions are designed to reduce or eliminate the problems associated with flooding, the impacts of project actions on people relevant to flooding

are positive. Assessed impacts were based upon a projected flood with a probability of occurring approximately once every 200 years, or with one chance in 200 of occurring in any given year. The following factors were used in determining the impacts relevant to flooding:

Individual Level

1. Quality of life.

Regional Level

1. Change in number of communities with residential properties sustaining floodwater damage and requiring evacuation.
2. Number of automobile crossings closed.
3. Incidence of transportation disruptions.
4. Incidence of health and safety problems to flooding.

ECONOMICS

*COSTS: The cost of a project includes the Total Construction Cost (land acquisition, relocation, and structure) interest payments, and operation, maintenance, and replacement costs. The cost can be described as construction cost and interest during the construction period. Cost is also expressed as the Total Annual Cost which is the total construction cost, annualized over the life of the project, and the operation, maintenance, and replacement costs.

BENEFITS

*REGULATORY STORAGE BENEFITS: Three types of benefits result with regulatory storage: water supply, energy management, and hydropower. Water supply benefits can be classified as irrigation benefits, Indian water supply benefits and municipal-industrial water supply benefits. The former are measured as the value of water in agricultural production. M&I benefits are measured as the cost of developing a new alternative supply. Energy management benefits equal the value, measured in dollars, of capacity (amount of power which can be produced at a given moment in time) and energy (amount of power which can be produced over a given period of time) that is made available for other use (sale) as a result of the flexible pumping patterns provided by regulatory storage. Hydropower benefits are equal to the value of hydropower generated under each plan.

*FLOOD CONTROL BENEFITS: Economic benefits of flood control are calculated for two categories: inundation reduction and location benefits. Inundation reduction benefits equal the net difference, in dollars, between flood damages that would occur with a project and damages that would occur without a project. Flood damages are classified as physical damages, which are losses to residential, commercial, industrial, public, agricultural, and other land uses. Other flood damages include business and income losses, emergency costs, transportation delays, and savings in cost of future flood-proofing. Location benefits are derived by analyzing undeveloped land without a plan as compared with new expected development with a plan. The benefit is measured by the increase in land values with the plan.

*SAFETY OF DAMS BENEFITS: SOD benefits are equal to the cost of the least cost single-purpose SOD alternative.

*RECREATION BENEFITS: Recreation benefits equal the value of the recreational experience based on what people would be willing to pay to use the particular site. (Not available at this time.)

*FISH AND WILDLIFE BENEFITS: The value of the enhancement of the fish and wildlife resource. Benefits are determined based on what users would be willing to pay to use the resources. (Not available at this time.)

*NET ECONOMIC BENEFITS: Net economic benefits are the difference between the total annual benefits derived from a project and its total annual cost. These economic benefits are measured in dollars and are calculated to determine the economic efficiency of a plan.

BENEFIT/COST RATIO: Dollar amount of benefits divided by the cost. It is a measure of the economic efficiency of a plan and normally must be greater than one for a project to be economically justified.

FINANCIAL

The CAWCS plans will be funded from several sources. Non-reimbursable cost associated with the various plans is that amount paid by the federal government with federal taxes and does not have to be repaid by project users. The other cost is the reimbursable cost. The master repayment contract between the Central Arizona Water Conservation District (CAWCD) and the federal government sets forth a procedure for determining the amount of CAP Costs that the district must repay the government, reimbursable costs, and the amount that the government will absorb, non-reimbursable costs.

As part of the same procedure, the amount of reimbursable cost that must be repayed with interest is calculated. Since the CAP includes a share of the Navajo power plant, sales of surplus Navajo power are a tool that the CAWCD has available to meet a portion of their repayment obligation. Implementation of any CAWCS alternative will change the District's repayment obligation and also the power revenues that the district has to meet a portion of their obligation. The CAWCD Net Repayment Obligation is the amount of money that the District must raise, on an annual basis, above power revenues to repay their portion of CAP costs. Non-reimbursable costs include flood control and dam safety costs; regulatory storage costs are reimbursable.

OTHER EVALUATION FACTORS

VISUAL QUALITY: Implementation of a project action could cause changes in visual resources (scenery) in the project area. The impact of plans were measured by the creation of new resources and/or the loss of existing resources considering flowing streams, flat water (lakes), lake fluctuations, changes in vegetation, and placement of structures.

NOISE: Increases in noise that could affect people and wildlife are likely to occur because of blasting, construction, excavation, and pumping activities in site areas. The impacts of changes in noise levels were assessed on wildlife, residential areas, and recreational areas.

LAND QUALITY: The effect of plans on future and existing land use is assessed. The assessment focused on the compatibility of land uses

associated with plans and the potential for conversion of land to more intensive uses, particularly in the floodplain.

GEOLOGIC RESOURCES: Potential impacts to sand and gravel resources and prime agricultural farmland were assessed.

AIR QUALITY: The effects of Total Suspended Particulates (TSP) on local air quality due to project construction activity were assessed.

DETAILED PLAN INFORMATION

TABLE 2
Design and Cost - Plan 1

FUNCTION	CLIFF			ROOSEVELT			RECONSTRUCTED STEWART MOUNTAIN		
	Regulatory Storage	Flood Control	SOD	Regulatory Storage	Flood Control	SOD	Regulatory Storage	Flood Control	SOD
	X	X	X	X*	X	X			X
DAM STRUCTURE									
Height		338 feet			299 feet				
Crest Length		2,900 feet			1,110 feet				as required for SOD
Embankment Volume		15,000,000 cubic yards			340,000 cubic yards (Concrete)				
SPILLWAY		(Ungated)			(Gated)				
Crest Length		125 feet			100 feet				
Head		47 feet			29 feet				
Capacity		150,000 cfs			150,000 cfs				
APPURTENANT WORKS									
Hydropower Plant		4,130 KW							
Pumping Plant (for Cliff and Roosevelt)			1,600 cfs						
Service Outlet		4,000 cfs			3,160 cfs				as required for SOD
Flood Outlet									
Capacity in Flood Pool		25,000 cfs			25,000 cfs				
Capacity at Maximum Water Surface		36,000 cfs			35,000 cfs				
STORAGE ALLOCATION									
	Increased Storage (af)	Total Storage (af)	Surface Area (acres)	Elevation (feet)	Increased Storage (af)	Total Storage (af)	Surface Area (acres)	Elevation (feet)	
Conservation	0	0	0	1,810	0	0	0	1,902	
Streambed									
Sediment	5,000	5,000	324	1,852	241,000	241,000	6,707	2,043	
Inactive									as required for SOD
Replacement	139,000	144,000	2,912	1,952	1,381,000	1,622,000	20,933	2,147	
Regulatory Storage	200,000	344,000	5,328	2,001					
Flood Control	445,000	789,000	8,713	2,066	565,000	2,187,000	25,256	2,172	
Surcharge	861,000	1,650,000	14,246	2,143	820,000	3,007,000	30,004	2,201	
Dam Crest				2,148				2,201	
ESTIMATED COST (JANUARY 1981 \$)									
Construction		252,700,000				133,200,000			30,000,000 (Spillway Only)
Dam Structure		95,400,000				44,800,000			
Spillway		5,100,000				13,900,000			
Outlets		50,100,000				15,100,000			
Pumping Plant		23,300,000				11,800,000			
Hydropower Plant		4,800,000				-			
Recreation		Not Available				Not Available			
Miscellaneous **		74,000,000				47,600,000			
Interest During Construction @ 7 3/8%		37,270,000				19,650,000			3,320,000
Total Construction***		289,970,000				152,850,000			33,320,000
Annual OM&R		3,000,000				2,970,000			0
Total Annual Cost @ 7 3/8%		24,400,000				14,250,000			2,460,000

*Joint use of the dedicated sediment space would provide increased water supply from Roosevelt for an interim period.

**Includes land acquisition and relocation, except at Roosevelt, and all engineering and contingencies.

***Does not include mitigation costs.

TABLE 3
BENEFIT/COST SUMMARY
PLAN 1

BENEFITS @ 7-3/8% INTEREST (JANUARY 1981 \$)

ANNUAL BENEFITS @ 7-3/8% INTEREST (JANUARY 1981 \$)

Regulatory Storage Benefits	
Power Benefits	
Energy Management	\$ 0
Hydropower	\$ 700,000
Total Power Benefits	<u>\$ 700,000</u>
Water Supply Benefits	
Irrigation	\$ 7,030,000
Municipal and Industrial	\$ 1,400,000
Indian Irrigation	\$ 230,000
Total Water Supply Benefits	<u>\$ 8,660,000</u>
Total Regulatory Storage Benefits	\$ 9,360,000
Flood Control Benefits	
Inundation Reduction	\$ 10,580,000
Location	\$ 16,460,000
Total Flood Control Benefits	<u>\$ 27,040,000</u>
Safety of Dams Benefits*	\$ 29,530,000
Recreation, Fish and Wildlife Benefits	<u>Not Available</u>
TOTAL BENEFITS	\$ 65,930,000

CAWCS	\$ 36,400,000
SOD*	\$ 29,530,000
Total	<u>\$ 65,930,000</u>

COSTS (January 1981 \$)

Construction	\$415,900,000
IDC @ 7-3/8% Interest	\$ 60,240,000
Total Construction	<u>\$476,140,000</u>

ANNUAL COST (JANUARY 1981 \$)

Annual Equivalent @ 7-3/8%	\$ 35,140,000
Annual OM&R	5,970,000
Total Annual	<u>\$ 41,110,000</u>

*Least Cost Single Purpose SOD Alternative

COST ALLOCATION @ 3-1/4% INTEREST (JANUARY 1981 \$)

CAWCS/SOD ALLOCATION

	CAWCS	SOD	Total		<u>Reimbursable</u>	<u>Flood Control & SOD</u>
Construction	\$226,600,000	\$189,300,000	\$415,900,000	Total CAP w/o CAWCS	833,829,000	67,948,000
IDC @ 3-1/4%	\$ 14,490,000	\$ 12,060,000	\$ 26,550,000	Total CAP w/CAWCS	870,850,000	458,636,000
OM&R	\$176,190,000	\$ 0	\$176,190,000	Net CAWCS	37,021,000 **	390,688,000
Total	<u>\$417,280,000</u>	<u>\$201,360,000</u>	<u>\$618,640,000</u>			

**Increased CAWCD Repayment Obligation Net of Power Revenues Due to CAWCS

**TABLE 4
Design and Cost - Plan 2**

FUNCTION	CLIFF			ROOSEVELT			RECONSTRUCTED STEWART MOUNTAIN		
	Regulatory Storage	Flood Control	SOD	Regulatory Storage	Flood Control	SOD	Regulatory Storage	Flood Control	SOD
			X	X*		X			X
DAM STRUCTURE									
Height		299 feet			283 feet				
Crest Length		2,550 feet			1,110 feet				As required for SOD
Embankment Volume		11,000,000 cubic yards			310,000 cubic yards (concrete)				
SPILLWAY									
		(ungated)			(gated)				
Crest Length		125 feet			140 feet				
Head		44 feet			38 feet				
Capacity		131,000 cfs			150,000 cfs				
APPURTENANT WORKS									
Hydropower Plant		--			--				
Pump Plant		--			300 cfs				
Service Outlet		4,000 cfs			3,160 cfs				As required for SOD
Low-level Outlet									
Capacity at Top of Conservation		37,500 cfs			--				
Capacity at Maximum Water Surface		55,000 cfs			--				
STORAGE ALLOCATION									
	Increased Storage (af)	Total Storage (af)	Surface Area (acres)	Elevation (feet)	Increased Storage (af)	Total Storage (af)	Surface Area (acres)	Elevation (feet)	
Conservation									
Streambed	0	0	0	1,810	0	0	0	1,902	
Sediment	5,000	5,000	324	1,852	241,000	241,000	6,707	2,043	
Inactive	--	--	--	--	--	--	--	--	As required for SOD
Replacement	139,000	144,000	2,912	1,952	1,381,000	1,622,000	20,933	2,147	
Regulatory Storage	--	--	--	--	--	--	--	--	
Flood Control	--	--	--	--	--	--	--	--	
Surcharge	1,022,000	1,166,000	10,970	2,104	926,000	2,548,000	27,391	2,185	
Dam Crest				2,109				2,185	
ESTIMATED COST (Jan '81 \$)									
Construction		210,500,000				116,500,000			30,000,000 (Spillway Only)
Dam Structure		68,800,000				41,700,000			
Spillway		4,900,000				19,500,000			
Outlets		67,100,000				2,900,000			
Pump Plant		--				8,400,000			
Hydropower Plant		--				--			
Recreation		Not Available				Not Available			
Miscellaneous**		69,700,000				44,000,000			
Interest During Construction @ 7 3/8%		31,050,000				17,180,000			3,320,000
Total Construction Cost***		241,550,000				133,680,000			33,320,000
Annual O&M		840,000				840,000			0
Total Annual Cost @ 7 3/8%		18,670,000				10,710,000			2,460,000

*Joint use of the dedicated sediment space would provide increased water supply from Roosevelt for an interim period.

**Includes land acquisition and relocation, except at Roosevelt, and all engineering and contingencies.

***Does not include mitigation costs.

TABLE 5
BENEFIT/COST SUMMARY
PLAN 2

BENEFITS @ 7-3/8% INTEREST (JANUARY 1981 \$)

ANNUAL BENEFITS @ 7-3/8% INTEREST (JANUARY 1981 \$)

Regulatory Storage Benefits		
Power Benefits		
Energy Management	\$	0
Hydropower	\$	0
Total Power Benefits	\$	0
Water Supply Benefits		
Irrigation	\$	1,200,000
Municipal and Industrial	\$	0
Indian Irrigation	\$	0
Total Water Supply Benefits	\$	1,200,000
Total Regulatory Storage Benefits	\$	1,200,000
Flood Control Benefits		
Inundation Reduction	\$	5,373,000
Location	\$	4,873,000
Total Flood Control Benefits	\$	10,246,000
Safety of Dams Benefits*	\$	29,530,000
Recreation, Fish and Wildlife Benefits		<u>Not Available</u>
TOTAL BENEFITS	\$	40,976,000

CAWCS	\$ 11,446,000
SOD*	\$ 29,530,000
Total	\$ 40,976,000

COSTS (January 1981 \$)

Construction	\$357,000,000
IDC @ 7-3/8% Interest	\$ 51,550,000
Total Construction	\$408,550,000

ANNUAL COST (JANUARY 1981 \$)

Annual Equivalent @ 7-3/8%	\$ 30,160,000
Annual OM&R	1,680,000
Total Annual	\$ 31,840,000

*Least Cost Single Purpose SOD Alternative

COST ALLOCATION @ 3-1/4% INTEREST (JANUARY 1981 \$)

CAWCS/SOD ALLOCATION

	CAWCS	SOD	Total	Total CAP w/o CAWCS
Construction	\$	\$	\$	Total CAP w/CAWCS
IDC @ 3-1/4%	\$	\$	\$	Net CAWCS**
OM&R	\$	\$	\$	
Total	\$	\$	\$	

Reimbursable Flood Control & SOD

**Increased CAWCD Repayment Obligation Net of Power Revenues Due to CAWCS

TABLE 6
Design and Cost - Plan 3

FUNCTION	CONFLUENCE			CLIFF			ROOSEVELT			RECONSTRUCTED STEWART MOUNTAIN		
	Regulatory Storage	Flood Control	SOD	Regulatory Storage	Flood Control	SOD	Regulatory Storage	Flood Control	SOD	Regulatory Storage	Flood Control	SOD
	X			X	X	X	X*	X	X			X
DAM STRUCTURE												
Height		143 feet			338 feet			299 feet				
Crest Length		4,200 feet			2,900 feet			1,110 feet				
Embankment Volume		12,000,000 cubic yards			15,000,000 cubic yards			340,000 cubic yards (concrete)				As required for SOD
SPILLWAY												
		(ungated)			(ungated)			(gated)				
Crest Length		520 feet			125 feet			100 feet				
Head		26 feet			47 feet			29 feet				
Capacity		240,000 cfs			150,000 cfs			150,000 cfs				
APPURTENANT WORKS												
Hydropower Plant		12,220 KW			4,130 KW			--				
Pump-Generator Plant		3,000 cfs			--			--				
Service Outlet		4,700 cfs			4,000 cfs			3,160 cfs				
Flood Outlet												As required for SOD
Capacity in Flood Pool		--			25,000 cfs			25,000 cfs				
Capacity at Maximum Water Surface		--			36,000 cfs			35,000 cfs				
Reversible Canal												
Capacity		3,000 cfs			--			--				
Length		4 miles			--			--				
STORAGE ALLOCATION												
	Increased Storage (af)	Total Storage (af)	Surface Area (acres)	Elevation (feet)	Increased Storage (af)	Total Storage (af)	Surface Area (acres)	Elevation (feet)	Increased Storage (af)	Total Storage (af)	Surface Area (acres)	Elevation (feet)
Conservation	0	0	0	1,320	0	0	0	1,810	0	0	0	1,902
Sreambed	50,000	50,000	2,408	1,375	5,000	5,000	324	1,852	241,000	241,000	6,707	2,043
Sediment	7,000	57,000	2,731	1,378	--	--	--	--	--	--	--	--
Inactive	--	--	--	--	139,000	144,000	2,912	1,952	1,381,000	1,622,000	20,933	2,147
Replacement	--	--	--	--	200,000	344,000	5,328	2,001	--	--	--	--
Regulatory Storage	300,000	357,000	8,853	1,431	445,000	789,000	8,713	2,066	565,000	2,187,000	25,256	2,172
Flood Control	--	--	--	--	861,000	1,650,000	14,246	2,143	820,000	3,007,000	30,004	2,201
Surcharge	279,000	636,000	12,975	1,457	--	--	--	2,148	--	--	--	2,201
Dam Crest	--	--	--	1,463	--	--	--	--	--	--	--	--
ESTIMATED COST (Jan '81 \$)												
Construction		277,600,000				229,400,000				121,400,000		
Dam Structure		38,600,000				95,400,000				44,800,000		
Spillway		31,800,000				5,100,000				13,900,000		
Outlets		17,600,000				50,100,000				15,100,000		
Pump-Generator Plant		28,500,000				--				--		
Hydropower Plant		9,800,000				4,800,000				--		
Reversible Canal		14,400,000				--				--		
Recreation		Not Available				Not Available				Not Available		
Miscellaneous**		136,900,000				74,000,000				47,600,000		
Interest During Construction @ 7 3/8%		51,170,000				33,840,000				17,910,000		3,320,000
Total Construction***		328,770,000				263,240,000				139,310,000		33,320,000
Annual OM&R		3,850,000				3,200,000				3,160,000		0
Total Annual @ 7 3/8%		28,120,000				22,630,000				13,440,000		2,460,000

*Joint use of the dedicated sediment space would provide increased water supply from Roosevelt for an interim period.
 **Includes all land acquisition and relocation at Cliff only; Indian land acquisition and relocation at Confluence; and all engineering and contingencies.
 ***Does not include mitigation cost.

