

TABLE IV-34 (Continued)

Condition	200-Year Flood (275,000 cfs) (Plan 8)	Flood Level of 157,000 cfs (Plan 2)	Impact
<u>Area Level Factors (Continued)</u>			
(2) Public Utilities	Damages totalling \$6,400,000 to electrical transmission towers and power lines; repairs would take 2 months to complete. No blackout expected. \$275,000 in damages to sewage and wastewater treatment plants. Damages to active landfills cannot be quantified at the present time.	Damages totalling approximately \$1,500,000 to electrical transmission towers and power lines. Approximately \$80,000 in damages to sewage and wastewater treatment plants (majority at Buckeye Plant). Damages to active landfills cannot be quantified at the present time.	Substantial reduction of damages to electrical transmission towers and power lines (\$4,900,000). Reduction of \$195,000 in damages to sewage and wastewater treatment plants. Substantial reduction of damages to active landfills.
(3) Communication	Temporary delays in telephone service. Major delays in delivery schedules of newspaper, mail, and other subscription services.	No delays in delivery schedules of newspapers, mail, and other subscription services. Temporary delays in telephone service in some areas. Damage costs cannot be quantified at the present time.	Elimination of delays in scheduled deliveries of subscription services (i.e., newspapers, mail, etc.), due to reduction of transportation disruptions. Substantial reduction in number of telephone service disruptions.

TABLE IV- 34 (Continued)

Condition	200-Year Flood (275,000 cfs) (Plan 8)	Flood Level of 157,000 cfs (Plan 2)	Impact
<u>Area Level Factors (Continued)</u>			
(4) Business Community	Damages totalling \$68,713,000; combined with both short and long term revenue losses costs could be in excess of \$150 million.	Damages totalling \$6,977,000. Majority of damages to sand and gravel operations.	Reduction of \$61,736,000 in damages to business community. Substantial reduction of damages to sand and gravel operations.
(5) Tourism	Short- and long-term losses due to forced cancellations of trips and adverse publicity.	No significant disruption in tourist trade.	Substantial reduction of short- and long-term losses due to cancellations of trips and adverse publicity.
(6) Public Safety	Civil defense warning system fully activated. Emergency aid required from outside of metropolitan area. Emergency costs of \$1,109,000. Lack of emergency personnel to carry out all door-to-door warnings.	Civil defense warning system fully activated. Emergency costs in excess of \$505,000. ^(a) No aid required from outside of metropolitan area.	Reduction of approximately \$604,000 in costs of emergency aid. Elimination of needed aid from outside of the Phoenix metropolitan area.

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TABLE IV-34 (Continued)

Condition	200-Year Flood (275,000 cfs) (Plan 8)	Flood Level of 157,000 cfs (Plan 2)	Impact
<u>Area Level Factors (Continued)</u>			
(7) Communities Inundated	Mesa, Tempe, Phoenix, SRPMIC, GRIC, Buckeye, Holly Acres. Breakdowns in established informal support networks and community cohesion for 7 communities.	Phoenix, Holly Acres. Breakdowns in established informal support networks and community cohesion for 2 communities (approximately) 525 individuals.	Elimination of residential property damage in 5 communities (Mesa, Tempe, Phoenix, SRPMIC, GRIC, Buckeye); elimination of damage for approximately 46,035 individuals. Damages continue to occur in Phoenix ^(b) and Holly Acres.
(8) Additional Land Use	No additional land available for development.	2,248 acres available for higher urban uses. Value for year 2000 is \$66,026,000.	2,248 additional acres available for higher urban uses. Value for year 2000 is \$66,026,000.

TABLE IV-35

FLOOD DAMAGE REDUCTION IMPACTS OF PLAN 9
CONTROL OF 200-YEAR FLOOD TO FLOW OF 215,000 CFS

Condition	200-Year Flood (275,000 cfs) (Plan 8)	Flood Level of 215,000 cfs (Plan 9)	Impact
<u>Individual Level Factors</u>			
(1) Physical and Mental Health	Potential for inundation for 46,560 individuals in year 2000. High probability for large numbers of flood-related deaths. Widespread potential for physical injuries and illness and severe stress for inundated flood victims. High levels of disorganized (panic) activity.	Potential for inundation for >525 individuals by the year 2000. Low probability for large numbers of flood-related deaths. Potential for physical injury and severe stress among >525 individuals. Moderate levels of disorganized (panic) activity.	Elimination of potential for inundation for approximately 46,035 individuals in year 2000. Moderate decrease in probability for large number of flood-related deaths. Elimination of potential for physical injury and illness and severe stress for 46,035 individuals. Substantial reduction in potential for disorganized (panic) activity.
(2) Net Disaster Losses	Projected \$87,292,000 in residential property damage in year 2000; majority of 46,560 people directly affected are in low-to-moderate income brackets.	Projected \$18,954,000 in residential property damages by the year 2000. Majority of >525 individuals directly affected in low-to-moderate income brackets. Majority of >525 potential flood victims required to obtain loans or deplete personal savings to make repairs to property.	Reductions of projected \$81,608,000 in residential property damage by year 2000; majority of directly affect individuals are in low-to-

TABLE IV-35 (Continued)

Condition	200-Year Flood (275,000 cfs) (Plan 8)	Flood Level of 215,000 cfs (Plan 9)	Impact
<u>Individual Level Factors (Continued)</u>			
(3) Lifestyle Disruption	majority of inundated flood victims required to obtain loans or use personal savings to make repairs to property.	Temporary lifestyle disruption for >525 individuals. Long and debilitating cleanup. Permanent changes in lifestyle for many of >525 individuals, some of whom are sequential disaster victims. Lost work and school time for >525 individuals.	moderate income brackets. Elimination of potential for loans and depletion of personal saving for property repairs for <46,035 individuals.
	Temporary lifestyle disruption for 46,560 individuals subject to inundation by floodwaters. Long and debilitating cleanup for many months. Lost work and school time. Permanent changes in lifestyle for majority of 525 sequential disaster victims in Holly Acres.		Substantial reduction of lifestyle disruption. Elimination of disruption for <46,035 individuals. Elimination of lost work and school time for <46,035 individuals.

TABLE IV-35 (Continued)

Condition	200-Year Flood (275,000 cfs) (Plan 8)	Flood Level of 215,000 cfs (Plan 9)	Impact
<u>Area Level Factors</u>			
(1) Transportation Disruptions			
- Automobile	Damages to roads and bridges projected to be \$15,800,000 by year 2000. 0-1 river crossings operable. Transportation delay costs projected to be \$39,694,000 by year 2000. High levels of stress experienced by area motorists due to traffic delays and hazardous driving conditions. Many unable to cross floodplain area.	Damages to roads and bridges projected to be \$9,100,000 by year 2000. Three river crossings operable. Transportation delay costs projected to be \$36,693,000 by year 2000. High levels of stress experienced by area motorists due to delays and hazardous driving conditions.	Substantial reduction of damages to bridges and roads as a result of flooding (<\$6,700,000). Substantial reduction of transportation delay costs.
- Air and Rail	Damages to airport facilities and railroad tracks and yard projected to be \$7,021,000 by year 2000. Major delays in air service for 2 days beyond peak flow. Repairs would require 3 months to complete. >\$500,000 damage to airport channel clearing project.	No damages to air and rail transportation facilities projected for year 2000. No delays in service. >\$500,000 damage to airport channel clearing project.	Elimination of \$7,021,000 in damages to airport facilities and railroad tracks and yards by year 2000. Elimination of service disruptions.

TABLE IV-35 (Continued)

Condition	200-Year Flood (275,000 cfs) (Plan 8)	Flood Level of 215,000 cfs (Plan 9)	Impact
<u>Area Level Factors</u> (Continued)			
(2) Public Utilities	Damages totalling \$6,400,000 to electrical transmission towers and power lines; repairs would take 2 months to complete. No blackout expected. \$275,000 in damages to sewage and wastewater treatment plants. Damages to active landfills cannot be quantified at the present time.	Damages totalling approximately \$4,800,000 to electrical transmission towers and power lines; >\$135,000 in damages to sewage and wastewater treatment plants. Damages to active landfills nonquantifiable at present time.	Reduction of damages to electrical transmission towers and power lines (\$1,600,000). Reduction of <\$140,000 in damages to sewage and wastewater treatment plants. Potential reduction of damages to active landfills.
(3) Communication	Temporary delays in telephone service. Major delays in delivery schedules of newspaper, mail, and other subscription services.	Major delays in delivery schedules of newspapers, mail, and other subscription services. Temporary delays in telephone service in some areas. Unable to quantify damages at present time.	Minimal reduction in delays in scheduled deliveries of newspapers, mail and other subscription services. Potential slight reduction in number of disruptions to telephone service.

TABLE IV-35 (Continued)

Condition	200-Year Flood (275,000 cfs) (Plan 8)	Flood Level of 215,000 cfs (Plan 9)	Impact
<u>Area Level Factors (Continued)</u>			
(4) Business Community	Damages totalling \$68,713,000; combined with both short and long term revenue losses costs could be in excess of \$150 million.	Damages totalling \$21,761,000. Majority of damages to sand and gravel operations. Lost revenues due to transportation disruptions.	Reduction of \$46,952,000 in damages to business community.
(5) Tourism	Short- and long-term losses due to forced cancellations of trips and adverse publicity.	Short-term losses due to forced cancellations of trips and adverse publicity.	No impact.
(6) Public Safety	Civil defense warning system fully activated. Emergency aid required from outside of metropolitan area. Emergency costs of \$1,109,000. Lack of emergency personnel to carry out all door-to-door warnings	Civil defense warning system fully activated. Emergency costs of approximately \$809,000. No aid required from outside of metropolitan areas.	Reduction of approximately \$300,000 in costs of emergency aid. Elimination of needed aid from outside of the Phoenix metropolitan area.

TABLE IV-35 (Continued)

Condition	200-Year Flood (275,000 cfs) (Plan 8)	Flood Level of 215,000 cfs (Plan 9)	Impact
<u>Area Level Factors (Continued)</u>			
(7) Communities Inundated	Mesa, Tempe, Phoenix, SRPMIC, GRIC, Buckeye, Holly Acres. Breakdowns in established informal support networks and community cohesion for 7 communities.	Phoenix, Holly Acres. Breakdowns in established informal support networks and community cohesion for 2 communities (>525 individuals).	Elimination of residential property damage in 5 communities (Mesa, Tempe Phoenix, SRPMIC, GRIC, Buckeye); elimination of damage for approximately <46,035 individuals. Damages continue to occur in Phoenix ^(b) and Holly Acres.

2,400,000 for the year 2000. Under Plan 8, these people in the following communities could be subjected to a flood of 275,000 cfs:

200-YEAR INUNDATION AREA POPULATION IN FUTURE-WITHOUT

<u>Community</u>	<u>Population</u>
Holly Acres Area	1,500
City of Mesa	16,000
City of Tempe	2,600
City of Phoenix	22,000
Salt River Pima-Maricopa Indian Community	360
Gila River Indian Community (Lehi)	300
Buckeye Area	3,800
Total projected 200-year inundation area population (year 2000)	46,560

(3) Direct and Indirect Impacts of Plans 1, 3, 6, 7

Future social conditions with Plans 1, 3, 6, and 7 assume a flood control plan that would reduce a 200-year flood (275,000 cfs) through the Phoenix metropolitan area to a flow of between 70,000 and 92,000 cfs. By controlling flows to between 70,000 cfs and 92,000 cfs, Plans 1, 3, 6 and 7 would eliminate the inundation and evacuation of Salt-Gila River ownstream community residents with the possible exception of a few individuals residing at Holly Acres. Additionally, New Waddell Dam would provide incidental flood control on the Agua Fria River although no dedicated flood control space would be provided. Benefits would include the elimination of flooding for 46,460 of the 46,560 residents projected to be living in the 200-year flood plain in the year 2000. Fourteen of the 29 automobile river crossings would remain open resulting in the elimination of major disruptions to transportation.

