Glen Canyon Dam Adaptive Management Program

Roles, Responsibilities, Schedules

and

Process Integration

Glen Canyon Adaptive Management Work Group
Technical Work Group

January 1998

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GLEN CANYON ADAPTIVE MANAGEMENT PROGRAM

1. INTRODUCTION AND PURPOSE[1]

The completion of the Final Glen Canyon Dam Environmental Impact Statement (FEIS) in March 1995 and signing of the Record of Decision (ROD) by the Secretary of the Department of the Interior on October 25, 1996 ushered in a new era of management associated with the operation of Glen Canyon Dam and downstream natural and cultural resources. The FEIS and the ROD require the development and implementation of a long-term adaptive management program (AMP). The AMP is intended to provide a process through which "...the effects of dam operations on downstream resources would be assessed and the results of those resource assessments would form the basis for future modifications of dam operations."[2] This paper is intended to briefly describe the various AMP components, applicable statutory authorities and mandates, and roles and responsibilities of the agencies and groups associated with the AMP. Additionally, the paper will describe the current AMP elements or specific programs which may require coordination, scheduling, or integration with other on-going processes in the Colorado River Basin.

2. DESCRIPTIONS AND COMPOSITION OF THE GLEN CANYON DAM ADAPTIVE MANAGEMENT PROGRAM

As mentioned above, the Glen Canyon Dam FEIS preferred alternative included the requirement to develop a process which provides cooperative integration of dam operations, resource protection and management, and monitoring and research information. The AMP would meet the purpose and strengthen the intent for which the FEIS was prepared and ensure that the primary mandate of the 1992 Grand Canyon Protection Act (GCPA) is met through future advances in scientific knowledge and resource management techniques.

On page 35, the FEIS identifies the principles and goals underlying the AMP as:

1. Monitoring and research programs should be designed by qualified researchers in direct response to the needs of management agencies;

2. A process is required to coordinate and communicate management agency needs to researchers and to develop recommendations for decision-making;

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[1]This paper is intended to provide general information to members of the Glen Canyon Dam Adaptive Management Work Group's Technical Work Group. Statements or information in this document are those of the author and do not necessarily represent the views or official positions of the Arizona Department of Water Resources, or other entities and agencies involved in the Glen Canyon Adaptive Management Program.

[2]*Glen Canyon Dam Final Environmental Impact Statement*, U.S. Bureau of Reclamation, March 1995, p. 34.

3. A forum is required for the transfer of monitoring and research investigation results to the management agencies and to develop consensus on management response to information on affected resource conditions, trends, and processes;

4. All monitoring and research programs in Glen and Grand Canyons should be independently reviewed; and

5. Interested parties identified in the GCPA should be provided the opportunity for full and timely participation in proposals and recommendations.

The specific AMP goals are also outlined on page 35 of the FEIS, and include:

1. Facilitating management response to monitoring and research information on affected resource conditions, trends, and processes;

2. Ensuring compliance with Section 1802 of the GCPA, and the statutory purposes for Glen Canyon Dam (the "Law of the River"), Grand Canyon National Park, and Glen Canyon National Recreation Area;

3. Assuring resource management obligations are defined and fulfilled in good faith without abridgement of any federal, state, Tribal, or other legal obligation; and

4. Providing a mechanism for resolving disputes.

The FEIS preferred alternative describes the organizational characteristics of the AMP in the following fashion:

> *The Adaptive Management Program would be administered through a senior Department of the Interior official (designee) and facilitated through an Adaptive Management Work Group (AMWG) organized as a federal advisory committee. The AMWG would be chaired by the designee and supported by a monitoring and research center and technical work group.*[3]

The AMP also requires the use of independent review panels to provide a review of technical studies and evaluations developed by the monitoring and research center. Figure 1 illustrates the organizational structure of the Glen Canyon Dam Adaptive Management Program.

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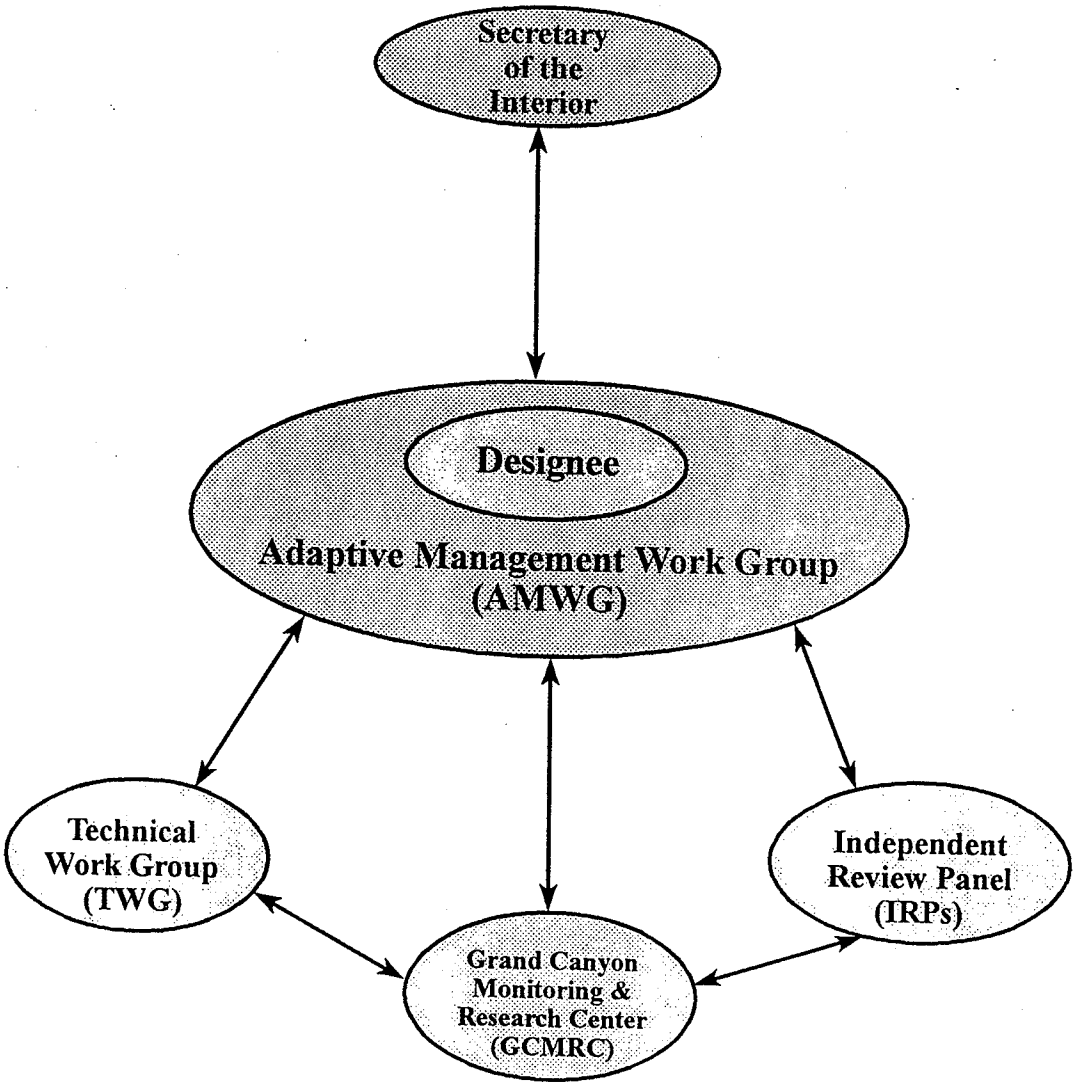
[3]*Glen Canyon Dam FEIS*, U.S. Bureau of Reclamation, March 1995, p. 36.

The AMP is to be directed by the Secretary's designee, who serves as the Secretary's principal contact for the AMP and as the focal point for issues and decisions associated with the program. According to the FEIS, the designee will review, modify, accept, or remand recommendations from the AMWG in making decisions about any changes in dam operation and other management actions.

Figure 1

Glen Canyon Adaptive Management Program
Organizational Structure



In summary, the Glen Canyon Adaptive Management Program is described in the Final EIS and adopted in the Secretary's ROD. The AMP's principle components includes the (1) Adaptive Management Work Group; (2) Technical Work Group; (3) Grand Canyon Monitoring and Research Center; (4) independent review panel(s); (5) a dispute resolution process; and (6) continued endangered fish research.

3. STATUTORY AUTHORITIES AND ADMINISTRATIVE MANDATES

Management of Glen Canyon Dam originates in a complex collection of interstate compacts, federal legislation, Supreme Court decrees, and international treaties. This collection of laws, compacts, treaties, and decrees are known as the "Law of the River." The Law of the River is interpreted, utilized, and relied upon by the seven Colorado River Basin States, Native American Tribes, and many different federal agencies (primarily in the Department of the Interior) while managing the myriad of resources associated with the Colorado River. Elements of the Law of the River which are applicable to the management of Glen Canyon Dam and implementation of the AMP include the following:

Colorado River Compact, November 24, 1922 (Appendix 1)
Treaty Between the United States and Mexico, February 3, 1944
Colorado River Storage Project Act, April 11, 1956 (Appendix 2)
Colorado River Basin Project Act, September 30, 1968 (Appendix 3)
Long-Range Operating Criteria, June 8, 1970 (Appendix 4)
Grand Canyon Protection Act, October 30, 1992 (Appendix 5)

Table 1 briefly describes the relationship between each of the applicable elements of the Law of the River and the operation of Glen Canyon Dam and the AMP. Additionally, each of the above referenced elements of the Law of the River is included as an appendix to this discussion paper, with the exception of the Treaty Between the United States and Mexico.

There are also several administrative mandates which are applicable to operations at Glen Canyon Dam and implementation of the AMP. These mandates and their relationship to Glen Canyon Dam operations and the AMP are briefly described in Table 2 and include:

Programmatic Agreement on Cultural Resources, August 30, 1994 (Appendix 6)
Final Biological Opinion on the Operation of Glen Canyon Dam, January 7, 1995 (Appendix 7)
Glen Canyon Dam Final Environmental Impact Statement, March 1995
Biological & Conference Opinion on Operation of Glen Canyon Dam, Controlled Release for Habitat and Beach Building, February 16, 1996
Glen Canyon Dam Final EIS, Record of Decision, October 25, 1996 (Appendix 8)
Glen Canyon Adaptive Management Work Group Charter, January 15, 1997 (Appendix 9)
Operating Criteria for Glen Canyon Dam, February 24, 1997 (Appendix 10)

Operating Guidelines Associated with Glen Canyon Dam Operating Criteria, July 7, 1997 (Appendix 11)
Biological Opinion of the Potential Effects of a Fall Test Flow from Glen Canyon Dam, _____ __, 199_
Glen Canyon Adaptive Management Work Group Operating Procedures, _____ 1997 (Appendix 12)
Glen Canyon Technical Work Group Operating Procedures, _____ 1997 (Appendix 13)

TABLE 1

Statutory Authorities and Relationship to Glen Canyon Dam and the Adaptive Management Program

Statutory Authority	Date	Relationship to GCD and/or AMP
Colorado River Compact	November 24, 1922	Divided the Colorado River Basin into an Upper and Lower Basin, with the compact division point at Lee Ferry, Arizona. Each basin was apportioned 7.5 maf, with an additional 1.0 maf apportioned to the Lower Basin
Treaty Between the United States and Mexico	February 3, 1944	Obligated the United States to provide Mexico with 1.5 maf of Colorado River water annually
Colorado River Storage Project Act	April 11, 1956	Authorized construction of Glen Canyon Dam, among others, and created the Upper Basin Fund
Colorado River Basin Project Act	September 30, 1968	Authorized construction of CAP, Navajo Generating Station, created the Lower Basin Fund, and required development of Long-Range Operating Criteria and development of Annual Operating Plan (AOP) for Colorado River Reservoirs
Criteria for Coordinated Long-Range Operation of Colorado River Reservoirs (Long-Range Operating Criteria)	June 8, 1970	Stipulated criteria for coordinated operation of reservoirs in the Colorado River Basin, with particular emphasis placed on Upper Basin Reservoirs, including Glen Canyon Dam and Lake Powell and operations at Hoover Dam and Lake Mead
Grand Canyon Protection Act	October 30, 1992	Mandated protection of the natural and cultural resources of Grand Canyon National Park, required continued implementation of Glen Canyon Dam interim operating criteria, completion of the final EIS and plan for long-term operation of GCD, implementation of long-term monitoring, and identification of replacing lost electrical power generation capacity

TABLE 2

Administrative Mandates and relationship to Glen Canyon Dam and the Adaptive Management Program