TABLE 7
BENEFIT/COST SUMMARY
PLAN 3

BENEFITS @ 7-3/8% INTEREST (JANUARY 1981 \$)

Regulatory Storage Benefits	
Power Benefits	
Energy Management	\$ 17,170,000
Hydropower	\$ 3,600,000
Total Power Benefits	<u>\$ 20,770,000</u>
Water Supply Benefits	
Irrigation	\$ 11,270,000
Municipal and Industrial	\$ 2,120,000
Indian Irrigation	\$ 530,000
Total Water Supply Benefits	<u>\$ 13,920,000</u>
Total Regulatory Storage Benefits	\$ 34,690,000
Flood Control Benefits	
Inundation Reduction	\$ 10,580,000
Location	\$ 16,460,000
Total Flood Control Benefits	<u>\$ 27,040,000</u>
Safety of Dams Benefits*	\$ 29,530,000
Recreation, Fish and Wildlife Benefits	<u>Not Available</u>
TOTAL BENEFITS	<u>\$ 91,260,000</u>

ANNUAL BENEFITS @ 7-3/8% INTEREST (JANUARY 1981 \$)

CAWCS	\$ 61,730,000
SOD*	<u>\$ 29,530,000</u>
Total	<u>\$ 91,260,000</u>

COSTS (January 1981 \$)

Construction	\$658,400,000
IDC @ 7-3/8% Interest	<u>\$106,240,000</u>
Total Construction	<u>\$764,640,000</u>

ANNUAL COST (JANUARY 1981 \$)

Annual Equivalent @ 7-3/8%	\$ 56,440,000
Annual OM&R	<u>10,210,000</u>
Total Annual	<u>\$ 66,650,000</u>

*Least Cost Single Purpose SOD Alternative

COST ALLOCATION @ 3-1/4% INTEREST (JANUARY 1981 \$)

CAWCS/SOD ALLOCATION

	CAWCS	SOD	Total	Total CAP w/o CAWCS	Reimbursable	Flood Control & SOD
Construction	\$444,050,000	\$214,350,000	\$ 658,400,000	833,829,000		67,948,000
IDC @ 3-1/4%	\$ 35,570,000	\$ 11,250,000	\$ 46,820,000	406,827,000		564,244,000
OM&R	<u>\$300,440,000</u>	<u>\$ 0</u>	\$ 300,440,000	Net CAWCS	-427,002,000 **	496,296,000
Total	<u>\$780,060,000</u>	<u>\$225,600,000</u>	<u>\$1,005,660,000</u>			

**Increased CAWCD Repayment Obligation Net of Power Revenues Due to CAWCS

TABLE 8
Design and Cost - Plan 4

FUNCTION	CONFLUENCE			CLIFF			ROOSEVELT			RECONSTRUCTED STEWART MOUNTAIN		
	<u>Regulatory Storage</u>	<u>Flood Control</u>	<u>SOD</u>	<u>Regulatory Storage</u>	<u>Flood Control</u>	<u>SOD</u>	<u>Regulatory Storage</u>	<u>Flood Control</u>	<u>SOD</u>	<u>Regulatory Storage</u>	<u>Flood Control</u>	<u>SOD</u>
	X	X				X			X			X
DAM STRUCTURE												
Height		224 feet			299 feet			283 feet				
Crest Length		5,750 feet			2,550 feet			1,110 feet				As Required for SOD
Embankment Volume		15,500,000 cubic yards			11,000,000 cubic yards			310,000 cubic yards (concrete)				
SPILLWAY												
		(ungated)			(ungated)			(gated)				
Crest Length		1,500 feet			125 feet			140 feet				
Head		39 feet			44 feet			38 feet				
Capacity		1,280,000 cfs			131,000 cfs			150,000 cfs				
APPURTENANT WORKS												
Hydropower Plant		12,220 KW			-			-				
Pumping Generator Plant		3,000 cfs			-			-				
Service Outlet		4,700 cfs			4,000 cfs			3,160 cfs				
Flood Outlet												
Capacity in Flood Pool		50,000 cfs			-			-				
Capacity at Maximum Water Surface		73,000 cfs			-			-				As Required for SOD
Low Level Outlet												
Capacity at Top of Conservation		-			37,500 cfs			-				
Capacity at Maximum Water Surface		-			55,000 cfs			-				
Reversible Canal												
Capacity		3,000 cfs			-			-				
Length		4 miles			-			-				
STORAGE ALLOCATION												
	<u>Increased Storage (af)</u>	<u>Total Storage (af)</u>	<u>Surface Area (Acres)</u>	<u>Elevation (feet)</u>	<u>Increased Storage (af)</u>	<u>Total Storage (af)</u>	<u>Surface Area (Acres)</u>	<u>Elevation (feet)</u>	<u>Increased Storage (af)</u>	<u>Total Storage (af)</u>	<u>Surface Area (Acres)</u>	<u>Elevation (feet)</u>
Conservation	0	0	0	1320	0	0	0	1810	0	0	0	1902
Streambed Sediment	50,000	50,000	2,408	1375	5,000	5,000	324	1852	241,000	241,000	6,707	2043
Inactive Replacement	7,000	57,000	2,731	1378	-	-	-	-	-	-	-	-
Regulatory Storage	300,000	357,000	8,853	1431	139,000	144,000	2,912	1952	1,381,000	1,622,000	20,933	2147
Flood Control	970,000	1,327,000	20,780	1498	-	-	-	-	-	-	-	-
Surcharge	974,000	2,301,000	30,273	1537	1,022,000	1,166,000	10,970	2104	926,000	2,548,000	27,391	2185
Dam Crest				1544				2109				2185
ESTIMATED COST (January 1981 \$)												
Construction		654,300,000				210,500,000				108,100,000		
Dam Structure		192,200,000				68,800,000				41,700,000		
Spillway		73,500,000				4,900,000				19,500,000		
Outlets		54,300,000				67,100,000				2,900,000		
Pump-Generator Plant		28,500,000				-				-		
Hydropower Plant		10,200,000				-				-		
Reversible Canal		14,400,000				-				-		
Recreation		Not Available				Not Available				Not Available		
Miscellaneous*		281,200,000				69,700,000				44,000,000		
Interest During Construction @ 7 3/8%		120,600,000				31,050,000				15,940,000		3,320,000
Total Construction Cost**		774,900,000				241,550,000				124,040,000		33,320,000
Annual O&M		3,650,000				2,820,000				2,820,000		0
Total Annual Cost @ 7 3/8%		60,840,000				20,650,000				11,980,000		2,460,000

*Includes all land acquisition and relocation at Cliff only; Indian land acquisition and relocation at Confluence; and all engineering and contingencies.
** Does not include mitigation cost.

TABLE 9
BENEFIT/COST SUMMARY
PLAN 4

BENEFITS @ 7-3/8% INTEREST (JANUARY 1981 \$)

ANNUAL BENEFITS @ 7-3/8% INTEREST (JANUARY 1981 \$)

Regulatory Storage Benefits	
Power Benefits	
Energy Management	\$ 16,160,000
Hydropower	\$ 2,900,000
Total Power Benefits	<u>\$ 19,060,000</u>
Water Supply Benefits	
Irrigation	\$ 9,900,000
Municipal and Industrial	\$ 1,500,000
Indian Irrigation	\$ 300,000
Total Water Supply Benefits	<u>\$ 11,700,000</u>
Total Regulatory Storage Benefits	\$ 30,760,000
Flood Control Benefits	
Inundation Reduction	\$ 9,560,000
Location	\$ 17,400,000
Total Flood Control Benefits	<u>\$ 26,960,000</u>
Safety of Dams Benefits*	\$ 14,500,000
Recreation, Fish and Wildlife Benefits	<u>Not Available</u>
TOTAL BENEFITS	\$ 72,220,000

CAWCS	\$ 57,720,000
SOD*	\$ 14,500,000
Total	<u>\$ 72,220,000</u>

COSTS (January 1981 \$)

Construction	\$1,002,900,000
IDC @ 7-3/8% Interest	\$ 170,910,000
Total Construction	<u>\$1,173,810,000</u>

ANNUAL COST (JANUARY 1981 \$)

Annual Equivalent @ 7-3/8%	\$ 86,640,000
Annual OM&R	9,290,000
Total Annual	<u>\$ 95,930,000</u>

*Least Cost Single Purpose SOD Alternative

COST ALLOCATION @ 3-1/4% INTEREST (JANUARY 1981 \$)

CAWCS/SOD ALLOCATION

	CAWCS	SOD	Total	Total CAP w/o CAWCS	Reimbursable	Flood Control & SOD
Construction	\$654,300,000	\$348,600,000	\$1,002,900,000		833,829,000	67,948,000
IDC @ 3-1/4%	\$ 53,200,000	\$ 22,170,000	\$ 75,370,000		573,510,000	767,225,000
OM&R	\$274,170,000	\$ 0	\$ 274,170,000		-260,319,000 **	699,272,000
Total	<u>\$981,670,000</u>	<u>\$370,770,000</u>	<u>\$1,352,440,000</u>			

**Increased CAWCD repayment obligation net of power revenues due to CAWCS

**TABLE 10
Design and Cost - Plan 5**

FUNCTION	CONFLUENCE			CLIFF			ROOSEVELT			RECONSTRUCTED STEWART MOUNTAIN		
	Regulatory Storage	Flood Control	SOD	Regulatory Storage	Flood Control	SOD	Regulatory Storage	Flood Control	SOD	Regulatory Storage	Flood Control	SOD
	X	X				X			X			X
DAM STRUCTURE												
Height		224 feet			299 feet			283 feet				
Crest Length		5,750 feet			2,550 feet			1,110 feet				as required for SOD
Embankment Volume		19,000,000 cubic yards			11,000,000 cubic yards			310,000 cubic yards (concrete)				
SPILLWAY												
	Service (Ungated)	Auxiliary (Failure Dike Section)		(ungated)		(gated)						
Crest Length	590 feet	-		125 feet		140 feet						
Head	39 feet	39 feet		44 feet		38 feet						
Capacity	500,000 cfs	780,000 cfs		131,000 cfs		150,000 cfs						
APPURTENANT WORKS												
Hydropower Plant		12,220 KW		-		-						
Pump-Generator Plant		3,000 cfs		-		-						
Service Outlet		4,700 cfs		4,000 cfs		3,160 cfs						
Flood Outlet												as required for SOD
Capacity in Flood Pool		50,000 cfs		-		-						
Capacity at Maximum Water Surface		73,000 cfs		-		-						
Low Level Outlet												
Capacity at Top of Conservation		-		37,500 cfs		-						
Capacity at Max. Water Surface		-		55,000 cfs		-						
Reversible Canal												
Capacity		3,000 cfs		-		-						
Length		4 miles		-		-						
STORAGE ALLOCATION												
	Increased Storage (af)	Total Storage (af)	Surface Area (acres)	Elevation (feet)	Increased Storage (af)	Total Storage (af)	Surface Area (acres)	Elevation (feet)	Increased Storage (af)	Total Storage (af)	Surface Area (acres)	Elevation (feet)
Conservation	0	0	0	1320	0	0	0	1810	0	0	0	1902
Streambed Sediment	50,000	50,000	2,408	1375	5,000	5,000	324	1852	241,000	241,000	6,707	2043
Inactive Replacement	7,000	57,000	2,731	1378	-	-	-	-	-	-	-	-
Regulatory Storage	300,000	357,000	8,853	1431	139,000	144,000	2,912	1952	1,381,000	1,622,000	20,933	2147
Flood Control	970,000	1,327,000	20,780	1498	-	-	-	-	-	-	-	-
Surcharge	974,000	2,301,000	30,273	1537	1,022,000	1,166,000	10,970	2104	926,000	2,548,000	27,391	2185
Dam Crest				1544				2109				2185
ESTIMATED COST (January 1981 \$)												
Construction		578,300,000				210,500,000				108,100,000		30,000,000 (Spillway Only)
Dam Structure		172,700,000				68,800,000				41,700,000		
Spillway		31,900,000				4,900,000				19,500,000		
Outlets		54,300,000				67,100,000				2,900,000		
Pump-Generator Plant		28,500,000				-				-		
Hydropower Plant		10,200,000				-				-		
Reversible Canal		14,400,000				-				-		
Recreation		Not Available				Not Available				Not Available		
Miscellaneous*		266,300,000				69,700,000				44,000,000		
Interest During Construction @ 7 3/8%		106,600,000				31,050,000				15,940,000		3,320,000
Total Construction **		684,900,000				241,550,000				124,040,000		33,320,000
Annual O&M		3,640,000				2,820,000				2,820,000		0
Total Annual Cost @ 7 3/8%		54,190,000				20,650,000				11,980,000		2,460,000

*Includes land acquisition and relocation at Cliff only; Indian land acquisition and relocation at Confluence; and all engineering and contingencies.
**Does not include mitigation cost.

TABLE 11
BENEFIT/COST SUMMARY
PLAN 5

BENEFITS @ 7-3/8% INTEREST (JANUARY 1981 \$)

Regulatory Storage Benefits	
Power Benefits	
Energy Management	\$ 16,160,000
Hydropower	\$ 2,900,000
Total Power Benefits	\$ 19,060,000
Water Supply Benefits	
Irrigation	\$ 9,900,000
Municipal and Industrial	\$ 1,500,000
Indian Irrigation	\$ 300,000
Total Water Supply Benefits	\$ 11,700,000
Total Regulatory Storage Benefits	\$ 30,760,000
Flood Control Benefits	
Inundation Reduction	\$ 9,560,000
Location	\$ 17,400,000
Total Flood Control Benefits	\$ 26,960,000
Safety of Dams Benefits*	\$ 14,500,000
Recreation, Fish and Wildlife Benefits	<u>Not Available</u>
TOTAL BENEFITS	\$ 72,220,000

ANNUAL BENEFITS @ 7-3/8% INTEREST (JANUARY 1981 \$)

CAWCS	\$ 57,720,000
SOD*	\$ 14,500,000
Total	\$ 72,220,000

COSTS (January 1981 \$)

Construction	\$ 926,900,000
IDC @ 7-3/8% Interest	\$ 156,910,000
Total Construction	\$1,083,810,000

ANNUAL COST (JANUARY 1981 \$)

Annual Equivalent @ 7-3/8%	\$ 80,000,000
Annual OM&R	9,280,000
Total Annual	\$ 89,280,000

*Least Cost Single Purpose SOD Alternative

COST ALLOCATION @ 3-1/4% INTEREST (JANUARY 1981 \$)

CAWCS/SOD ALLOCATION

	CAWCS	SOD	Total		Reimbursable	Flood Control & SOD
Construction	\$578,300,000	\$348,600,000	\$ 926,900,000	Total CAP w/o CAWCS	833,829,000	67,948,000
IDC @ 3-1/4%	\$ 47,000,000	\$ 22,170,000	\$ 69,170,000	Total CAP w/CAWCS	510,921,000	720,769,000
OM&R	\$273,880,000	\$ 0	\$ 273,880,000	Net CAWCS	-322,908,000 **	652,821,000
Total	\$899,180,000	\$370,770,000	\$1,269,950,000			

**Increased CAWCD repayment obligation net of power revenues due to CAWCS

**TABLE 12
Design and Cost - Plan 6**

FUNCTION	NEW WADDELL			CLIFF			ROOSEVELT			RECONSTRUCTED STEWART MOUNTAIN		
	Regulatory Storage	Flood Control	SOD	Regulatory Storage	Flood Control	SOD	Regulatory Storage	Flood Control	SOD	Regulatory Storage	Flood Control	SOD
	X			X	X	X	X*	X	X			X
DAM STRUCTURE												
Height		263 feet			338 feet			299 feet				
Crest Length		4,000 feet			2,900 feet			1,110 feet				as required for SOD
Embankment Volume		17,700,000 cubic yards			15,000,000 cubic yards			340,000 cubic yards (Concrete)				
SPILLWAY												
		(ungated)			(ungated)			(gated)				
Crest Length		640 feet			125 feet			100 feet				
Head		33 feet			47 feet			29 feet				
Capacity		450,000 cfs			150,000 cfs			150,000 cfs				
APPURTENANT WORKS												
Hydropower Plant		1,400 KW			4,130 KW			--				
Pump Plant		3,000 cfs					1,000 cfs					as required for SOD
Service Outlet		600 cfs			4,000 cfs			3,160 cfs				
Flood Outlet												
Capacity in Flood Pool		--			25,000 cfs			25,000 cfs				
Capacity at Maximum Water Surface		--			36,000 cfs			35,000 cfs				
Reversible Canal												
Capacity		3,000 cfs			--			--				
Length		5 miles			--			--				
STORAGE ALLOCATION												
	Increased Storage (af)	Total Storage (af)	Surface Area (acres)	Elevation (feet)	Increased Storage (af)	Total Storage (af)	Surface Area (acres)	Elevation (feet)	Increased Storage (af)	Total Storage (af)	Surface Area (acres)	Elevation (feet)
Conservation	0	0	0	1,430	0	0	0	1,810	0	0	0	1,902
Streambed												
Sediment	62,400	62,400	1,986	1,560	5,000	5,000	324	1,852	241,000	241,000	6,707	2,043
Inactive	5,000	67,400	2,122	1,563	--	--	--	--	--	--	--	--
Replacement	157,600	225,000	4,649	1,610	139,000	144,000	2,912	1,952	1,381,000	1,622,000	20,933	2,147
Regulatory Storage	250,000	475,000	6,990	1,653	200,000	344,000	5,328	2,001	--	--	--	--
Flood Control	--	--	--	--	445,000	789,000	8,713	2,066	565,000	2,187,000	25,256	2,172
Surcharge	279,000	754,000	9,021	1,688	861,000	1,650,000	14,246	2,143	820,000	3,007,000	30,004	2,201
Dam Crest				1,693				2,148				2,201
ESTIMATED COST (Jan '81 \$)												
Construction		247,400,000				244,700,000				129,100,000		
Dam Structure		73,900,000				95,400,000				44,800,000		
Spillway		36,900,000				5,100,000				13,900,000		
Outlets		14,900,000				50,100,000				15,100,000		
Pump Plant		49,500,000				15,300,000				7,700,000		
Hydropower Plant		2,000,000				4,800,000				--		
Reversible Canal		14,100,000				--				--		
Recreation		Not Available				Not Available				Not Available		
Miscellaneous**		56,100,000				74,000,000				47,600,000		
Interest During Construction @ 7 3/8%		36,500,000				36,090,000				19,040,000		
Total Construction***		283,900,000				280,790,000				148,140,000		
Annual O&M		3,570,000				2,860,000				2,820,000		
Total Annual Cost @ 7 3/8%		24,520,000				23,590,000				13,750,000		
												30,000,000 (Spillway Only)
												3,320,000
												33,320,000
												0
												2,460,000

181

*Joint use of the dedicated sediment space would provide increased water supply from Roosevelt for an interim period.
 **Includes land acquisition, except at Roosevelt and Waddell; relocation at Cliff only; recreation relocation at Waddell; all engineering and contingencies.
 ***Does not include mitigation costs.