The effects of Plans 1, 3, 6 and 7 are considered a Beneficial Flag because they reduce or virtually eliminate all of the flooding problems affecting people living in the 200-year flood plain.

(4) Direct and Indirect Impacts of Plan 2

Future social conditions with Plan 2 assume a flood control plan that would reduce a 200-year flood through the Phoenix metropolitan area to a flow of 157,000 cfs at Sky Harbor Airport.

Individuals residing in the following communities would receive nearly total protection from inundation with flows controlled 157,000 cfs.

- City of Mesa
- City of Tempe
- Salt River Pima-Maricopa Indian Community
- Gila River Indian Community
- Buckeye (including the towns of Arlington, Liberty and Palo Verde)

Individuals residing in the City of Phoenix and the Holly Acres area would sustain at least some damage as a result of a flood measured at 157,000 cfs at the airport:

Once construction of proposed new bridges is completed (see Plan 8), general transportation disruptions and the accompanying escalations in personal stress projected for area residents in the event of flooding are not expected to occur with flows of 200,000 cfs or under.

The effects of Plan 2 are considered Significant Beneficial because most of the problems resulting from flooding that affect 44,035 of the 44,560 people living in the 200-year flood plain would be reduced or eliminated. The impacts do not significantly alter the effects of flooding on the residents living in the Holly Acres area.

(5) Direct and Indirect Impacts of Plan 9

Future social conditions with Plan 9 assume a flood control plan that would reduce a 200-year flood through the Phoenix metropolitan area to a flow of 215,000 cfs at Sky Harbor Airport.

Individuals residing in the following communities would receive nearly total protection from inundation with flows controlled at 215,000 cfs.

City of Mesa
City of Tempe
Salt River Pima-Maricopa Indian Community
Gila River Indian Community
Buckeye (including the towns of Arlington,
Liberty and Palo Verde)

Individuals residing in the City of Phoenix and the Holly Acres area would sustain damage as a result of a flood measured at 215,000 cfs at the airport. Only three river crossings would remain open resulting in significant delays in transportation and associated escalations.

The effects of Plan 9 are considered beneficial, because problems from flooding are reduced. However, somewhat significant damages still occur in Holly Acres, City of Phoenix, and because of transportation delays.

Impacts and effects of action plans are summarized in Tables IV-32, IV-33, IV-34, and IV-35.

6. Economics

a. Types of Economic Impacts

Impacts on national economic development are expressed as changes in average annual cost and benefits over the life of the project from

a national income viewpoint. The degree of beneficial effects from these impacts is determined by the amount of net benefits resulting from a plan.

The accounting framework used in the CAWCS studies is shown schematically in Figure IV-2. Costs include construction contracts, design, engineering, and administration of the plans. Energy is a significant component of the operation costs of all plans except 2 and 8 because much of the increased water supply developed by the plans must be pumped into Central Arizona from the Colorado River.

For the purpose of the analysis financing of the features was assumed to be from one source, the federal treasury. Under this assumption funds would be appropriated under two authorizing acts, the Reclamation Safety of Dams Act of 1978 and the Colorado River Basin Project Act. Currently, efforts are being made at the local level to develop other funding sources for the entire CAP, including the Regulatory Storage Division (see Appendix B). This effort could change the actual source of funding.

Benefits include the major categories of regulatory storage, flood control, and safety of dams corresponding to the major CAWCS project purposes. Recreation benefits are expressed as net loss or gain.

Regulatory storage benefits include water supply, hydropower, and power management benefits. Water supply benefits were calculated separately for irrigation water and municipal and industrial water. Power management benefits are distinguished from hydropower benefits. Power management refers to benefits derived from the ability to better manage CAP pumping loads provided by some of the regulatory storage structures. Hydropower benefits are benefits derived from the installation of a powerplant at a regulatory storage structure.

Flood control benefits include inundation reduction benefits, which result from prevention of physical damages to structures in the flood plain as well as savings in costs associated with floodfighting, closed businesses, transportation delays, and emergency operations. Location and intensification benefits of flood control result from improved land use in former flood prone areas.

For purposes of comparing and illustrating the effects of CAWCS plan features, SOD benefits were assumed to be equal to the least-cost SOD solution.

b. Methodology

Where possible, market values were used to estimate the benefits and costs of the resources provided by the project as well as of the resources used in construction and operation of the project. For example, construction costs were estimated using unit costs obtained from bids at current construction sites. However, all of the project outputs and many of the project inputs are extra-market goods. Several alternative methods exist for measuring the value of extra-market goods, and an attempt was made to select the most appropriate method for each type of project output. Despite

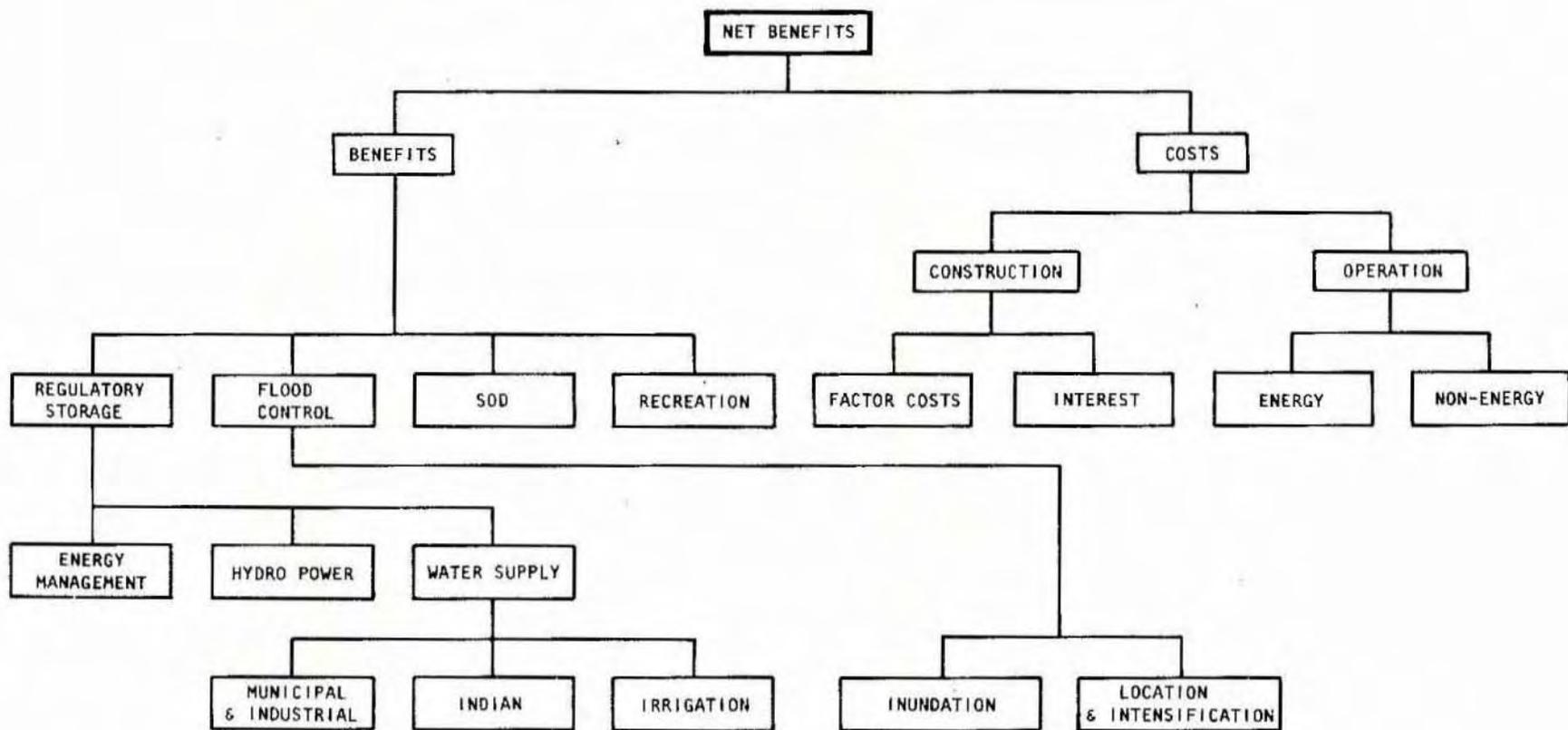


FIGURE IV-2
National Economic Development Impacts Accounting Frame Work

the diversity of detail, all approaches adhere to a consistent general model. The net benefits associated with any plan are the amount that a person would be willing to pay if that person could not externalize benefits or costs.

Figure IV-3 is adapted from the Smith-Krutella framework for classifying measurement benefits for extra-market goods. Within this general framework, the major project outputs of flood control, SOD, water supply, and power were measured using physical linkages. Behavioral linkages were used to measure recreation gains and losses.

c. Direct and Indirect Impacts

(1) Cost

The total construction cost of each plan and the total annual cost are shown on Table IV-36.

(2) Net Economic Benefits

The net economic benefits for each CAWCS plan are shown in Table IV-37. Net benefits are the dollar difference between annual costs and annual benefits. Details of the determination of the values are also discussed in Economics Supporting Document and Recreation Planning Report, (USBR, 1982). All values are based on the 1982 price level. All are annualized at 7-3/8 percent. Economic benefits by major category are shown in Table IV-37.

(3) Impacts with Modified Roosevelt and Modified Stewart Mountain Dams in Plans

Table IV-36 shows differences in costs and benefits between new and modified dams.

7. Other Impacts of Plans

a. Air Quality

(1) Types of Impacts to Air Quality

The primary impact on air quality will be dust emissions, or TSP, from construction-related activities. The degree of impact is a direct function of distance from the construction site(s). Other miscellaneous air quality impacts are expected to have insignificant effects. The exception may be incineration impacts which may have Significant Adverse effects at times. The impacts of project actions on the ambient concentrations of air pollutants other than TSP (non-methane hydrocarbons, nitrogen dioxide, ozone and sulfur dioxide) were investigated during the study. Both short and long-term impacts for all factors except TSP were found to be negligible in all of the scenarios analyzed; therefore, this section describes only construction-related TSP impacts of plans.