Administrative Mandate	Date	Relationship to GCD and/or AMP
Programmatic Agreement on Cultural Resources	August 30, 1994	Interagency agreement, separate from the AMP, which requires identification and evaluation of cultural resources, monitoring and remedial action programs, development of Historic Preservation Plan, and dispute resolution
Final Biological Opinion on the Operation of Glen Canyon Dam	January 7, 1995	The BO's reasonable and prudent alternative includes utilization of "adaptive management," experimental flows for native fishes, evaluation of selective withdrawal and response of native fishes to temperature regimes, protect humpback chub populations in LCR, establish second spawning HBC population, and take actions which ensure existence of razorback sucker
Operation of Glen Canyon Dam Final Environmental Impact Statement	March 1995	Evaluates range of operational regimes and identifies preferred alternative (MLFF) and the common elements including: adaptive management, monitoring and protection of cultural resources, flood frequency reduction measures, beach/habitat building flows, new population of HBC, further study of selective withdrawal, and modify existing or develop new emergency exception criteria
Biological and Conference Opinion on Operation of Glen Canyon Dam - Controlled Release for Habitat and Beach Building	February 16, 1996	This BO was prepared to evaluate the potential effects of the BHBF on HBC, WIFL, and KAS. The USFWS concluded that the proposed BHBF would not jeopardize these species or adversely modify critical habitat
Glen Canyon Dan Final EIS - Record of Decision	October 25, 1996	The ROD implemented the FEIS' preferred alternative (MLFF), with modifications to the upramp rate and maximum flow criteria, and directed implementation of the FEIS' seven common elements, including adaptive management

Glen Canyon Adaptive Management Work Group Charter	January 15, 1997	This charter created the AMWG, in accordance w the Federal Advisory Committee Act, which is to facilitate implementation of the AMP, recommend monitoring and research programs, and make recommendations to the Secretary. The charter describes the membership of the AMWG, its duties, meeting frequency, and operating and travel costs
Operating Guidelines associated with Glen Canyon Dam Operating Criteria, Interagency Agreement 97-SLC-0333, USBR/WAPA	July 7, 1997	This interagency agreement was entered into by USBR and WAPA in order to implement the Secretary's Glen Canyon Dam Operating Criteria which were signed in February 1997.
Biological Opinion of the Potential Effects of a Fall Test Flow from Glen Canyon Dam	October 30, 1997	This BO concluded that the one-time Fall Test flow would not jeopardize HBC or KAS and would not adversely modify critical habitat
Glen Canyon Adaptive Management Work Group Operating Procedures	January 17, 1998	These operating procedures lay out the administrative process for the AMWG, including: membership, public notice and meeting requirements, meeting frequency, decision-making, travel reimbursement, record keeping and information dissemination, and formation of ad hoc sub-groups
Glen Canyon Technical Work Group Operating Procedures	January 17, 1998	These operating procedures lay out the administrative process for the AMWG's Technical Work Group (TWG), including: membership, public notice and meeting requirements, meeting frequency, decision-making, record keeping and information dissemination, and formation of ad hoc sub-groups.

4. ROLES AND RESPONSIBILITIES OF ADAPTIVE MANAGEMENT PROGRAM ELEMENTS

This section of the report is intended to outline and briefly describe the various roles and responsibilities of the various Adaptive Management Program elements. These elements include: (1) the Secretary of the Department of the Interior and his Designee; (2) Adaptive Management Work Group, or AMWG; (3) Technical Work Group, or TWG; (4) Grand Canyon Monitoring and Research Center, or GCMRC; and (5) the Independent Review Panel(s), or IRP.

A. Secretary of the Department of the Interior & Designee

The FEIS and the Secretary's ROD (Appendix 8) specify an "adaptive management program" (AMP) as the required process for incorporating science and diverse stakeholders in the evaluation and management of future Glen Canyon Dam operations. The AMP calls for continued interaction of managers and scientists to both monitor the effects of current Glen Canyon Dam operations on the Colorado River ecosystem and conduct research on alternative dam operating criteria that may be necessary to ensure protection of resources and improve natural processes.

The AMP is administered through a senior Department of the Interior official (designee) and facilitated through the AMWG organized as a Federal Advisory Committee. The AMWG is chaired by the designee and supported by the Grand Canyon Monitoring and Research Center (GCMRC), the AMWG's Technical Work Group (TWG), and the independent review panel(s). The overall program is directed by the designee, who serves as the Secretary's principal contact for the AMP and as the focal point for issues and decisions associated with the program. The designee's responsibilities include ensuring that the Department of the Interior complies with the obligations under the GCPA and the FEIS ROD. The designee reviews, modifies, accepts, or may remand any recommendation from the AMWG in making decisions regarding any changes in operation of Glen Canyon Dam or other management actions.

B. Adaptive Management Work Group (AMWG)

The Adaptive Management Work Group, or AMWG, is a Federal Advisory Committee chartered by the Secretary of the Interior, consisting of a group of stakeholders that are federal and state resource management agencies, representatives of the seven Basin states, Native American Tribes, hydroelectric power marketers, environmental and conservation organizations, recreational and other interest groups (Charter is attached as Appendix 9). The AMWG was established to develop, evaluate and recommend alternative operational strategies for Glen Canyon Dam and

submit these recommendations to the Secretary of the Interior. Specifically, the FEIS and the AMWG Charter identify the roles and responsibilities of the AMWG[4] to include the following:

1. Establish AMWG Operating Procedures;

2. Advise the Secretary in meeting environmental and cultural commitments of the FEIS, as requested;

3. Recommend the framework for the AMP policy, goals and direction;

4. Develop recommendations for modifying operating criteria and other resource management actions pursuant to the GCPA;

5. Define and recommend resource management objectives for development and implementation of a long-term monitoring plan, and any necessary research and studies required to determine the effect of the operation of Glen Canyon Dam on the natural, recreational, and cultural resources of the Grand Canyon National Park and Glen Canyon National Recreation Area;

6. Review and provide input to the Secretary on the reports required in Sections 1804(c)(2) and 1804(d) of the GCPA;

7. Facilitate input and coordination of information from stakeholders to the Secretary of the Interior to assist in meeting consultation requirements under Sections 1804(c)(3) and 1805(c) of the GCPA;

8. Review and forward annual budget proposals;

9. Ensure coordination of operating criteria changes into the Annual Operating Plan for Colorado River Reservoirs and other ongoing activities; and

10. Monitor and report on compliance of all program activities with applicable laws, permitting requirements and the GCPA. The duties of the AMWG are in an advisory capacity only.

Finally, in light of item 10, it should be made very clear that the AMWG does not displace federal or state legal authority and responsibility to manage the resources in the best interests of the environment and society. Additionally, the AMWG's Operating Procedures are attached to this report as Appendix 12.

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[4] *Operation of Glen Canyon Dam FEIS*, page 36; *Charter, Adaptive Management Work Group*, February 4, 1997, page 2.

C. Technical Work Group (TWG)

The FEIS requires the formation of a "technical work group" (TWG) and suggests that the TWG would "...translate AMWG policy and goals into resource management objectives and establish criteria and standards for long-term monitoring and research in response to the GCPA."[5] The TWG is comprised of technical representatives from federal, state and Tribal governments, and other interests represented on the AMWG. Members of the TWG are appointed by the member agencies or interests represented on the AMWG. Additionally, although not a member of the AMWG, the Secretary's designee appointed a representative of the U.S. Geological Survey to participate as a member of the TWG.

The FEIS[6] and the TWG's Operating Procedures[7] (attached as Appendix 13) generally describe the TWG's roles and responsibilities, which include the following:

1. Develop criteria and standards for monitoring and research programs within three (3) months of the formation of the group and provide periodic reviews and updates;

2. Develop resource management questions for the design of monitoring and research by or under the direction of the GCMRC;

3. Provide information as necessary for preparing annual resource reports and other reports as required for the AMWG; and

4. TWG shall perform additional tasks as directed by the AMWG.

It should be pointed out that the TWG must comply with the Federal Advisory Committee Act as it provides recommendations to the AMWG which is a Federal Advisory Committee. Also, there are currently members of the AMWG which serve as the technical representatives on the TWG. Consequently, all meetings of the TWG, like the AMWG, are publicly noticed and meetings are open to the general public.

D. Grand Canyon Monitoring & Research Center (GCMRC)

The FEIS described the "monitoring and research center" as another primary component of the Glen Canyon Dam AMP. The primary purpose of this center is to assist and support the

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[5] *Operation of Glen Canyon Dam FEIS*, p. 37.

[6] *Operation of Glen Canyon Dam FEIS*, p. 37.

[7] *Glen Canyon Dam Technical Work Group Operating Procedures*, Draft, January 16, 1997, p. 1.

Secretary's designee and the AMWG. The center is responsible for development of annual monitoring and research plans, managing all data collected as part of those programs. All adaptive management research programs will be coordinated through the center.[8]

In mid-1996, the Deputy Assistant Secretary of the Interior for Water and Science, in an undated memorandum, directed the establishment of the Grand Canyon Monitoring and Research Center (GCMRC) with the following guidelines:

1. During an interim period not to exceed two years, the Deputy Assistant Secretary for Water and Science, the Director of the USGS, or his designee, and the Commissioner of Reclamation, or his designee, jointly, and in consultation with the Chief of the GCMRC (Center Chief), shall provide guidance and oversight for the program, including determining priorities and level of funding for research planning, program implementation and related matters. At the end of the interim period, a decision will be made on the final organizational location of the program.

2. A senior level position shall be established for the Center Chief for a period not to exceed two years. The Center Chief shall report to the Director of the USGS, or his designee, with oversight provided by the Deputy Assistant Secretary for Water and Science. At the end of the interim period, the reporting relationship and grade level of the Center Chief's position shall be re-evaluated.

3. The GCMRC, co-located with the USGS facility in Flagstaff, Arizona, shall be composed of a small staff of administrative and scientific personnel. The research program is proposed to be conducted through an open call proposal and/or contract process, including a competitive request for proposals, with federal and state agencies, universities, the private sector, and Native American Tribes which result in the selection of research projects based on scientific merit and cost. Required elements of the monitoring program may be proposed as an on-going responsibility of the USGS after an open decision-making process.

4. All funding for the operation of the GCMRC, including salary and related expenses (benefits and travel) of the incumbents of the GCMRC positions; space; equipment, and the research and monitoring programs; shall be derived from the sale of electric power and energy from the Colorado River Storage Project, pursuant to the GCPA, and shall be reimbursed by Reclamation. The annual obligation of funds for the GCMRC shall be proposed by the Center Chief with the concurrence of the Commissioner of Reclamation and the Director of the USGS, and after consultation with the AMWG and Independent Scientific Review Panel. The proposed budget shall be submitted to the Deputy Assistant Secretary for Water and Science for final approval.

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[8] *Operation of Glen Canyon Dam FEIS*, p. 36.

5. Among the immediate work tasks to be assigned to the Center Chief for further elaboration are the following:

   a) By August 1, 1996, the Center Chief shall develop a long-term monitoring and research plan and staffing plan for the GCMRC in consultation with the AMWG or the "Transition Work Group;" and

   b) By October 1, 1996, the Center Chief, in consultation with the AMWG or Transition Work Group, shall draft a plan for the organizational location of the GCMRC.

Additionally, long-term monitoring and research associated with cultural resources would be carried out in accordance with the approved Programmatic Agreement on Cultural Resources (PA) which was executed by numerous signatories in 1993 and 1994. The executed PA is included in this report as Appendix 6. All provisions as agreed upon by the consulting parties would be implemented through the Monitoring and Remedial Action Plan and the Historic Preservation Plan. Activities outlined in these documents will be coordinated through the GCMRC to ensure integration with other facets of the long-term monitoring and research program.

The GCMRC's administrative responsibilities include the following:

1. Managing resource data;

2. Reporting monitoring and research results;

3. Contracts administration; and

4. Development of annual reports.

The FEIS states that the GCMRC will emphasize long-term monitoring and research design, integration and program management. The GCMRC will be staffed by a Center Chief and a group of program managers responsible for functions such as physical science, biological science, cultural resources, social sciences, engineering and infrastructure operations and Native American coordination. The Native American coordinator will facilitate and manage monitoring and research related to Tribal needs. The coordinator also will ensure integration of Tribal concerns with all other monitoring and research programs.