TABLE 13
BENEFIT/COST SUMMARY
PLAN 6

BENEFITS @ 7-3/8% INTEREST (JANUARY 1981 \$)

Regulatory Storage Benefits	
Power Benefits	
Energy Management	\$ 16,160,000
Hydropower	\$ 940,000
Total Power Benefits	<u>\$ 17,100,000</u>
Water Supply Benefits	
Irrigation	\$ 9,580,000
Municipal and Industrial	\$ 1,910,000
Indian Irrigation	\$ 390,000
Total Water Supply Benefits	<u>\$ 11,880,000</u>
Total Regulatory Storage Benefits	\$ 28,980,000
Flood Control Benefits	
Inundation Reduction	\$ 10,580,000
Location	\$ 16,460,000
Total Flood Control Benefits	<u>\$ 27,040,000</u>
Safety of Dams Benefits*	\$ 29,530,000
Recreation, Fish and Wildlife Benefits	<u>Not Available</u>
TOTAL BENEFITS	\$ 85,550,000

ANNUAL BENEFITS @ 7-3/8% INTEREST (JANUARY 1981 \$)

CAWCS	\$ 56,020,000
SOD*	\$ 29,530,000
Total	<u>\$ 85,550,000</u>

COSTS (January 1981 \$)

Construction	\$ 651,200,000
IDC @ 7-3/8% Interest	\$ 94,950,000
Total Construction	<u>\$ 746,150,000</u>

ANNUAL COST (JANUARY 1981 \$)

Annual Equivalent @ 7-3/8%	\$ 55,070,000
Annual OM&R	9,250,000
Total Annual	<u>\$ 64,320,000</u>

82

*Least Cost Single Purpose SOD Alternative

COST ALLOCATION @ 3-1/4% INTEREST (JANUARY 1981 \$)

CAWCS/SOD ALLOCATION

	CAWCS	SOD	Total		Reimbursable	Flood Control & SOD
Construction	\$452,910,000	\$198,290,000	\$ 651,200,000	Total CAP w/o CAWCS	833,829,000	67,948,000
IDC @ 3-1/4%	\$ 29,180,000	\$ 12,660,000	\$ 41,840,000	Total CAP w/CAWCS	468,307,000	483,998,000
OM&R	\$272,990,000	\$ 0	\$ 272,990,000	Net CAWCS	-365,522,000 **	416,050,000
Total	<u>\$755,080,000</u>	<u>\$210,950,000</u>	<u>\$ 966,030,000</u>			

**Increased CAWCD repayment obligation net of power revenues due to CAWCS

TABLE 14
Design and Cost - Plan 7

FUNCTION	NEW WADDELL				CLIFF				ROOSEVELT				RECONSTRUCTED STEWART MOUNTAIN		
	Regulatory Storage	Flood Control	SOD		Regulatory Storage	Flood Control	SOD		Regulatory Storage	Flood Control	SOD		Regulatory Storage	Flood Control	SOD
	X				X	X	X				X				
DAM STRUCTURE															
Height		263 feet				338 feet					299 feet				
Crest Length		4,000 feet				2,900 feet					1,110 feet				As required for SOD
Embankment Volume		17,700,000 cubic yards				15,000,000 cubic yards					340,000 cubic yards (Concrete)				
SPILLWAY															
		(ungated)				(ungated)					(gated)				
Crest Length		640 feet				125 feet					100 feet				
Head		33 feet				47 feet					29 feet				
Capacity		450,000 cfs				150,000 cfs					150,000 cfs				
APPURTENANT WORKS															
Hydropower Plant		1,400 KW				4,130 KW					--				
Pump Plant		3,000 cfs							1,000 cfs						
Service Outlet		600 cfs				4,000 cfs					3,160 cfs				As required for SOD
Flood Outlet															
Capacity in Flood Pool		--				25,000 cfs					25,000 cfs				
Capacity at Maximum Water Surface		--				36,000 cfs					35,000 cfs				
Reversible Canal															
Capacity		3,000 cfs				--					--				
Length		5 miles				--					--				
STORAGE ALLOCATION															
		Increased Storage (af)	Total Storage (af)	Surface Area (acres)	Elevation (feet)	Increased Storage (af)	Total Storage (af)	Surface Area (acres)	Elevation (feet)	Increased Storage (af)	Total Storage (af)	Surface Area (acres)	Elevation (feet)		
Conservation															
Streambed		0	0	0	1,430	0	0	0	1,810	0	0	0	1,902		
Sediment		62,400	62,400	1,986	1,560	5,000	5,000	324	1,852	241,000	241,000	6,707	2,043		As required for SOD
Inactive		5,000	67,400	2,122	1,563	10,000	15,000	638	1,873	--	--	--	--		
Replacement		157,600	225,000	4,649	1,610	139,000	154,000	3,063	1,956	1,381,000	1,622,000	20,933	2,147		
Regulatory Storage		250,000	475,000	6,990	1,653	200,000	354,000	5,421	2,003	--	--	--	--		
Flood Control		--	--	--	--	445,000	799,000	8,773	2,067	565,000	2,187,000	25,256	2,172		
Surcharge		279,000	754,000	9,021	1,688	851,000	1,650,000	14,246	2,143	820,000	3,007,000	30,004	2,201		
Dam Crest					1,693				2,148				2,201		
ESTIMATED COST (Jan '81 \$)															
Construction			247,400,000				244,700,000				129,100,000				
Dam Structure			73,900,000				95,400,000				44,800,000				30,000,000 (Spillway Only)
Spillway			36,900,000				5,100,000				13,900,000				
Outlets			14,900,000				50,100,000				15,100,000				
Pump Plant			49,500,000				15,300,000				7,700,000				
Hydropower Plant			2,000,000				4,800,000				--				
Reversible Canal			14,100,000				--				--				
Recreation			Not Available				Not Available				Not Available				
Miscellaneous**			56,100,000				74,000,000				47,600,000				
Interest During Construction @ 7 3/8%							36,500,000				19,040,000				3,320,000
Total Construction***			283,900,000				280,790,000				148,140,000				33,320,000
Annual O&M			3,100,000				2,380,000				2,340,000				0
Total Annual Cost @ 7 3/8%			24,050,000				23,110,000				13,270,000				2,460,000

*Joint use of the dedicated sediment space would provide increased water supply from Roosevelt for an interim period.

**Includes land acquisition, except at Roosevelt and Waddell; relocation at Cliff only; recreation relocation at Waddell; all engineering and contingencies.

***Does not include mitigation costs.

TABLE 15
BENEFIT/COST SUMMARY
PLAN 7

BENEFITS @ 7-3/8% INTEREST (JANUARY 1981 \$)

ANNUAL BENEFITS @ 7-3/8% INTEREST (JANUARY 1981 \$)

Regulatory Storage Benefits	
Power Benefits	
Energy Management	\$ 16,160,000
Hydropower	\$ 940,000
Total Power Benefits	<u>\$ 17,100,000</u>
Water Supply Benefits	
Irrigation	\$ 6,900,000
Municipal and Industrial	\$ - 500,000
Indian Irrigation	\$ - 200,000
Total Water Supply Benefits	<u>\$ 6,200,000</u>
Total Regulatory Storage Benefits	\$ 23,300,000
Flood Control Benefits	
Inundation Reduction	\$ 10,580,000
Location	\$ 16,460,000
Total Flood Control Benefits	<u>\$ 27,040,000</u>
Safety of Dams Benefits*	\$ 29,530,000
Recreation, Fish and Wildlife Benefits	<u>Not Available</u>
TOTAL BENEFITS	\$ 79,870,000

CAWCS	\$ 50,340,000
SOD*	\$ 29,530,000
Total	<u>\$ 79,870,000</u>

COSTS (January 1981 \$)

Construction	\$ 651,200,000
IDC @ 7-3/8% Interest	\$ 94,950,000
Total Construction	<u>\$ 746,150,000</u>

ANNUAL COST (JANUARY 1981 \$)

Annual Equivalent @ 7-3/8%	\$ 55,070,000
Annual OM&R	7,820,000
Total Annual	<u>\$ 62,890,000</u>

84

*Least Cost Single Purpose SOD Alternative

COST ALLOCATION @ 3-1/4% INTEREST (JANUARY 1981 \$)

CAWCS/SOD ALLOCATION

	CAWCS	SOD	Total
Construction	\$452,910,000	\$198,290,000	\$651,200,000
IDC @ 3-1/4%	\$ 29,180,000	\$ 12,660,000	\$ 41,840,000
OM&R	\$272,990,000	\$ 0	\$272,990,000
Total	<u>\$755,080,000</u>	<u>\$210,950,000</u>	<u>\$966,030,000</u>

	<u>Reimbursable</u>	<u>Flood Control & SOD</u>
Total CAP w/o CAWCS		
Total CAP w/CAWCS		
Net CAWCS**		

**Increased CAWCD repayment obligation due to CAWCS

TABLE 16

ENVIRONMENTAL IMPACTS AND EFFECTS OF PLAN 1

<u>Category/Factor</u>	<u>Unmitigated Impact/Mitigation Recommendation</u>	<u>Effect Unmitigated/Mitigated</u>
Biological Resources		
Riparian/Wetland Community	Total of 3,490 acres potentially affected by plan. Loss of 1,390 acres of riparian habitat primarily at Cliff Reservoir; however, net gain of 1,570 acres anticipated due to expected regrowth of poor quality mixed-scrub riparian vegetation in old Horseshoe Reservoir lake bed. Up to 2,200 acres could potentially be enhanced through mitigation at Cliff Reservoir.	Insignificant/ Significant Beneficial
Other Terrestrial Communities	Total of 20,590 acres potentially affected by plan. Loss of 3,130 acres from typical-year inundation. About 300 acres could potentially be reclaimed or improved through mitigation.	Insignificant/Insignificant
Perennial Stream/ Riverine Community	Up to 23 miles potentially affected by plan. Loss of 2 miles from typical-year inundation. No mitigation possible for loss of perennial stream. Flow regime expected to remain unchanged.	Insignificant/Insignificant
Reservoir Aquatic Community	Gain of approximately 90 surface acres, (typical year minimum pool gain), most of which is at Cliff Reservoir. Spawning habitat adversely affected by drawdown rates greater than 2 inches per day at Cliff Reservoir. Impact mitigated through reduction of drawdown rate.	Insignificant/ Significant Beneficial

TABLE 16 (CONT'D.)

ENVIRONMENTAL IMPACTS AND EFFECTS OF PLAN 1

<u>Category/Factor</u>	<u>Unmitigated Impact/Mitigation Recommendation</u>	<u>Effect Unmitigated/Mitigated</u>
Biological Resources		
Threatened and Endangered Plants and Wildlife	Total of 730 acres of preferred habitat and 1 breeding area potentially affected by plan. Loss of 280 acres of preferred bald eagle habitat and possibly productivity of 1 bald eagle breeding area through typical-year inundation. Loss of perennial stream foraging areas for bald eagles. Cumulative impact would be reduction in bald eagle productivity. Potential mitigation would include improvement of 280 acres of bald eagle preferred habitat at Cliff Reservoir.	Significant Adverse/ Insignificant
Special Use and Management Areas	Loss of special use sites includes several cottonwood rehabilitation sites but less than 135 AUMs of range resource lost. Special use sites could be set aside in the Confluence area.	Insignificant/ Significant Beneficial
Water Quality		
Salt Loading	9.6 percent increase in imported salt volume.	Insignificant/Insignificant
Constituents	Degradation of water in SRP canals each year during the exchange period. This affects an annual average of about 70,000 acre-feet of SRP (Salt and/or Verde River) surface water which is delivered for M&I and agricultural use. Most notable increases are in hardness, total dissolved solids (TDS) and sulfates. Average CAP concentrations for both TDS and sulfates exceed secondary drinking water standards.	Insignificant/Insignificant
	No mitigation recommended except close coordination with local users each year to provide advance notice of exchange period.	

TABLE 16 (CONT'D.)

ENVIRONMENTAL IMPACTS AND EFFECTS OF PLAN 1

<u>Category/Factor</u>	<u>Unmitigated Impact/Mitigation Recommendation</u>	<u>Effect Unmitigated/Mitigated</u>
Water Quality		
Eutrophication Potential	No reservoir mixing of CAP and local water. Eutrophication problems in existing reservoirs will not differ significantly from existing conditions. During the exchange period, water treatment plants on SRP canals will receive CAP water which may produce trihalomethane during normal disinfection. Mitigation may include modification of disinfection process at water treatment plants.	Insignificant/Insignificant
Air Quality		
Total Suspended Particulates	Annual average increase of 20 to 70 ug/m ³ in ambient concentrations of TSP within 1 to 1-1/2 mile of construction areas. Dust suppression measures such as paving, chemical stabilization, watering, etc. would substantially reduce impact.	Significant Adverse/ Insignificant (on-site)
	Annual average increase of less than 20 ug/m ³ in ambient concentrations of TSP at distances greater than 1-1/2 mile from construction areas. Application of dust suppression measures would substantially reduce impact.	Significant Adverse/ Insignificant (off-site)
Sound Quality		
Noise Levels	Localized temporary increase in noise levels at Cliff and New Roosevelt sites during construction.	Insignificant/Insignificant

TABLE 16 (CONT'D.)

ENVIRONMENTAL IMPACTS AND EFFECTS OF PLAN 1

<u>Category/Factor</u>	<u>Unmitigated Impact/Mitigation Recommendation</u>	<u>Effect</u> <u>Unmitigated/Mitigated</u>
Visual Quality		
Land Composition	Gain of 3,000 acres of Visual Quality Zone 1 (highest quality) and loss of 1,000 acres of Visual Quality Zone 2 (average quality) and 2,000 acres of Visual Quality Zone 3 (lowest quality). These changes indicate a substantial shift from low quality visual resource to higher quality visual resource. Most of the beneficial changes occur in the Cliff area as a result of additional public sensitivity provided by new access areas, a major gain in riparian vegetation, and an increase in the lake size.	Significant Beneficial/ Significant Beneficial
Land Quality		
Land Use Compatibility	Plan 1 will not likely result in the modification to the compatibility of any parcels of land located adjacent to the designated IDF land acquisition lines.	Insignificant/Insignificant
Land Use Conversions	Plan 1 will provide a level of flood protection (92,000 cfs at Sky Harbor International Airport) which would generally permit the partial implementation of other downstream public plans (e.g., Rio Salado Development District, Sky Harbor Airport Expansion and Maricopa County Flood Control District phreatophyte vegetation control) as currently conceived, but will not likely create conditions favorable for localized secondary land conversions near the proposed reservoir sites.	Significant Beneficial/ Beneficial Flag

TABLE 16 (CONT'D.)

ENVIRONMENTAL IMPACTS AND EFFECTS OF PLAN 1

<u>Category/Factor</u>	<u>Unmitigated Impact/Mitigation Recommendation</u>	<u>Effect Unmitigated/Mitigated</u>
Geological Resources/ Soils		
Mineral Resources (Sand and Gravel)	Reduction of flood levels results in enhancement of 3,120 surface acres (17 percent of total resource) along the Salt-Gila channel.	Significant Beneficial/ Significant Beneficial
Prime Farmland	Long-term loss of 130 acres of prime farmland at Cliff Dam site.	Significant Adverse/ Significant Adverse
Cultural Resources		
Prehistoric Resources	Total of 2,906 sites (7,808 acres) would be affected by Plan 1: 1,370 sites (1,398 acres) at Cliff and 1,536 sites (6,410 acres) at Roosevelt. Of these sites 134 (411 acres) will be destroyed by construction, 5 sites (17 acres) will be severely altered in the permanent pool, 31 sites (75 acres) will be severely altered in the fluctuating pool, 219 sites (262 acres) will be moderately altered in the less than annual and flood pool, 257 sites (823 acres) will be subjected to highly infrequent flooding in the rare event of an IDF as well as subjected to secondary impacts. An additional 2,260 sites (6,220 acres) fall in the secondary impact zone and would be affected by such activities as pothunting and inadvertent destruction as a result of increased accessibility, pedestrian and vehicular disturbance, etc. These impacts result in an effects factor of -8,984.	Adverse Flag/Adverse Flag

TABLE 16 (CONT'D.)

ENVIRONMENTAL IMPACTS AND EFFECTS OF PLAN 1

<u>Category/Factor</u>	<u>Unmitigated Impact/Mitigation Recommendation</u>	<u>Effect</u> <u>Unmitigated/Mitigated</u>
Cultural Resources	<p>Mitigation would include avoiding the resource, partial data recovery (e.g., mapping sites, collecting surface artifacts, use of remote sensing techniques, test excavations, partial site excavations); and site protection (e.g., fencing around site, policing, site monitoring, enforcement of laws against vandalism). Even with a comprehensive mitigation program, complete data recovery cannot be accomplished, and therefore significant destruction and alteration of archaeological sites would occur.</p>	
Historic Resources	<p>A total of 44 sites would be potentially affected by Plan 1, with 21 sites affected under typical year operation conditions. These impacts result in an effects factor of -260. Two sites, the Verde River Sheep Bridge at Cliff and Roosevelt Dam at New Roosevelt are on the National Register of Historic Places. Both of these sites would be impacted; impacts to Roosevelt Dam are not mitigatable, although the magnitude of this impact could be reduced. Impacts to other sites are mitigatable assuming adequate institutional support, performance time, and funding. Mitigation would include measures recommended above under prehistoric resources, plus site documentation (e.g., recording surface architecture or structural features) and additional historical research.</p>	Adverse Flag/Adverse Flag

TABLE 16 (CONT'D.)

ENVIRONMENTAL IMPACTS AND EFFECTS OF PLAN 1

<u>Category/Factor</u>	<u>Unmitigated Impact/Mitigation Recommendation</u>	<u>Effect</u> <u>Unmitigated/Mitigated</u>
Recreation		
Stream-Oriented	A total of 2.2 miles of stream on the Verde River would be lost at the Cliff site. Conceptual recreation plans call for the development of one stream-oriented site each at Cliff and Roosevelt. Impact of the conceptual recreation plans would be a net gain of 43,000 maximum recreation days per year for stream-oriented activities (stream fishing, swimming, camping, picnicking).	Insignificant/Insignificant
Recreation		
Reservoir-Oriented	Gain of 845 acres (average during recreation season) at the Cliff Reservoir. Conceptual recreation plans propose 5 reservoir-oriented sites at Cliff and 11 sites at Roosevelt. Impacts of the conceptual recreation plans would be a net gain of 1,152,000 maximum recreation days per year for reservoir-oriented activities (boat fishing, swimming, power boating, non-power boating, waterskiing, camping, picnicking). Plan 1 will partially meet regional reservoir-oriented recreation needs. Significant needs met include: swimming (46 percent needs met) and developed camping (surplus increased by 190 percent). Plan 1 will intensify boat fishing and non-powerboating needs by an insignificant amount. No mitigation is recommended.	Significant Beneficial/ Significant Beneficial

TABLE 17

ENVIRONMENTAL IMPACTS AND EFFECTS OF PLAN 2

<u>Category/Factor</u>	<u>Unmitigated Impact/Mitigation Recommendation</u>	<u>Effect Unmitigated/Mitigated</u>
Biological Resources		
Riparian/Wetland Community	Total of 3,390 acres potentially affected by plan. Loss of 3,130 acres of riparian habitat primarily at Cliff Reservoir; however, net gain of 2,110 acres anticipated due to expected regrowth of poor-quality mixed-scrub riparian vegetation in old Horseshoe Reservoir lake bed in typical-year pool. Up to 2,740 acres could potentially be enhanced through mitigation at Cliff Reservoir.	Insignificant/ Significant Beneficial
Other Terrestrial Communities	Total of 14,870 acres potentially affected by plan. Loss of 1,750 acres from typical-year inundation. About 300 acres could potentially be reclaimed or improved through mitigation.	Insignificant/Insignificant
Perennial Stream/ Riverine Community	Up to 22 miles potentially affected by plan. Loss of 2 miles from typical-year inundation. No mitigation possible for loss of perennial stream. Flow regime expected to remain unchanged.	Insignificant/Insignificant
Reservoir Aquatic Community	No change of surface acres. No new guaranteed minimum pools. Spawning habitat adversely affected by drawdown rates greater than 2 inches per day at Cliff Reservoir. Impact could be mitigated through reduction of draw-down rate.	Insignificant/ Significant Beneficial

TABLE 17 (CONT'D.)

ENVIRONMENTAL IMPACTS AND EFFECTS OF PLAN 2

<u>Category/Factor</u>	<u>Unmitigated Impact/Mitigation Recommendation</u>	<u>Effect</u> <u>Unmitigated/Mitigated</u>
Biological Resources		
Threatened and Endangered Plants and Wildlife	Total of 670 acres of preferred habitat and 1 breeding area potentially affected by plan. Loss of 280 acres of preferred bald eagle habitat and possibly productivity of 1 bald eagle breeding area through typical-year inundation. Loss of perennial stream foraging areas for bald eagles. Cumulative impact would be reduction in bald eagle productivity. Potential mitigation would include improvement of 280 acres of preferred habitat at Cliff Reservoir.	Significant Adverse/ Insignificant
93 Special Use and Management Areas	Loss of special use sites including several cottonwood rehabilitation sites but gain of 26 AUMs of range resource. Special use sites could be set aside in the Confluence area.	Insignificant/ Significant Beneficial
Water Quality		
Salt Loading	No increase in imported salt volume.	No Effect
Constituents	The CAP system would remain isolated from local surface water sources with no reservoir mixing of CAP and local waters prior to delivery. Water quality constituents of surface water would not be affected by this plan.	No Effect
Eutrophication Potential	There would be no reservoir storage of CAP water and no induced mixing of CAP and local surface water sources as a result of this plan. Eutrophication problems in existing reservoirs would not differ significantly from existing conditions.	No Effect

TABLE 17 (CONT'D.)