TABLE IV-36

ECONOMIC COSTS AND BENEFITS OF PLANS

Plan Options	Total Construction Cost ^{a,b} (\$)	Total Annual Cost ^{a,c} (\$)	Total Annual Benefits ^a (\$)	Net Economic Benefits ^a (\$)
<u>Plan 1</u>				
Cliff + Modified Roosevelt + Modified Stewart Mountain	694,940,000	58,060,000	81,587,000	23,527,000
Cliff + New Roosevelt + New Stewart Mountain	874,230,000	71,300,000	81,587,000	10,287,000
Cliff + New Roosevelt + Modified Stewart Mountain	788,340,000	64,960,000	81,587,000	16,627,000
Cliff + Modified Roosevelt + New Stewart Mountain	780,830,000	64,400,000	81,587,000	17,187,000
<u>Plan 2^d</u>				
Cliff + Modified Roosevelt + Modified Stewart Mountain	541,570,000	41,870,000	50,711,000	8,840,000
Cliff + Modified Roosevelt + New Stewart Mountain	627,460,000	48,210,000	50,711,000	2,501,000
<u>Plan 3</u>				
Confluence + Cliff + Modified Roosevelt + Modified Stewart Mountain	1,116,250,000	93,970,000	119,277,000	25,307,000
Confluence + Cliff + New Roosevelt + New Stewart Mountain	1,295,540,000	107,200,000	119,277,000	12,077,000
Confluence + Cliff + New Roosevelt + Modified Stewart Mountain	1,209,650,000	100,860,000	119,277,000	18,417,000
Confluence + Cliff + Modified Roosevelt + New Stewart Mountain	1,202,140,000	100,310,000	119,277,000	18,967,000
<u>Plan 6</u>				
New Waddell + Cliff + Modified Roosevelt + Modified Stewart Mountain	978,430,000	82,710,000	166,837,000	84,127,000
New Waddell + Cliff + New Roosevelt + New Stewart Mountain	1,157,720,000	95,940,000	166,837,000	70,896,000
New Waddell + Cliff + New Roosevelt + Modified Stewart Mountain	1,071,830,000	89,600,000	166,837,000	77,237,000
New Waddell + Cliff + Modified Roosevelt + New Stewart Mountain	1,064,320,000	89,050,000	166,837,000	77,787,000
<u>Plan 7</u>				
New Waddell + Cliff + Modified Roosevelt + Modified Stewart Mountain	978,430,000	82,710,000	160,707,000	77,997,000
New Waddell + Cliff + New Roosevelt + New Stewart Mountain	1,157,720,000	95,940,000	160,707,000	64,767,000
New Waddell + Cliff + New Roosevelt + Modified Stewart Mountain	1,071,830,000	89,600,000	160,707,000	71,107,000
New Waddell + Cliff + Modified Roosevelt + New Stewart Mountain	1,064,320,000	89,050,000	160,707,000	71,657,000
<u>Plan 9</u>				
New Waddell + Modified Roosevelt + Modified Stewart Mountain + Verde River Dams Modifications	931,790,000	76,030,000	143,089,000	67,059,000
New Waddell + New Roosevelt + New Stewart Mountain + Verde River Dams Modifications	1,111,080,000	89,260,000	143,089,000	53,829,000
New Waddell + New Roosevelt + Modified Stewart Mountain + Verde River Dams Modifications	1,025,190,000	82,920,000	143,089,000	60,169,000
New Waddell + Modified Roosevelt + New Stewart Mountain + Verde River Dams Modifications	1,017,680,000	82,360,000	143,089,000	60,729,000

^aCosts and benefits are shown in January 1982 dollars. Annual equivalents are calculated at 7 3/8%. Cost of plans would be allocated among several funding sources; for this analysis two sources were assumed: Reclamation Safety of Dams Act and Colorado River Basin Project Act.

^bIncludes interest during construction (IDC).

^cIncludes operation, maintenance, and replacements costs (OM&R).

^dPlan 2 (limited construction) includes only modifications to Roosevelt Dam which may be required for dam safety.

Source: Economics Supporting Document, USBR, 1982.

		TYPES OF LINKAGE BETWEEN OUTPUT CHANGE AND OBSERVED EFFECTS	TYPES OF ASSUMPTIONS REQUIRED	MEASUREMENT METHODS	BENEFIT CATEGORY
NO ROLE FOR BEHAVIORAL RESPONSES OF ECONOMIC AGENTS	PHYSICAL LINKAGES		RESPONSES ARE DETERMINED BY ENGINEERING OR TECHNOLOGICAL RELATIONSHIPS	DAMAGE FUNCTION LEAST COST ALTERNATIVE	FLOOD CONTROL AGRICULTURAL WATER SUPPLY POWER SOD M&I WATER SUPPLY
	BEHAVIORAL LINKAGES	INDIRECT LINKS	RESTRICTIONS ON THE NATURE OF INDIVIDUAL PREFERENCES OR TECHNICALLY OBSERVED ASSOCIATIONS IN THE DELIVERY OF GOODS OR SERVICES	HEDONIC PROPERTY VALUE TECHNICAL TRAVEL COST HEDONIC TRAVEL COST	FLAT WATER RECREATION FISH AND WILDLIFE
DIRECT LINKS		INSTITUTIONAL		CONTINGENT VALUATION CONTINGENT RANKING	FLOWING WATER RECREATION

ADAPTED FROM SMITH-KRUTILLA FRAMEWORK FOR CLASSIFYING THE MEASUREMENT BASES AND METHODS OF ECONOMIC BENEFITS RESULTING FROM CHANGES IN OUTPUT OF EXTRAMARKET GOODS.

FIGURE IV-3
METHODOLOGY FOR
ECONOMIC BENEFITS
ANALYSIS

Table IV-37

ECONOMIC BENEFITS OF PLANS^a

Factors/Measures	Plan 8 CAWCS No Action (Future Without Project)	Plan 1	Plan 2	Plan 3	Plan 6	Plan 7	Plan 9
<u>Regulatory Storage Benefits</u>	0						
Power Management		0	0	18,640,000	72,640,000	72,640,000	72,640,000
Hydropower		0	0	3,910,000	7,820,000	7,820,000	7,820,000
Water Supply		<u>9,410,000</u>	<u>1,310,000</u>	<u>15,130,000</u>	<u>12,900,000</u>	<u>6,770,000</u>	<u>10,738,000</u>
Total Regulatory Storage Benefits		9,410,000	1,310,000	37,680,000	93,360,000	87,230,000	91,248,000
<u>Flood Control Benefits</u>	0						
Inundation Reduction		10,587,000	5,368,000	10,587,000	10,587,000	10,587,000	4,861,000
Location and Intensification		<u>16,460,000</u>	<u>4,873,000</u>	<u>16,460,000</u>	<u>16,460,000</u>	<u>16,460,000</u>	<u>3,249,000</u>
Total Flood Control Benefits		27,047,000	10,241,000	27,047,000	27,047,000	27,047,000	8,110,000
<u>Safety of Dams Benefits</u>	0	39,220,000	39,220,000	39,220,000	39,220,000	39,220,000	39,220,000
<u>Recreation Benefits</u>	0	5,910,000	0	15,330,000	7,210,000	7,210,000	4,511,000
<u>Total Annual Benefit</u>	0	81,587,000	50,771,000	119,277,000	166,837,000	160,707,000	143,089,000

^aShown in January 1982 dollars.

SOURCE: Economics Supporting Document, USBR, 1982. Plan 9 estimated on comparable basis.

It should be noted that all the impacts and effects described below are of short-to-moderate duration, lasting only as long as construction activities.

(2) Direct and Indirect Impacts

(a) Plan 8

The future-without conditions for ambient TSP at the affected site areas are shown in Table IV-38. The information presented for the period 1981 to 2000 is an estimate of the overall trend from the beginning of the period to the end.

TABLE IV-38
FUTURE-WITHOUT CONDITION
TOTAL SUSPENDED PARTICULATES^a

<u>Site Area</u>	<u>1981-2000</u> (est. ann. geometric mean concentrations in ug/m ³)
Stewart Mountain	50 - 75
Cliff	35 - 60
New Roosevelt	35 - 60
Confluence	50 - 75
New Waddell	40 - 65
Downstream	
Country Club to 35th Avenue	100 - 140
91st Avenue to Gillespie Dam	60 - 75

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

Within the general Phoenix metropolitan area the Federal primary and State annual geometric mean TSP standard of 75 micrograms per cubic meter (ug/m³) is often exceeded. With controls, the annual geometric mean is expected to decrease from 1981 through 1985 and then increase gradually through 2000. It is assumed that planned control measures will result in the regional attainment and maintenance 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 2000.

(b) Plans 1 and 2

With regard to the Cliff site, any points of public access within 1/2 mile of construction sites may have increases in ambient TSP concentrations of approximately 55 ug/m³. Beyond 1/2 mile the impact should be less than 55 ug/m³.

Within approximately 1/4-mile of the construction areas at the New Roosevelt site, public access areas may have increases in ambient TSP concentrations of about 50 ug/m³ due to construction activity. At distances greater than 1-1/2 miles the increases should be less than 35 ug/m³.

Within about 1/2 mile of the Stewart Mountain construction site, areas of public access may have increases in ambient TSP concentrations of about 25 ug/m³ or more due to construction activity. At distances greater than 1 mile, the increases should be less than 15 ug/m³.

(c) Plan 3

Impacts related to TSP would be the same as for Plans 1 and 2 with the addition of impacts from Confluence Dam. At the Confluence site, public access areas within approximately 1-1/2 miles of construction areas may have increases in ambient TSP concentrations of 30 to 70 ug/m³ due to construction activity. Beyond 1-1/2 miles the increases should be less than 30 ug/m³.

(d) Plans 6, 7, and 9

Impacts related to TSP would be the same as for Plans 1 and 2 with the addition of impacts from New Waddell Dam construction. At the New Waddell site, public access areas within approximately 1/2-mile of construction areas may have increases in ambient TSP concentrations of 25 to 70 ug/m³ due to construction activity. Beyond 1-1/2 miles the increases should be less than 25 ug/m³.

(3) Mitigation

The effect of air quality impacts is considered Significant Adverse for all plans. Effects may be reduced to Insignificant if mitigation measures in the form of dust suppression are applied. Dust suppression may be accomplished through the use of any or all of the following: paving, chemical stabilization, watering, speed control; covering, vegetation, gravelling unsurfaced roads, and wind breaks.

(4) Residual Impacts

The only residual TSP impacts that are expected to result from plan implementation are those related to increased vehicular activity in excess of the existing condition. Such impacts would be secondary TSP impacts that cannot be quantified at this time.

(5) Impacts with Modified Roosevelt and Modified Stewart Mountain Dams in Plans

Construction impacts for a modified dam at Roosevelt or Stewart Mountain would be the same; no long-term impacts have been identified for either option.

b. Aesthetics

(1) Types of Impacts to Visual Quality

Visual quality impacts include project-related changes in the natural character of the landscape, and changes in terms of viewer sensitivity and opportunity to enjoy the scenic qualities of the area.

Types of visual impacts to the natural environment that may occur with the construction or modification of a dam include the partial loss of a stream and high-quality riparian vegetation often associated with streams, the creation of a lake or the enlargement of an existing lake, and, in the case of new dam construction, the intrusion of a major structure into the natural landscape. As shown in Table IV-39, five measures were used to assess visual quality impacts on the natural environment: 1) acres of high-quality riparian vegetation lost or gained, 2) miles of flowing water lost, 3) acres of flat water gained, 4) acres of land exposed by reservoir drawdown, and 5) visual intrusion of major new structures.

Viewer sensitivity and opportunity to enjoy the scenic qualities of an area may be diminished or enhanced by project actions. To measure the scenic qualities of a site areas as they would be interpreted by viewers, Visual Interpretive Zones were developed and mapped. Visual Interpretive Zones classify the natural landscape into three zones: V1 (distinctive), V2 (average), and V3 (undistinguished). Adverse changes in the natural landscape may cause a shift from higher to lower quality Visual Interpretive Zones in an area. Likewise, beneficial alternation of the natural environment may cause a shift from lower to higher quality Visual Interpretive Zones.

(2) Direct and Indirect Impacts

(a) Plan 8

Within the aggregated site areas, over half of the visual resources are of average quality (V2), approximately 30 percent are of distinctive (V1) quality and less than 20 percent are of undistinguished (V3) quality. The visual quality of the natural landscape in the site areas is not anticipated to change significantly from the existing condition. Visual Interpretive Zones, as shown in Table IV-40, are expected to remain essentially unchanged in the future without the project.