As described above, the GCMRC's programs associated with long-term monitoring and research will be funded by CRSP power revenues and coordinated through Reclamation's budget process. Professional staffing for the GCMRC would be provided by the USGS and participating agencies in the AMWG. The GCMRC will closely coordinate its activities with the TWG. The following specific duties are assigned to the GCMRC:

1. Develop research designs and proposals for implementing monitoring and research identified by the AMWG;

2. Manage all monitoring and research on resources affected by Glen Canyon Dam operations;

3. Manage and maintain the Glen Canyon Environmental Studies (GCES) information database, monitoring and research programs and other data sources as appropriate;

4. Administer research proposals through a competitive contract process, as appropriate;

5. Coordinate, prepare and distribute technical reports and documentation for review as final products;

6. Coordinate review of the monitoring and research programs with the independent review panel(s) (IRPs); and

7. Prepare and forward technical management recommendations and annual reports, as specified in Section 1804 of the GCPA, to the AMWG.

E. Independent Review Panel(s) (IRP)

The last major component of the AMP which is specified in the FEIS is the use of "independent review panels" (IRPs). The FEIS states that the IRPs will be comprised of qualified individuals not otherwise participating in the long-term monitoring and research studies. The IRPs will be established by the Secretary of the Interior in consultation with the National Academy of Sciences, the Tribes and other AMWG entities. The IRPs will be responsible for periodically reviewing resource specific monitoring and research programs and for making recommendations to the AMWG and GCMRC regarding monitoring, priorities, integration and management. Responsibilities of the IRPs includes the following:

1. Annual review of the monitoring and research program;

2. Technical advice as requested by the GCMRC or AMWG; and

3. Conducting five-year review of monitoring and research protocols.

The GCMRC's "operating guidelines" states that the role of the IRPs is "to provide independent science assessments of proposed research plans and programs, technical reports and publications

and other program accomplishments."[9] Prior to the GCMRC's implementation of monitoring and research procedures, specific protocols will be developed and reviewed for scientific credibility, including panel and peer review of proposals, as well as GCMRC consultation with the AMWG and TWG. These GCMRC "operating protocols" were completed in June 1996 and specify that the GCMRC's Long-Term Monitoring and Research Plan, when completed, would be submitted to the National research Council for scientific peer review. Finally, the GCMRC operating protocols require that research proposals, manuscripts, technologies and guidelines, etc. meet the rigors of scientific peer review. In order to accomplish this, the operating protocols state that differing review methodologies will be employed, and differing scientific groups will be utilized in the reviews.[10]

5. PROCESS COORDINATION, INTEGRATION AND SCHEDULING FOR THE ADAPTIVE MANAGEMENT PROGRAM

This section of the report is intended to provide a brief description of processes, programs or activities external to the Glen Canyon Dam AMP which may require coordination, integration and scheduling with elements of the AMP. Examples of processes which will, or may, require coordination, integration and scheduling with the AMP include the following:

A. Development of Reclamation's annual budget;

B. Development of the Annual Operating Plan for Colorado River Reservoirs;

C. Consultation and coordination with signatories of the Programmatic Agreement on Cultural Resources;

D. Consultation and coordination associated with Reclamation's implementation of the reasonable and prudent alternative of the Final Biological Opinion for Glen Canyon Dam operations; and

E. Consultation and coordination associated with other Endangered Species Act and/or National Environmental Policy Act compliance activities or programs.

Appendix 14 contains an issue paper prepared by Reclamation regarding the formulation of the budget for the Glen Canyon AMP. Appendix 15 contains a Reclamation issue paper regarding the operation of Glen Canyon Dam pursuant to the 1968 Colorado River Basin Project Act and the 1992 Grand Canyon Protection Act.

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[9] *Guidelines for the Grand Canyon Monitoring and Research Center*, 1996, p. 3.

[10] *Operating Protocols for the Grand Canyon Monitoring and Research Center*, June 1996, p. 4-5.

6. GENERALIZED ANNUAL GLEN CANYON DAM ADAPTIVE MANAGEMENT PROGRAM SCHEDULE

The GCMRC staff prepared a visual representation of accomplished and proposed work task targets for Fiscal Years (FY) 1996, 1997, 1998 and 1999. These are attached for review, discussion and modification. It is suggested that these be expanded to include work tasks, coordinated programs and dates associated with all elements of the AMP, as well as programs and activities external to the AMP, but requiring coordination.

GRAND CANYON MONITORING AND RESEARCH CENTER ACCOMPLISHMENTS AND TARGETS
FY 1996 and FY 1997

FY 1996
ACCOMPLISHMENTS

O (95)	N	D	J (96)	F	M	A	M	J	J	A	S
	Grand Canyon Monitoring and Research Center (GCMRC) established	Location & initial Operating Procedures	Planning Group established			Center Guidelines established	Center Transition Plan developed	Center Protocols established	FY 1997 Program established	Objectives and Info Needs established	Draft NRC Contract

FY 1997
ACCOMPLISHMENTS

O (96)	N	D	J (97)	F	M	A	M	J	J	A	S
Monitoring and Research Questions	Draft LTP to BRD	Start Lake Powell Assessment	GCMRC assumes all GCES responsibilities and authorities		Revise LTP			Release LTP and FY1998 Plan to AMWG and Administration Release RFPs	Complete Lake Powell Assessment	LTP and FY1998 Plan to NRC Release FY1998 Logistic Plans Review of Lake Powell Assessment Review of State of Canyon and 1998 Flow Regime	Receive all NPS permits Lake Powell Assessment, State of Canyon Resources and 1998 Flow Information to AMWG

GRAND CANYON MONITORING AND RESEARCH CENTER TARGETS
FY 1998

O (97)	N	D	J (98)	F	M	A	M	J	J	A	S
Initiate Climate Study and Assessment (Melis)	Draft FY1997 Report to Congress (Garrett) Final GCMRC Staffing Plan (Garrett) Draft Water Year 1999 Adaptive Management Flow Hydrography (Melis) Implement all FY 1998 RFPs, Co-op Agreements and IGAs (Prog Mgrs) Review of FY 1995-1997 Program Accomplish-ments (Prog Mgrs)	Draft Hulapai NSF Proposal (Lambert) Final FY98 Survey and Aerial/Video/ Photo Plans (Liszewski) Draft State of Canyon Resource Report FY1998 (Stevens) Draft FY1999 Monitoring and Research Plan (Garrett) Develop Final Review Protocols 7 Process (Gold) Final Strategic Inf. Mgt. Plan (Liszewski)	Draft Indian Student Proposal (Lambert) Conceptual Modeling Scoping Meeting (Gold) Complete All Personnel Placements (Garrett) Protocol for Programmatic Agreement and Biological Opinion Operations (Garrett,/ Lambert/ Gold)	Initiate Information Needs Assessment for Lake Powell (Garrett) Draft Assessment of 1997 Long-Term High Flow Impacts (Garrett)	Review and Modification of GCMRC Monitoring and Research Protocol (Melis) Implement 1998 Spike Flow Project (Stevens) Draft Information Management Protocols (Liszewski)	First Conceptual Modeling Workshop (Gold)	Release of RFPs (Prog Mgrs) Complete Lake Powell Information Needs Assessment (Garrett)	Implement Unscheduled Spill Research Plan (Stevens)	Draft of Lake Powell Strategic and Annual Monitoring Plans (Garrett) Draft AEA Conceptual Simulation Model (Gold)	Cultural Resources Work Plans (Lambert) Lake Powell Strategic Plan and 1999 Annual Plan to AMWG Revised Information Needs Assessment to AMWG (Garrett)	Information Management Protocols to AMWG (Liszewski) Draft Annual Report to Congress to AMWG (Garrett) Award of FY 1999 RFPs, Co-op and IGAs (Prog Mgrs)

O (98)	N	D	J (99)	F	M	A	M	J	J	A	S
	Begin Review of Major Model Efforts (Melis) Review of Tailwater Monitoring and Research Programs (Gold) Contingency Science Plan for FY1998 High Release (Stevens) Contingency Science Plan for Unscheduled Spill (Stevens) Implement NRC Review of GCMRC Program Plans (Garrett) Draft Logistics Plan (Gold)	Issue Logistics RFPs (Gold									

COLORADO RIVER COMPACT
SIGNED AT SANTA FE, NEW MEXICO,
November 24, 1922

The States of Arizona, California, Colorado, Nevada, New Mexico, Utah, and Wyoming, having resolved to enter into a compact under the act of the Congress of the United States of America approved August 19, 1921, (42 Stat. L., p. 171), and the acts of the legislatures of the said States, have through their governors appointed as their commissioners: W. S. Norviel for the State of Arizona, W. F. McClure for the State of California, Delph E. Carpenter for the State of Colorado, J. G. Scrugham for the State of Nevada, Stephen B. Davis, Jr. for the State of New Mexico R. E. Caldwell for the State of Utah, Frank C. Emerson for the State of Wyoming, who, after negotiations participated in by Herbert Hoover, appointed by the President as the representative of the United States of America, have agreed upon the following articles.

ARTICLE I

The major purposes of this compact are to provide for the equitable division and apportionment of the use of the waters of the Colorado River system; to establish the relative importance of different beneficial uses of water; to promote interstate comity; to remove causes of present and future controversies and to secure the expeditious agricultural and industrial development of the Colorado River Basin, the storage of its waters, and the protection of life and property from floods. To these ends the Colorado River Basin is divided into two basins, and an apportionment of the use of part of the water of the Colorado River system is made to each of them with the provision that further equitable apportionment may be made.

ARTICLE II

As used in this compact:

(a) The term "Colorado River system" means that portion of the Colorado River and its tributaries within the United States of America.

(b) The term "Colorado River Basin" means all of the drainage area of the Colorado River system and all other territory within the United States of America to which the waters of the Colorado River system shall be beneficially applied.

(c) The term "States of the upper division" means the States of Colorado, New Mexico, Utah, and Wyoming.

(d) The term "States of the lower division" means the States of Arizona, California, and Nevada.

(e) The term "Lee Ferry" means a point in the main stream of the Colorado River 1 mile below the mouth of the Paria River.

(f) The term "Upper Basin" means those parts of the States of Arizona, Colorado, New Mexico, Utah, and Wyoming within and from which waters naturally drain into the Colorado River system above Lee Ferry, and also all parts of said States located without the drainage area of the Colorado River system which are now or shall hereafter be beneficially served by waters diverted from the system above Lee Ferry.

(g) The term "Lower Basin" means those parts of the States of Arizona, California, Nevada, New Mexico, and Utah within and from which waters naturally drain into the Colorado River system below Lee Ferry, and also all parts of said States located without the drainage area of the Colorado River system which are now or shall hereafter be beneficially served by waters diverted from the system below Lee Ferry.

(h) The term "domestic use" shall include the use of water for household, stock, municipal, mining, milling, industrial, and other like purposes, but shall exclude the generation of electrical power.

ARTICLE III

(a) There is hereby apportioned from the Colorado River system in perpetuity to the upper basin and the lower basin, respectively, the exclusive beneficial consumptive use of 7,500,000 acre-feet of water per annum, which shall include all water necessary for the supply of any rights which may now exist.

(b) In addition to the apportionment in paragraph (a), the lower basin is hereby given the right to increase its beneficial consumptive use of such waters by 1,000,000 acre-feet per annum.

(c) If, as a matter of international comity, the United States of America shall hereafter recognize in the United States of Mexico any right to the use of any waters of the Colorado River system, such waters shall be supplied first from the waters which are surplus over and above the aggregate of the quantities specified in paragraphs (a) and (b); and if such surplus shall prove insufficient for this purpose, then the burden of such deficiency shall be equally borne by the upper basin and the lower basin, and whenever necessary the States of the upper division shall deliver at Lee Ferry water to supply one-half of the deficiency so recognized in addition to that provided in paragraph (d).

(d) The States of the upper division will not cause the flow of the river at Lee Ferry to be depleted below an aggregate of 75,000,000 acre-feet for any period of 10 consecutive years reckoned in continuing progressive series beginning with the 1st day of October next succeeding the ratification of this compact.

(e) The States of the upper division shall not withhold water, and the States of the lower division shall not require the delivery of water, which can not reasonably be applied to domestic and agricultural uses.

(f) Further equitable apportionment of the beneficial uses of the waters of the Colorado River system unapportioned by paragraphs (a), (b), and (c) may be made in the manner provided in paragraph (g) at any time after October 1, 1963, if and when either basin shall have reached its total beneficial consumptive use as set out in paragraphs (a) and (b).

(g) In the event of a desire for further apportionment as provided in paragraph (f) any two signatory States, acting through their governors, may give joint notice of such desire to the governors of the other signatory States and to the President of the United States of America, and it shall be the duty of the governors of the signatory States and of the President of the United States of America forthwith to appoint representatives, whose duty it shall be to divide and apportion equitably between the upper basin and lower basin the beneficial use of the unapportioned water of the Colorado River system as mentioned in paragraph (f), subject to the legislative ratification of the signatory States and the Congress of the United States of America.