ENVIRONMENTAL IMPACTS AND EFFECTS OF PLAN 2

<u>Category/Factor</u>	<u>Unmitigated Impact/Mitigation Recommendation</u>	<u>Effect</u> <u>Unmitigated/Mitigated</u>
Air Quality	Annual average increase of 20 to 70 ug/m ³ in ambient concentrations of TSP within 1 to 1-1/2 mile of construction areas. Dust suppression measures such as paving, chemical stabilization, watering, etc. would substantially reduce impact.	Significant Adverse/ Insignificant (on-site)
Total Suspended Particulates	Annual average increase of less than 20 ug/m ³ in ambient concentrations of TSP at distances greater than 1-1/2 mile from construction areas. Application of dust suppression measures would substantially reduce impact.	Significant Adverse/ Insignificant (off-site)
Sound Quality	Localized temporary increase in noise levels at Cliff and New Roosevelt sites during construction.	Insignificant/Insignificant
Noise Levels		
Visual Quality	The net impact in Plan 2 was not sufficient to cause a change in the Visual Quality Zones. The 35,656 acres of Visual Quality Zone 1 (highest quality) along with 65,341 acres of Visual Quality Zone 2 (average quality) and 28,793 acres of Visual Quality Zone 2 (lowest quality) remained the same. The changes at Roosevelt other than an increase in public access are negligible and those at Cliff are a mix of gains and losses that result in a locally insignificant effect.	Insignificant/Insignificant
Land Composition		

TABLE 17 (CONT'D.)

ENVIRONMENTAL IMPACTS AND EFFECTS OF PLAN 2

<u>Category/Factor</u>	<u>Unmitigated Impact/Mitigation Recommendation</u>	<u>Effect</u> <u>Unmitigated/Mitigated</u>
Land Quality		
Land Use Compatibility	Plan 2 will not likely result in the modification of the compatibility of any parcels of land which would be located adjacent to the approximate IDF land acquisition line for the Cliff and New Roosevelt Reservoirs. Compatibility of lands located downstream in Verde, Salt, and Gila River floodplains similarly are not likely to be affected by the implementation of SRP reregulation, floodplain zoning, and other nonstructural institutional measures.	Insignificant/Insignificant
Land Use Conversions	Plan 2 will only provide a minimal level of flood protection (approximately 165,000 cfs at the Verde/Salt confluence and at Sky Harbor International Airport) which generally will be inadequate to permit implementation of other public plans (e.g., Rio Salado Development District, Sky Harbor International Airport Expansion, and Maricopa County Flood Control District phreatophyte vegetation control program) as currently conceived without implementation of additional site-specific structural measures such as limited levees. Also, land conversion in the vicinity of the proposed Cliff and New Roosevelt Reservoirs are not likely to occur given public land ownership patterns within Tonto National Forest. No additional "nonstructural" mitigation/enhancement measures have been identified.	Insignificant/Insignificant

TABLE 17 (CONT'D.)

ENVIRONMENTAL IMPACTS AND EFFECTS OF PLAN 2

<u>Category/Factor</u>	<u>Unmitigated Impact/Mitigation Recommendation</u>	<u>Effect</u> <u>Unmitigated/Mitigated</u>
Geological Resources/ Soils		
Mineral Resources (Sand and Gravel)	Reduction of flood flows would result in enhancement of 1,350 surface acres (7 percent of total resource) along the Salt-Gila channel.	Significant Beneficial/ Significant Beneficial
Prime Farmland	Loss of 130 acres of prime farmland at Cliff Dam site.	Significant Adverse/ Significant Adverse
Cultural Resources		
Prehistoric Resources	Under Plan 2 a total of 2,906 prehistoric sites (7,808 acres) will be affected; 1,370 sites (1,398 acres) at Cliff and 1,536 sites (6,410 acres) at Roosevelt. Of these sites, 57 sites (122 acres) will be destroyed by construction, 25 sites (79 acres) will be severely altered by inundation in the fluctuating pool, 50 sites (79 acres) will be moderately altered by inundation in the less than annual and flood pool, and 370 sites (966 acres) will be subjected to highly infrequent flooding in the rare event of an IDF, as well as subjected secondary impacts. An additional 2,405 sites (6,562 acres) are located solely in the secondary impact zone and will be subjected to impacts such as pothunting resulting from increased accessibility, pedestrian and vehicular disturbances, etc. The effects factor for these impacts is -8,210.	Adverse Flag/Adverse Flag

TABLE 17 (CONT'D.)

ENVIRONMENTAL IMPACTS AND EFFECTS OF PLAN 2

<u>Category/Factor</u>	<u>Unmitigated Impact/Mitigation Recommendation</u>	<u>Effect</u> <u>Unmitigated/Mitigated</u>
Cultural Resources	Mitigation would include avoiding the resource, partial data recovery; (e.g., mapping sites, collecting surface artifacts, use of remote sensing techniques, test excavations, partial site excavations); and site protection (e.g., fencing around site, policing, site monitoring, enforcement of laws against vandalism). Even with a comprehensive mitigation program, complete data recovery cannot be accomplished, and therefore significant destruction and alteration of archaeological sites would occur.	
Historic Resources	A total of 38 sites would be potentially affected by Plan 2. Of this total, 27 sites would be destroyed and 11 would be altered. Under maximum storage pool conditions, 21 sites would be potentially affected; 11 of these would be destroyed, and 10 altered. The effects factor for these impacts is -213. One of the destroyed sites, T. Roosevelt Dam, is a National Register of Historic Places property, and is a National Historic Landmark. The anticipated destruction of this site is not mitigatable; it may be possible, however, to reduce the magnitude of this impact. Impacts to other sites are mitigatable assuming adequate institutional support, performance time, and funding. Mitigation would include measures described above for prehistoric resources, plus site documentation (e.g. recording surface architecture or structural features); additional historical research.	Adverse Flag/Adverse Flag

TABLE 17 (CONT'D.)

ENVIRONMENTAL IMPACTS AND EFFECTS OF PLAN 2

<u>Category/Factor</u>	<u>Unmitigated Impact/Mitigation Recommendation</u>	<u>Effect Unmitigated/Mitigated</u>
Recreation Stream-Oriented	A total of 2.2 miles of stream on the Verde River would be lost at the Cliff site. No stream-oriented recreation developments are associated with this plan. Approximately 1,000 stream-oriented maximum recreation days per year would be lost with this plan. No mitigation is recommend.	Insignificant/Insignificant
Recreation Reservoir-Oriented	No increase in reservoir resources. No reservoir-oriented recreation developments are associated with this plan. Approximately 9,000 reservoir-oriented maximum recreation days per year would be lost with this plan because of the change in boating mix at Cliff. Plan 2 will intensify boat fishing, powerboating, and non-powerboating needs by an insignificant amount. No mitigation is recommended.	Insignificant/Insignificant

TABLE 18

ENVIRONMENTAL IMPACTS AND EFFECTS OF PLAN 3

<u>Category/Factor</u>	<u>Unmitigated Impact/Mitigation Recommendation</u>	<u>Effect</u> <u>Unmitigated/Mitigated</u>
Biological Resources Riparian/Wetland Community	Total of 7,430 acres potentially affected by plan. In typical-year pool, loss of 3,270 acres of good-quality habitat (including Blue Point cottonwoods) and gain of 3,050 acres of poor-quality habitat, resulting in a net loss of 220 acres. Up to 2,680 acres could potentially be reclaimed through mitigation at Cliff Reservoir, but virtually no mitigation at Confluence.	Significant Adverse/ Insignificant
Other Terrestrial Communities	Total of 24,970 acres potentially affected by plan. Loss of 6,070 acres from typical-year inundation. About 1,000 acres could potentially be reclaimed or improved through mitigation.	Insignificant/Insignificant
Perennial Stream/ Riverine Community	Up to 44 miles potentially affected by plan. Loss of 18 miles from typical-year inundation. No mitigation possible for loss of perennial stream. Flow regime upstream of Confluence remains unchanged, minimum flow downstream of Confluence 200 cfs.	Adverse Flag/Adverse Flag
Reservoir Aquatic Community	Gain of approximately 2,950 surface acres, most of which are at Confluence. Gain of minimum pool at Confluence, but drawdown rates greater than 2 inches per day at Cliff Reservoir and Confluence. Moderate enhancement of spawning habitat in the Confluence regulatory storage pool could be achieved.	Insignificant/ Significant Beneficial

TABLE 18 (CONT'D.)

ENVIRONMENTAL IMPACTS AND EFFECTS OF PLAN 3

<u>Category/Factor</u>	<u>Unmitigated Impact/Mitigation Recommendation</u>	<u>Effect</u> <u>Unmitigated/Mitigated</u>
Biological Resources		
Threatened and Endangered Plants and Wildlife	Total of 1,320 acres of preferred habitat and 3 breeding areas potentially affected by plan. Net loss of 840 acres of preferred bald eagle habitat and disruption of productivity in at least 2 highly productive bald eagle breeding areas at the Confluence Reservoir as well as 1 breeding area at Cliff Reservoir through typical-year inundation. Loss of perennial stream foraging areas for bald eagles. Cumulative impact would be reduction in bald eagle productivity. All of the preferred Yuma clapper rail habitat at Confluence (30 acres) will be lost. Potential mitigation would include improvement of about 200 acres of preferred habitat at Cliff Reservoir and Verde River upstream of Confluence.	Adverse Flag/Significant Adverse
Special Use and Management Areas	Loss of special use sites including Blue Point cottonwood area and a loss of 1,055 AUMs of range resource. Special use sites could be added in take line easement area at Confluence.	Insignificant/Insignificant
Water Quality		
Salt Loading	13.1 percent increase in imported salt volume.	Insignificant/Insignificant
Constituents	Degradation of entire Salt River Project (Salt River and Verde River water) average annual surface water yield of 845,000 acre-feet. Most notable increases are in hardness, total dissolved solids (TDS), and sulfates. Only standard exceeded because of mixing is for average TDS, which increases nearly 70 mg/l (200 mg/l for special Verde case) and exceeds secondary drinking water standard. Numerous SRP constituents capable of experiencing higher maximum concentrations. No mitigation recommended, except for aeration of water between reservoir and water treatment plants.	Significant Adverse/ Significant Adverse

TABLE 18 (CONT'D.)

ENVIRONMENTAL IMPACTS AND EFFECTS OF PLAN 3

<u>Category/Factor</u>	<u>Unmitigated Impact/Mitigation Recommendation</u>	<u>Effect</u> <u>Unmitigated/Mitigated</u>
Water Quality		
Eutrophication Potential	<p>At Confluence Reservoir very high eutrophication potential with high probability of blue-green algal dominance. Aesthetic degradation of Verde arm of reservoir and increased nutrients in SRP canals. Probable high organic levels leading to increased tri-halo methane (THM) production with normal disinfection of water from Confluence at treatment plants.</p> <p>All downstream impacts can be mitigated by aeration and different disinfection process for water. Costs of mitigation could be high if disinfection process includes modification of treatment plants.</p>	Significant Adverse/ Insignificant
Air Quality		
Total Suspended Particulates	<p>Annual average increase of 20 to 70 ug/m³ in ambient concentrations of TSP within 1 to 1-1/2 mile of construction areas. Dust suppression measures such as paving, chemical stabilization, watering, etc. would substantially reduce impact.</p> <p>Annual average increase of less than 20 ug/m³ in ambient concentrations of TSP at distances greater than 1-1/2 mile from construction areas. Application of dust suppression measures would substantially reduce impact.</p>	Significant Adverse/ Insignificant (on-site)
Sound Quality		
Noise Levels	<p>Localized temporary increase in noise levels at Confluence, Cliff, and New Roosevelt sites during construction.</p>	Insignificant/Insignificant

TABLE 18 (CONT'D.)

ENVIRONMENTAL IMPACTS AND EFFECTS OF PLAN 3

<u>Category/Factor</u>	<u>Unmitigated Impact/Mitigation Recommendation</u>	<u>Effect</u> <u>Unmitigated/Mitigated</u>
Visual Quality		
Land Composition	<p>Loss of 3,500 acres of Visual Quality Zone 1 (highest quality); gain of 2,500 acres of Visual Quality Zone 2 (average quality) and 1,000 acres of Visual Quality Zone 3 (lowest quality). These changes indicate a substantial shift from high quality visual resources to lower quality visual resources. Most of the adverse change occurs in the Confluence area and is caused by the loss of flowing river and streamside vegetation, and the presence of a large drawdown area, or "bathtub-ring," around the reservoir. Mitigation for changes in visual quality is not possible.</p>	<p>Significant Adverse/ Significant Adverse</p>
Land Quality		
Land Use Compatibility	<p>Implementation of Plan 3 will only likely modify the compatibility (from compatible to complementary) of one parcel of land totalling approximately 4% of the land area of all parcels which would be located adjacent to the designated IDF land acquisition line for the Cliff, New Roosevelt, and Confluence Reservoirs.</p>	<p>Insignificant/Insignificant</p>

TABLE 18 (CONT'D.)

ENVIRONMENTAL IMPACTS AND EFFECTS OF PLAN 3

<u>Category/Factor</u>	<u>Unmitigated Impact/Mitigation Recommendation</u>	<u>Effect Unmitigated/Mitigated</u>
Land Quality		
Land Use Conversions	Implementation of Plan 3 will provide a level of flood protection (approx. 80,000 cfs at Sky Harbor International Airport) which would generally permit the partial implementation of other downstream public plans (e.g., Rio Salado Development District, Sky Harbor Airport Expansion, and Maricopa County Flood Control District phreatophyte vegetation control) as currently conceived and will likely excelerate urban land use conversions in selected locations in the vicinity of the proposed Confluence reservoir.	Significant Beneficial/ Beneficial Flag
Geological Resources/ Soils		
Mineral Resources (Sand and Gravel)	Estimated 18,295 surface acres of known and potential sand and gravel deposits. Long-term loss of 190 surface acres (1 percent of the total resource) at the Fort McDowell Indian Reservation. Reduction of flood levels results in enhancement of 3,120 surface acres (17 percent of the total resource) along the Salt-Gila channel.	Significant Beneficial/ Significant Beneficial
Prime Farmland	Total of 848 acres of prime farmland taken out of agricultural production: 130 acres at Cliff Dam site, 718 acres on Fort McDowell Indian Reservation.	Significant Adverse/ Significant Adverse

TABLE 18 (CONT'D.)

ENVIRONMENTAL IMPACTS AND EFFECTS OF PLAN 3

<u>Category/Factor</u>	<u>Unmitigated Impact/Mitigation Recommendation</u>	<u>Effect</u> <u>Unmitigated/Mitigated</u>
Cultural Resources		
Prehistoric Resources	<p>Total of 3,151 sites (13,754 acres) would be affected by Plan 3: 1,370 sites (1,398 acres) at Cliff, 1,536 sites (6,410 acres) at New Roosevelt, and 245 sites (5,946 acres) at Confluence. Some 158 sites (491 acres) would be destroyed by construction, 11 (22 acres) will be severely altered in the permanent pool, 59 (616 acres) will be severely altered in the fluctuating pool, 231 (276 acres) will be moderately altered in the less than annual and flood pool, 279 (1,031 acres) will be subjected to highly infrequent flooding in the rare event of an IDF as well as subjected to secondary impacts. An additional 2,413 sites (11,318 acres) fall in the secondary impact zone and would be affected by such activities as pothunting and inadvertent destruction as a result of increased accessibility, pedestrian and vehicular disturbance, etc. The effects factor for these impacts is -15,650.</p> <p>Mitigation would include avoiding the resource, partial data recovery (e.g., mapping sites, collection of surface artifacts, use of remote sensing techniques, test excavations, partial site excavations); and site protection (e.g., fencing around site, policing, site monitoring, enforcement of laws against vandalism). Even with a comprehensive mitigation program, complete data recovery cannot be accomplished, and therefore significant destruction and alteration of archaeological sites would occur.</p>	Adverse Flag/Adverse Flag

TABLE 18 (CONT'D.)

ENVIRONMENTAL IMPACTS AND EFFECTS OF PLAN 3

<u>Category/Factor</u>	<u>Unmitigated Impact/Mitigation Recommendation</u>	Effect <u>Unmitigated/Mitigated</u>
Cultural Resources		
Historic Resources	Total of 116 sites would be potentially affected by Plan 3 with 66 sites affected under typical-year conditions. The effects factor for these impacts is -698. Two sites, Fort McDowell at Confluence and Roosevelt Dam at the New Roosevelt site, are on the National Register of Historic Places; Roosevelt Dam is a National Landmark as well. Impacts to these sites are not mitigatable, although the magnitude of the impact can be reduced. Impacts to other sites are mitigatable to the extent that the sites' significant qualities or data values could be recovered, documented, and reported through archaeological and historical resource procedures. Mitigation would include measures described above for prehistoric resources, plus site documentation (e.g. recording surface architecture or structural features) and additional historical research.	Adverse Flag/Adverse Flag
Recreation		
Stream-Oriented	Loss of a total of 18 miles of stream, 16.8 miles of which are used for tubing. This represents the loss of half the tubing miles on the Salt and Verde Rivers in the study area, and would result in intensification of regional needs for tubing by 94%. This loss cannot be adequately mitigated, although partial mitigation may be accomplished by improving conditions for tubing on the Verde River below Bartlett Dam.	Adverse Flag/Adverse Flag

TABLE 18 (CONT'D.)

ENVIRONMENTAL IMPACTS AND EFFECTS OF PLAN 3

<u>Category/Factor</u>	<u>Unmitigated Impact/Mitigation Recommendation</u>	<u>Effect</u> <u>Unmitigated/Mitigated</u>
Recreation	<p>Conceptual recreation plans call for the development of one stream-oriented site each at Cliff, Roosevelt, and Confluence sites with facilities for camping and picnicking. Impacts of the conceptual recreation plans would be a net loss of 1,469,000 maximum recreation days per year for stream-oriented activities (stream fishing, swimming, tubing, camping, picnicking). Regional stream-oriented needs met by the conceptual recreation plans are limited to developed camping (surplus increases by 8.4 percent).</p>	
Reservoir-Oriented	<p>Gain of 5,320 acres (average during recreation season) of surface water at Confluence site. Conceptual recreation plans at Confluence would provide 7 reservoir-oriented sites on Salt arm of the Confluence Reservoir, 5 sites at Cliff, and 11 sites at Roosevelt. Impact of the conceptual recreation plans would be a net gain of 4,359,000 maximum recreation days per year for reservoir-oriented activities (boat fishing, swimming, power boating, waterskiing, non-power boating, camping, picnicking). Regional reservoir-oriented recreation needs significantly met by Plan 3 include swimming (343 percent needs met), powerboating (17 percent needs met), waterskiing (7 percent needs met), developed camping (surplus increased by 192 percent), picnicking (37 percent needs met).</p> <p>Along Verde arm of the Confluence Reservoir a "bathtub-ring" and probable algal growth are likely to detract from recreational experience.</p>	<p>Significant Beneficial/ Significant Beneficial</p>

TABLE 19

ENVIRONMENTAL IMPACTS AND EFFECTS OF PLANS 4 AND 5

<u>Category/Factor</u>	<u>Unmitigated Impact/Mitigation Recommendation</u>	<u>Effect Unmitigated/Mitigated</u>
Biological Resources		
Riparian/Wetland Community	Total of 9,020 acres potentially affected by plan. In the typical-year pool, loss of 3,210 acres of good-quality habitat, including the Blue Point cottonwoods; gain of 3,050 acres of poor-quality habitat, resulting in a net loss of 160 acres of habitat. Up to 2,680 acres could potentially be reclaimed through mitigation at Cliff Reservoir, but virtually no mitigation at Confluence.	Significant Adverse/ Insignificant
Other Terrestrial Communities	Total of 32,620 acres potentially affected by plan. Loss of 5,410 acres from typical-year inundation. Up to 1,000 acres could potentially be reclaimed or improved through mitigation.	Insignificant/Insignificant
Perennial Stream/ Riverine Community	Up to 53 miles potentially affected by plan. Loss of 19 miles from typical-year inundation. No mitigation possible for loss of perennial stream. Flow regime upstream of Confluence remains unchanged, minimum flow downstream of Confluence 200 cfs.	Adverse Flag/Adverse Flag
Reservoir Aquatic Communities	Gain of approximately 2,950 surface acres, most of which are at Confluence. Gain of minimum pool at Confluence but drawdown rate greater than 2 inches per day at Cliff Reservoir and Confluence. Moderate enhancement of spawning habitat in the Confluence regulatory storage pool could be achieved.	Insignificant/ Significant Beneficial

ENVIRONMENTAL IMPACTS AND EFFECTS OF PLANS 4 AND 5

<u>Category/Factor</u>	<u>Unmitigated Impact/Mitigation Recommendation</u>	<u>Effect</u> <u>Unmitigated/Mitigated</u>
Biological Resources		
Threatened and Endangered Plants and Wildlife	Total of 1,600 acres of preferred habitat and 3 breeding areas potentially affected by plan. Net loss of 840 acres of preferred bald eagle habitat and disruption of productivity in at least 2 highly productive bald eagle breeding areas at the Confluence Reservoir as well as 1 breeding area at Cliff Reservoir through typical-year inundation. Loss of perennial stream foraging areas for bald eagles. Cumulative impact would be reduction in bald eagle productivity. All of the preferred Yuma clapper rail habitat at Confluence (30 acres) would be lost. Potential mitigation would include improvement of about 200 acres of preferred habitat at Cliff Reservoir and Verde upstream of Confluence.	Adverse Flag/Adverse Flag
Special Use and Management Areas	Loss of special use sites including Blue Point cottonwood area and a loss of 986 AUMs of range resource. Special use sites could be added in take line easement area at Confluence.	Insignificant/Insignificant
Water Quality		
Salt Loading	13.1 percent increase in imported salt volume.	Insignificant/Insignificant
Constituents	Degradation of entire Salt River Project (Salt River and Verde River water) average annual surface water yield of 845,000 acre-feet. Most notable increases are in hardness, total dissolved solids (TDS), and sulfates. Only standard exceeded because of mixing is for average TDS, which increases 60 mg/l and exceeds secondary drinking water standard. Numerous SRP constituents capable of experiencing higher maximum concentrations. No mitigation recommended, except for aeration of water between reservoir and water treatment plants.	Significant Adverse/ Significant Adverse

TABLE 19 (CONT'D.)