Visual resources at the Cliff site area are primarily average (V2) and undistinguished (V3). This is due, in part, to the presence of Horseshoe Reservoir, which is often severely drawn down exposing unvegetated slopes. However, below Horseshoe Dam, along the Verde River, high-quality riparian vegetation is found.

Table IV-39

VISUAL QUALITY IMPACTS OF PLANS ON THE NATURAL ENVIRONMENT

	HIGH QUALITY RIPARIAN VEGETATION (acres)	FLOWING WATER (miles)	FLAT WATER (acres)	DRAWDOWN (acres)	MAJOR NEW STRUCTURES (number)
PLAN 1					
CLIFF	- 700	- 3.0	+ 683	+ 884	0
ROOSEVELT	- 230	0	0	0	0
PLAN 2					
CLIFF	- 690	+ 1.0	0	0	0
ROOSEVELT	- 210	0	0	0	0
PLAN 3					
CONFLUENCE	-2,400	-17.2	+5,320	+5,201	+1
CLIFF	- 700	+ 1	- 77	- 156	0
ROOSEVELT	- 230	0	0	0	0
PLAN 6					
CLIFF	- 700	+ 1	- 77	- 156	0
ROOSEVELT	- 230	0	0	0	0
NEW WADDELL	- 210	0	+4,299	+6,142	0
PLAN 7					
CLIFF	- 700	- 2.0	+ 796	- 24	0
ROOSEVELT	- 230	0	0	0	0
NEW WADDELL	- 210	0	+4,299	+6,142	0
PLAN 9					
VERDE RIVER DAMS	- 310	0	0	0	0
ROOSEVELT	- 230	0	0	0	0
NEW WADDELL	- 210	0	+4,299	+6,142	0

TABLE IV-40
ACREAGE OF VISUAL INTERPRETIVE ZONES IN FUTURE WITHOUT PROJECT

	VQZ1	VQZ2	VQZ3	TOTAL
Cliff	13,170	17,428	22,192	52,790
(Verde River Dams)	(14,905)	(36,913)	(24,052)	(75,090)
Roosevelt	23,973	50,396	6,601	80,970
Confluence	25,443	35,466	9,491	70,400
New Waddell	16,590	24,490	0	41,080
Aggregate	79,176	127,780	38,284	245,240

Visual resources at Roosevelt are primarily distinctive (V1) and average (V2). Although frequently drawn down leaving unvegetated slopes, Roosevelt Lake is the dominant visual resource in the site area. Flowing into Roosevelt Lake are Tonto Creek and the Salt River. Riparian vegetation along these two streams is composed of high-quality cottonwoods, willows and mesquite.

The Confluence site area is the only area where the natural environment has not been significantly altered by a dam. Abundant in riparian vegetation along their banks, the Salt and Verde Rivers meander for a total of 34 miles to their confluence. The site area is composed primarily of V1 (distinctive) and V2 (average) visual resources.

Upper and Lower Lake Pleasant dominate the natural landscape at the New Waddell site area. Although frequently drawn down exposing unvegetated slopes, Upper Lake Pleasant has many interesting coves and inlets along its shores. Very little high quality riparian vegetation and no perennial streams are found at New Waddell. The area is primarily composed of distinctive (V1) and average (V2) visual quality resources; no V3 (undistinguished) visual resources exist within the site area.

(b) Plan 1

Plan 1 would have an overall insignificant effect on visual resources in the site areas. Adverse changes in visual resources at individual site areas include the loss of high-quality riparian vegetation at Cliff and Roosevelt, and the loss of flowing water and an increase in drawdown at Cliff. Beneficial visual changes include an increase in flat water surface acres at Cliff. Some changes in Visual Interpretive Zones from higher quality visual resources to lower quality resources is projected at the Cliff site; no change in Visual Interpretative Zones is expected to occur at Roosevelt.

(c) Plan 2

With Plan 2 the net impact on visual quality resources is anticipated to be insignificant. At individual site areas, adverse visual changes include the loss of high quality riparian vegetation at both Cliff and Roosevelt. Beneficial changes include an increase in flowing water at Cliff. Because the overall effect of Plan 2 on visual resources is projected to be insignificant, changes in Visual Interpretive Zones would not occur at either Cliff or Roosevelt site areas.

(d) Plan 3

The implementation of Plan 3 would result in an overall significant adverse effect on visual quality resources in the study region, due primarily to the creation of a new reservoir with a large drawdown at the Confluence site. Although the increase in flat water associated with the new reservoir is a beneficial visual change, the accompanying dam structure, loss of flowing water and increase in drawdown has an overriding adverse impact on visual resources. Other adverse changes in visual resources associated with this plan include a loss of high-quality vegetation at Cliff, Roosevelt and Confluence, and a decrease in flat water at Cliff. Beneficial changes include a decrease in drawdown at the Cliff site. With the implementation of this plan, Visual Interpretive Zones at the Confluence site would shift from higher quality visual resources to those of lower quality. Visual Interpretive Zones at Cliff and Roosevelt would not change.

(e) Plan 6

With the implementation of Plan 6, the net impact on visual quality resources would be insignificant. At individual site areas adverse changes in visual resources include a loss of high quality riparian vegetation at Cliff, Roosevelt, and New Waddell, a decrease in flat water acres at Cliff; and an increase in drawdown at New Waddell. Beneficial changes include an increase in water surface acres at New Waddell; an increase in flowing water at Cliff, and a decrease in drawdown at Cliff. No changes in Visual Interpretive Zones is anticipated for any site area with the implementation of this plan.

(f) Plan 7

The implementation of Plan 7 would result in an insignificant effect on visual quality resources. At individual site areas, adverse changes on visual resources would include the loss of high quality riparian vegetation at Cliff, Roosevelt, and New Waddell; a loss of flowing water at Cliff and an increase in drawdown at New Waddell. Beneficial visual changes include an increase in flat water surface acres at Cliff and New Waddell and a decrease in drawdown at Cliff. No changes in Visual Interpretive Zones is anticipated with the implementation of Plan 7.

(g) Plan 9

With the implementation of Plan 9, the net impact on visual quality resources would be insignificant. At individual site areas adverse changes in visual resources include a loss of high quality riparian vegetation at Roosevelt, and New Waddell, and an increase in drawdown at New Waddell. Beneficial changes include an increase in water surface acres at New Waddell. No changes in Visual Interpretative Zones are anticipated for any site area with the implementation of this plan.

(3) Mitigation

The overall impact of Plan 3 on visual quality includes adverse impacts on flowing stream, loss of riparian vegetation, and drawdown, especially at the Confluence area. These impacts, to a large degree, cannot be mitigated. Tree planting is not effective when a constant water level cannot be maintained. No mitigation is required for Plans 1, 2, 6, 7 and 9.

(4) Impacts with Modified Roosevelt and Modified Stewart Mountain Dams in Plans

Construction impacts for a modified dam at Roosevelt or Stewart Mountain would be the same as the new dam option except construction activities for a modified dam would be shorter in duration and require less area. Operational impacts would be the same at Roosevelt or Stewart Mountain because lake elevations, size, and changes in visual quality zones would be identical for a new structure or modified dam. Therefore, there is no significant difference in impact at either location for visual quality.

c. Noise

(1) Types of Impacts to Noise

Noise impacts are described as construction or short-term impacts, and operational or long-term impacts. Impacts are measured by decibel (dB) changes in the ambient day-night sound level (L_{dn}) at each of the affected site areas. The EPA has suggested an annual L_{dn} of less than 55 dB as being requisite to protect public health and welfare. Recent EPA strategy calls for a short-term goal in which the L_{dn} should not exceed 65 dB in residential and recreational areas or other outdoor areas in which quiet is the basis of use.

Impact analysis has been restricted to noise-sensitive areas where potential impacts would occur. For example, only those areas where existing sound levels are below a L_{dn} of 65 dB and which would experience an increase in the ambient L_{dn} exceeding 10 dB due to project construction or operations have been assessed.

Construction activities at each of the dam sites will generally occur in open areas and away from noise-sensitive receptors (people or wildlife affected by noise), although some cases of noise impact may occur.

(2) Direct and Indirect Impacts

(a) Plan 8

Little or no change in the Cliff site ambient sound environment is expected by the year 2000. Day-night sound levels are expected to remain below 55dB.

At the Roosevelt site area, developed recreational facilities and new facilities will generally be anticipated to result in increases in the day-night sound level to between 55 and 65 dB. The L_{dn} would comply with the EPA's short-term goals for residential and noise-sensitive recreational areas.

At the Confluence site, continued growth in population in the communities of Fountain Hills, Fort McDowell, Rio Verde, and Goldfield Estates will cause an increase in the ambient sound levels to between 35 and 70 dB. Most noise-sensitive receptors will continue to experience L_{dn} below 65 dB; however, the number of residents experiencing sound levels between 55 and 65 dB will increase significantly.

Little or no change in the ambient sound quality environment at the New Waddell site is expected. The day-night sound levels are expected to remain below 55 dB.

(b) Plans 1 and 2

Construction activities at Cliff Dam are anticipated to result in insignificant noise impacts with the relocation of recreational facilities and residents near the existing Horseshoe Dam prior to construction. Upon completion of construction, no significant change from existing or future-without sound levels is anticipated. Day-night sound levels would remain below 55 dB.

Construction activities at Roosevelt Dam and borrow pits would occur and within less than 1/4-mile of the community of Roosevelt. The sound levels anticipated during construction at these two sites could be as high as 71 dB during peak periods of construction. Upon completion of construction, no significant change from future-without sound levels is anticipated.

Construction activities at the Stewart Mountain Dam are anticipated to result in insignificant noise impacts with the relocation of the nearest noise sensitive receptors prior to construction. Upon completion of construction, no significant change from existing or future-without sound levels is anticipated.

In summary, Plans 1 and 2 would result in localized temporary increases in noise levels at the Cliff and Roosevelt sites during construction. The effect of these impacts is considered Insignificant.

(c) Plan 3

In Plan 3 impacts at Cliff and Roosevelt are combined with impacts at the Confluence site.

Construction activities for the Confluence Dam would occur away from local receptors and would therefore result in insignificant noise impacts. Upon completion of construction no significant change from future-without conditions is anticipated.

The effect of these impacts is considered Insignificant.

(d) Plans 6,7, and 9

In Plans 6, 7, and 9 construction noise impacts in the area of the New Waddell Dam would be insignificant.

Upon completion of construction, no significant change from existing sound levels is anticipated due to the minimal development within the primary or secondary acoustical study areas. Day-night sound levels would remain below 55 dB.

The effect of these impacts is considered Insignificant.

(3) Mitigation

Because of the generally insignificant effect of noise associated with CAWCS plans, no mitigation is recommended.

(4) Residual Impacts

There are no residual impacts since no mitigation is proposed.

(5) Impacts with Modified Roosevelt and Modified Stewart Mountain Dams in Plans

Construction impacts for a modified dam at Roosevelt or Stewart Mountain would be the same as the new dam option except construction activities for a modified dam would be shorter in duration and require less area. Operational impacts would be the same at Roosevelt or Stewart Mountain for a new structure or modified dam. Therefore, there is no significant difference in noise impact at either location.

d. Geology/Soils

(1) Types of Impacts to Geology/Soils

Impacts of CAWCS plans on geology and soils focus on mineral resources, primarily sand and gravel, and on prime farmland. Impacts to mineral resources were measured in terms of surface acres enhanced by reduced flood levels or lost as a result of acquisition and inundation. Impacts to prime farmland were measured by acres lost for construction and operation of a plan.