ARTICLE IV

(a) Inasmuch as the Colorado River has ceased to be navigable for commerce and the reservation of its waters for navigation would seriously limit the development of its basin, the use of its waters for purposes of navigation shall be subservient to the uses of such waters for domestic, agricultural, and power purposes. If the Congress shall not consent to this paragraph, the other provisions of this compact shall nevertheless remain binding.

(b) Subject to the provisions of this compact, water of the Colorado River system may be impounded and used for the generation of electrical power, but such impounding and use shall be subservient to the use and consumption of such water for agricultural and domestic purposes and shall not interfere with or prevent use for such dominant purposes.

(c) The provisions of this article shall not apply to or interfere with the regulation and control by any State within its boundaries of the appropriation, use, and distribution of water.

ARTICLE V

The chief official of each signatory State charged with the administration of water rights, together with the Director of the United States Reclamation Service and the Director of the United States Geological Survey, shall cooperate, ex officio—

(a) To promote the systematic determination and coordination of the facts as to flow, appropriation, consumption, and use of water in the Colorado River Basin, and the interchange of available information in such matters.

(b) To secure the ascertainment and publication of the annual flow of the Colorado River at Lee Ferry.

(c) To perform such other duties as may be assigned by mutual consent of the signatories from time to time.

ARTICLE VI

Should any claim or controversy arise between any two or more of the signatory States: (a) With respect to the waters of the Colorado River system not covered by the terms of this compact; (b) over the meaning or performance of any of the terms of this compact; (c) as to the allocation of the burdens incident to the performance of any article of this compact or the delivery of waters as herein provided; (d) as to the construction or operation of works within the Colorado River Basin to be situated in two or more States, or to be constructed in one State for the benefit of another State; or (e) as to the diversion of water in one State for the benefit of another State, the governors of the States affected upon the request of one of them, shall forthwith appoint commissioners with power to consider and adjust such claim or controversy, subject to ratification by the legislatures of the States so affected.

Nothing herein contained shall prevent the adjustment of any such claim or controversy by any present method or by direct future legislative action of the interested States.

ARTICLE VII

Nothing in this compact shall be construed as affecting the obligations of the United States of America to Indian tribes.

ARTICLE VIII

Present perfected rights to the beneficial use of waters of the Colorado River system are unimpaired by this compact. Whenever storage capacity of 5,000,000 acre-feet shall have been provided on the Main Colorado River within or for the benefit of the lower basin, then claims of such rights, if any, by appropriators or users of water in the lower basin against appropriators or users of water in the upper basin shall attach to and be satisfied from water that may be stored not in conflict with Article III.

All other rights to beneficial use of waters of the Colorado River system shall be satisfied solely from the water apportioned to that basin in which they are situated.

ARTICLE IX

Nothing in this compact shall be construed to limit or prevent any State from instituting or maintaining any action or proceeding, legal or equitable, for the protection of any right under this compact or the enforcement of any of its provisions.

ARTICLE X

This compact may be terminated at any time by the unanimous agreement of the signatory States. In the event of such termination, all rights established under it shall continue unimpaired.

ARTICLE XI

This compact shall become binding and obligatory when it shall have been approved by the legislatures of each of the signatory States and by the Congress of the United States. Notice of approval by the legislatures shall be given by the governor of each signatory State to the governors of the other signatory States and to the President of the United States, and the President of the United States is requested to give notice to the governors of the signatory States of approval by the Congress of the United States.

In witness whereof the commissioners have signed this compact in a single original, which shall be deposited in the archives of the Department of State of the United States of America and of which a duly certified copy shall be forwarded to the governor of each of the signatory States.

Done at the city of Santa Fe, New Mexico, this twenty-fourth day of November, A. D. one thousand nine hundred and twenty-two.

W. S. Norviel
W. F. McClure
Delph E. Carpenter
J. G. Scrugham
Stephen B. Davis, Jr.
R. E. Caldwell
Frank C. Emerson

Approved:

Herbert Hoover

COLORADO RIVER STORAGE PROJECT - AUTHORITY TO CONSTRUCT, OPERATE AND MAINTAIN CHAPTER 203-PUBLIC LAW 485 [S.500] April 11, 1956

An Act To authorize the Secretary of the Interior to construct, operate, and maintain the Colorado River storage project and participating projects, and for other purposes.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That:

In order to initiate the comprehensive development of the water resources of the Upper Colorado River Basin, for the purposes, among others, of regulating the flow of the Colorado River, storing water for beneficial consumptive use, making it possible for the States of the Upper Basin to utilize, consistently with the provisions of the Colorado River Compact, the apportionments made to and among them in the Colorado River Compact and the Upper Colorado River Basin Compact, respectively, providing for the reclamation of arid and semiarid land, for the control of floods, and for the generation of hydroelectric power, as an incident of the foregoing purposes, the Secretary of the Interior is hereby authorized (1) to construct, operate, and maintain the following initial units of the Colorado River storage project, consisting of dams, reservoirs, powerplants, transmission facilities and appurtenant works: Curecanti, Flaming Gorge, Navajo (dam and reservoir only), and Glen Canyon: *Provided*, That the Curecanti Dam shall be constructed to a height which will impound not less than nine hundred and forth thousand acre-feet of water or will create a reservoir of such greater capacity as can be obtained by a high waterline located at seven thousand five hundred and twenty feet above mean sea level, and that construction thereof shall not be undertaken until the Secretary has, on the basis of further engineering and economic investigations, reexamined the economic justification and such unit and, accompanied by appropriate documentation in the form of a supplemental report, has certified to the Congress and to the President that, in his judgement, the benefits of such unit will exceed its costs; and (2) to construct, operate, and maintain the following additional reclamation projects (including power-generating and transmission facilities related thereto), hereinafter referred to as participating projects: Central Utah (initial phase); Emery County, Florida, Hammond, La Barge, Lyman, Paonia (including the Minnesota unit, a dam and reservoir on Muddy Creek just above its confluence with the North Fork of the Gunnison River, and other necessary works), Pine River Extension, Seedskadee, Silt and Smith Fork: *Provided further*, That as part of the Glen Canyon Unit the Secretary of the Interior shall take adequate protective measures to preclude impairment of the Rainbow Bridge National Monument.

Section 2.

In carrying out further investigation of projects under the Federal reclamation laws in the Upper Colorado River Basin, the Secretary shall give priority to completion of planning reports on the Gooseberry, San Juan-Chama, Navajo, Parshall, Troublesome, Rabbit Ear, Eagle Divide, San Miguel, West Divide, Bluestone, Battlement Mesa, Tomichi Creek, East River, Ohio Creek, Fruitland Mesa, Bostwick Park, Grand Mesa, Dallas Creek, Savery-Pot Hook, Dolores, Fruit Growers Extension, Animas-La Plata, Yellow Jacket, and Sublette participating projects. Said reports shall be completed as expeditiously as funds are made available therefor and shall be submitted promptly to the affected States, which in the case of the San Juan-Chama project shall include the State of Texas, and thereafter to the President and the Congress: *Provided*, That with reference to the plans and specifications for the San Juan-Chama project, the storage for control and regulation of water imported from the San Juan River shall (1) be limited to a single offstream dam and reservoir on a tributary of the Chama River, (2) be used solely for control and regulation and no power facilities shall be established, installed or operated thereat, and (3) be operated at all times by the Bureau of Reclamation of the Department of the Interior in strict compliance with the Rio Grande Compact as administered by the Rio Grande Compact Commission. The preparation of detailed designs and specifications for the works proposed to be constructed in connection with projects shall be carried as far forward as the investigations thereof indicate is reasonable in the circumstances.

The Secretary, concurrently with the investigations directed by the preceding paragraph, shall also give priority to completion of a planning report on the Juniper project.

Section 3.

It is not the intention of Congress, in authorizing priority in planning only those additional projects designated in section 2 of this Act, to limit, restrict, or otherwise interfere with such comprehensive development as will provide for the consumptive use by States of the Upper Colorado River Basin of waters, the use of which is apportioned to the Upper Colorado River Basin by the Colorado River Compact and to each State thereof by the Upper Colorado River Basin Compact, not to preclude consideration and authorization by the Congress of additional projects under the allocations of the compacts as additional needs are indicated. It is the intention of Congress that no dam or reservoir constructed under the authorization of this Act shall be within any national park or monument.

Section 4.

Except as otherwise provided in this Act, in constructing, operating, and maintaining the units of the Colorado River storage project and the participating projects listed in section 1 of this Act, the Secretary shall be governed by the Federal reclamation laws (Act of June 17, 1902, 32 Stat.388, and Acts amendatory thereof or supplementary thereto): *Provided,* That (a) irrigation repayment contracts shall be entered into which, except as otherwise provided for the Paonia and Eden projects, provide for repayment of the obligation assumed thereunder with respect to any project contract unit over a period of not more than fifty years exclusive of any development period authorized by law; (b) prior to construction of irrigation distribution facilities, repayment contracts shall be made with an "organization" as defined in paragraph 2(g) of the Reclamation Project Act of 1939 (53 Stat. 1187) which has the capacity to levy assessments upon all taxable real property located within its boundaries to assist in making repayments, except where a substantial proportion of the lands to be served are owned by the United States; (c) contracts relating to municipal water supply may be made without regard to the limitations of the last sentence of section 9(c) of the Reclamation Project Act of 1939; and (d), as to Indian lands within, under or served by any participating project, payment of construction costs within the capability of the land to repay shall be subject to the Act of July 1, 1932 (47 Stat. 564): *Provided further,* That for a period of ten years from the date of enactment of this Act, no water from any participating project authorized by this Act shall be delivered to any water user for production on newly irrigated lands of any basic agricultural commodity, as defined in the Agricultural Act of 1949, or any amendment thereof, if the total supply of such commodity for the marketing year in which the bulk of the crop would normally be marketed is in excess of the normal supply as defined in section 301(b) (10) of the Agricultural Adjustment Act of 1938, as amended, unless the Secretary of Agriculture calls for an increase in production of such commodity in the interest of national security. All units and participating projects shall be subject to the apportionments of the use of water between the Upper and Lower Basins of the Colorado River and among the States of the Upper Basin fixed in the Colorado River Compact and the Upper Colorado River Basin Compact, respectively, and to the terms of the treaty with the United Mexican States (Treaty Series 994).

Section 5.

(a) There is hereby authorized a separate fund in the Treasury of the United States to be known as the Upper Colorado River Basin Fund (hereinafter referred to as the Basin Fund) which shall remain available until expended, as hereafter provided, for carrying out provisions of this Act other than section 8.

(b) All appropriations made for the purpose of carrying out the provisions of this Act, other than section 8, shall be credited to the Basin Fund as advances from the general fund of the Treasury.

(c) All revenues collected in connection with the operation of the Colorado River storage project and participating projects shall be credited to the Basin Fund, and shall be available, without further appropriation, for (1) defraying the costs of operation, maintenance, and replacements of, and emergency expenditures for, all facilities of the Colorado River storage project and participating projects, within such separate limitations as may be included in annual appropriation acts: *Provided,* That with respect to each participating project, such costs shall be paid from revenues received from each such project; (2) payment is required by subsection (d) of this section; and (3) payment

as required by subsection (e) of this section. Revenues credited to the Basin Fund shall not be available for appropriation for construction of the units and participating projects authorized by or pursuant to this Act.

(d) Revenues in the Basin Fund in excess of operating needs shall be paid annually to the general fund of the Treasury to return-

(1) the costs of each unit, participating project, or any separable feature thereof which are allocated to power pursuant to section 6 of this Act, within a period not exceeding fifty years from the date of completion of such unit, participating project, or separable feature thereof;

(2) the costs of each unit, participating project, or any separable feature thereof which are allocated to municipal water supply pursuant to section 6 of this Act, within a period not exceeding fifty years from the date of completion of such unit, participating project, or separable feature thereof;

(3) interest on the unamortized balance of the investment (including interest during construction) in the power and municipal water supply features of each unit, participating project, or any separable feature thereof, at a rate determined by the Secretary of the Treasury as provided in subsection (f), and interest due shall be a first charge; and

(4) the costs of each storage unit which are allocated to irrigation pursuant to section 6 of this Act within a period not exceeding fifty years.

(e) Revenues in the Basin Fund in excess of the amounts needed to meet the requirements of clause (1) subsection (c) of this section, and to return to the general fund of the Treasury the costs set out in subsection (d) of this section, shall be apportioned among the States of the Upper Division in the following percentages: Colorado, 46 per centum; Utah, 21.5 per centum; Wyoming, 15.5 per centum; and New Mexico, 17 per centum; *Provided,* That prior to the application of such percentages, all revenues remaining in the Basin Fund from each participating project (or part thereof), herein or hereinafter authorized, after payments, where applicable, with respect to such projects, to the general fund of the Treasury under subparagraphs (1), (2), and (3) of subsection (d) of this section shall be apportioned to the State in which such participating project, or part thereof, is located.