ENVIRONMENTAL IMPACTS AND EFFECTS OF PLANS 4 AND 5

<u>Category/Factor</u>	<u>Unmitigated Impact/Mitigation Recommendation</u>	<u>Effect</u> <u>Unmitigated/Mitigated</u>
Water Quality		
Eutrophication Potential	<p>At Confluence Reservoir very high eutrophication potential with high probability of blue-green algal dominance. Aesthetic degradation of Verde arm of reservoir and increased nutrients in SRP canals. Probable high organic levels leading to increased tri-halo methane (THM) production with normal disinfection of water from Confluence at treatment plants.</p> <p>All downstream impacts can be mitigated by aeration and different disinfection process for water. Costs of mitigation could be high if disinfection process includes modification of treatment plants.</p>	Significant Adverse/ Insignificant
Air Quality		
Total Suspended Particulates	<p>Annual average increase of 20 to 70 ug/m³ in ambient concentrations of TSP within 1 to 1-1/2 mile of construction areas. Dust suppression measures such as paving, chemical stabilization, watering, etc. would substantially reduce impact.</p> <p>Annual average increase of less than 20 ug/m³ in ambient concentrations of TSP at distances greater than 1-1/2 mile from construction areas. Application of dust suppression measures would substantially reduce impact.</p>	<p>Significant Adverse/ Insignificant (on-site)</p> <p>Significant Adverse/ Insignificant (off-site)</p>

TABLE 19 (CONT'D.)

ENVIRONMENTAL IMPACTS AND EFFECTS OF PLANS 4 AND 5

<u>Category/Factor</u>	<u>Unmitigated Impact/Mitigation Recommendation</u>	<u>Effect Unmitigated/Mitigated</u>
Sound Quality		
Noise Levels	Localized temporary increase in noise levels at Confluence, Cliff, and New Roosevelt sites during construction.	Insignificant/Insignificant
Visual Quality		
Land Composition	Loss of 12,000 acres of Visual Quality Zone 1 (highest quality); gain of 2,000 acres of Visual Quality Zone 2 (average quality) and 10,000 acres of Visual Quality Zone 3 (lowest quality). These changes indicate a substantial shift from high quality visual resources to lower quality visual resources. Most of the adverse change occurs in the Confluence area and is caused by the loss of flowing river and streamside vegetation, and the presence of a large drawdown area, or "bathtub-ring," around the reservoir. Mitigation for changes in visual quality is not possible.	Adverse Flag/Adverse Flag
Land Quality		
Land Use Compatibility	Modification to the compatibility of approximately 4 percent of the parcels of land located adjacent to the designated land acquisition lines.	Insignificant/Insignificant

TABLE 19 (CONT'D.)

ENVIRONMENTAL IMPACTS AND EFFECTS OF PLANS 4 AND 5

<u>Category/Factor</u>	<u>Unmitigated Impact/Mitigation Recommendation</u>	<u>Effect</u> <u>Unmitigated/Mitigated</u>
Land Quality Land Use Conversions	Plans 4 and 5 will generally permit implementation of other public plans (Rio Salado development and Sky Harbor International Airport expansion) as currently conceived and would create conditions for localized secondary land conversions. Enhancement measures include additional operational procedure to provide releases of water for Rio Salado and construction of a levee system to protect Holly Acres area.	Significant Beneficial/ Beneficial Flag
Geological Resources/ Soils	Reduction of flood flows resulting in enhancement of 3,120 surface acres (17 percent of total resource) along the Salt-Gila channel. Long-term loss of 485 surface acres (2.6 percent of total resource) at Fort McDowell Indian Reservation. Total resource includes 18,295 surface acres. Mitigation would provide opportunity for 485 surface acres to be mined out prior to filling of Confluence Reservoir.	Significant Beneficial/ Significant Beneficial
Prime Farmland	Total of 1,250 acres of prime farmland taken out of agricultural production: 130 acres at Cliff, 1,120 at Confluence. Long-term loss is not mitigatable.	Significant Adverse/ Significant Adverse

III

TABLE 19 (CONT'D.)

ENVIRONMENTAL IMPACTS AND EFFECTS OF PLANS 4 AND 5

<u>Category/Factor</u>	<u>Unmitigated Impact/Mitigation Recommendation</u>	<u>Effect</u> <u>Unmitigated/Mitigated</u>
Cultural Resources		
Prehistoric Resources	<p>A total of 3,169 sites (15,551 acres) would be affected by Plan 4: 1,370 sites (1,398 acres) at Cliff, 1,536 sites (6,410 acres) at Roosevelt, and 263 sites (7,743 acres) at Confluence. Some 77 sites (200 acres) would be destroyed by construction, 71 sites (639 acres) severely altered by inundation, 91 sites (3,010 acres) moderately altered by inundation, and 415 sites (1,401 acres) subjected to infrequent, short-term flooding in the event of an IDF, as well as subjected to secondary impacts. An additional 2,515 sites (10,301 acres) fall in the secondary impact zone and would be affected by such activities as pothunting and inadvertent destruction as a result of increased accessibility, pedestrian and vehicular disturbance, etc. The effects factor for these impacts is -19,600.</p> <p>Mitigation would include avoiding the resource, partial data recovery (e.g., mapping sites, collection of surface artifacts, use of remote sensing techniques, test excavations, partial site excavations); and site protection (e.g., fencing around site, policing, site monitoring, enforcement of laws against vandalism). Even with a comprehensive mitigation program, complete data recovery cannot be accomplished, and therefore significant destruction and alteration of archaeological sites would occur.</p>	Adverse Flag/Adverse Flag

TABLE 19 (CONT'D.)

ENVIRONMENTAL IMPACTS AND EFFECTS OF PLANS 4 AND 5

<u>Category/Factor</u>	<u>Unmitigated Impact/Mitigation Recommendation</u>	<u>Effect</u> <u>Unmitigated/Mitigated</u>
Cultural Resources		
Historic Resources	<p>Total of 127 sites would be potentially affected by Plans 4 and 5, with 64 sites affected under typical-year conditions. The effects factor for these impacts is -753. Two sites, Fort McDowell at Confluence and Roosevelt Dam at the New Roosevelt site, are on the National Register of Historic Places; Roosevelt Dam is a National Landmark as well. Impacts to these sites are not mitigatable, although the magnitude of the impact can be reduced. Impacts to other sites are mitigatable to the extent that the sites' significant qualities or data values could be recovered, documented, and reported through archaeological and historical resource procedures. Mitigation would include measures described above for prehistoric resources, plus site documentation (e.g., recording surface architecture or structural features) and additional historical research.</p>	Adverse Flag/Adverse Flag
Recreation		
Stream-Oriented	<p>Loss of a total of 19 miles of stream, 16.8 of which are used for tubing. This represents the loss of half the tubing miles on the Salt and Verde Rivers in the study area, and would result in intensification of regional needs for tubing by 94 percent. This loss cannot be adequately mitigated, although partial mitigation may be accomplished by improving conditions for tubing on the Verde River below Bartlett Dam. Conceptual recreation plan at Confluence includes development of one stream-oriented site. Impact of the conceptual recreation plan would be a net loss of 1,514,000 maximum recreation days per year for stream-oriented activities (stream fishing, tubing, camping, picnicking).</p>	Adverse Flag/Adverse Flag

TABLE 19 (CONT'D.)

ENVIRONMENTAL IMPACTS AND EFFECTS OF PLANS 4 AND 5

<u>Category/Factor</u>	<u>Unmitigated Impact/Mitigation Recommendation</u>	<u>Effect</u> <u>Unmitigated/Mitigated</u>
Recreation		
Reservoir-Oriented	<p>Gain of 5,230 acres (average during recreation season) of surface water at Confluence Reservoir. Conceptual recreation plan at Confluence would provide 7 sites along the Salt arm of the reservoir. Impact of the conceptual recreation plan would be a net gain of 2,875,000 maximum recreation days per year for reservoir-oriented activities (boatfishing, swimming, powerboating, waterskiing, non-powerboating, camping, picnicking). Plan 4 recreation will partially meet regional reservoir-oriented recreation needs. Significant needs met include: increase in powerboating (17.4 percent needs met), increase in waterskiing (7.2 percent needs met), and increase in picnicking (32 percent needs met).</p> <p>Along Verde arm of the Confluence Reservoir a "bathtub-ring" and probable algal growth are likely to detract from recreational experience.</p>	Significant Beneficial/ Significant Beneficial

TABLE 20

ENVIRONMENTAL IMPACTS AND EFFECTS OF PLAN 6

<u>Category/Factor</u>	<u>Unmitigated Impact/Mitigation Recommendation</u>	<u>Effect Unmitigated/Mitigated</u>
Biological Resources		
Riparian/Wetland Community	Total of 3,890 acres potentially affected by plan. Loss of 1,600 acres of riparian habitat primarily at Lake Pleasant and Cliff Reservoir; however, net gain of 1,780 acres anticipated due to expected regrowth of poor-quality mixed-scrub riparian vegetation in old Horseshoe Reservoir lake bed. Up to 2,680 acres could potentially be enhanced through mitigation at Cliff Reservoir.	Insignificant/ Significant Beneficial
Other Terrestrial Communities	Total of 28,910 acres potentially affected by plan. Loss of 6,010 acres from typical-year inundation. About 2,000 acres could potentially be reclaimed or improved through mitigation.	Insignificant/Insignificant
Perennial Stream/Riverine Community	Up to 23 miles potentially affected by plan. Net loss of 1 mile from typical-year inundation. No mitigation possible for loss of perennial stream. Flow regime expected to remain unchanged.	Insignificant/Insignificant
Reservoir Aquatic Community	Gain of approximately 730 surface acres (typical year minimum pool gain), most of which are at Lake Pleasant and Cliff Reservoir. Gain of a guaranteed minimum pool at Lake Pleasant. Spawning habitat adversely affected by drawdown rates greater than 2 inches per day at Lake Pleasant and Cliff Reservoir. Impact mitigated through reduction of drawdown rate.	Insignificant/ Significant Beneficial

TABLE 20 (CONT'D.)

ENVIRONMENTAL IMPACTS AND EFFECTS OF PLAN 6

<u>Category/Factor</u>	<u>Unmitigated Impact/Mitigation Recommendation</u>	<u>Effect Unmitigated/Mitigated</u>
Biological Resources		
Threatened and Endangered Plants and Wildlife	Total of 740 acres of preferred habitat and 1 breeding area potentially affected by plan. Loss of 280 acres of preferred bald eagle habitat and possibly productivity of 1 bald eagle breeding area through typical-year inundation. Loss of perennial stream foraging areas for bald eagles. Cumulative impact would be reduction in bald eagle productivity. Potential mitigation would include improvement of 280 acres of preferred habitat at Cliff Reservoir.	Significant Adverse/ Insignificant
Special Use and Management Areas	Loss of special use sites include several cottonwood rehabilitation sites but less than 406 AUMs of range resource lost. Special use sites could be set aside in the Confluence area.	Insignificant/ Significant Beneficial
Water Quality		
Salt Loading	12.3 percent increase in imported salt volume.	Insignificant/Insignificant
Constituents	Degradation of entire Maricopa County Municipal Water Conservation District #1 (Lake Pleasant) average annual surface water yield of 25,000 acre-feet. Most notable increases are in hardness, total dissolved solids (TDS), and sulfates. Only standard exceeded because of mixing is for average TDS, which increases 406 mg/l and exceeds secondary drinking water standard. Numerous MCMWCD #1 constituents capable of experiencing higher maximum concentrations. However, MCMWCD#1 water is not used for domestic purposes and short-term maximums should have no significant impact on agricultural water users. Aeration of water during reservoir discharge recommended.	

TABLE 20 (CONT'D.)

ENVIRONMENTAL IMPACTS AND EFFECTS OF PLAN 6

<u>Category/Factor</u>	<u>Unmitigated Impact/Mitigation Recommendation</u>	<u>Effect Unmitigated/Mitigated</u>
Water Quality		
Eutrophication Potential	Low-to-moderate eutrophication potential projected for New Waddell Reservoir with no significant changes in algal growth patterns expected during normal operation.	Insignificant/Insignificant
Air Quality		
Total Suspended Particulates	Annual average increase of 20 to 70 ug/m ³ in ambient concentrations of TSP within 1 to 1-1/2 mile of construction areas. Dust suppression measures such as paving, chemical stabilization, watering, etc. would substantially reduce impact.	Significant Adverse/ Insignificant (on-site)
	Annual average increase of less than 20 ug/m ³ in ambient concentrations of TSP at distances greater than 1-1/2 mile from construction areas. Application of dust suppression measures would substantially reduce impact.	Significant Adverse/ Insignificant (off-site)
Sound Quality		
Noise Levels	Localized temporary increase in noise levels at New Waddell, Cliff, and New Roosevelt sites during construction.	Insignificant/Insignificant

TABLE 20 (CONT'D.)

ENVIRONMENTAL IMPACTS AND EFFECTS OF PLAN 6

<u>Category/Factor</u>	<u>Unmitigated Impact/Mitigation Recommendation</u>	<u>Effect</u> <u>Unmitigated/Mitigated</u>
Visual Quality		
Land Composition	Gain of 4,000 acres of Visual Quality Zone 1 (highest quality) and loss of 1,000 acres of Visual Quality Zone 2 (average quality) and 3,000 acres of Visual Quality Zone 3 (lowest quality). These changes indicate a substantial shift from low quality visual resources to higher quality visual resources. Most of the beneficial changes occur in the Cliff area as a result of additional public sensitivity provided by new access areas and a gain in riparian vegetation.	Significant Beneficial/ Significant Beneficial
Land Quality		
Land Use Compatibility	Plan 6 will not likely result in the modification to the compatibility of any parcels of land located adjacent to the designated IDF land acquisition lines.	Insignificant/Insignificant
Land Use Conversions	Plan 6 will provide a level of flood protection (92,000 cfs at Sky Harbor International Airport) which would generally permit the partial implementation of other downstream public plans (e.g., Rio Salado Development District, Sky Harbor Airport Expansion and Maricopa County Flood Control District phreatophyte vegetation control) as currently conceived, but will not likely create conditions favorable for localized secondary land conversions near the proposed reservoir sites.	Significant Beneficial/ Beneficial Flag

TABLE 20 (CONT'D.)

ENVIRONMENTAL IMPACTS AND EFFECTS OF PLAN 6

<u>Category/Factor</u>	<u>Unmitigated Impact/Mitigation Recommendation</u>	<u>Effect Unmitigated/Mitigated</u>
Geological Resources/ Soils		
Mineral Resources (Sand and Gravel)	Reduction of flood flows resulting in enhancement of 3,120 surface acres (17 percent of total resource) along the Salt-Gila channel.	Significant Beneficial/ Significant Beneficial
Prime Farmland	Long-term loss of 130 acres of prime farmland at Cliff Dam site.	Significant Adverse/ Significant Adverse
Cultural Resources		
Prehistoric Resources	Total of 3,033 sites (7,925 acres) would be affected by Plan 6: 1,370 sites (1,398 acres) at Cliff, 1,536 sites (6,410 acres) at New Roosevelt, and 127 sites (117 acres) at New Waddell. Some 160 sites (446 acres) would be destroyed by construction; 5 sites (17 acres) will be severely altered in the permanent pool, 35 sites (83 acres) will be severely altered in the fluctuating pool, 233 sites (277 acres) will be moderately altered in the less than annual and flood pool, 268 sites (827 acres) will be subjected to highly infrequent flooding in the rare event of an IDF as well as subjected to secondary impacts. An additional 2,332 sites (6,275 acres) fall in the secondary impact zone and would be affected by such activities as pothunting and inadvertent destruction as a result of increased accessibility, pedestrian and vehicular disturbance, etc. These impacts result in an effects factor of -9,194.	Adverse Flag/Adverse Flag

TABLE 20 (CONT'D.)

ENVIRONMENTAL IMPACTS AND EFFECTS OF PLAN 6

<u>Category/Factor</u>	<u>Unmitigated Impact/Mitigation Recommendation</u>	<u>Effect</u> <u>Unmitigated/Mitigated</u>
Cultural Resources	<p>Mitigation would include avoiding the resource, partial data recovery; (e.g., mapping sites, collecting surface artifacts, use of remote sensing techniques, test excavations, partial site excavations); and site protection (e.g., fencing around site, policing, site monitoring, enforcement of laws against vandalism). Even with a comprehensive mitigation program, complete data recovery cannot be accomplished, and therefore significant destruction and alteration of archaeological sites would occur.</p>	Adverse Flag/Adverse Flag
Historic Resources	<p>A total of 44 sites would be potentially affected by Plan 6; with 33 sites destroyed under typical-year operation conditions. These impacts result in an effects factor of -260. Two sites, the Verde River Sheep Bridge at Cliff and Roosevelt Dam at New Roosevelt are on the National Register of Historic Places. Both of these sites would be impacted; impacts to Roosevelt Dam are not mitigatable, although the magnitude of this impact could be reduced. Impacts to other sites are mitigatable assuming adequate institutional support, performance time, and funding. Mitigation would include measures described under prehistoric resources above, plus site documentation (e.g., recording surface architecture or structural features) and additional historical research.</p>	Adverse Flag/Adverse Flag

TABLE 20 (CONT'D.)