(2) Direct and Indirect Impacts

(a) Plan 8

With Plan 8, the future-without condition assumes that mining of sand and gravel in the Verde-Salt-Gila channel area will occur on approximately 570 surface acres on the Fort McDowell Indian Community and on portions of approximately 17,725 surface acres within the Salt-Gila River channel (primarily on the Salt River Indian Community, in the Salt River channel, and along the Gila River). In these areas, mining is expected to occur where suitable material is found, where mining is compatible with surrounding land use, and near areas where the greatest urban development is anticipated.

Mining of sand and gravel within the study area is anticipated to yield nearly 22 million short tons for the year 2000. Approximately 19 million short tons were extracted in 1980 (CAWCS, Regional Future Without the Project).

Prime farmland by the year 2000 is expected to include approximately 16,385 acres in affected areas: 15,065 acres in the downstream area, 130 acres in the Cliff site area, 1,120 acres in the Confluence site area, and 70 acres in the New Waddell site area.

Within the CAWCS study area, there are an estimated 620,000 acres of prime farmland (1980 value). By the year 2000 it is projected that there will be approximately 589,000 acres. In general, there will be an increase in prime farmland acreage on the Indian reservations and a decrease on non-Indian lands, primarily as a result of urban growth.

(b) Plans 1, 2, 3, 6, 7, and 9

Plans 1, 2, 3, 6, 7, and 9 have impacts on the sand and gravel deposits in the Verde-Salt-Gila Rivers area. Nearly all of the 18,295 surface acres of known and potential sand and gravel resource is currently subject to losses from major flooding. Plan 9 does not eliminate losses due to major flooding. The impacts and effects of alternative plans are summarized in Table IV-41.

Adverse impacts to prime farmland result from loss of acreage during construction and/or operation of a project. Downstream

Table IV-41

IMPACTS TO SAND AND GRAVEL
DEPOSITS ON VERDE, SALT, AND GILA RIVERS

<u>Plan</u>	<u>Impact/Mitigation</u>	<u>Effect Unmitigated/Mitigated</u>
1	3,120 surface acres enhanced by reduced flood levels; 15,175 surface acres unaffected by project. No mitigation necessary.	Significant Beneficial/ Significant Beneficial
2	1,350 surface acres enhanced by reduced flood levels; 16,945 surface acres unaffected by project. No mitigation necessary.	Significant Beneficial/ Significant Beneficial
3	3,120 surface acres enhanced by reduced flood levels; 190 surface acres acquired for project; 14,985 surface acres unaffected by project. Mitigation plan negates loss of 190 surface acres.	Significant Beneficial/ Significant Beneficial
6,7	3,120 surface acres enhanced by reduced flood levels; 15,175 surface acres unaffected by project. No mitigation necessary.	Significant Beneficial/ Significant Beneficial
9	0 acres enhanced by reduced flood levels. 18,295 acres unaffected by project. No mitigation necessary.	Insignificant/ Insignificant

impacts to prime farmland were not evaluated because of the uncertainty of land use changes as a result of increased flood control. The end result of this protection may be the conversion of agricultural lands to industrial, commercial, or recreational uses. Table IV-42 shows the impacts and effects of plans to prime farmland.

(3) Mitigation

In Plan 3, approximately 190 surface acres of known and potential sand and gravel deposits on the Fort McDowell Indian Community would be acquired for the project and inundated during operation. A mitigation policy which would allow mining operations to continue beyond the limits of the

Confluence maximum storage pool would reduce loss of on-site resources from 33 percent to 27 percent. Increasing sand and gravel production capabilities at the Fort McDowell Indian Community may require Federal assistance for equipment, market development, and other related items.

Historically there has not been a policy for mitigation of environmental losses of prime farmland. However, on-site losses could be minimized if additional acreage of prime farmland were brought into agricultural production as a replacement for the acreage lost. With Plans 1, 2, 6, and 7 on-site mitigation of prime farmland losses is not possible. With Plan 3, some prime farmland acreage loss could be prevented if a policy was established allowing acreage outside the Confluence maximum storage pool to remain under agricultural production.

(4) Residual Impacts

Unmitigatable losses of prime farmland occur at the Cliff site (130 acres) and at the Confluence site (350 acres). Loss at Cliff is a residual impact of all plans. Loss at Confluence site occurs in Plan 3.

(5) Impacts with Modified Roosevelt and Modified Stewart Mountain Dams in Plans

Impacts would be the same for New or Modified Roosevelt or Stewart Mountain because lake elevations, size, storage allocations, and level of flood control would be identical for a new structure or modified dam. Therefore, there is no significant difference in impact at either location for geology/soils.

e. Land Resources

(1) Types of Impacts to Land Resources

The land resource analysis focuses on two factors: impacts on adjacent land resources (land use compatibility), and impacts of potential secondary development opportunities and induced land use changes of regional significance (land use conversions). Complex site-specific landownership and institutional decisions and agreements will be required once the preferred plan has been selected and detailed engineering plans have been completed.

Table IV-42

IMPACTS TO PRIME FARMLAND

<u>Plan</u>	<u>Impact/Mitigation</u>	<u>Effect</u> <u>Unmitigated/Mitigated</u>
1,2	130 acres of prime farmland at Cliff site acquired for project. On site mitigation is not possible.	Significant Adverse/ Significant Adverse
3	850 acres of prime farmland acquired for project (130 acres at Cliff site, 720 acres at Confluence site). On site mitigation at Cliff site not possible. Mitigation at Confluence site could reduce loss of 720 acres to 350 acres; mitigation of total loss is not possible.	Significant Adverse/ Significant Adverse
6,7	130 acres of prime farmland at Cliff site acquired for project. On site mitigation is not possible. Prime farmland acreage within New Waddell site area boundary is not affected by the project.	Significant Adverse/ Significant Adverse
9	No prime farmland affected by project.	Insignificant/ Insignificant

(2) Direct and Indirect Impacts

(a) Plan 8

The CAWCS no-action alternative, Plan 8, will not provide any additional increment of flood protection to areas within the Agua Fria, Verde and Salt/Gila River floodplains, and thus will limit or prohibit the implementation of proposed plans such as the

Rio Salado Development District, Sky Harbor International Airport Expansion, and the Maricopa County Flood Control District channel maintenance program.

As the Phoenix metropolitan area expands, considerable development will likely occur on presently vacant lands and agricultural lands located outside of the 100-year flood plain. However, the land use patterns of the Gila River flood plain below the Salt/Gila confluence will most likely remain essentially as agricultural/conservation open space areas, with development opportunities generally prohibited by possible flood flows from the Salt and Gila Rivers and their uncontrolled tributaries.

The predominantly open space desert characteristics of the Cliff area are expected to be maintained in the future given present Forest Service land management plans and policies. Additionally, lands along the Verde River corridor immediately north of the existing Sheep Bridge near Hot Springs have been determined to meet criteria for possible Congressional designation as a wild and scenic river. Through the Tonto National Forest the Verde flood plain is likely to continue to remain as an open space area primarily used for recreational, conservation, and livestock grazing purposes (Forest Service, Tonto National Forest).

Roosevelt Lake is the largest water body in the CAWCS study area. The recreational facilities at Roosevelt Lake are expected to increasingly serve regional recreational demands.

Developments which are expected to occur in the Confluence area include the continued development of the Fountain Hills, Rio Verde, and Goldfield Estates urban areas; the construction of some additional Forest Service recreational facilities and upgrading of access routes near the Blue Point Bridge on the Lower Salt River; and, the development of approximately 5,000 acres of irrigated agricultural lands and the establishment of sand and gravel mining operations at five locations on the Fort McDowell Indian Community. The Salt River Indian Community also has conceptual plans for commercial recreation developments extending from the Confluence site to south of Granite Reef Diversion Dam. The presently unincorporated area immediately south of the Tonto National Forest between Granite Reef Diversion Dam and the Superstition Mountains is likely to be urbanized as part of the City of Mesa.

Several public- and private-sector plans have been proposed within the Lake Pleasant vicinity. Such plans include State acquisition of selected BLM lands with eventual disposition planned to private developers; City of Peoria annexation of State trust lands for future

development; and, the Cities of Phoenix and Glendale are considering alternative locations for a new water treatment plant to deliver CAP municipal and industrial water. Residential and electronic/engineering industrial development are also being considered in the Lake Pleasant vicinity.

(b) Plan 1

Land use compatibility assessments for the alternative action plans are based on four major assumptions:

- Land areas encompassed within the surcharge space at the reservoirs will be managed as open space with natural habitat land cover;

- All construction-related sites will be completely reclaimed as stated in the plan descriptions;

- Present Congressional, Forest Service, Indian and local governmental land management and conservation policies will remain relatively unchanged for national forests, Indian reservations and regional parks through the next century; and

- Any future developments on adjacent private lands will be planned and implemented in accordance with contemporary zoning and environmental regulations so as to minimize the formation of any potential incompatible land use patterns.

The implementation of Plan 1 would likely result in only insignificant modifications to the existing land use compatibility of parcels located adjacent to the maximum storage pools. Almost all of the parcels adjacent to the proposed reservoirs are classified as mostly compatible open space desert rangelands within the Tonto National Forest. The effect of Plan 1 on land use compatibility is considered Insignificant.

No significant use conversions are expected as a result of Cliff, Roosevelt and Stewart Mountain Dams because these are almost exclusively public lands located within the Tonto National Forest.

Plan 1 would reduce flood flows in the Salt River significantly. The 100 year flood, for instance, would be reduced from 215,000 cfs to 55,000 cfs at Sky Harbor International Airport. This flood protection would eliminate the flooding of 6219 acres of land, then by creating many opportunities for land conversions and redevelopment of adjacent parcels along the Salt River corridor through the cities of Mesa, Tempe, and Phoenix. These changes in land use would be governed by local zoning ordinances, and would be influenced by an increase in the value of land.

For the past decade local governments have supported a plan for the development of the Salt River corridor known as "Rio Salado". The Rio Salado Development District (RSDD) was established by the State Legislature to formulate a master plan for the development of the area.

A draft of the master plan is currently being considered by the RSDD. It includes a continuous regional park, and intensive development of its banks for industry, housing, recreation, tourism, cultural and educational uses. One of several obstacles to implementation of the Rio Salado concept is that the area is prone to flooding. Other obstacles are that the RSDD lacks authority to levy taxes, lacks the power of eminent domain, lacks the authority to zone or regulate land use, and lacks the funds required for implementation.

The flood protection afforded by Plan 1 would remove one of the obstacles to Rio Salado implementation. If flood protection is not provided by the Federal Government, local government is expected to explore the feasibility of implementing its own plan. Although Rio Salado might be influenced by the implementation of this plan it cannot be established that Rio Salado will necessarily follow the implementation of Plan 1, or it will be precluded if flood control is not provided by the Federal Government.

At Sky Harbor International Airport the 1,100-foot reconstruction of the eastern part of the southern runway destroyed during the three recent floods was completed in November 1983. Plan 1 would provide adequate permanent flood protection required for the reconstructed runway (City of Phoenix).

Also at Sky Harbor, the concept of constructing a third 9,000-foot parallel runway requiring the relocation or channelization of a segment of the Salt River has been proposed.

None of the CAWCS alternative plans would create additional land development/land conversion opportunities in flood plain areas downstream of the Salt/Gila confluence nor would they provide an adequate level of permanent flood protection to preclude the need for Maricopa County Flood Control District to develop and maintain a cleared (from phreatophytic vegetation) and graded 1,000-foot-wide corridor within the floodway of the Salt and Gila Rivers from 91st Avenue to Gillespie Dam (Maricopa County Flood Control District, Fish and Wildlife Service).