Revenues so apportioned to each State shall be used only for the repayment of construction costs of participating projects or parts of such projects in the State to which such revenues are apportioned and shall not be used for such purpose in any other State without the consent, as expressed through its legally constituted authority, of the State to which such revenues are apportioned. Subject to such requirement, there shall be paid annually into the general fund of the Treasury from the revenues apportioned to each State (1) the costs of each participating project herein authorized (except Paonia) or any separable feature thereof, which are allocated to irrigation pursuant to section 6 of this Act, within a period not exceeding fifty years, in addition to any development period authorized by law, from the date of completion of such participating project or separable feature thereof, or, in the case of Indian lands, payment in accordance with section 4 of this Act; (2) costs of the Paonia project, which are beyond the ability of the water users to repay, within a period prescribed in the Act of June 25, 1947 (61 Stat. 181); and (3) costs in connection with the irrigation features of the Eden project as specified in the Act of June 28, 1949 (63 Stat. 277).

(f) The interest rate applicable to each unit of the storage project and each participating project shall be determined by the Secretary of the Treasury as of the time the first advance is made for initiating construction of said unit or project. Such interest rate shall be determined by calculating the average yield to maturity on the basis of daily closing market bid quotations during the month of June next preceding the fiscal year in which said advance is made, on all interest-bearing marketable public debt obligations of the United States having a maturity date of fifteen or more years from the first day of said month, and by adjusting such average annual yield to the nearest one-eighth of 1 per centum.

(g) Business-type budgets shall be submitted to the Congress annually for all operations financed by the Basin Fund.

Section 6.

Upon completion of each unit, participating project or separable feature thereof, the Secretary shall allocate the to costs (excluding any expenditures authorized by section 8 of this Act) of constructing said unit, project or feature to power, irrigation, municipal water supply, flood control, navigation, or any other purposes authorized under reclamation law. Allocations of construction, operation and maintenance costs to authorize nonreimbursable purposes shall be nonreturnable under the provisions of the Act. In the event that the Navajo participating project is authorized, the costs allocated to irrigation of Indian-owned tribal or restricted lands within, under, or served by such project, and beyond the capability of such lands to repay, shall be determined, and, in recognition of the fact that assistance to the Navajo Indians is the responsibility of the entire nation, such costs shall be nonreimbursable. On January 1 of each year the Secretary shall report to the Congress for the previous fiscal year, beginning with the fiscal year 1957, upon the status of the revenues from, and the cost of, constructing, operating, and maintaining the Colorado River storage project and the participating projects. The Secretary's report shall be prepared to reflect accurately the Federal investment allocated at that time to power, to irrigation, and to other purposes, the progress of return and repayment thereon, and the estimated rate of progress, year by year, in accomplishing full repayment.

Section 7.

The hydroelectric power plants and transmission lines authorized by this Act to be constructed, operated, and maintained by the Secretary shall be operated in conjunction with other Federal powerplants, present and potential, so as to produce the greatest practicable amount of power and energy that can be sold at firm power and energy rates, but in the exercise of the authority hereby granted he shall not affect or interfere with the operation of the provisions of the Colorado River Compact, the Upper Colorado River Basin Compact, the Boulder Canyon Project Act, the Boulder Canyon Project Adjustment Act and any contract lawfully entered unto under said Compacts and Acts. Subject to the provisions of the Colorado River Compact, neither the impounding nor the use of water for the generation of power and energy at the plants of the Colorado River storage project shall preclude or impair the appropriation of water for domestic or agricultural purposes pursuant to applicable State law.

section 8.

In connection with the development of the Colorado River storage project and of the participating projects, the Secretary is authorized and directed to investigate, plan, construct, operate, and maintain (1) public recreational facilities on lands withdrawn or acquired for the development of said project or of said participating projects, to conserve the scenery, the natural, historic, and archaeologic objects, and the wildlife on said lands, and to provide for public use and enjoyment of the same and of the water areas created by these projects by such means as are consistent with the primary purposes of said projects; and (2) facilities to mitigate losses of, and improve conditions for, the propagation of fish and wildlife. The Secretary is authorized to acquire lands and to withdraw public lands from entry or other disposition under the public land laws necessary for the construction, operation, and maintenance of the facilities herein provided, and to dispose of them to Federal, State, and local governmental agencies by lease, transfer, exchange, or conveyance upon such terms and conditions as will best promote their development and operation in the public interest. All costs incurred pursuant to the section shall be nonreimbursable and nonreturnable.

Section 9.

Nothing contained in this Act shall be construed to alter, amend, repeal, construe, interpret, modify, or be in conflict with the provisions of the Boulder Canyon Project Act (45 Stat. 1057), the Boulder Canyon Adjustment Act (54 Stat. 774), the Colorado River Compact, the Upper Colorado River Basin Compact, the Rio Grande Compact of 1938, or the Treaty with the United Mexican States (Treaty Series 994).

Section 10.

Expenditures for the Flaming Gorge, Glen Canyon, Curecanti, and Navajo initial units of the Colorado River storage project may be made without regard to the soil survey and land classification requirements of the Interior Department Appropriation Act, 1954.

Section 11.
The final Judgement, Final Decree and stipulations incorporated therein in the consolidated cases of United States of America v. Northern Colorado Water Conservancy District, et al., Civil No.s 2782, 5016 and 5017, in the United States District Court for the District of Colorado, are approved, shall become effective immediately, and the proper agencies of the United States shall act in accordance therewith.

Section 12.
There are hereby authorized to be appropriated, out of any moneys in the Treasury not otherwise appropriated, such sums as may be required to carry out the purposes of this Act, but not to exceed $760,000,000.

Section 13.
In planning the use of, and in using credits from, net power revenues available for the purpose of assisting in the pay-out of costs of participating projects herein and hereafter authorized in the States of Colorado, New Mexico, Utah, and Wyoming, the Secretary shall have regard for the achievement within each of said States of the fullest practicable use of the waters of the Upper Colorado River system, consistent with the apportionment thereof among such States.

Section 14.
In the operation and maintenance of all facilities, authorized by Federal law and under the jurisdiction and supervision of the Secretary of the Interior, in the basin of the Colorado River, the Secretary of the Interior is directed to comply with the applicable provisions of the Colorado River Compact, the Upper Colorado River Basin Compact, the Boulder Canyon Project Act, the Boulder Canyon Project Adjustment Act, and the Treaty with the United Mexican States, in the storage and release of water from reservoirs in the Colorado River Basin In the event of the failure of the Secretary of the Interior to so comply, any State of the Colorado River Basin may maintain an action in the Supreme Court of the United States to enforce the provisions of this section, and consent is given to the joinder of the United States as a party in such suit or suits, as a defendant or otherwise.

Section 15.
The Secretary of the Interior is directed to continue studies and to make a report to the Congress and to the States of the Colorado River Basin on the quality of water of the Colorado River.

Section 16.
As used in this Act-

The Terms "Colorado River Basin", "Colorado River Compact", "Colorado River System", "Lee Ferry", "States of the Upper Division", "Upper Basin", and "domestic use" shall have the meaning ascribed to them in article II of the Upper Colorado River Basin Compact;

The term "States of the Upper Colorado River Basin" shall mean the States of Arizona, Colorado, New Mexico, Utah, and Wyoming;

The term "Upper Colorado River Basin" shall have the same meaning as the term "Upper Basin";

The term "Upper Colorado River Basin Compact" shall mean that certain compact executed on October 11, 1948 by commissioners representing the States of Arizona, Colorado, New Mexico, Utah, and Wyoming, and consented to by the Congress of the United States of America by Act of April 6, 1949 (63 Stat. 31);

The term "Rio Grande Compact" shall mean that certain compact executed on March 18, 1938, by commissioners representing the States of Colorado, New Mexico, and Texas and consented to by the Congress of the United States of America by Act of May 31, 1939 (53 Stat. 785);

The term "Treaty with the United Mexican States" shall mean that certain treaty between the United States of

America and the United Mexican States, signed at Washington, District of Columbia, February 3, 1944, relating to the utilization of the waters of the Colorado River and other rivers, as amended and supplemented by the protocol dated November 14, 1944, and the understandings recited in the Senate resolution of April 18, 1945, advising consenting to ratification thereof.

Approved April 11, 1956.

UNITED STATES CODE ANNOTATED
Title 43 Public Lands, Chapter 32
COLORADO RIVER BASIN PROJECT

Subchapter I-OBJECTIVES

Section

Subchapter II-INVESTIGATIONS AND PLANNING

Subchapter III-AUTHORIZED UNITS; PROTECTION OF EXISTING USES

Subchapter IV-LOWER COLORADO RIVER BASIN DEVELOPMENT FUND

Subchapter V-GENERAL PROVISIONS

Cross References

Compliance with Colorado law in diversion and storage of water for projects constructed under authority of this chapter if located within and intended for benefit of Colorado only, see section 620c-1 of this title.

Construction of Colorado River Basin Project Act with provisions relating to Colorado River Basin salinity control, see section 1597 of this title.

Development of water resources plan for western United States, cooperation of Secretary of Army with federal, state, and local agencies, see section 1511a of this title.

Subchapter I-OBJECTIVES

§ 1501. Congressional declaration of purpose and policy

(a) It is the object of this chapter to provide a program for the further comprehensive development of the water resources of the Colorado River Basin and for the provision of additional and adequate water supplies for use in the Upper as well as in the lower Colorado River Basin. This program is declared to be for the purposes, among others, of regulating the flow of the Colorado River; controlling floods; improving navigation; providing for the storage and delivery of the waters of the Colorado River for reclamation of lands, including supplemental water supplies, and for municipal, industrial, and other beneficial purposes; improving water quality; providing for basic public outdoor recreation facilities; improving conditions for fish and wildlife, and the generation and sale of electrical power as an incident of the foregoing purposes.

(b) It is the policy of the Congress that the Secretary of the Interior (hereinafter referred to as the "Secretary") shall continue to develop, after consultation with affected States and appropriate Federal agencies, a regional water plan, consistent with the provisions of this chapter and with future authorizations, to serve as the framework under which projects in the Colorado River Basin may be coordinated and constructed with proper timing to the end that an adequate supply of water may be made available for such projects, whether heretofore, herein, or hereafter authorized.

(Pub.L. 90-537, Title I, § 102, Sept. 30, 1968, 82 Stat. 886)

Historical Note

References in Text. This chapter, referred to in text, was in the original "this Act", meaning Pub.L. 90-537, Sept. 30, 1968, 82 Stat. 885, as amended, known as the Colorado River Basin Project Act, which enacted this chapter and sections 616aa-1, 620a-1, 620a-2, 620c-1, and 620d-1 of this title, amended sections 616hh, 620, and 620a of this title, and enacted provisions set out as notes under sections 620, 620k, and 1501 of this title. For complete classification of this Act to the Code, see Short Title note set out below and Tables volume.

Short Title. Section 101 of Pub.L. 90-537 provided: "That this Act [enacting this chapter and sections 616aa-1, 620a-1, 620a-2, 620c-1, and 620d-1 of this title, amending sections 616hh, 620, and 620a of this title, and enacting provisions set out as notes under this section and sections 620 and 620k of this title] may be cited as the 'Colorado River Basin Project Act'."

Legislative History. For legislative history and purpose of Pub.L. 90-537, see 1968 U.S. Code Cong. and Adm.News, p. 3666.

Subchapter II-INVESTIGATIONS AND PLANNING

Cross References

Allocation of costs for lower Colorado River Basin projects, see section 1541 of this title.

§ 1511. Reconnaissance investigations by Secretary of the Interior; reports; 10-year moratorium on water importation studies

Pursuant to the authority set out in the Reclamation Act of June 17, 1902, 32 Stat. 388, and Acts amendatory thereof or supplementary thereto, and the provisions of the Water Resources Planning Act of July 22, 1965, 79 Stat. 244, as amended [42 U.S.C.A. § 1962 et. seq.], with respect to the coordination of studies, investigations and assessments, the Secretary of the Interior shall conduct full and complete reconnaissance investigations for the purpose of developing a general plan to meet the future water needs of the Western United States. Such investigations shall include the long-range water supply available and the long-range water requirements in each water resource region of the Western United States. Progress reports in connection with these investigations shall be submitted to the President, the National Water Commission (while it is in existence), the Water Resources Council, and to the Congress every two years. The first of such reports shall be submitted on or before June 30, 1971, and a final reconnaissance report shall be submitted not later than June 30, 1977: *Provided*, That for a period of ten years from November 2, 1978, any Federal official shall not undertake reconnaissance studies of any plan

for the importation of water into the Colorado River Basin from any other natural river drainage basin lying outside the States of Arizona, California, Colorado, New Mexico, and those portions of Nevada, Utah, and Wyoming which are in the natural drainage basin of the Colorado River.
(Pub.L. 90-537, Title II, § 201, Sept. 30, 1968, 82 Stat. 886; Pub.L. 95-578, § 10, Nov. 2, 1978, 92 Stat. 2472; zpub.L. 96-375, § 10, Oct. 3, 1980, 94 Stat. 1507.)