ENVIRONMENTAL IMPACTS AND EFFECTS OF PLAN 6

<u>Category/Factor</u>	<u>Unmitigated Impact/Mitigation Recommendation</u>	<u>Effect</u> <u>Unmitigated/Mitigated</u>
Recreation		
Stream-Oriented	A total of 1.3 miles of stream on the Verde River would be lost at the Cliff site. Conceptual recreation plans call for the development of one stream-oriented site each at Cliff and Roosevelt with camping and picnicking facilities. No stream resources of recreation value exist at New Waddell. Impact of the conceptual recreation plans would be a net gain of 43,000 maximum recreation days per year for stream-oriented activities (stream fishing, swimming, camping, picnicking). Regional stream-oriented recreation needs met by Plan 6 include developed camping (surplus increased by 8.4 percent). No mitigation is recommended.	Insignificant/Insignificant
Recreation		
Reservoir-Oriented	Gain of 1,781 acres (average during recreation season) at the New Waddell site. Conceptual recreation plans propose 3 reservoir-oriented sites at New Waddell, 5 at Cliff, and 11 at Roosevelt. Impact of the conceptual recreation plans would be a net gain of 1,564,000 maximum recreation days per year for reservoir-oriented activities (boatfishing, swimming, powerboating, waterskiing, non-powerboating, camping, picnicking). Regional reservoir-oriented recreation needs significantly met by Plan 6 include swimming (61 percent needs met), developed camping (surplus increased by 200 percent), and picnicking (28 percent needs met). No mitigation is recommended.	Significant Beneficial/ Significant Beneficial

TABLE 21

ENVIRONMENTAL IMPACTS AND EFFECTS OF PLAN 7

<u>Category/Factor</u>	<u>Unmitigated Impact/Mitigation Recommendation</u>	<u>Effect</u> <u>Unmitigated/Mitigated</u>
Biological Resources		
Riparian/Wetland Community	Total of 3,890 acres potentially affected by plan. Loss of 1,670 acres of riparian habitat primarily at Lake Pleasant and Cliff Reservoir; however, net gain of 1,300 acres anticipated due to expected regrowth of poor-quality mixed-scrub riparian vegetation in old Horseshoe Reservoir lake bed. Up to 2,200 acres could potentially be enhanced through mitigation at Cliff Reservoir.	Insignificant/ Significant Beneficial
Other Terrestrial Communities	Total of 28,910 acres potentially affected by plan. Loss of 6,350 acres from typical-year inundation. About 400 acres could potentially be reclaimed or improved through mitigation.	Insignificant/Insignificant
Perennial Stream/ Riverine Community	Up to 23 miles potentially affected by plan. Loss of 4 miles from typical-year inundation. No mitigation possible for loss of perennial stream. Flow regime expected to increase 200 cfs for both Salt and Verde Rivers.	Significant Beneficial/ Significant Beneficial
Lake Community	Gain of approximately 1,420 surface acres (typical year minimum pool gain), most of which are at Lake Pleasant and Cliff Reservoir. Gain of minimum pools at Lake Pleasant and Cliff Reservoir. Spawning habitat adversely affected by drawdown rates greater than 2 inches per day at Lake Pleasant and Cliff Reservoir but less than 2 inches per day at Roosevelt Lake. Impact mitigated through reduction of drawdown rate.	Significant Beneficial/ Beneficial Flag

TABLE 21

ENVIRONMENTAL IMPACTS AND EFFECTS OF PLAN 7

<u>Category/Factor</u>	<u>Unmitigated Impact/Mitigation Recommendation</u>	<u>Effect Unmitigated/Mitigated</u>
Water Quality		
Eutrophication Potential	Low-to-moderate eutrophication potential projected for New Waddell Reservoir with no significant changes in algal growth patterns expected during normal operation.	
Air Quality		
Total Suspended Particulates	Annual average increase of 20 to 70 ug/m ³ in ambient concentrations of TSP within 1 to 1-1/2 mile of construction areas. Dust suppression measures such as paving, chemical stabilization, watering, etc. would substantially reduce impact.	Significant Adverse/ Insignificant (on-site)
	Annual average increase of less than 20 ug/m ³ in ambient concentrations of TSP at distances greater than 1-1/2 mile from construction areas. Application of dust suppression measures would substantially reduce impact.	Significant Adverse/ Insignificant (off-site)
Sound Quality		
Noise Levels	Localized temporary increase in noise levels at New Waddell, Cliff, and New Roosevelt sites during construction.	Insignificant/Insignificant

TABLE 21

ENVIRONMENTAL IMPACTS AND EFFECTS OF PLAN 7

<u>Category/Factor</u>	<u>Unmitigated Impact/Mitigation Recommendation</u>	<u>Effect Unmitigated/Mitigated</u>
Biological Resources		
Threatened and Endangered Plants and Wildlife	Total of 740 acres of preferred habitat and 1 breeding area potentially affected by plan. Loss of 280 acres of preferred bald eagle habitat and possible productivity of 1 bald eagle breeding area through typical-year inundation. Loss of perennial stream foraging areas for bald eagles. Final impact would be reduction in bald eagle productivity. Potential mitigation would include improvement of 280 acres of preferred habitat at Cliff Reservoir.	Significant Adverse/ Insignificant
Special Use and Management Areas	Loss of special use sites include several cottonwood rehabilitation sites but less than 406 AUMs of range resource lost. Special use sites could be set aside in the Confluence area.	Insignificant/ Significant Beneficial
Water Quality		
Salt Loading	12.3 percent increase in imported salt volume.	Insignificant/Insignificant
Constituents	Degradation of Maricopa County Municipal Water Conservation District #1 (Lake Pleasant) water. Most notable increases are in hardness, total dissolved solids (TDS), and sulfates. Only standard exceeded because of mixing is for average TDS, which increases 406 mg/l and exceeds secondary drinking water standard. Numerous MCMWCD#1 constituents capable of experiencing higher maximum concentrations. However, MCMWCD#1 water is not used for domestic purposes and has a relatively small average annual yield of 25,000 acre-feet. No mitigation recommended.	Insignificant/ Insignificant

TABLE 21

ENVIRONMENTAL IMPACTS AND EFFECTS OF PLAN 7

<u>Category/Factor</u>	<u>Unmitigated Impact/Mitigation Recommendation</u>	<u>Effect</u> <u>Unmitigated/Mitigated</u>
Visual Quality		
Land Composition	Gain of 4,000 acres of Visual Quality Zone 1 (highest quality) and loss of 1,000 acres of Visual Quality Zone 2 (average quality) and 3,000 acres of Visual Quality Zone 3 (lowest quality). These changes indicate a substantial shift from low quality visual resources to higher quality visual resources. Most of the beneficial changes occur in the Cliff area as a result of a significantly larger lake, additional public sensitivity provided by new access areas and a major gain in riparian vegetation. Changes at Roosevelt and New Waddell are a mix of gains and losses that result in a locally insignificant effect.	Significant Beneficial/ Significant Beneficial
Land Quality		
Land Use Compatibility	Plan 7 will not likely result in the modification to the compatibility of any parcels of land located adjacent to the designated IDF land acquisition lines.	Insignificant/Insignificant
Land Use Conversions	Plan 7 will generally permit implementation of other public plans (e.g., Rio Salado development and Sky Harbor Airport Expansion) as currently conceived, and would create conditions favorable for developing the CAP water distribution system for delivering anticipated municipal and industrial water allocations necessary to support or accelerate the projected outward urban growth on the northern and western fringe of the Phoenix metropolitan area. Possible enhancement measures include the construction of a levee system to protect Holly Acres area.	Beneficial Flag/ Beneficial Flag

TABLE 21

ENVIRONMENTAL IMPACTS AND EFFECTS OF PLAN 7

<u>Category/Factor</u>	<u>Unmitigated Impact/Mitigation Recommendation</u>	<u>Effect Unmitigated/Mitigated</u>
Geological Resources/ Soils		
Mineral Resources (Sand and Gravel)	Reduction of flood flows resulting in enhancement of 3,120 surface acres (17 percent of total resource) along the Salt-Gila channel.	Significant Beneficial/ Significant Beneficial
Prime Farmland	Long-term loss of 130 acres of prime farmland at Cliff Dam site.	Significant Adverse/ Significant Adverse
Cultural Resources		
Prehistoric Resources	Total of 3,033 sites (7,925 acres) would be affected by Plan 7: 1,370 sites (1,398 acres) at Cliff, 1,536 sites (6,410 acres) at New Roosevelt, and 127 sites (117 acres) at New Waddell. Some 160 sites (446 acres) would be destroyed by construction; 13 sites (31 acres) will be severely altered in the permanent pool, 39 sites (83 acres) would be severely altered in the fluctuating pool, 221 sites (263 acres) will be moderately altered by inundation on a less than annual basis and 268 sites (827 acres) will be subjected to highly infrequent flooding in the rare event of an IDF as well as subjected to secondary impacts. An additional 2,332 sites (6,275 acres) fall in the secondary impact zone and would be affected by such activities as pothunting and inadvertent destruction as a result of increased accessibility, pedestrian and vehicular disturbance, etc. These impacts result in an effects factor of -9,194.	Adverse Flag/Adverse Flag

TABLE 21

ENVIRONMENTAL IMPACTS AND EFFECTS OF PLAN 7

<u>Category/Factor</u>	<u>Unmitigated Impact/Mitigation Recommendation</u>	<u>Effect Unmitigated/Mitigated</u>
Cultural Resources	<p>Mitigation would include avoiding the resource, partial data recovery; (e.g., mapping sites, collecting surface artifacts, use of remote sensing techniques, test excavations, partial site excavations); and site protection (e.g., fencing around site, policing, site monitoring, enforcement of laws against vandalism). Even with a comprehensive mitigation program, complete data recovery cannot be accomplished, and therefore significant destruction and alteration of archaeological sites would occur.</p>	
Historic Resources	<p>A total of 44 sites would be potentially affected by Plan 7; with 33 sites destroyed under typical-year operation conditions. These impacts result in an effects factor of -260. Two sites, the Verde River Sheep Bridge at Cliff and Roosevelt Dam at New Roosevelt are on the National Register of Historic Places. Both of these sites would be impacted; impacts to Roosevelt Dam are not mitigatable, although the magnitude of this impact could be reduced. Impacts to other sites are mitigatable assuming adequate institutional support, performance time, and funding. Mitigation would include measures described under prehistoric resources above, plus site documentation (e.g., recording surface architecture or structural features) and additional historical research.</p>	Adverse Flag/Adverse Flag

TABLE 21

ENVIRONMENTAL IMPACTS AND EFFECTS OF PLAN 7

<u>Category/Factor</u>	<u>Unmitigated Impact/Mitigation Recommendation</u>	<u>Effect</u> <u>Unmitigated/Mitigated</u>
Recreation		
Stream-Oriented	A total of 2.2 miles of stream on the Verde River would be lost at the Cliff site. Conceptual recreation plans call for the development of one stream-oriented site each at Cliff and Roosevelt with camping and picnicking facilities. No stream resources of recreation value exist at New Waddell. Impacts of conceptual recreation plans would be a net gain of 43,000 maximum recreation days per year for stream-oriented activities (stream fishing, swimming, camping, picnicking). Regional stream-oriented recreation needs met by Plan 7 include developed camping (+145 sites, surplus increased by 8.4 percent). Maintenance of minimum flows on the Verde has the potential to enhance tubing and fishing opportunities.	Insignificant/Insignificant
Reservoir-Oriented	Gain of 1,991 acres (average during recreation season) at the New Waddell site. Conceptual recreation plans propose 3 reservoir-oriented sites at New Waddell, 5 at Cliff and 11 at Roosevelt. Impact of the conceptual recreation plans would be a net gain of 1,587,000 maximum recreation days per year for reservoir-oriented activities (boat fishing, swimming, powerboating, waterskiing, non-powerboating, camping, picnicking). Regional reservoir-oriented recreation needs significantly met by Plan 7 include swimming (61 percent needs met), developed camping (surplus increased by 200 percent), and picnicking (28 percent needs met). With Plan 7 the potential for development of recreation facilities associated with the Rio Salado project is increased due to the provision of 30,000 acre-feet of water each year. No mitigation is recommended.	Beneficial Flag/ Beneficial Flag

TABLE 22

PLAN 8

ENVIRONMENTAL CONDITIONS IN FUTURE WITHOUT PROJECT

<u>Category/Factor</u>	<u>Future Without Project Condition</u>
BIOLOGICAL RESOURCES	
Riparian/Wetland Community	There will be approximately 11,890 acres of riparian habitat in the future in the site areas. Of these 11,890 acres, 2,120 acres are cottonwood-willow association, 100 mixed broadleaf series, 7,690 mesquite association, 1,940 salt-cedar communities, and 40 cattail wetland.
Other Terrestrial Communities	There will be approximately 195,000 acres of other terrestrial habitat (shrubland and paloverde-mixed cacti desert) in the future in the site areas.
Perennial Stream/Riverine Community	Total of 68 miles of perennial stream lie within site areas (Confluence, Cliff, New Roosevelt, New Waddell). Approximately 137 miles of perennial stream are within the CAWCS area boundaries. Flow regime on the SRP-controlled reaches of the Salt and Verde Rivers upstream of the confluence does not guarantee minimum flows. On average in these reaches, there are 106 days per year of flows equal to or less than 50 cfs on the Salt River, and 61 days per year on the Verde River.
Reservoir Aquatic Community	Some 13,640 surface acres of habitat are available in Horseshoe Lake, Roosevelt Lake, and Lake Pleasant. Approximately 30,000 surface acres of habitat are available within the CAWCS area. No SRP lakes or Lake Pleasant have guaranteed minimum pools to maintain fisheries. Typical drawdown rates for lakes in the site areas during the spawning season, in inches per day, are as follows: Horseshoe - 9.2; Roosevelt - 3.0; Lake Pleasant - 1.6. Rates greater than 2 inches per day are not conducive to spawning.
Threatened/Endangered Plants and Wildlife	There are 13 bald eagle breeding areas in the Southwestern United States and six within the CAWCS area (all of these along the Salt or Verde Rivers in the study area); of these, the three most productive are at the Confluence.

TABLE 22 (Continued)

<u>Category/Factor</u>	<u>Future Without Project Condition</u>										
Threatened/Endangered Plants and Wildlife, Cont.	<p>There are five breeding areas located within sites areas (Confluence, Cliff, New Roosevelt) having the following productivity values (based on data from 1973 to 1981):</p> <table border="0"> <tr> <td data-bbox="806 604 1191 668">Blue Point breeding area (Confluence)</td> <td data-bbox="1235 604 1496 638">3 young per year</td> </tr> <tr> <td data-bbox="806 668 1091 732">Fort McDowell b.a. (Confluence)</td> <td data-bbox="1186 668 1496 702">1.33 young per year</td> </tr> <tr> <td data-bbox="806 732 1025 795">Bartlett b.a. (Confluence)</td> <td data-bbox="1186 732 1496 766">1.11 young per year</td> </tr> <tr> <td data-bbox="806 795 1058 859">Pinal Creek b.a. (Roosevelt)</td> <td data-bbox="1186 795 1496 829">1.00 young per year</td> </tr> <tr> <td data-bbox="806 859 1108 923">Chalk Mountain b.a. (Cliff)</td> <td data-bbox="1186 859 1496 893">0.22 young per year</td> </tr> </table> <p>In addition, approximately 1,920 acres of cottonwood willow (preferred habitat for the bald eagle) currently lie within the site areas, along with 40 acres of cattail wetland at the Confluence which is preferred habitat for the endangered Yuma clapper rail.</p> <p>Breeding areas and productivity for the bald eagle are expected to remain <u>status quo</u> or to improve slightly because of efforts of the Bald Eagle Recovery Team in conjunction with conservation management by the U.S. Fish and Wildlife Service and Tonto National Forest. By 2000, preferred habitat is expected to be increased to 2,220 acres within the site areas due to habitat rehabilitation by Tonto National Forest. Yuma clapper rail preferred habitat is expected to remain <u>status quo</u> (40 acres).</p>	Blue Point breeding area (Confluence)	3 young per year	Fort McDowell b.a. (Confluence)	1.33 young per year	Bartlett b.a. (Confluence)	1.11 young per year	Pinal Creek b.a. (Roosevelt)	1.00 young per year	Chalk Mountain b.a. (Cliff)	0.22 young per year
Blue Point breeding area (Confluence)	3 young per year										
Fort McDowell b.a. (Confluence)	1.33 young per year										
Bartlett b.a. (Confluence)	1.11 young per year										
Pinal Creek b.a. (Roosevelt)	1.00 young per year										
Chalk Mountain b.a. (Cliff)	0.22 young per year										
Special Use and Management Areas	<p>Special use resources for livestock will include approximately 23,580 Animal Unit Months (AUM) in the site areas. Special use resources for wildlife will include: wildlife areas at Roosevelt Lake and Three Bar Wildlife Area; limited-access areas</p>										

TABLE 22 (Continued)

<u>Category/Factor</u>	<u>Future Without Project Condition</u>
Special Use and Management Areas (Cont'd)	near bald eagle breeding areas at Bartlett and Blue Point cottonwoods; six reservoirs on the Salt and Verde Rivers for continued use as State warmwater fisheries; the Confluence area as an area of special interest for research and wildlife diversity. There is likely to be an increase in special use sites for cottonwood rehabilitation in the Tonto National Forest, plus development of the Lower Salt River Recreation Plan at the confluence.
WATER QUALITY	
General	CAP water is high in dissolved organics and normal disinfection by CAP recipients at domestic water treatment plants could produce trihalomethane (THM). In the future-without, CAP water would be imported to Central Arizona, but would not be stored in a reservoir. Distribution would occur through conveyance systems connected to the CAP aqueduct.
Salt Loading	CAP will import about 1,020,000 tons of salt per year without regulatory storage.
Constituents	The CAP system would remain isolated from local surface water sources with no reservoir mixing of CAP and local waters prior to delivery. Water quality constituents of surface waters (SRP and MCMWCD#1) would not be affected by mixing in a reservoir. Concentrations of constituents in these waters are given on the following tables.
Eutrophication Potential	There would be no reservoir storage of CAP water and no induced mixing of CAP and local surface water sources. Eutrophication problems, which have historically been infrequent and minor, would not differ significantly from existing conditions.

WATER QUALITY COMPARISON FOR CAP AND SRP WATER
WITH PUBLISHED STANDARDS AND CRITERIA AND PROJECTED FUTURE WITHOUT PROJECT CONDITIONS

Units mg/l	Surface Water Standards ^a	Drinking Water Standards ^b	Crop Irrigation Criteria ^b	Freshwater Aquatic Life Criteria ^b	Future Without Conditions					
					CAP Water ^e			SRP Water ^f		
					Minimum	Average	Maximum	Minimum ^g	Average ^h	Maximum ^g
Alkalinity as CaCO ₃	---	---	---	>20.	98.0	127.9	150.0	0.0	153.0	350.
Ammonia as NH ₄	0.02	---	---	---	---	---	---	0.10	0.036	0.130
Arsenic	0.05	0.05 ^d	0.1	---	0.0	0.0028	0.005	0.002	0.007	0.018
Barium	1.0	1.0 ^d	NNS	---	0.0	0.135	0.500	0.0	0.067	0.200
Boron	1.0	NNS	0.75	---	0.050	0.196	0.360	0.0	0.100	0.620
Cadmium	0.01	0.01 ^d	0.01	0.0004- 0.004	0.0	0.005	0.013	0.0	0.0012	0.014
Calcium	---	200. ^c	---	---	73.0	85.0	100.0	19.	47.0 ⁱ	420.
Chloride	---	250.	---	---	75.0	94.5	140.0	2.0	138. ⁱ	610.
Chromium	0.05	0.05 ^d	0.1	0.1	0.0	0.004	0.020	0.0	0.001	0.010
Copper	0.05	1.0	0.2	NNS	0.0	0.008	0.029	0.0	0.0026	0.007
Cyanides	0.02	---	---	---	0.0	0.0009	0.02	---	---	---
Dissolved Oxygen	---	Max	---	>5.0	5.1	8.5	11.7	1.6	8.8	17.8
Fluoride (84.7°)	---	1.4 ^d	2.0	---	0.20	0.38	0.50	0.0	0.363	1.1
Hardness as CaCO ₃	---	<170. ^d	---	---	290.0	339.3	380.0	79.	192. ⁱ	413.
Hardness, Noncarbonate	---	---	---	---	170.0	210.8	243.0	0.0	36.3	182.
Iron	---	0.3	NNS	1.0	0.030	0.158	0.550	0.0	0.014	0.440
Lead	0.05	0.05 ^d	5.0	NNS	0.0	0.041	0.100	0.0	0.005	0.060
Magnesium	---	150.	---	---	26.0	30.8	40.0	5.5	18.6 ⁱ	55.0
Manganese	10.0	0.05	0.2	---	0.0	0.021	0.040	0.0	0.043	0.400
Mercury	0.002	0.002 ^d	---	0.00005	0.0	0.00004	0.0006	0.0	0.00002	0.0002
Nitrate as N	---	10. ^d	---	---	0.140	0.315	1.000	0.0	0.150	0.810
pH	---	6.5-9.0	5-9	6.5 - 9.0	7.1	7.95	8.8	4.5	7.8	9.1
Phosphorus (ortho)	---	---	---	---	0.0	0.036	0.310	0.0	0.025	0.090
Potassium	---	50.	---	---	4.50	5.21	6.80	1.3	4.4 ⁱ	42.0
Selenium	0.01	0.01 ^d	0.02	NNS	0.0	0.003	0.005	0.0	0.0004	0.003
Specific Conductance $\mu\text{S}/\text{cm}$	---	---	---	---	950.0	1118.9	1720.0	0.70	834. ⁱ	2340.
Silver	0.05	0.05 ^d	---	NNS	0.0	0.004	0.010	0.0	0.0010	0.010
Sodium	---	<500.	Min	---	90.0	107.4	120.0	4.2	101. ⁱ	382.
Sodium Adsorption Ratio	---	---	26.	---	2.20	2.57	3.00	0.20	21.44	677.00
Sulfate	---	250.	---	---	240.0	309.4	380.0	11.0	52.3 ⁱ	360.
Sulfides	0.1	---	---	---	---	---	---	---	---	---
Total Dissolved Solids	---	500.	500- 5000	---	603.6	722.3	845.7	110.3	463. ⁱ	1300.
N/P	---	---	---	---	0.45	8.75	---	---	3.50	---
Zinc	0.5	5.	5.	NNS	0.0	0.024	0.310	0.0	0.012	0.120

^aArizona Department of Health Services, Bureau of Water Quality Control, 1981 (Standards Listed Reflect Highest Protected Use for Water at Mix Site).
^bU.S. Environmental Protection Agency, 1976.