The effects of land use conversion impacts have been assessed as Significant Beneficial for Plan 1.

(c) Plan 2

The land resources impacts of Plan 2 are the same as Plan 1, with the following exceptions for land conversions.

Plan 2 is a limited structural plan, and would provide flood control of the 100-year event to 157,000 cfs, rather than 55,000 cfs, at Sky Harbor Airport; thereby protecting approximately 2,248 acres of land located in the present flood plain. Implementation of Plan 2 would not enhance development opportunities in the vicinity of any of the proposed dam sites.

An Insignificant effects value has been assigned to identified land conversion impacts of Plan 2.

(d) Plan 3

Land resources impacts of Plan 3 are the same as Plan 1 with the addition of impacts at the Confluence site.

At the Confluence site some adjacent residential parcels would periodically overlook reservoir drawdown areas. Also, new recreational facilities could complement the planned Goldfield Estates Residential Community. Overall, the effect of land use compatibility impacts of Plan 3 is considered Insignificant.

Under Plan 3, the Confluence Dam and Reservoir would necessitate the acquisition of approximately 9,460 acres of Fort McDowell and Salt River Indian reservation lands and would preclude the planned development of irrigated agricultural lands and planned sand and gravel mining operations on the Fort McDowell Indian Community.

On privately owned lands, the anticipated rate of urban development could be slightly accelerated. Also, some limited urban development could potentially occur on approximately 1,200 acres of adjacent State trust lands. In total, the effect of land use conversions in Plan 3 is considered Insignificant.

(e) Plan 6

The impacts of Plan 6 are the same as Plan 1, with the following additions.

Implementation of Plan 6 may permit or accelerate urbanization of the northern and western sectors of the greater Phoenix metropolitan area. This is because of a locational advantage offered by storage of CAP water intended for municipal and industrial purposes at the New Waddell site instead of storage at the Confluence site.

Implementation of the proposed larger New Waddell Dam and Lake Pleasant Reservoir under Plan 6 would necessitate the acquisition of approximately 1,350 acres of privately owned lands, 400 acres of BLM National Resource Lands, and 2,050 acres of Arizona State Land Department trust lands.

Also, under Plan 6 no land conversion opportunities are likely within the 35-mile segment of the Agua Fria River flood plain between the existing Waddell Dam and the Agua Fria/Gila River confluence because the New Waddell Dam would provide only incidental additional downstream flood protection.

Overall, the effect of Plan 6 for land use conversions is considered Significant Beneficial.

(f) Plan 7

Plan 7 is the same as Plan 6 except that it would provide approximately 30,000 af of water per year of water for the Rio Salado Development District. Because of this, the effect of Plan 7 for land use conversions is considered a Beneficial Flag.

(g) Plan 9

The land resources impacts of Plan 9 are the same as Plan 1, with the following exceptions for land conversions.

Plan 9 would provide flood control of the 100-year event to 170,000 cfs, rather than 55,000 cfs, at Sky Harbor Airport; thereby protecting approximately 2,000 acres of land located in the present flood plain. Implementation of Plan 9 would not enhance development opportunities in the vicinity of any of the proposed dam sites.

An insignificant effects value has been assigned to identified land conversion impacts of Plan 9.

(3) Mitigation

Because of the generally insignificant and/or beneficial effects of CAWCS plans, no mitigation is recommended.

(4) Residual Impacts

There are no residual impacts since no mitigation is proposed.

(5) Impacts with Modified Roosevelt and Modified Stewart Mountain Dams in Plans

Impacts would be the same at Roosevelt or Stewart Mountain because lake elevations, size, storage allocation, and land use and ownership would be identical for a new structure or modified dam. Therefore, there is no significant difference in impact at either location for land resources.

8. Summary of Impacts

The impacts of the alternative plans are summarized for significant resources (biological resources, water quality, recreation, cultural resources, social resources, and economics) in Table IV-43 (environmental impacts), Table IV-44 (social impacts), and Table IV-45 (economic impacts).

C. Mitigation Plan for the Proposed Action (Plan 6)

Reclamation is committed to either minimize or eliminate the adverse impacts caused by the proposed action. The mitigation plan specifies the measures adopted by Reclamation at this time. However, specific features may be adjusted to accommodate changes incurred during project implementation.

Table IV-43

SUMMARY OF ENVIRONMENTAL IMPACTS AND EFFECTS OF PLANS

Factors/Measures	Plan 8 CAWCS No Action (Future Without Project)	Plan 1	Plan 2	Plan 3	Plan 6	Plan 7	Plan 9
<u>BIOLOGICAL RESOURCES</u>							
<u>Threatened/Endangered Plants and Wildlife</u>							
Loss of acres of preferred habitat in typical year (bald eagle in all plans and Yuma clapper rail in Plan 3)	+300 (2,260 acres in site areas)	-440	-430	-1,030	-440	-440	-170
Number of bald eagle breeding areas with disrupted productivity as a result of loss of stream miles (see Perennial Stream/Riverine Communities factor)	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	0	2	3	1	0
Conceptual Mitigation		Establish 230 acres preferred habitat	None proposed	Establish 370 acres preferred habitat	Section 7 reasonable and prudent alternatives will be implemented	Establish 280 acres preferred habitat	None proposed
Typical Year Unmitigated/Mitigated Effect		SA/I	I	AF/AF	SA/I	SA/I	I
<u>Riparian/Wetland Biotic Communities</u>							
Loss or gain of high quality habitat in typical year	-2,260 (9,970 acres in site areas)	-930	-900	-3,330	-1,140	-1,140	-740
Loss or gain of low-quality habitat in typical year	-90 (1,940 acres in site areas)	+420	+860	+1,040	+1,030	+1,020	+740
Total loss or gain of acres of habitat in typical year	-2,350 (11,910 acres in site areas)	-510	-40	-2,290	-110	-120	0
Conceptual Mitigation		Establish 480 acres of high quality habitat	Establish 790 acres of high quality habitat	Establish 1,060 acres of high quality habitat	Establish 1,060 acres of high quality habitat	Establish 1,060 acres of high quality habitat	Establish 120 acres of high quality habitat
Typical Year Unmitigated/Mitigated Effect (on high quality habitat)		SA/SA	SA/SA	AF/AF	SA/I	SA/SA	I/I

Table IV-43 (Continued)

Factors/Measures	Plan 8 CAWCS No Action (Future Without Project)	Plan 1	Plan 2	Plan 3	Plan 6	Plan 7	Plan 9
BIOLOGICAL RESOURCES Cont'd							
<u>Perennial Stream/ Riverine Communities</u>							
Loss of miles of perennial stream in typical year	0 (70 miles in site areas; 137 miles in CAWCS area)	-3	+1	-16	+1	-2	0
Change in flow characteristics of Salt and Verde Rivers	No change (on average, 106 days/year \leq 50 cfs in Salt, 61 days/year \leq 50 cfs in Verde)	No change	No change	No change	No change	Guaranteed minimum flows of 200 cfs in Salt and Verde	No change
Conceptual Mitigation		None proposed	None proposed	Stream losses not mitigatable	None proposed	None proposed	None Proposed
Typical Year Unmitigated/ Mitigated Effect		I	I	AF/AF	I	SB	I
<u>Reservoir Aquatic Communities</u>							
Gain or loss of surface acres of habitat in typical year	0 (13,640 acres in site areas; 30,000 acres in CAWCS area)	+400	-360	+3,080	+1,900	+3,690	+1,770
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 Cliff and New Waddell	0
Drawdown rates greater than 2 inches/day during spawning season	No change (drawdown rates 1.3 in/day at Roosevelt, 9.2 in/day at Horseshoe, 1.6 in/day at Lake Pleasant)	4.6 in/day at Cliff (decrease from current condition)	9.2 in/day at Cliff (no change from current condition)	4.0 in/day at Cliff and 2.6 in/day at Confluence (increase over current condition)	4.0 in/day at Cliff and 4.7 in/day at New Waddell (increase over current condition)	4.5 in/day at Cliff and 4.7 in/day at New Waddell (increase over current condition)	4.7 in/day at New Waddell
Conceptual Mitigation		None proposed	None proposed		Reduction in drawdown rates to 2 in/day during spawning season		
Typical Year Unmitigated/ Mitigated Effect		I	I	SA/SB	SA/SB	SA/BF	SA/SB

Table IV-43 (Continued)

Factors/Measures	Plan 8 CAWCS No Action (Future Without Project)	Plan 1	Plan 2	Plan 3	Plan 6	Plan 7	Plan 9
WATER QUALITY							
Constituents							
	CAP water in local systems at locations and times chosen by users. Local surface water sources maintain quality independent of CAP influence. CAP water known to have high levels of dissolved organics	Average of 70,000 af of SRP (Verde River) water exchanged w/CAP each year. <u>Comparison of Water Sources^a</u> (mg/l)	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. <u>Changes in Average Verde River Concentrations^a</u> (mg/l)	Annual average of 25,000 af of MCMWCD#1 surface water mixed with 701,800 af of CAP water at Waddell site. None of the MCMWCD#1 water treated for M&I uses. <u>Changes in Average MCMWCD#1 Concentrations^a</u> (mg/l)		
		Verde CAP					
		Ca 42.5 85.6		Ca 42.5 to 61.4 (+44%)	Ca 50.8 to 84.4 (+66%)		
		D Cd 0.00156 <0.000286		D Cd 0.00156 to 0.00100 (-36%)	D Cd <0.00300 to 0.000378 (-87%)		
		T Cd 0.00619 <0.00462		T Cd 0.00619 to 0.00550 (-11%)	T Cd <0.00150 to 0.00451 (+201%)		
		T Fe 0.192 0.159		T Fe 0.192 to 0.178 (-7%)	T Fe 2.04 to 0.223 (-89%)		
		Hard 212. 339.		Hard 212. to 268. (+26%)	Hard 215. to 335. (+56%)		
		Na 30.5 107.		Na 30.4 to 64.0 (+111%)	Na 37.8 to 105. (+178%)		
		D Pb 0.00300 0.00144		D Pb 0.00300 to 0.00232 (-23%)	D Pb 0.00200 to 0.00146 (-27%)		
		T Pb 0.0714 0.0408		T Pb 0.0714 to 0.0580 (-19%)	T Pb 0.00425 to 0.0396 (+832%)		
		D Se 0.000750 <0.00300		D Se 0.000750 to 0.00174 (+132%)	D Se <0.00100 to 0.00293 (+193%)		
		T Se 0.000600 <0.00279		T Se 0.000600 to 0.00156 (+160%)	T Se <0.00100 to 0.00273 (+173%)		
		SO ₄ 52.9 309.		SO ₄ 52.9 to 165. (+212%)	SO ₄ 85.0 to 301. (+254%)		
		TDS 314. 722.		TDS 314. to 493. (+57%)	TDS 358. to 710. (+98%)		
		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.		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. High dissolved organic levels in CAP water reach water treatment plants which otherwise would receive only SRP water.		After-mix maximum MCMWCD#1 concentrations reach new highs for numerous constituents with no significant effect on agricultural users.	
Conceptual Mitigation	None proposed	Not applicable	None proposed	None proposed	None proposed	None proposed	
Typical Year Unmitigated Effect	I	No effect	SA	I	I		

Table IV- 43 (Continued)

Factors/Measures	Plan 8 CAWCS No Action (Future Without Project)	Plan 1	Plan 2	Plan 3	Plan 6	Plan 7	Plan 9
<u>WATER QUALITY Cont'd</u>							
<u>Eutrophication</u>							
Potential for eutrophic conditions to occur in reservoirs which store CAP Colorado River water in CAWCS study area ^b .	No Colorado River water storage reservoir in study area.	Same as Future Without Condition		Confluence Reservoir has high potential for eutrophication with high probability for blue-green algal dominance. Probable aesthetic impacts on Verde arm in most years. Eutrophication provides potential for increased levels of dissolved organics in Confluence Reservoir water.			New Waddell Reservoir has low to moderate potential for eutrophication with no projected problems
Conceptual Mitigation		----- Not applicable -----		Downstream impacts mitigatable with different disinfection process for SRP M&I water.			None proposed
Typical Year Unmitigated/ Mitigated Effect		----- No Effect -----		SA/I	I		I
<u>Salt Loading</u>							
Increased amount of dissolved salts imported in Colorado River water.	Baseline CAP imports average of 1,020,000 tons of dissolved salts each year.	10.6% increase in average annual imported salt volume.	1.6% increase in average annual imported salt volume.	16.2% increase in average annual imported salt volume.			13.3% increase in average annual imported salt volume.
Conceptual Mitigation		None proposed	None proposed	None proposed			None proposed
Typical Year Unmitigated/ Effect		I	I	I	I		I

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^aPrefix D means dissolved fraction while T means total recoverable. All values shown rounded to three significant figures. Constituents shown on this table were selected to show some significant impacts; a more complete list of constituents and their impacts is included in Chapter IVB2.