Historical Note

References in Text. The Reclamation Act of June 17, 1902, 32 Stat. 388, referred to in text, is classified generally to chapter 12 (section 371 et seq.) of this title. For complete classification of this Act to the Code, see Short Title note set out under section 371 of this title and Tables volume.
The Water Resources Planning Act, as amended, referred to in text, is Pub.L. 89-80, July 22, 1965, 79 Stat. 244, as amended, which is classified generally to chapter 19B (section 1962 et seq.) of Title 42, The Public Health and Welfare. For complete classification of this Act to the Code, see Short Title note set out under section 1962 of Title 42 and Tables volume.
1980 Amendment. Pub.L. 96-375 substituted "any Federal official" for "the Secretary" in the proviso.
1978 Amendment. Pub.L. 95-578 substituted "November 2, 1978" for "September 30, 1968".
Termination of National Water Commission. The National Water Commission, established by Pub.L. 90-515, Sept. 26, 1968, 82 Stat. 868, terminated on Sept. 26, 1973.
Legislative History. For legislative history and purpose of Pub.L. 90-537, see 1968 U.S. Code Cong. and Adm.News, p. 3666. See, also, Pub.L. 95-578, 1978 U.S. Code Cong. and Adm.News, p. 5542.

Cross References

Importation of water from sources outside river system, protection of exporting area, see section 1513 of this title.
Mexican Water Treaty, obligation of water augmentation project to satisfy its requirements, see section 1512 of this title.
Repayment of costs for units below Lee Ferry from lower Colorado River Basin Development Fund, see section 1543 of this title.

§ 1511a. Cooperation and participation by Secretary of Army with Federal, State, and local agencies

The Secretary of the Army, acting through the Chief of Engineers, is authorized to cooperate and participate with concerned Federal, State, and local agencies in preparing the general plan for the development of the water resources of the western United States authorized by the Colorado River Basin Project Act [43 U.S.C.A. § 15 et seq.].
(Pub.L. 91-611, Title II, § 203, Dec. 31, 1970, 84 Stat. 1828.)

Historical Note

References in Text. The Colorado River Basin Project Act, referred to in text, is Pub.L. 90-537, Sept. 30, 1968, 82 Stat. 885, as amended, which is classified principally to this chapter. For complete classification of this Act to the Code, see Short Title note set out under section 1501 of this title and Tables volume.
Codification. Section was not enacted as part of the Colorado River Basin project Act which comprises this chapter.

§ 1512. Mexican Water Treaty

The Congress declares that the satisfaction of the requirements of the Mexican Water Treaty from the Colorado River constitutes a national obligation which shall be the first obligation of any water augmentation project planned pursuant to section 1511 of this title and authorized by the Congress. Accordingly, the States of the Upper Division (Colorado, New Mexico, Utah, and Wyoming) and the States of the Lower Division (Arizona, California, and Nevada) shall be relieved from all obligations which may have been imposed upon them by article III(c) of the Colorado River Compact so long as the Secretary shall determine and proclaim that means are available and in operation which augment the water supply of the Colorado River system in such quantity as to satisfy the requirements of the Mexican Water Treaty together with any losses of water associated with the performance of that treaty: *Provided*, That the satisfaction of the requirements of the Mexican Water Treaty (Treaty Series 994, 59 Stat. 1219), shall be from the waters of the Colorado River pursuant to the treaties, laws, and compacts presently relating thereto, until such time as a feasibility plan showing the most economical means of augmenting the water supply available in the Colorado River below Lee Ferry by two and one-half million acre-feet shall be authorized by the Congress and is in operation as provided in this chapter.
(Pub.L. 90-537, Title II, § 202, Sept. 30, 1968, 82 Stat. 887)

Cross References

Measures necessary to replace certain waters resulting from desalting plants undertaken independently from national obligation under this section, see section 1571 of this title.

Release of water from Lake Powell to supply deficiency described in Colorado River Compact unnecessary if proclamation issued under this section, see section 1552 of this title.

§ 1513. Importation of water; protection of exporting areas

(a) In the event that the Secretary shall, pursuant to section 1511 of this title, plan works to import water into the Colorado River system from sources outside the natural drainage areas of the system, he shall make provision for adequate and equitable protection of the interests of the States and areas of origin, including assistance from funds specified in this chapter, to the end that water supplies may be available for use in such States and areas of origin adequate to satisfy their ultimate requirements at prices to users not adversely affected by the exportation of water to the Colorado River system.

(b) All requirements, present or future, for water within any State lying wholly or in part within the drainage area of any river basin from which water is exported by works planned pursuant to this chapter shall have a priority of right in perpetuity to the use of the waters of that river basin, for all purposes, as against the uses of the water delivered by means of such exportation works, unless otherwise provided by interstate agreement.

(Pub.L. 90-537, Title II, § 203, Sept. 30, 1968, 82 Stat. 887.)

§ 1514. Authorization of appropriations

There are hereby authorized to be appropriated such sums as are required to carry out the purposes of this subchapter.

(Pub.L. 90-537, Title II, § 204, Sept. 30, 1968, 82 Stat. 887.)

Subchapter III-AUTHORIZED UNITS; PROTECTION OF EXISTING USES

Cross References

Eligibility to receive irrigation water for ten-year period upon terms and conditions established pursuant to provisions of reclamation law, see section 390rr of this title.

Fish and wildlife conservation and recreational opportunity development, see section 1527 of this title.

Lower Colorado River Basin Development Fund, appropriations and revenues credited to and units subject to return of costs from general funds, see section 1543 of this title.

§ 1521. Central Arizona Project

(a) Construction and operation; Granite-Reef aqueduct and pumping plants; Orme Dam and Reservoir; Buttes Dam and Reservoir; Hooker Dam and Reservoir; Charleston Dam and Reservoir; Tucson aqueducts and pumping plants; Salt-Gila aqueducts; related and appurtenant works

For the purposes of furnishing irrigation water and municipal water supplies to the water-deficient areas of Arizona and western New Mexico through direct diversion or exchange of water, control of floods, conservation and development of fish and wildlife resources, enhancement of recreation opportunities, and for other purposes, the Secretary shall construct, operate, and maintain the Central Arizona Project, consisting of the following principal works: (1) a system of main conduits and canals, including a main canal and pumping plants (Granite-Reef aqueduct and pumping plants), for diverting and carrying water from Lake Havasu to Orme Dam or suitable alternative, which system may have a capacity of 3,000 cubic feet per second or whatever lesser capacity is found to be feasible: *Provided*, That any capacity in the aqueduct in excess of 2,500 cubic feet per second shall be utilized for the conveyance of Colorado River water only when Lake Powell is full or releases of water are made from Lake Powell to prevent the reservoir from exceeding elevation 3,700 feet above mean sea level or when releases are made pursuant to the proviso in section 1552(a)(3) of this title: *Provided further*, That the costs of providing any capacity in excess of 2,500 cubic feet per second shall

be repaid by those funds available to Arizona pursuant to the provision of section 1543(f) of this title, or by funds from sources other than the development fund;

(2) Orme Dam and Reservoir and power-pumping plant or suitable alternative; (3) Buttes Dam and Reservoir, which shall be so operated as not to prejudice the rights of any user in and to the waters of the Gila River as those rights are set forth in the decree entered by the United States District Court for the District of Arizona on June 29, 1935, in United States against Gila Valley Irrigation District of Arizona on June 29, 1935, in United States against Gila Valley Irrigation District and others (Globe Equity Numbered 59); (4) Hooker Dam and Reservoir or suitable alternative, which shall be constructed in such a manner as to give effect to the provisions of subsection (f) of section 1524 of this title; (5) Charleston Dam and Reservoir; (6) Tucson aqueducts and pumping plants; (7) Salt-Gila aqueducts; (8) related canals, regulating facilities, hydroelectric powerplants, and electrical transmission facilities required for the operation of said principal works; (9) related water distribution and drainage works; and (10) appurtenant works.

(b) Limitation on water diversions in years of insufficient main stream Colorado River water

Article II (B)(3) of the decree of the Supreme Court of the United States in Arizona against California (376 U.S. 340) shall be so administered that in any year in which, as determined by the Secretary, there is insufficient main stream Colorado River water available for release to satisfy annual consumptive use of seven million five hundred thousand acre-feet in Arizona, California, and Nevada, diversions from the main stream for the Central Arizona Project shall be so limited as to assure the availability of water in quantities sufficient to provide for the aggregate annual consumptive use by holders of present perfected rights, by other users in the State of California served under existing contracts with the United States by diversion works heretofore constructed, and by other existing Federal reservations in that State, of four million four hundred thousand acre-feet of mainstream water, and by users of the same character in Arizona and Nevada. Water users in the State of Nevada shall not be required to bear shortages in any proportion greater than would have been imposed in the absence of this subsection. This subsection shall not affect the relative priorities, among themselves, of water users in Arizona, Nevada, and California which are senior to diversions for the Central Arizona Project, or amend any provisions of said decree.

(c) Augmentation of water supply of the Colorado River system

The limitation stated in subsection (b) of this section shall not apply so long as the Secretary shall determine and proclaim that means are available and in operation which augment the water supply of the Colorado River system in such quantity as to make sufficient mainstream water available for release to satisfy annual consumptive use of seven million five hundred thousand acre-feet in Arizona, California, and Nevada.
(Pub.L. 90-537, Title III, § 301, Sept. 30, 1968, 82 Stat. 887.)

§ 1522. Orme Dam and Reservoir

(a) Acquisition of lands of the Salt River Pima-Maricopa Indian Community and the Fort McDowell-Apache Indian Community; relocation; eminent domain

The Secretary shall designate the lands of the Salt River Pima-Maricopa Indian Community, Arizona, and the Fort McDowell-Apache Indian Community, Arizona, or interests therein, and any allotted lands or interests therein within said communities which he determines are necessary for use and occupancy by the United States for the construction, operation, and maintenance of Orme Dam and Reservoir, or alternative. The Secretary shall offer to pay the fair market value of the lands and interests designated, inclusive of improvements. In addition, the Secretary shall offer to pay toward the cost of relocating or replacing such improvements not to exceed $500,000 in the aggregate, and the amount offered for the actual relocation or replacement of a residence shall not exceed the difference between the fair market value of the residence and $8,000. Each community and each affected allottee shall have six months in which to accept or reject the Secretary's offer. If the Secretary's offer is rejected

the United State may proceed to acquire the property interests involved through eminent domain proceedings in the United States District Court for the District of Arizona under 40 U.S.C.A., Sections 257 and 258a. Upon acceptance in writing of the Secretary's offer, or upon the filing of a declaration of taking in eminent domain proceedings, title to the lands or interests involved, and the right to possession thereof, shall vest in the United States. Upon a determination by the Secretary that all or any part of such lands or interests are no longer necessary for the purpose for which acquired, title to such lands or interests shall be restored to the appropriate community upon repayment to the Federal Government of the amounts paid by it for such lands.

(b) Rights of former owners to use or lease land

Title to any land or easement acquired pursuant to this section shall be subject to the right of the former owner to use or lease the land for purposes not inconsistent with the construction, operation, and maintenance of the project, as determined by, and under terms and conditions prescribed by, the Secretary. Such right shall include the right to extract and dispose of minerals. The determination of fair market value under subsection (a) of this section shall reflect the right to extract and dispose of minerals and all other uses permitted by this section.

(c) Addition of land to Fort McDowell Indian Reservation

In view of the fact that a substantial portion of the lands of the Fort McDowell Mojave-Apache Indian Community will be required for Orme Dam and Reservoir, or alternative, the Secretary shall, in addition to the compensation provided for in subsection (a) of this section, designate and add to the Fort McDowell Indian Reservation twenty-five hundred acres of suitable lands in the vicinity of the reservation that are under the jurisdiction of the Department of the Interior in township 4 north, range 7 east; township 5 north, range 7 east; and township 3 north, range 7 east, Gila and Salt River base meridian, Arizona. Title to lands so added to the reservation shall be held by the United States in trust for the Fort McDowell Mojave-Apache Indian Community.