^cWorld Health Organization, 1963.

^dLegal Standard.

^eArizona Department of Health Services from U.S. EPA STORET, 1981; period of record, October 1968-June 1981.

^fNational Stream Quality Accounting Network (NASQAN), U.S. Geological Survey, 1980; period of record, December 1950-September 1979.

^gMinimum and maximum values are for the Salt or Verde Rivers and could be experienced if the other river was not flowing.

^hWeighted average based on NASQAN data and USGS flow records resulting in a 43 percent Verde and 57 percent Salt mix at the confluence of the two rivers.

ⁱThese average values include data taken at Granite Reef Diversion Dam by the Salt River Project, period of record, January 1972-December 1979.

NNS = No Numerical Standard.

WATER QUALITY COMPARISON FOR CAP AND MCMWCD#1 WATER
WITH PUBLISHED STANDARDS AND CRITERIA AND PROJECTED FUTURE WITHOUT PROJECT CONDITIONS

Units mg/l	Surface Water Standards ^a	Drinking Water Standards ^b	Crop Irrigation Criteria ^b	Freshwater Aquatic Life Criteria ^b	Future Without Conditions					
					CAP Water ^e			MCMWCD#1 Water ^h		
					Minimum	Average	Maximum	Minimum	Average	Maximum
Alkalinity as CaCO ₃	---	---	---	>20.	98.0	127.9	150.0	120.	140.	160.0
Ammonia as NH ₄	0.02	---	---	---	---	---	---	---	---	---
Arsenic	0.05	0.05 ^d	0.1	---	0.0	0.0028	0.005	---	0.012	0.012
Barium	1.0	1.0 ^d	NNS	---	0.0	0.135	0.500	---	< 0.2	< 0.2
Boron	1.0	NNS	0.75	---	0.050	0.196	0.360	< 0.1	0.18	0.3
Cadmium	0.01	0.01 ^d	0.01	0.0004- 0.004	0.0	0.005	0.013	---	< 0.01	0.01
Calcium	---	200. ^c	---	---	73.0	85.0	100.0	36.	75.	125.
Chloride	---	250.	---	---	75.0	94.5	140.0	24.5	30.5	38.
Chromium	0.05	0.05 ^d	0.1	0.1	0.0	0.004	0.020	< 0.01	0.013	< 0.022
Copper	0.05	1.0	0.2	NNS	0.0	0.008	0.029	0.004	0.048	< 0.05
Cyanides	0.02	---	---	---	0.0	0.0009	0.02	---	---	---
Dissolved Oxygen	---	Max	---	> 5.0	5.1	8.5	11.7	4.3	6.0	8.0
Fluoride (84.7°)	---	1.4 ^d	2.0	---	0.20	0.38	0.50	0.28	0.34	0.4
Hardness as CaCO ₃	---	< 170.	---	---	290.0	339.3	380.0	150.	170.5	198.
Hardness, Noncarbonate	---	---	---	---	170.0	210.8	243.0	28.	33.	38.
Iron	---	0.3	NNS	1.0	0.030	0.158	0.550	< 0.01	0.01	0.230
Lead	0.05	0.05 ^d	5.0	NNS	0.0	0.041	0.100	---	< 0.010	< 0.02
Magnesium	---	150.	---	---	26.0	30.8	40.0	17.3	30.9	60.
Manganese	10.0	0.05	0.2	---	0.0	0.021	0.040	0.014	0.065	0.377
Mercury	0.002	0.002 ^d	---	0.00005	0.0	0.00004	0.0006	---	< 0.001	< 0.001
Nitrate as N	---	10. ^d	---	---	0.140	0.315	1.000	< 0.2	0.329	0.67
pH	---	6.5-9.0	5-9	6.5 - 9.0	7.1	7.95	8.8	< 0.2	7.9	8.5
Phosphorus (ortho)	---	---	---	---	0.0	0.036	0.310	< 0.01	0.05	0.17
Potassium	---	50.	---	---	4.50	5.21	6.80	3.2	3.93	4.69
Selenium	0.01	0.01 ^d	0.02	NNS	0.0	0.003	0.005	---	< 0.005	< 0.005
Specific Conductance µS/cm	---	---	---	---	950.0	1118.9	1720.0	350.	567.	750.
Silver	0.05	0.05 ^d	---	NNS	0.0	0.004	0.010	---	< 0.02	< 0.02
Sodium	---	< 500.	Min	---	90.0	107.4	120.0	23.9	32.65	39.
Sodium Adsorption Ratio	---	---	26.	---	2.20	2.57	3.00	4.11	5.37	7.55
Sulfate	---	250.	---	---	240.0	309.4	380.0	50.9	70.41	92.
Sulfides	0.1	---	---	---	---	---	---	---	---	---
Total Dissolved Solids	---	500.	500- 5000	---	603.6	722.3	845.7	259.	265.9	270.
N/P	---	---	---	---	0.45	8.75	---	1.17	6.58	---
Zinc	0.5	5.	5.	NNS	0.0	0.024	0.310	0.002	0.007	< 0.05

^aArizona Department of Health Services, Bureau of Water Quality Control, 1981 (Standards Listed Reflect Highest Protected Use for Water at Mix Site).

^bU.S. Environmental Protection Agency, 1976.

^cWorld Health Organization, 1963.

^dLegal Standard.

^eArizona Department of Health Services from U.S. EPA STORET, 1981; period of record, October 1968-June 1981.

^fU.S. Bureau of Reclamation and Dames & Moore, 1981.

NNS = No Numerical Standard.

TABLE 22 (Continued)

<u>Category/Factor</u>	<u>Future Without Project Condition</u>
AIR QUALITY	
Total Suspended Particulates	<p>The future-without conditions relative to ambient total suspended particulates (TSP) concentrations at the various potential construction sites are summarized on the table on the next page. Within the general Phoenix metropolitan area the Federal primary and State annual geometric mean TSP standard is often exceeded today. With controls, the annual geometric mean is expected to decrease from 1981 through 1985 and then increase gradually through 2000. At this time, however, it must be assumed that planned control measures will result in the regional attainment of standards after 2000. TSP concentrations in the region outside the metropolitan area will likely remain near or below the Federal primary and State annual geometric mean standard during the entire period of 1981 through 2100.</p>
SOUND QUALITY	
Noise	<p>Day-night sound levels are expected to be below 65 dB at most residential and noise-sensitive recreational areas within the region. These levels are compatible with EPA's short-term sound quality goals. Certain receptors immediately adjacent to local water ways, within several hundred feet of major arterials without urbanized areas, or within several hundred feet of shopping centers or commercial establishments are anticipated to experience day-night sound levels as high as 70 dB. Noisiest areas affected by CAWCS projects will include Roosevelt Lake communities which will experience sounds typical of an urban environment.</p>

FUTURE-WITHOUT CONDITION
TOTAL SUSPENDED PARTICULATES^a

<u>Site Area</u>	<u>1981-2000</u> (est. ann. geometric mean concentrations in ug/m ³)	<u>2000-2100</u> (attainment and maintenance of Federal and State standards)
New Waddell	40 - 65	Yes
Cliff	35 - 60	Yes
Confluence	50 - 75	Yes
Stewart Mountain	50 - 75	Yes
New Roosevelt	35 - 60	Yes

^aFederal and State annual geometric mean standard is 75 microgram per cubic meter (ug/m³)

TABLE 22 (Continued)

Category/Factor

Future Without Project Condition

Noise (Cont'd)

In aggregate, sound levels in the site areas will be as follows in the future-without:

Residential areas 65 dB or less
 Open lands 55 dB or less
 Recreational areas 70 dB or less

VISUAL QUALITY

Land Composition

Visual quality of the site areas will not change significantly from the existing condition. Quality of the site areas is expressed in terms of the number of acres of visual quality zones, with VQZ 1 being highest quality, VQZ 2 average quality, and VQZ 3 lowest quality. Acreages are as follows:

	<u>VQZ1</u>	<u>VQZ2</u>	<u>VQZ3</u>
Confluence	24,801	34,695	6,004
Cliff	11,683	14,945	22,192
Roosevelt	23,973	50,396	6,601
New Waddell	<u>15,905</u>	<u>23,805</u>	<u>0</u>
Aggregate	76,362	123,841	34,797

LAND QUALITY

Land Use Compatibility

Without construction of any flood control, regulatory storage, or dam safety structures, no land use compatibility modifications can be attributed to CAWCS actions.

Land Use Conversions

CAWCS no action will not provide any additional increment of flood protection along the Salt and Gila Rivers, which is required for implementation of proposed public plans such as Rio Salado and the airport expansion. In comparison to previous floods, damage potential to lands and structures within the floodplain will remain unchanged, but transportation disruptions should be lessened by construction of several new bridges that can withstand flows up to 200,000 cfs.

TABLE 22 (Continued)

Category/Factor

Future Without Project Condition

GEOLOGICAL RESOURCES

Mineral Resources
(Sand and Gravel)

In the Verde-Salt-Gila River channel, mining of sand and gravel by the year 2000 is expected to occur on approximately 570 surface acres on the Fort McDowell Indian Reservation and on portions of approximately 17,725 surface acres within the Salt-Gila River channel area (primarily on the Salt River Indian Reservation, from Reeb Road to 16th Street, and from 91st Avenue to U.S. 80). In these areas, mining is expected to occur where suitable materials are found, where mining is compatible with surrounding land use, and near areas where the greatest urban development is anticipated. The 18,295 surface acres of sand and gravel deposits would be subject to losses due to flooding. An SPF event would inundate all or nearly all of the identified mineral resource.

Mining of sand and gravel within the CAWCS area is anticipated to yield nearly 22 million short tons for the year 2000. Of the total amount of sand and gravel mined in Arizona, Maricopa County produces more than 50 percent of the total.

Prime Farmland

Prime farmland acreage in the affected areas totals 16,385 acres: 15,065 acres in the SPF floodplain between Granite Reef Dam and Gillespie Dam, 130 acres in the Cliff site, 1,120 on the Fort McDowell Indian Reservation in the Confluence site, and 70 acres in the New Waddell site. Within the entire CAWCS area, it is projected that there will be approximately 589,000 acres of prime farmland in the year 2000.

TABLE 22 (Continued)

<u>Category/Factor</u>	<u>Future Without Project Condition</u>
CULTURAL RESOURCES	
Prehistoric Resources	<p>There are a total of 3,296 sites (15,668 acres of archaeological deposits) in the four site areas (Confluence, Cliff, New Roosevelt, New Waddell). Of this total 263 sites (7,743 acres) are in the Confluence site area; 1,370 sites (1,398 acres) are in the Cliff site area; 1,536 sites (3,181 acres) are in the New Roosevelt site area; and 127 sites (117 acres) are in the New Waddell site area.</p> <p>In the future without the project, the overall quality of the resource base will deteriorate as a result of both natural and cultural factors. Sites which are accessible will be subjected to continued pothunting, wave action, or erosion, and will decay more rapidly than those located in more remote areas.</p>
Historic Resources	<p>It is estimated that 175 sites will be present with the combined element site areas (14 at Cliff, 46 at Roosevelt, 15 at New Waddell, and 100 at Confluence) under future-without (Plan 8 or "no action") conditions. Each of the above element areas contain historic sites that have either been entered on or are potentially eligible for inclusion in the National Register of Historic Places.</p> <p>In general, the condition of significant historic sites within the study area and at each of the element site areas will deteriorate at an increasing rate in the future. While the physical remains of these sites may deteriorate, the sites will continue to be present in the future and may have increased in significance due to their increased age and uniqueness. In addition, new sites, not considered in this study, will achieve significance in the future.</p>

TABLE 22 (Continued)

<u>Category/Factor</u>	<u>Future Without Project Condition</u>
RECREATION	
Stream-Oriented	<p>The demand for stream-oriented recreation opportunities will intensify as the population of the Phoenix metropolitan area continues to grow. Tubing on the Lower Salt River will continue to be popular and, as the Lower Salt River Recreation Area is developed, opportunities for picnicking and fishing will also be enhanced. Total maximum recreation days for stream-oriented recreation per year are approximately 2,210,000 for the aggregated site areas. Maximum recreation days per year for the 5-county region are approximately 8,236,000, including 527,000 for stream fishing and 2,122,393 for tubing. Regional needs for tubing will be met.</p>
Reservoir-Oriented	<p>Reservoir-oriented recreation demand will increase in the future without the project. Boating activities will continue to be popular and capacity control systems at reservoirs may be required to maintain resource quality. Total maximum recreation days for reservoir-oriented recreation per year would equal approximately 752,000 for the aggregated site areas and 6,479,000 for the 5-county region, including 222,000 days for boat fishing, and 772,000 days for boating and waterskiing. Regional needs for all reservoir-oriented activities except developed camping will not be met.</p>

TABLE 23

HABITAT EVALUATION PROCEDURE (HEP)

Under the authority of the Fish and Wildlife Coordination Act, a team of staff biologists of the U.S. Fish and Wildlife Service, the Bureau of Reclamation, and the Arizona Game and Fish Department conducted a habitat evaluation procedure (HEP) on wildlife impacts of the proposed CAWCS plans. HEP entailed identification of major vegetation types, collection of evaluation species, and modeling of life requisites of the selected species (HSI models) for determining habitat quality in accordance with USFWS procedural guidelines. In addition, the vegetation type acreages were determined for each of the CAWCS plan areas. From these data, a preliminary estimate was made of the number of habitat units lost with each of the plans. A habitat unit is the unit measure of habitat acreage by habitat quality for a given evaluation species. A composite habitat unit figure was computed for each vegetation type within each plan area, and from these data net impacts were computed for each plan, as displayed below. These data are preliminary and are subject to change.

A preliminary estimate of impact based on HEP habitat units for the proposed CAWCS plans:

<u>Plan No.</u>	<u>Total HUs Lost</u>	<u>Riparian HUs Lost</u>	<u>Total</u>
1	12,794	4,201	16,995
2	9,498	4,201	13,699
3	35,794	21,028	56,822
4/5	32,335	19,339	51,674
6/7	26,516	5,425	31,941

Evaluation species selected by the HEP team for determining habitat quality:

- Osprey (Pandion halaetus carolinensis)
- Bell's vireo (Vireo bellii)
- Green heron (Butorides striatus)
- Desert tortoise (Gopherus agassizi)
- Desert cottontail (Sylvilagus audubonii)
- White-winged dove (Zenaida asiatica)
- Harris' hawk (Parabuteo unicinctus)
- Long-billed marsh wren (Cistothorus palustris)
- Gray fox (Urocyon cinereoargenteus)
- Cinnamon teal (Anas cyanoptera)
- Gambel's quail (Lophortyx gambelii)
- Gila woodpecker (Centurus uropygialis)
- Black-throated sparrow (Amphispiza bilineata)
- Verdin (Auriparus flaviceps)
- Javelina (Dicotyles tajacu)
- Channel catfish (Ictalurus punctatus)
- Largemouth bass (Micropterus salmoides)

Evaluation species were selected by the HEP team to satisfy the following general requirements:

- A. Species with high public interest, economic value, or both.
- B. Species known to be sensitive to specific land use actions.
- C. Species that represent groups of species which utilize a common environmental resource.

TABLE 24

INDIAN RELOCATIONS - PLANS 1, 2, 6, AND 7

Factors	Unmitigated Impacts	Mitigation Recommendation	Overall Effect
INDIVIDUAL			
1. Changes in mortality and illness rates	0	Not Applicable	No Effect
2. Changes in personal autonomy: the degree to which individuals believe they have freedom and power to control their lives	(Under Plans 1, 2, 6, and 7 there are no impacts because no Indians are relocated)		
3. Satisfaction with way of life			
4. The potential for financial self-sufficiency			
INTERPERSONAL			
1. The nature and extensiveness of family ties and informal support networks	0		
2. Incidence of family problems such as divorce, child abuse and neglect, alcohol and drug abuse			
COMMUNITY			
1. Community cohesiveness: the extent to which a community is unified, with individuals mutually depending on each other for support. A cohesive community is characterized by extensive informal support networks, frequent personal interaction, and by strong identification of residents with the community as a whole	0		
2. Community viability: the ability of a community to sustain itself. Community leadership: the degree to which leaders are capable of protecting the interest of the community. Community autonomy: the degree to which residents believe they have the freedom and power to control the direction of the community			
3. Economic self-sufficiency: the degree to which a community is/is not reliant on outside agencies for economic support; unemployment rate			
4. Potential for sustaining the Yavapai culture; how relocation affects the transmission of a unique culture			

TABLE 25

INDIAN RELOCATIONS - PLANS 3, 4, AND 5

Factors	Unmitigated Impacts	Mitigation Recommendation	Overall Effect
INDIVIDUAL			
<ol style="list-style-type: none"> Changes in mortality and illness rates Changes in personal autonomy: the degree to which individuals believe they have freedom and power to control their lives Satisfaction with way of life The potential for financial self-sufficiency 	<ol style="list-style-type: none"> Substantial increase in mortality and illness rates Extreme decline in levels of personal autonomy Extreme decrease in satisfaction with way of life Substantial decrease in potential for sustained financial self-sufficiency 	<ol style="list-style-type: none"> Relocate the entire community together; do not relocate on an individual basis Provide the tribe with additional land equal to or greater in size than that purchased and of the highest quality available which is contiguous to the reservation boundaries Monetary compensation should cover all expenditures and new expenses incurred by the residents as a result of relocation and should be distributed according to the tribe's wishes Provide special services to meet needs that are unique to this area Initiate a plan that ensures the participation of the entire community in all decisions and plans relevant to the relocation Provide an accurate, reliable system for disseminating information to residents so that they are constantly informed about the relocation proceedings Guarantee that the land and water rights provided the tribe will never be revoked 	<p>Unmitigated effect: Adverse Flag</p> <p>Mitigated effect: Adverse Flag</p> <p>The impacts at Fort McDowell would be severe, irreversible, long lasting, and would affect every member of the tribe. The severity of these impacts is compounded by the Yavapai history of forced relocations and the religious and cultural significance of the land for the Yavapai. Most of the people at Fort McDowell are related to each other, know each other well and identify strongly with the tribe and community. As a result, anything that affects the community affects each member personally. Mitigation could not address the underlying causes of these impacts. At best, it could only lessen the severity of a few impacts to a limited degree.</p>
INTERPERSONAL			
<ol style="list-style-type: none"> The nature and extensiveness of family ties and informal support networks Incidence of family problems such as divorce, child abuse and neglect, alcohol and drug abuse 	<ol style="list-style-type: none"> Substantial decrease in extended family ties and family support systems Substantial increase in incidence of family problems such as alcohol and drug abuse, divorce, child abuse and neglect 		
COMMUNITY			
<ol style="list-style-type: none"> Community cohesiveness: the extent to which a community is unified, with individuals mutually depending on each other for support. A cohesive community is characterized by extensive informal support networks, frequent personal interaction, and by strong identification of residents with the community as a whole Community viability: the ability of a community to sustain itself. Community leadership: the degree to which leaders are capable of protecting the interest of the community. Community autonomy: the degree to which residents believe they have the freedom and power to control the direction of the community Economic self-sufficiency: the degree to which a community is/is not reliant on outside agencies for economic support; unemployment rate Potential for sustaining the Yavapai culture; how relocation affects the transmission of a unique culture 	<ol style="list-style-type: none"> Extreme decrease in community cohesion; substantial decline in number and efficacy of informal support networks Extreme decrease in community viability; substantial decline in autonomy (ability to control the direction of the community) and in efficacy of tribal leadership; elimination of trend toward self-determination Substantial decrease in potential for tribal economic self-sufficiency (increased dependency on government services); substantial increase in unemployment Extreme decrease in potential to sustain Yavapai culture 		