^bEutrophication potentials were computed using the Canfield and Bachman equations described in the USSR Technical Memorandum titled "Guidelines for Studies of Potential Eutrophication" Denver, Co., 1981. Risk of eutrophication under normal operating conditions is based on phosphorus concentration which is assumed uniform over the studied area.

Table IV-43 (Continued)

Factors/Measures	Plan 8 CAWCS No Action (Future Without Project)	Plan 1	Plan 2	Plan 3	Plan 6	Plan 7	Plan 9
<u>CULTURAL RESOURCES</u>							
<u>Prehistoric Cultural Resources</u>							
Number of sites destroyed by construction activities/total number of sites potentially affected in dam site areas ^c	0 sites in site areas)	132/2,942	72/2,942	156/3,208	158/3,062		53/3603
Acres of archaeological deposits affected	0 acres of deposits in site areas)	4,272	4,272	12,015	4,374		4688
Effects Factor (for total sites affected) ^d		-5,760	-4,747	-14,665	-5,887		-5456
Conceptual 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
<u>Historic Cultural Resources</u>							
Number of sites destroyed by construction and related activities/total number of sites potentially affected in dam site areas ^c	0 (192 sites in site areas)	29/64	29/64	73/90	39/73		36/67
Effects Factor (Range) ^d		-73 to -320	-173 to -370	-438 to -798	-225 to -422		-207 to -383
Conceptual Mitigation		Avoiding resource; partial data recovery; site protection; site documentation (e.g., recording surface architecture or structural features); additional historical research.					
		Roosevelt Dam and Verde River Sheep Bridge impacts only partially mitigable		Fort McDowell, Roosevelt Dam, and Verde River Sheep Bridge impacts only partially mitigable	Roosevelt Dam and Verde River sheep Bridge impacts only partially mitigable		Roosevelt Dam impacts only partially mitigable
Unmitigated/Mitigated Effect		AF/AF	AF/AF	AF/AF	AF/AF		AF/AF

^cAffected areas include all reservoir pool zones plus a secondary impact zone that extends approximately 1 mile beyond the maximum water surface elevation.

^dThis factor incorporates both the quality of the resource and the severity of the impacts. See Stage III Methodology for Environmental Quality Assessment (Dames & Moore, 1981) for details.

Table IV-43

Factors/Measures	Plan 8 CAWCS No Action (Future Without Project)	Plan 1	Plan 2	Plan 3	Plan 6	Plan 7	Plan 9
<u>RECREATION</u>							
<u>Stream-Oriented Recreation</u>							
Net loss or gain of miles of perennial stream/loss of tubing miles in typical year	0/0 (70 stream miles in site areas; 986 miles in 5-county region)	-3/0	+1/0	-16/17	+1/0	-2/0	0/0
Net loss or gain in maximum annual recreation days for stream-oriented activities in typical year	0/0 (2,280,000 stream-oriented recreation days in site areas; 8,236,000 in 5-county region)	+5,850	+696	-1,504,802	+7,992	+6,386	0
Conceptual Mitigation		None proposed	None proposed	Loss of stream miles not mitigatable	None proposed	None proposed	None proposed
Typical Year Unmitigated/Mitigated Effect		I	I	AF/AF	I	I	I
<u>Reservoir-Oriented Recreation</u>							
Net loss or gain in usable surface acres in typical year	0 (16,600 acres in site areas; 35,000 in 5-county region)	+683	-853	+5,243	+4,222	+5,095	+4,233
Net loss or gain in maximum annual recreation days for reservoir-oriented activities in typical year	0 (822,000 reservoir-oriented recreation days in site areas; 6,479,000 for 5-county region)	+670,520	-48,647	+3,537,383	+1,066,005	+1,085,873	+884,000
Conceptual Mitigation		----- None proposed for this factor -----					
Typical Year Unmitigated Effect		SB	I	SB	SB	BF	SB

Table IV-44

SUMMARY OF SOCIAL IMPACTS AND EFFECTS OF PLANS

	Relocation of Indian People	Relocation of Non-Indian People	Flood Damage Reduction
<p><u>Plan 8</u> CAWCS No Action (Future Without the Project)</p>	<p>For 374 Fort McDowell Indian Community residents:</p> <ul style="list-style-type: none"> Normal incidence of physical and mental health problems. High satisfaction with way of life. High levels of personal autonomy. High potential for increased financial self-sufficiency. High levels of extended family ties. Normal incidence of family problems. High community cohesion and viability. High potential for increased tribal economic self-sufficiency. Moderate levels of unemployment. High potential for sustaining Yavapai culture. 	<p>For 596 Roosevelt Lake area residents:</p> <ul style="list-style-type: none"> Normal incidence of physical and mental health problems. High levels of personal autonomy. High satisfaction with way of life. High potential for financial self-sufficiency. <p>Low levels of informal support networks in all communities except Roosevelt Gardens.</p> <p>Low to moderate community cohesion in all communities except Roosevelt Gardens.</p> <p>Community development likely to remain at present low level.</p>	<p>For 46,560 people living in the flood prone areas by the year 2000 (conditions occur with a 200-year flood of 275,000 cfs)</p> <p>COMMUNITIES AFFECTED: Mesa, Tempe, Phoenix, Salt River Pima Maricopa Indian Community (SRPMIC), Gila River Indian Community (GRIC), Buckeye, Holly Acres:</p> <p>Potential for inundation for 46,560 individuals. High probability for large numbers of flood-related deaths. Projected \$87,292,000 in residential property damage.</p> <p>Temporary lifestyle disruption for 46,560 individuals subjected to inundation by floodwaters. Permanent changes in lifestyle for majority of 525 sequential disaster victims in Holly Acres.</p> <p>Damages to roads and bridges projected to be \$15,800,000. Transportation delay costs projected to be \$39,694,000. Air and rail facility damages projected to be \$7,021,000.</p> <p>Damages of \$6,400,000 to power facilities. >\$275,000 in damages to treatment plants.</p> <p>Temporary delays in telephone service.</p> <p>Business losses of \$68,713,000; combined with both short- and long-term revenue losses, costs could be in excess of \$150 million.</p> <p>Short- and long-term losses to tourism.</p> <p>Civil defense warning system fully activated. Emergency costs of \$1,109,000.</p> <p>No additional land available for development.</p>

Table IV-44 (Continued)

Relocation of Indian People	Relocation of Non-Indian People	Flood Damage Reduction
<u>Plan 1</u>	Same as Future-Without conditions.	<p><u>IMPACTS</u> For 46,560 people living in the flood prone areas by the year 2000 (conditions occur with reduction of a 200-year flood to 70-92,000 cfs at airport): Potential for inundation for less than 100 individuals in Holly Acres area.</p> <p>Projected \$602,000 in residential property damage.</p> <p>Temporary lifestyle disruption for <100 individuals; permanent lifestyle disruption for majority of sequential disaster victims in Holly Acres.</p> <p>15 bridge crossings remain operable. Damages to roads and bridges totaling <\$5,000,000. No significant delays in transportation.</p> <p>Damages to electrical transmission towers and power lines would be well below \$1 million.</p> <p>Possibility of delays in telephone service for some. No delays in delivery schedules of newspapers, mail, etc.</p> <p>Business losses totaling \$6,194,000; majority of damages occurring to sand and gravel operations.</p> <p>No significant disruption to tourist trade.</p> <p>Emergency costs would be below \$60,000.</p> <p>Approximately 3,563 additional acres valued at \$107,311,000 available for higher urban uses.</p>
	<p><u>IMPACTS</u> For 347 Roosevelt Lake area residents: Slight increase in incidence of physical and mental health problems. Substantial decrease in personal autonomy. Substantial decrease in satisfaction with way of life. Moderately reduced financial capacity. Moderate decrease in informal support networks. Moderate decrease in community cohesion. Substantial decrease in community viability.</p> <p><u>MITIGATION:</u> Relocate only those people who live within the 200-year flood pool, with no relocation of people in the IDF area. Provide Forest Service land in the Roosevelt Lake area for relocations, allowing enough space so neighbors may relocate near each other if they wish. Provide monetary compensation for all relocation expenses incurred by residents. Provide special services to meet needs that are unique to these communities. Provide an accurate and reliable system for disseminating information to residents so that they are constantly informed about relocation proceedings; provide a means by which residents can participate in the relocation planning process.</p> <p><u>UNMITIGATED/MITIGATED EFFECT:</u> SA/I</p>	<p><u>MITIGATION:</u> Not required</p> <p><u>UNMITIGATED EFFECT:</u> BF</p>

Table IV-44 (Continued)

Relocation of Indian People	Relocation of Non-Indian People	Flood Damage Reduction
<p><u>Plan 2</u></p>	<p>Same as Future-Without conditions.</p>	<p><u>IMPACTS</u> For 46,560 people living in the flood-prone areas by the year 2000 (conditions occur with a reduction of 200-year flood to 157,000 cfs at airport); Potential for inundation of approximately 525 individuals. Low probability of flood-related deaths.</p> <p>Projected \$5,684,000 in residential property damage.</p> <p>Temporary lifestyle disruption for 525 individuals inundated; permanent lifestyle disruption for many sequential disaster victims in Holly Acres.</p> <p>15 bridge crossings remain operable. Closure of all dip crossings. Damages to roads and bridge crossings totaling >\$5,000,000. No significant delays in transportation.</p> <p>Damages totaling \$1,500,000 to electrical transmission towers and power lines. Approximately \$80,000 in damages to sewage and wastewater treatment plants.</p> <p>Temporary delays in telephone service in some areas. No delays in delivery schedules of newspapers, mail, etc.</p> <p>Business losses totalling \$6,977,000; majority of damages to sand and gravel operations.</p> <p>No significant disruption in tourist trade.</p> <p>Civil defense warning system fully activated. Emergency costs in excess of \$505,000.</p> <p>2,248 acres valued at \$66,026,000 available for higher urban uses.</p> <p><u>MITIGATION:</u> Not required.</p> <p><u>UNMITIGATED EFFECT:</u> SB</p>
	<p><u>IMPACTS</u> For 247 Roosevelt Lake area residents: Slight increase in incidence of physical and mental health problems. Substantial decrease in personal autonomy. Moderate decrease in satisfaction with way of life. Moderately reduced financial capacity. Moderate decrease in informal support networks. Moderate decrease in community cohesion and slight decrease in social organization. Substantial decrease in potential for sustained community viability.</p> <p><u>MITIGATION:</u> Relocate only those people who live within the 200-year flood pool, with no relocation of people in the IDF area.</p> <p><u>UNMITIGATED/MITIGATED EFFECT:</u> SA/No effect</p>	