(d) Recreational facilities developed and operated by Indian communities along Orme Reservoir shoreline

Each community shall have a right, in accordance with plans approved by the Secretary, to develop and operate recreational facilities along the part of the shoreline of the Orme Reservoir located on or adjacent to its reservation, including land added to the Fort McDowell Reservation as provided in subsection (b) of this section, subject to rules and regulations prescribed by the Secretary governing the recreation development of the reservoir. Recreation development of the entire reservoir and federally owned lands under the jurisdiction of the Secretary adjacent thereto shall be in accordance with a master recreation plan approved by the Secretary. The members of each community shall have nonexclusive personal rights to hunt and fish on or in the reservoir without charge to the same extent they are now authorized to hunt and fish, but no community shall have the right to exclude others from the reservoir except by control of access through its reservation or any right to require payment by members of the public except for the use of community lands or facilities.

(e) Exemption of funds State and Federal income taxes

All funds paid pursuant to this section, and any per capita distribution thereof, shall be exempt from all forms of State and Federal income taxes.

(Pub.L. 90-537, Title III, § 302, Sept. 30, 1968, 82 Stat. 888.)

Cross References

Fish and wildlife conservation and recreational opportunity development, see section 1527 of this title.

§ 1523. Power requirements of Central Arizona Project and augmentation of Lower Colorado River Basin Development Fund.

(a) Engineering and economic studies

The Secretary is authorized and directed to continue to a conclusion appropriate engineering and economic studies and to recommend the most feasible plan for the construction and operation of hydroelectric generating [illegible] transmission facilities, the purchase of electrical energy, the purchase of entitlement to electrical plant capacity any combination thereof, including participation, operation, or construction by non-Federal entities, for the purpose of supplying the power requirements of the Central Arizona Project and augmenting the Lower Colorado River Basin Development Fund: *Provided*, That nothing in this section or in this chapter contained shall be construed to authorize the study or construction of any dams on the main stream of the Colorado River between Hoover Dam and Glen Canyon Dam.

(b) Construction of thermal generating powerplants; agreements for acquisition by United States of portions of plant capacity

If included as a part of the recommended plan, the Secretary may enter into agreements with non-Federal interests proposing to construct thermal generating powerplants whereby the United States shall acquire the right to such portions of their capacity, including delivery of power and energy over appurtenant transmission facilities to mutually agreed upon delivery points, as he determines is required in connection with the operation of the Central Arizona Project. When not required for the Central Arizona Project, the power and energy acquired by such agreements may be disposed of intermittently by the Secretary for other purposes at such prices as he may determine, including its marketing in conjunction with the sale of power and energy from Federal powerplants in the Colorado River system so as to produce the greatest practicable amount of power and energy that can be sold at firm power and energy rates. The agreements shall provide, among other things, that-

(1) the United States shall pay not more than that portion of the total construction cost, exclusive of interest during construction, of the powerplants, and of any switchyards and transmission facilities serving the United States, as is represented by the ratios of the respective capacities to be provided for the United States therein to the total capacities of such facilities. The Secretary shall make the Federal portion of such costs available to the non-Federal interests during the construction period, including the period of preparation of designs and specifications, in such installments as will facilitate a timely construction schedule, but no funds other than for preconstruction activities shall be made available by the Secretary until he determines that adequate contractual arrangements have been entered into between all the affected parties covering land, water, fuel supplies, power (its availability and use), rights -of-way, transmission facilities and all other necessary matters for the thermal generating powerplants;

(2) annual operation and maintenance costs shall be apportioned between the United States and the non-Federal interests on an equitable basis taking into account the ratios determined in accordance with the foregoing clause (1): *Provided, however*, That the United States shall share on the foregoing basis in the depreciation component of such costs only to the extent of provision for depreciation on replacements financed by the non-Federal interests;

(3) the United States shall be given appropriate credit for any interests in Federal lands administered by the Department of the Interior that are made available for the powerplants and appurtenances;

(4) costs to be borne by the United States under clauses (1) and (2) shall not include (a) interest and interest during construction, (b) financing charges, (c) franchise fees, and (d) such other costs as shall be specified in the agreement.

(c) Recommended plan; submission to Congress

No later than one year from September 30, 1968, the Secretary shall submit his recommended plan to the Congress. Except as authorized by subsection (b) of this section, such plan shall not become effective until approved by the Congress.

(d) Apportionment of water for Arizona plants diverted above Lee Ferry

If any thermal generating plant referred to in subsection (b) of this section is located in Arizona, and if it is served by water diverted from the drainage area of the Colorado River system above Lee Ferry, other provisions of existing law to the contrary notwithstanding, such consumptive use of water shall be a part of the fifty thousand acre-feet per annum apportioned to the State of Arizona by article III (a) of the Upper Colorado River Basin Compact (63 Stat. 31).

(Pub.L. 90-537, Title III, § 303, Sept. 30, 1968, 82 Stat. 889).

Notes of Decisions

1. Construction with other laws

Section 485h of this title requiring that preference be given to certain public entities in governmental sales or leases of electric power or power privileges applied to federal sales of thermally generated electrical power under this section. Arizona Power Pooling Ass'n v. Morton, C.A.Ariz.1975, 527 F.2d 721, certiorari denied 96 S.Ct. 1506, 425 U.S. 911, 47 L.Ed.2d 761.

2. Injunction

District court did not abuse its discretion in refusing to issue preliminary injunction to require Secretary of Interior to sell excess power supplies generated pursuant to this chapter to cities where evidence showed that cities did not offer to buy federal power until approximately three years after government had contracted to sell power, even though one of cities sat on committee soliciting offers and was therefore aware of impending sale. City of Anaheim, Cal. v. Kleppe, C.A. Ariz. 1978, 590 F.2d 285.

3. Review

Decision of Secretary of the Interior not to offer preference to public entities in sales of electric power in connection with Central Arizona Project was reviewable under Administrative Procedure Act, section 551 et seq. and 701 et seq. of Title 5. Arizona Power Pooling Ass'n v. Morton, C.A.Ariz. 1975, 527 F.2d 721, certiorari denied 96 S.Ct. 1506, 425 U.S. 911, 47 L.Ed.2d 761.

§ 1524. Water furnished from Central Arizona Project

(a) Restriction on use of water for Irrigation

Unless and until otherwise provided by Congress, water from the Central Arizona Project shall not be made available directly or indirectly for the irrigation of lands not having a recent irrigation history as determined by the Secretary, except in the case of Indian lands, national wildlife refuges, and, with the approval of the Secretary, State-administered wildlife management areas.

(b) Contracts with municipal and industrial users

(1) Irrigation and municipal and industrial water supply under the Central Arizona Project within the State of Arizona may, in the event the Secretary determines that it is necessary to effect repayment, be pursuant to master contracts with organizations which have power to levy assessments against all taxable real property within their boundaries. The terms and conditions of contracts or other arrangements whereby each such organization makes water from the Central Arizona Project available to users within its boundaries shall be subject to the Secretary's approval, and the United States shall, if the Secretary determines such action is desirable to facilitate carrying out the provisions of this chapter, have the right to require that it be a party to such contracts or that contracts subsidiary to the master contracts be entered into between the United States and any user. The provisions of this clause (1) shall not apply to the supplying of water to an Indian tribe for use within the boundaries of an Indian reservation.

(2) Any obligation assumed pursuant to section 485h(d) of this title with respect to any project contract unit or irrigation block shall be repaid over a basic period of not more than fifty years; any water service provided pursuant to section 485h(e) of this title may be on the basis of delivery of water for a period of fifty years and for the delivery of such water at an identical price per acre-foot for water of the same class at the several points of delivery from the main canals and conduits and from such other points of delivery as the Secretary may designate; and long-term contracts relating to irrigation water supply shall provide that water made available thereunder may be made

available by the Secretary for municipal or industrial purposes if and to the extent that such water is not required by the contractor for irrigation purposes.

(3) Contracts relating to municipal and industrial water supply under the Central Arizona Project may be made without regard to the limitations of the last sentence of section 485h(c) of this title; may provide for the delivery of such water at an identical price per acre-foot for water of the same class at the several points of delivery from the main canals and conduits; and may provide for repayment over a period of fifty years if made pursuant to clause (1) of said section and for the delivery of water over a period of fifty years if made pursuant to clause (2) thereof.

(c) Water conservation

Each contract under which water is provided under the Central Arizona Project shall require that (1) there be in effect measures, adequate in the judgment of the Secretary, to control expansion of irrigation from aquifers affected by the irrigation in the contract service area; (2) the canals and distribution systems through which water is conveyed after its delivery by the Untied States to the contractors shall be provided and maintained with linings adequate in his judgment to prevent excessive conveyance losses; and (3) neither the contractor nor the Secretary shall pump or permit others to pump ground water from within the exterior boundaries of the service area of a contractor receiving water from the Central Arizona Project for any use outside said contractor's service area unless the Secretary and such contractor shall agree, or shall have previously agreed, that a surplus of ground water exists and that drainage is or was required. Such contracts shall be subordinate at all times to the satisfaction of all existing contracts between the Secretary and users in Arizona heretofore made pursuant to the Boulder Canyon Project Act (45 Stat. 1057) [43 U.S.C.A. § 617 et. seq.].

(d) Water exchanges

The Secretary may require in any contract under which water is provided from the Central Arizona Project that the contractor agree to accept main stream water in exchange for or in replacement of existing supplies from sources other than the main stream. The Secretary shall so require in the case of users in Arizona who also use water from the Gila River system to the extent necessary to make available to users of water from the Gila River system in New Mexico additional quantities of water as provided in and under the conditions specified in subsection (f) of this section: *Provided*, That such exchanges and replacements shall be accomplished without economic injury or cost to such Arizona contractors.

(e) Water shortage priorities

In times of shortage or reduction of main stream Colorado River water for the Central Arizona Project, as determined by the Secretary, users which have yielded water from other sources in exchange for main stream water supplied by that project shall have a first priority to receive main stream water, as against other users supplied by that project which have not so yielded water from other sources, but only in quantities adequate to replace the water so yielded.

(f) New Mexico users; water exchange contracts

(1) In the operation of the Central Arizona Project, the Secretary shall offer to contract with water users in New Mexico for water from the Gila River, its tributaries and underground water sources in amounts that will permit consumptive use of water in New Mexico of not to exceed an annual average in any period of ten consecutive years of eighteen thousand acre-feet, including reservoir evaporation, over and above the consumptive uses provided for by article IV of the decree of the Supreme Court of the United States in Arizona against California (376 U.S. 340). Such increased consumptive uses shall not begin until, and shall continue only so long as, delivery of Colorado River water to downstream Gila River users in Arizona is being accomplished in accordance with this chapter, in quantities sufficient to replace any diminution of their supply resulting from such diversion from the Gila River

its tributaries and underground water sources. In determining the amount required for this purpose full consideration shall be given to any differences in the quality of the waters involved.

(2) The Secretary shall further offer to contract with water users in New Mexico for water from the Gila River, its tributaries, and underground water sources in amounts that will permit consumptive uses of water in New Mexico of not to exceed an annual average in any period of ten consecutive years of an additional thirty thousand acre-feet, including reservoir evaporation. Such further increases in consumptive use shall not begin until, and shall continue only so long as, works capable of augmenting the water supply of the Colorado River system have been completed and water sufficiently in excess of two million eight hundred thousand acre-feet per annum is available from the main stream of the Colorado River for consumptive use in Arizona to provide water for the exchanges herein authorized and provided. In determining the amount required for this purpose full consideration shall be given to any differences in the quality of the waters involved.

(3) All additional consumptive uses provided for in clauses (1) and (2) of this subsection shall be subject to all rights in New Mexico and Arizona as established by the decree entered by the United States District Court for the District of Arizona on June 29, 1935, in United States against Gila Valley Irrigation District and others (Globe Equity Numbered 59) and to all other rights existing on September 30, 1968, in New Mexico and Arizona to water from the Gila River, its tributaries, and underground water sources, and shall be junior thereto and shall be made only to the extent possible without economic injury or cost to the holders of such rights.
(Pub.L. 90-537, Title III, § 304, Sept. 30, 1968, 82 Stat. 891.)