TABLE 26

INDIAN RELOCATIONS - PLAN 8

Factors	Future Without	Unmitigated Impacts	Mitigation Recommendation	Unmitigated/Mitigated Effect
INDIVIDUAL				
1. Changes in mortality and illness rates	1. Normal mortality and illness rates given the age distribution of the population	0	Not Applicable	No Effect
2. Changes in personal autonomy: the degree to which individuals believe they have freedom and power to control their lives	2. High levels of personal autonomy			
3. Satisfaction with way of life	3. High satisfaction with way of life			
4. The potential for financial self-sufficiency	4. High potential for increased financial self-sufficiency			
INTERPERSONAL				
1. The nature and extensiveness of family ties and informal support networks	1. High levels of extended family ties; highly integrated support systems within the family	0		
2. Incidence of family problems such as divorce, child abuse and neglect, alcohol and drug abuse	2. Normal incidence of family problems such as divorce, child abuse and neglect, and drug abuse; moderate incidence of alcohol abuse			
COMMUNITY				
1. Community cohesiveness: the extent to which a community is unified, with individuals mutually depending on each other for support. A cohesive community is characterized by extensive informal support networks, frequent personal interaction, and by strong identification of residents with the community as a whole	1. High community cohesion; high levels of informal support networks	0		
2. Community viability: the ability of a community to sustain itself. Community leadership: the degree to which leaders are capable of protecting the interest of the community. Community autonomy: the degree to which residents believe they have the freedom and power to control the direction of the community	2. High community viability (significant increase from present condition); strong community leadership; high potential for tribal autonomy			
3. Economic self-sufficiency: the degree to which a community is/is not reliant on outside agencies for economic support; unemployment rate	3. High potential for increased tribal economic self-sufficiency; moderate level of unemployment			
4. Potential for sustaining the Yavapai culture; how relocation affects the transmission of a unique culture	4. High potential for sustaining Yavapai culture			

TABLE 27

NON-INDIAN RELOCATIONS (ROOSEVELT LAKE AREA)
PLANS 1, 3, 6, AND 7

Factors	Unmitigated Impacts	Mitigation Recommendation	Overall Effect
INDIVIDUAL			
<ol style="list-style-type: none"> Changes in mortality and illness rates Changes in personal autonomy: the degree to which individuals believe they have freedom and power to control their lives Satisfaction with way of life The potential for financial self-sufficiency 	<ol style="list-style-type: none"> Slight increase in mortality rates and increased illness rates Substantial decrease in personal autonomy Substantial decrease in satisfaction with way of life Moderately reduced financial capacity 	<ol style="list-style-type: none"> Relocate only those people who live within the confines of the SPF take-line, with no relocation of people in the IDF area Provision of low-cost flood insurance to people in the IDF area Provision of Forest Service land in the Roosevelt Lake area for relocations, allowing enough space so neighbors may relocate near each other if they wish Monetary compensation for all relocation expenses incurred by residents Provide special services to meet needs that are unique to this area (see Appendix B) 	<p>Unmitigated Effect: Significant Adverse</p> <p>Mitigated Effect: Insignificant</p> <p>The unmitigated impacts at Roosevelt Lake would be severe, especially to the people who are elderly and/or ill. These impacts stem from financial concerns, strong desire to live in the area, and problems associated with moving. Since it is possible through mitigation to compensate for financial losses, provide land in the area and provide moving services, the impacts can be mitigated</p>
INTERPERSONAL			
<ol style="list-style-type: none"> The nature and extensiveness of family ties and informal support networks Incidence of family problems such as divorce, child abuse and neglect, alcohol and drug abuse 	<ol style="list-style-type: none"> Slight decrease in informal support networks No change 		
COMMUNITY			
<ol style="list-style-type: none"> Community cohesiveness: the extent to which a community is unified, with individuals mutually depending on each other for support. A cohesive community is characterized by extensive informal support networks, frequent personal interaction, and by strong identification of residents with the community as a whole Community viability: the ability of a community to sustain itself 	<ol style="list-style-type: none"> Slight decrease in community cohesion and social organization Slight decrease in community viability 		

TABLE 28

NON-INDIAN RELOCATIONS (ROOSEVELT LAKE AREA)
PLANS 2, 4, AND 5

Factors	Unmitigated Impacts	Mitigation Recommendation	Overall Effect
INDIVIDUAL			
<ol style="list-style-type: none"> 1. Changes in mortality and illness rates 2. Changes in personal autonomy: the degree to which individuals believe they have freedom and power to control their lives 3. Satisfaction with way of life 4. The potential for financial self-sufficiency 	<ol style="list-style-type: none"> 1. Slight increase in mortality rates and increased illness rates 2. Substantial decrease in personal autonomy 3. Substantial decrease in satisfaction with way of life 4. Moderately reduced financial capacity 	<ol style="list-style-type: none"> 1. Relocate only those people who live within the area likely to be inundated more than once in 200 years, but not within the lower IDF area; provision of low-cost flood insurance to people residing in the IDF area 	<p>Unmitigated Effect: Significant Adverse</p> <p>Mitigated Effect: No Effect Elimination of impact as result of eliminating relocations</p> <p>The unmitigated impacts at Roosevelt Lake would be severe, especially to the people who are elderly and/or ill. These impacts stem from financial concerns, strong desires to live in the area, and problems associated with moving. Through mitigation, it is possible to eliminate all impacts by eliminating relocations</p>
INTERPERSONAL			
<ol style="list-style-type: none"> 1. The nature and extensiveness of family ties and informal support networks 2. Incidence of family problems such as divorce, child abuse and neglect, alcohol and drug abuse 	<ol style="list-style-type: none"> 1. Slight decrease in informal support networks 2. No change 		
COMMUNITY			
<ol style="list-style-type: none"> 1. Community cohesiveness: the extent to which a community is unified, with individuals mutually depending on each other for support. A cohesive community is characterized by extensive informal support networks, frequent personal interaction, and by strong identification of residents with the community as a whole 2. Community viability: the ability of a community to sustain itself 	<ol style="list-style-type: none"> 1. Slight decrease in community cohesion and social organization 2. Slight decrease in community viability 		

TABLE 29

NON-INDIAN RELOCATIONS (ROOSEVELT LAKE AREA) - PLAN 8

Factors	Future Without	Unmitigated Impacts	Mitigation Recommendation	Unmitigated/Mitigated Effect
INDIVIDUAL				
1. Changes in mortality and illness rates	1. Normal mortality and illness rates given the age distribution of the population	0	Not Applicable	No Effect
2. Changes in personal autonomy: the degree to which individuals believe they have freedom and power to control their lives	2. High levels of personal autonomy			
3. Satisfaction with way of life	3. High satisfaction with way of life			
4. The potential for financial self-sufficiency	4. High potential for increased financial self-sufficiency			
INTERPERSONAL				
1. The nature and extensiveness of family ties and informal support networks	1. Low levels informal support networks in all communities except Roosevelt Gardens; at Roosevelt Gardens, moderately developed informal support networks. Family interaction primarily within nuclear family at all location	0		
2. Incidence of family problems such as divorce, child abuse and neglect, alcohol and drug abuse	2. No change			
COMMUNITY				
1. Community cohesiveness: the extent to which a community is unified, with individuals mutually depending on each other for support. A cohesive community is characterized by extensive informal ties, frequent personal interaction, and by strong identification of residents with the community as a whole	1. Low to moderate community cohesion in all communities except Roosevelt Gardens; at Roosevelt Gardens high community cohesion	0		
2. Community viability: the ability of a community to sustain itself	2. Community development likely to remain at present low level which is adequate to sustain viability. (Formal social organization emerges on temporary basis to meet needs and respond to immediate problems.) Low level community organization on day-to-day basis. (Emphasis on individuality more than community.)			

TABLE 30

NON-INDIAN RELOCATIONS (KA RANCH)
PLANS 1, 2, 3, 4, 5, 6, AND 7

Factors	Unmitigated Impacts	Mitigation Recommendation	Overall Effect
INDIVIDUAL			
<ol style="list-style-type: none"> 1. Changes in personal autonomy: the degree to which individuals believe they have freedom and power to control their lives 2. Satisfaction with way of life 3. The potential for financial well-being 	<ol style="list-style-type: none"> 1. Slight reduction in levels of personal autonomy 2. Slight reduction in satisfaction with way of life 3. Slight reduction in financial well-being 	<ol style="list-style-type: none"> 1. Monetary compensation should cover all expenditures and new expenses incurred by the residents as a result of relocation 2. Attempt to replace patented land owned by residents with equivalent acreage in region with potential for adjacent grazing lease land and sufficient water rights to grow feed for cattle operation 3. Provide an accurate, reliable system for disseminating information to relocatees so that they are constantly informed about the relocation proceedings 	<p>Unmitigated Effect: Insignificant Adverse</p> <p>Mitigated Effect: Insignificant</p> <p>The unmitigated impacts at the KA Ranch stem mostly from financial considerations and from their desire to live in the present area. The impacts are described as slight because of the small number of people involved (approximately 10 to 15 people). Mitigation could reduce the impacts</p>
INTERPERSONAL			
<ol style="list-style-type: none"> 1. The nature and extensiveness of family ties and informal support networks 	No impact		
COMMUNITY			
Not applicable	Not applicable		

TABLE 31

NON-INDIAN RELOCATIONS (KA RANCH) - PLAN 8

Factors	Future-Without Condition	Unmitigated Impacts	Mitigation Recommendation	Overall Effect
INDIVIDUAL				
1. Changes in personal autonomy: the degree to which individuals believe they have freedom and power to control their lives	1. High levels of personal autonomy	0	Not Applicable	No Effect
2. Satisfaction with way of life	2. High satisfaction with way of life			
3. The potential for financial well-being	3. High levels of financial well-being			
INTERPERSONAL				
1. The nature and extensiveness of family ties and informal support networks	1. Strong family ties and informal support networks	0		
COMMUNITY				
Not applicable	Not applicable			

TABLE 32
SOCIAL IMPACTS OF RECREATION
PLANS 1, 2, 3, 4, 5, 6, 7, 8

Recreation is one of many factors which determines overall social well-being. Recreation enhances family life and contributes to healthy personality development in a variety of ways; it allows people to make friends, keep fit, release tension, gain prestige or status, and develop creative potential in a socially acceptable manner. The preferred type of recreation, as well as the function and meaning of the recreational experience, varies according to the social background, experiences, and personality of the participant. Typically, families tend to visit beaches, swim, and boat, while friends and peers engage more frequently in fishing and other more specialized activities. Waterskiing, power boating, and sailing are typically engaged in by higher economic groups, while fishing, hunting, and tubing attract members of lower to moderate economic groups.

Since members of different social classes with different backgrounds participate in different forms of recreation, changes in the availability of certain kinds of recreation will affect some groups disproportionately. Besides preference, cost is another factor relevant to the choice of recreation. Those with the most resources have more and varied recreational options available to them; those with less resources have fewer alternatives available, so when a form of recreation frequently used by those with limited resources is curtailed, the impact is more severe than it would be if a form of recreation preferred by those with greater resources is reduced or eliminated.

In keeping with these general descriptions of typical participants and benefits derived from recreation, the proposed plans would have the following impacts on social well-being:

Plans 1, 6, 7

Moderate increase in opportunities for, and benefits derived from, recreation most frequently used by higher income groups due to the enlargement of existing lakes and reservoirs. Slight decrease in availability of recreation most frequently used by lower income groups. Overall, insignificant beneficial effect on social well-being.

Plan 2, 8 (Future Without Project)

Slight decrease in recreational opportunities for both flat- and flowing-water as population and needs for recreation increases. Flowing-water recreation continues to be used most frequently by peer groups from lower economic groups; flat-water recreation continues to be used by families and higher economic groups.

Plans 3, 4, 5

Increased recreational opportunities and benefits from flat-water recreation most frequently used by families and higher income groups. Decreased recreational opportunities and benefits for flowing-water users. These plans produce the greatest impact because they eliminate a unique recreational activity--tubing--while duplicating existing flat-water recreational opportunities. The groups most affected--lower economic groups and younger peer groups--have less recreational opportunities available to them, so the elimination of their preferred activity affects them more severely than other leisure groups. Overall affect on social well-being is insignificant adverse.

For more information regarding recreation, see recreation section in environmental tables.

TABLE 33

SOCIAL IMPACTS AND EFFECTS OF FLOODING PLANS 1, 3, 4, 5, 6, 7

REDUCTION OF 200-YEAR FLOOD (275,000 @ AIRPORT) TO 70,000 to 92,000 CFS

Factors	Impacts	Mitigation Recommendation	Effect
<p>The conditions described have a probability of occurring approximately once every 200 years of one chance in 200 of occurring in any given year. In a flood of lesser magnitude, the conditions described in all plans would be less severe.</p>			
<p>Individual Impacts</p>			
-Quality of life	<p>Normal mortality rates. Elimination of health problems resulting from sewage and debris in inundated areas. Elimination of high stress and anxiety levels and financial losses, associated with flooding. Substantial reduction in inconveniences and disruptions to home and work routines.</p>	Not applicable	<p>Overall Effect: Beneficial Flag</p> <p>The impacts of project action are Beneficial Flag because they reduce or eliminate virtually all of the problems affecting 44,800 people as a result of a 200-year flood.</p>
<p>-Regional Impacts</p>			
Change in number of communities with residential properties likely to sustain floodwater damage and requiring evacuation	<p>Elimination of inundation and evacuations in downstream communities of Mesa, Tempe, Phoenix, Salt River Indian Community, Gila River Indian Community, Holly Acres and Buckeye areas (projected population of 200-year floodplain in year 2000 is 44,800).</p>		
-Number of automobile river crossings closed	<p>Closing of 15 crossings: 14 of 29 in total future crossing stock remain open up to 200-year condition; 15 of 29 remain open in 100-year flood condition.</p>		
-Incidence of transportation disruptions	<p>Elimination of major disruptions to transportation. (Bridges remaining open during 200-year flood are expected to carry 75 to 80 percent of all traffic crossing on a normal day.) Some traffic slow-down due to adjustments to new routes and added driving distance to open crossings.</p>		
-Incidence of health and safety problems related to flooding	<p>Elimination of health and safety hazards due to damages to major power lines and sewer lines. Substantial reduction in delays in delivery of emergency services.</p>		

TABLE 34

SOCIAL IMPACTS AND EFFECTS OF FLOODING PLAN 2

REDUCTION OF 200-YEAR FLOOD (275,000 CFS @ AIRPORT) TO 157,000 CFS

Factors	Impacts	Mitigation Recommendation	Effect
<p>The conditions described have a probability of occurring approximately once every 200 years or one chance in 200 of occurring in any given year. In a flood of lesser magnitude, the conditions described in all plans would be less severe.</p>			
<p>Individual Impacts</p>			
<p>-Quality of life</p>	<p>Holly Acres area: No impact, i.e. continued widespread minor health problems resulting from flooding debris. High levels of stress and anxiety resulting from disruptions due to flooding and evacuation. Substantial financial losses which could not be recovered. Continued inconveniences and major disruptions in home and work routines.</p>	<p>Not applicable</p>	<p>Overall Effect: Significant Beneficial</p> <p>The impacts of project action are Significant Beneficial because they reduce or eliminate most of the problems resulting from flooding that affect 44,275 people living in the 200-year floodplain. The impacts do not significantly alter the effects of flooding on the residents living in the Holly Acres area.</p>
<p><u>Other areas:</u></p>			
<p>Normal mortality rates. Substantial reduction in health problems resulting from sewage and debris in inundated areas. Elimination of high stress and anxiety levels and financial losses associated with flooding. Substantial reduction in inconveniences and disruptions to home and work routines.</p>			
<p>Regional Impacts</p>			
<p>-Change in number of communities with residential properties likely to sustain floodwater damage and requiring evacuation</p>	<p>Inundation of Holly Acres and evacuation of 525 residents (year 2000 projected population.) Elimination of inundation and evacuations in downstream communities of Mesa, Tempe, Phoenix, Salt River Indian Community, Gila River Indian Community, and Buckeye area (projected population of 200-year floodplain in year 2000 is 44,800).</p>		

TABLE 34 (Continued)

Factors	Impacts	Mitigation Recommendation	Effect
Regional Impacts (Cont'd)			
-Number of automobile river crossings closed	Closing of 16 crossings: 13 of 29 in total future crossing stock remain open in 200-year and 100-year condition		
-Incidence of transportation disruptions	Elimination of major disruptions to transportation. (Bridges remaining open during 200-year flood are expected to carry 75 to 80 percent of all traffic crossing on a <u>normal</u> day.) Some traffic slow-down due to adjustments to new routes and added driving distance to open crossings.		
-Incidence of health and safety problems related to flooding	Substantial reduction in health and safety hazards due to damages to major power lines and breaks in sewer lines. Substantial reduction in delays in delivery of emergency services.		

TABLE 35

SOCIAL IMPACTS AND EFFECTS OF FLOODING PLAN 8

FUTURE-WITHOUT PROJECT - 200 YEAR FLOOD (275,000 @ AIRPORT)

Factors	Future Without	Mitigation Recommendation	Effect
	The conditions described have a probability of occurring approximately once every 200 years of one chance in 200 of occurring in any given year. In a flood of lesser magnitude, the conditions described in all plans would be less severe.		
Individual Impacts			
-Quality of life	Slight increase in mortality rates. Extensive health problems resulting from sewage and debris in inundated areas. High levels of stress and anxiety resulting from disruptions due to flooding. Substantial financial losses which could not be recovered, i.e., loss of businesses and employment opportunities, lost wages during extended clean-up period, property damages. Inconveniences and major disruptions in home and work routines.	Not Applicable	No effect
-Regional Impacts			
Change in number of communities with residential properties likely to sustain floodwater damage and requiring evacuation.	Inundation and massive evacuations in communities of Mesa, Tempe, Phoenix, and Salt River Indian Community, Gila River Indian Community, Holly Acres and Buckeye areas in 200-year flood (200-year floodplain population in year 2000 projected to be 44,800).		
-Number of automobile river crossings closed	Closing of all but one (Mill Avenue) of 29 crossings in total future crossing stock (Southern Pacific Railroad bridge would be open for rail transport).		
-Incidence of transportation disruptions	Severe disruptions to transportation and affected services--probable limitation of the one remaining crossing to emergency use only. Separation of communities north and south of river for extended period. (If Mill Avenue and Southern Pacific Railroad Bridges were available for work-related crossings, of 125,000 commuters normally crossing per day, only 72,000 would be able to do so).		
-Incidence of health and safety problems related to flooding	Severe health hazards due to potential for raw sewage in river. Extensive inundation potential in large sector of the community. Hazards from down power lines. Greatly overburdened emergency and medical care facilities with some areas cut off from direct access to any emergency and medical services.		

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