Table IV-44 (Continued)

	Relocation of Indian People	Relocation of Non-Indian People	Flood Damage Reduction
<u>Plan 3</u>	<p><u>IMPACTS:</u> For 290 Fort McDowell Indian Community residents: High incidence of physical and mental health problems which is expected to result in increased illness and mortality. Extreme decline in levels of personal autonomy. Extreme decrease in satisfaction with way of life. Substantial decrease in potential for sustained financial self-sufficiency. Substantial decrease in extended family ties. Substantial increase in incidences of family problems. Extreme decrease in community cohesion and viability. Substantial decrease in potential for tribal economic self-sufficiency; substantial increase in unemployment. Extreme decrease in potential to sustain Yavapai culture.</p> <p><u>MITIGATION:</u> Relocate the entire community together. Provide land of the highest available quality contiguous to the reservation. Monetary compensation should cover all expenditures. Provide for participation of the entire community in all decisions and plans. Provide a system for disseminating information to residents.</p> <p><u>UNMITIGATED/MITIGATED EFFECT:</u> AF/AF</p>	Impacts and effects same as Plan 1.	Impacts and effects same as Plan 1.
<u>Plan 6</u> (Agency Proposed Action)	Same as Future-Without conditions.	Impacts and effects same as Plan 1.	Impacts and effects same as Plan 1.
<u>Plan 7</u>	Same as Future-Without conditions.	Impacts and effects same as Plan 1.	Impacts and effects same as Plan 1.

Table IV-44 (Continued)

Relocation of Indian People	Relocation of Non-Indian People	Flood Damage Reduction
Plan 9	Same as Future-Without conditions.	Impacts and effects same as Plan 1.
		<p>IMPACTS For 46,560 people living in the flood-prone areas by the year 2000 (conditions occur with a reduction of 200-year flood to 215,000 cfs at airport): Potential for inundation of >525 individuals. Low probability of flood-related deaths.</p> <p>Projected \$18,954,000 in residential property damage.</p> <p>Temporary lifestyle disruption for >525 individuals inundated; permanent lifestyle disruption for many sequential disaster victims in Holly Acres.</p> <p>3 bridge crossings remain operable. Closure of all dip crossings. Damage to roads and bridge crossings totaling \$9,100,000. Significant delay in transportation.</p> <p>Damages totalling \$4,800,000 to electrical transmission towers and power lines. Greater than \$135,000 in damages to sewage and wastewater treatment plants.</p> <p>Temporary delays in telephone service in some areas. Delays in delivery schedules of newspapers, mail, etc.</p> <p>Business losses totalling \$21,761,000; majority of damages to sand and gravel operations.</p> <p>Short-term disruption in tourist trade.</p> <p>Civil defense warning system fully activated. Emergency costs in excess of \$809,000</p> <p>MITIGATION: Not required.</p> <p>UNMITIGATED EFFECT: B</p>

TABLE IV-45

SUMMARY OF ECONOMIC COSTS AND BENEFITS OF PLANS

ECONOMICS	Plan	Total Construction Cost (\$ Range) ^a	Total Annual Cost (\$ Range) ^a	Total Annual Benefits (\$)	Net Economic Benefits (\$ Range) ^a
	Plan 8 (No CAWCS Action)	0	0	0	0
	Plan 1	694,940,000 to 874,230,000	58,060,000 to 71,300,000	89,040,000	30,980,000 to 17,740,000
	Plan 2 ^b	541,570,000 to 627,460,000	41,870,000 to 48,210,000	53,310,000	11,440,000 to 5,100,000
	Plan 3	1,116,250,000 to 1,295,540,000	93,970,000 to 107,200,000	125,970,000	32,000,000 to 18,770,000
	Plan 6 (Agency Proposed Action)	978,430,000 to 1,157,720,000	82,710,000 to 95,940,000	174,290,000	91,580,000 to 78,350,000
	Plan 7	same as Plan 6	same as Plan 6	168,160,000	85,450,000 to 72,220,000
	Plan 9	931,790,000 to 1,111,080,000	76,030,000 to 89,260,000	143,089,000	53,829,000 to 60,169,000

^aCosts range from Modified Roosevelt/Modified Stewart Mountain options to New Roosevelt/New Stewart Mountain options. Net economic benefits correspond to these options. Costs of plans would be allocated among several funding sources; for this analysis 2 sources were assumed: Reclamation Safety of Dams Act and Colorado River Basin Project Act.

^bNew Roosevelt is not included in Plan 2.

The mitigation plan is displayed for only the proposed action because that is the action Reclamation expects to implement. If another action is recommended for implementation, then very similar mitigation measures would be applied to mitigate the impacts of that action, although the actual quantity and quality would most likely be different.

The following subsections describe the mitigation plan for Plan 6. For each major resource category, commitments for mitigation are established, various means for accomplishing the commitments are described, and additional opportunities are discussed.

1. Biological Resources

Based on Habitat Evaluation Procedures utilized in developing this mitigation plan, mitigation measures and project modifications are described which will fully alleviate impacts to Riparian/Wetland Communities, Reservoir Aquatic Communities, Perennial Streams, and Special Use Areas and avoid jeopardizing endangered species. Other Terrestrial Communities have mitigation measures presented which are also reasonable and feasible but provide less than full compensation for losses due to cost and operational constraints. Reservoir Aquatic Communities will benefit from the Plan 6 action due to increases in habitat and prey availability. However, the largemouth bass and allied species, which are the mainstay of the sport fishery at New Waddell, will be adversely affected by the action. This will directly affect the economic value of this resource.

Throughout the development of this mitigation plan Reclamation has coordinated with the Fish and Wildlife Service and the Arizona Game and Fish Department in accordance with the Fish and Wildlife Coordination Act and the Endangered Species Act. Recommendations made by these agencies have been considered in the selection of mitigation measures that will be implemented.

Additional opportunities have been identified for impact reduction and/or enhancement of habitat values. These measures could be considered if 1) the proposed measures are not effective in meeting the objective of no net loss of habitat value, or 2) enhancement of habitat value is determined to be appropriate and the required sponsorship of the measure is available. Implementation of these opportunities will be dependent on discussions with wildlife and land management agencies as well as an analysis of the cost and effectiveness of the measures.

The primary impacts described in Chapter IV are based on the effects of impounding water. The amount of water impounded and the operation of the reservoir were determined by forecasting the availability of water based on historical records. The mitigation of the effects of the reservoirs is therefore dependent on the accuracy of these forecasts. The best information available has been used to determine the compensation for the adverse effects of the project on fish and wildlife resources. If new data become available the effects and mitigation measures will be reassessed while attempting to maintain the level of compensation committed to herein.

The principal method for determining mitigation needs was the Habitat Evaluation Procedure developed by the Fish and Wildlife Service. This methodology quantifies changes in wildlife habitat quality and quantity over time. The measure used to quantify change is a Habitat Unit (HU). Habitat unit values have been derived for each habitat type impacted in the Plan 6 area. Habitat Unit Values for each resource category with and without mitigation are presented in Table IV-46.

a. Riparian/Wetland Communities

(1) Commitment

Reclamation is committed to implementing a plan that will result in no net loss of habitat values to the Riparian/Wetland Communities upstream of Bartlett and Stewart Mountain Dams and at Lake Pleasant. Reclamation is also committed to revegetating 250 acres of cottonwood-willow and 690 acres of mesquite at the Cliff site.

(2) Means of Accomplishing Commitment

(a) The methods for meeting this commitment will include revegetating cottonwood/willow and mesquite habitat types in suitable areas within the exposed bed of Horseshoe Reservoir above elevation 1940. Based on current information sufficient area will be exposed to recover all of the habitat value lost to construction and operation of Plan 6, including losses at Roosevelt and New Waddell Dams (Table IV-46). Additionally, only partial conservation pool clearing will occur in existing stands of the riparian/wetland community at New Waddell and Cliff Damsites, thereby reducing impacts. No clearing will occur at Roosevelt Dam under current plans.

(b) The mixed scrub at all sites and cattail habitat at Cliff Dam will recover without revegetation through natural succession as they do now when reservoirs are drawn down for extended periods of time. To ensure full development of the habitat values, livestock grazing and ORV use would need to be eliminated in this riparian area and fencing may be required if adequate protection is not provided through other means such as fencing the IDF areas. (See discussion on other Terrestrial Communities). The Tonto National Forest has further recommended that this area be set aside as a wildlife and waterfowl area and managed in cooperation with other wildlife and land management agencies. This recommendation will be implemented through a management agreement among these agencies. As these measures will be within the Tonto National Forest, this agency will be requested to manage the area.

(c) The draining of Horseshoe Reservoir and the breaching of Horseshoe Dam will be scheduled to coincide with the seeding and germination period of cottonwood and willow species in March and April. By draining the lake during this period, the increased production of cottonwood and willow trees would offset mixed scrub establishment, as mixed scrub species tend to germinate in early to mid summer. This measure will be reflected in the construction schedule for Cliff Dam. The implementation of this measure would reduce the initial cost of revegetation by eliminating the need to root plow, burn, or spray unwanted vegetation such as salt cedar and reduce the amount of plant materials required to accomplish the objective.

Table IV-46. Acreage and habitat units for the future without and the future with the project and; mitigated acreages, habitat units and costs for each mitigation measure in each community type affected in the Plan 6.

	RIPARIAN/WETLAND COMMUNITIES						Totals Habitat Value	Cost	
	Cliff		Roosevelt		Waddell				
	Acres	Habitat Value	Acres	Habitat Value	Acres	Habitat Value	Acres		
<u>FUTURE WITHOUT PROJECT AREA</u>	+1270	+5797	+2140	+11017	+480	+1992	+3890	+18806	N/A
<u>PROJECT IMPACTS</u>									
Construction impact	-480	-2037	-130	-647	-40	-173	-650	-2857	N/A
Conservation pool clearing	-353	-2553	0	0	0	0	-353	-2553	N/A
Conservation pool flooding	-117	-846	-240	-1609	-440	-1819	-797	-4274	N/A
Construction reclamation	+120	+830	+110	+500	+20	+99	+250	+1429	N/A
Succession	+690	+3168	+180	+401	+80	+275	+950	+3844	N/A
<u>FUTURE WITH PROJECT¹ REMAINING AREA</u>	+1130	+4377	+2060	+9662	+100	+374	+3290	+14413	N/A
<u>TOTAL IMPACT²</u>	-140	-1420	-80	-1355	-380	-1618	-600	-4393	N/A
<u>MITIGATION</u>									
Revegetation	+840	+6383	0	0	0	0	+840	+6383	\$840,000
Succession	-300	-1405	0	+3868	0	+72	-300	+2535	N/A
<u>FUTURE WITH PROJECT³ AREA MANAGED</u>	+1670	+9355	+2060	+13530	+100	+446	+3830	+23331	
Change due to Project	+400	+3558	-80	+2513	-380	-1546	-60	+4525	N/A
<u>TOTAL COST</u>		\$840,000		-0-		-0-			\$840,000

1. The remaining area equals future without project after accounting for project impacts.
2. Total impacts = future without project + future with project remaining area.
3. Future with project area managed = future with project remaining area with mitigated habitat values.
4. Succession represents an ecological change from one vegetation cover type to another.