Historical Note

References in Text. This chapter, referred to in subsecs. (b)(1) and (f)(1), was in the original "this Act", meaning Pub.L. 90-537, Sept. 30, 1968, 82 Stat. 885, as amended, known as the Colorado River Basin Project Act, which enacted this chapter and sections 616aa-1, 620a-1, 620a-2, 620c-1, and 620d-1 of this title, amended sections 616hh, 620, and 620a of this title, and enacted provisions set out as notes under sections 620, 620k, and 1501 of this title. For complete classification of this Act to the Code, see Short Title note set out under section 1501 of this title and Tables volume.
The Boulder Canyon Project Act, referred to in subsec. (c), is Act Dec. 21, 1928, c. 42, 45 Stat. 1057, as amended, which is classified generally to subchapter I (section 617 et seq.) of chapter 12A of this title. For complete classification of this Act to the Code, see section 617t of this title and Tables volume.
Codification. Subsec. (g) of this section, which restricted the use of water from the projects authorized by this chapter for the production of basic agricultural commodities on newly irrigated lands for a period of ten years from Sept. 30, 1968, was omitted.

Cross References

Hooker Dam and Reservoir constructed to give effect to provision of this section on consumptive use of water users in New Mexico, see section 1521 of this title.
Use of Lower Colorado River Basin Development Fund to reimburse water users in State of Arizona, see section 1543 of this title.

§ 1525. Cost of main stream water of the Colorado River

To the extent that the flow of the main stream of the Colorado River is augmented in order to make sufficient water available for release, as determined by the Secretary pursuant to article II (b)(1) of the decree of the Supreme Court of the United States in Arizona against California (376 U.S. 340), to satisfy annual consumptive use of two million eight hundred thousand acre-feet in Arizona, four million four hundred thousand acre-feet in California, and three hundred thousand acre-feet in Nevada, respectively, the Secretary shall make such water available to users of main stream water in those States at the same costs (to the extent that such costs can be made comparable through the nonreimbursable allocation to the replenishment of the deficiencies occasioned by satisfaction of the Mexican Treaty burden as herein provided and financial assistance from the development fund established by section 1543 of this title) and on the same terms as would be applicable if main stream water were available for release in the quantities required to supply such consumptive use.
(Pub.L. 90-537, Title III, § 305, Sept. 30, 1968, 82 Stat. 893.)

§ 1526. Water salvage programs

The Secretary shall undertake programs for water salvage and ground water recovery along and adjacent to the n stream of the Colorado River. Such programs shall be consistent with maintenance of a reasonable degree o. undisturbed habitat for fish and wildlife in the area, as determined by the Secretary.
(Pub.L. 90-537, Title III, § 306, Sept. 30, 1968, 82 Stat. 893).

§ 1527. Fish and wildlife conservation and development

The conservation and development of the fish and wildlife resources and the enhancement of recreation opportunities in connection with the project works authorized pursuant to this subchapter shall be in accordance with the provisions of the Federal Water Project Recreation Act (79 Stat. 213) [16 U.S.C.A. § 460*l*-12 et seq.], except as provided in section 1522 of this title.
(Pub.L. 90-537, Title III, § 308, Sept. 30, 1968, 82 Stat. 893)

Historical Note

References in Text. The Federal Water Project Recreation Act, referred to in text, is Pub.L. 89-72, July 9, 1965, 79 Stat. 213, as amended, which is classified principally to part C (section 460*l*-12 et. seq.) of subchapter LXIX of chapter 1 of Title 16, Conservation. For complete classification of this Act to the Code, see Short Title note set out under section 460*l*-12 of Title 16 and Tables volume.

§ 1528. Authorization of appropriations

(a) There is hereby authorized to be appropriated for construction of the Central Arizona Project, including prepayment for power generation and transmission facilities but exclusive of distribution and drainage facilities for non-Indian lands, $832,180,000 plus or minus such amounts, if any, as may be justified by reason of ordinary fluctuations in construction costs as indicated by engineering cost indices applicable to the types of construction involved therein and, in addition thereto, such sums as may be required for operation and maintenance of th project.

(b) There is also authorized to be appropriated $100,000,000 for construction of distribution and drainage facilities for non-Indian lands plus or minus such amounts, if any, as may be justified by reason of ordinary fluctuations in construction costs as indicated by engineering and cost indices applicable to the types of construction involved therein from September 30, 1968: *Provided*, That the Secretary shall enter into agreements with non-Federal interests to provide not less than 20 per centum of the total cost of such facilities during the construction of such facilities. Notwithstanding the provisions of section 1543 of this title, neither appropriations made pursuant to the authorization contained in this subsection nor revenues collected in connection with the operation of such facilities shall be credited to the Lower Colorado River Basin Development Fund and payments shall not be made from that fund to the general fund of the Treasury to return any part of the costs of construction, operation, and maintenance of such facilities.
(Pub.L. 90-537, Title III, § 309, Sept. 30, 1968, 82 Stat. 893; Pub.L. 97-373, Dec. 20, 1982, 96 Stat. 1817.)

Historical Note

1982 Amendment. Subsec. (b). Pub.L. 97-373 substituted "There is also authorized to be appropriated $100,000,000 for construction of distribution and drainage facilities for non-Indian lands plus or minus such amounts, if any, as may be justified by reason of ordinary fluctuations in construction costs as indicated by engineering and cost indices applicable to the types of construction involved therein from September 30, 1968: *Provided*, That the Secretary shall enter into agreements with non-Federal interests to provide not less than 20 per centum of the total cost of such facilities during the construction of such facilities" for "There is also authorized to be appropriated $100,000,000 for construction of distribution and drainage facilities for non-Indian lands".

Legislative History. For legislative history and purpose of Pub.L. 90-537, see 1968 U.S. Code Cong. and Adm.News, p. 3666. See, also, Pub.L. 97-373, 1982 U.S. Code Cong. and Adm.News, p. 3432.

Subchapter IV-LOWER COLORADO RIVER BASIN DEVELOPMENT FUND

§ 1541. Allocation of costs; repayment

Upon completion of each lower basin unit of the project herein or hereafter authorized, or separate feature thereof, the Secretary shall allocate the total costs of constructing said unit or features to (1) commercial power, (2) irrigation, (3) municipal and industrial water supply, (4) flood control, (5) navigation, (6) water quality control, (7) recreation, (8) fish and wildlife, (9) the replenishment of the depletion of Colorado River flows available for use in the United States occasioned by performance of the Water Treaty of 1944 with the United Mexican States (Treaty Series 994; 59 Stat. 1219), and (10) any other purposes authorized under the Federal reclamation laws. Costs of construction, operation, and maintenance allocated to the replenishment of the depletion of Colorado River flows available for use in the United States occasioned by compliance with the Mexican Water Treaty (including losses in transit, evaporation from regulatory reservoirs, and regulatory losses at the Mexican boundary, incurred in the transportation, storage, and delivery of water in discharge of the obligations of that treaty) shall be nonreimbursable: *Provided*, That the nonreimbursable allocation shall be made on a pro rata basis to be determined by the ratio between the amount of water required to comply with the Mexican Water Treaty and the total amount of water by which the Colorado River is augmented pursuant to the investigations authorized by subchapter II of this chapter and any future Congressional authorization. The repayment of costs allocated to recreation and fish and wildlife enhancement shall be in accordance with the provisions of the Federal Water Project Recreation Act (79 Stat. 213) [16 U.S.C.A. § 460*l*-12 et seq.]: *Provided*, That all of the separable and joint costs allocated to recreation and fish and wildlife enhancement as a part of the Dixie project, Utah, shall be nonreimbursable. Costs allocated to nonreimbursable purposes shall be nonreturnable under the provisions of this chapter.
(Pub.L. 90-537, Title IV, § 401, Sept. 30, 1968, 82 Stat. 894.)

Historical Note

References in Text. The Federal reclamation laws, referred to in text, include the Act of June 17, 1902, c. 1093, 32 Stat. 388, popularly known as the Reclamation Act, and Act amendatory thereof and supplementary thereto, classified generally to chapter 12 (section 371 et. seq.) of this title. For complete classification of Act June 17, 1902, to the Code, see Short Title note set out under section 371 of this title and Tables volume.
The Federal Water Project Recreation Act, referred to in text, is Pub.L. 89-72, July 9, 1965, 79 Stat. 213, as amended, which is classified principally to part C (section 460*l*-12 et. seq.) of subchapter LXIX of chapter 1 of Title 16, Conservation. For complete classification of this Act to the Code, see Short Title note set out under section 460l-12 of Title 16 and Tables volume.

§ 1542. Repayment capability of Indian lands

The Secretary shall determine the repayment capability of Indian lands within, under, or served by any unit of the project. Construction costs allocated to irrigation of Indian lands (including provision of water for incidental domestic and stock water uses) and within the repayment capability of such lands shall be subject to section 386a of Title 25, and such costs that are beyond repayment capability of such lands shall be nonreimbursable.
(Pub.L. 90-537, Title IV, § 402, Sept. 30, 1968, 82 Stat. 894.)

§ 1543. Lower Colorado River Basin Development Fund

(a) Establishment

There is hereby established a separate fund in the Treasury of the United States to be known as the Lower Colorado River Basin Development Fund (hereafter called the "development fund"), which shall remain available until expended as hereafter provided.

(b) Appropriations

(1) All appropriations made for the purpose of carrying out the provisions of subchapter III of this chapter shall be credited to the development fund as advances from the general fund of the Treasury, and shall be available for such purpose.

(2) Except as provided in section 1528(b) of this title, sums advanced by non-Federal entities for the purpose of carrying out the provisions of subchapter III of this chapter shall be credited to the developm fund and shall be available without further appropriation for such purpose.

(c) Revenues credited to fund

There shall also be credited to the development fund -

(1) all revenues collected in connection with the operation of facilities authorized in subchapter III of this chapter in furtherance of the purposes of this chapter (except entrance, admission, and other recreation fees or charges and proceeds received from recreation concessionaires), until completion of repayment requirements of the Central Arizona project;

(2) any Federal revenues from the Boulder Canyon and Parker-Davis projects which, after completion of repayment requirements of the said Boulder Canyon and Parker-Davis projects, are surplus, as determined by the Secretary, to the operation, maintenance, and replacement requirements of those projects: *Provided, however,* That for the Boulder Canyon project commencing June 1, 1987, and for the Parker-Davis project commencing June 1, 2005, and until the end of the repayment period for the Central Arizona project described in section 1521(a) of this title, the Secretary of Energy shall provide for surplus revenues by including the equivalent of 4½ mills per kilowatthour in the rates charged to purchasers in Arizona for application to the purposes specified in subsection (f) of this section and by including the equivalent 2½ mills per kilowatthour in the rates charged to purchasers in California and Nevada for application to the purposes of subsection (g) of this section as amended and supplemented: *Provided further,* That after the repayment period for said Central Arizona project, the equivalent of 2½ mills per kilowatthour shall be included by the Secretary of Energy in the rates charged to purchasers in Arizona, California, and Nevada to provide revenues for application to the purposes of said subsection (g) of this section: *Provided, however,* That the Secretary is authorized and directed to continue the in-lieu-of-tax payments to the Sta of Arizona and Nevada provided for in section 618a(c) of this title so long as revenues accrue from t operation of the Boulder Canyon project; and

(3) any Federal revenues from that portion of the Pacific Northwest-Pacific Southwest intertie located in the States of Nevada and Arizona which, after completion of repayment requirements of the said part of the Pacific Northwest-Pacific Southwest intertie located in the States of Nevada and Arizona, are surplus, as determined by the Secretary, to the operation, maintenance, and replacement requirements of said portion of the Pacific Northwest-Pacific Southwest intertie and related facilities.

(d) Use of revenue funds

All moneys collected and credited to the development fund pursuant to subsection (b) and clauses (1) and (3) of subsection (c) of this section and the portion of revenues derived from the sale of power and energy for use in Arizona pursuant to clause (2) of subsection (c) of this section shall be available, without further appropriation, for--

(1) defraying the costs of operation, maintenance, and replacements of, and emergency expenditures for, all facilities of the projects, within such separate limitations as may be included in annual appropriation Acts; and

(2) payments to reimburse water users in the State of Arizona for losses sustained as a result of diminution of the production of hydroelectric power at Coolidge Dam, Arizona, resulting from exchanges of water between users in the States of Arizona and New Mexico as set forth in section 1524(f) of this title.

(e) Appropriation by Congress required for construction of works

Revenues credited to the development fund shall not be available for construction of the works comprised within any unit of the project herein or hereafter authorized except upon appropriation by the Congress.

(f) Return of costs and interest

Moneys credited to the development fund pursuant to subsection (b) and clauses (1) and (3) of subsection (c) of this section and the portion of revenues derived from the sale of power and energy for use in Arizona pursuant to clause (2) of subsection (c) of this section in excess of the amount necessary to meet the requirements of clauses (1) and (2) of subsection (d) of this section shall be paid annually to the general fund of the Treasury to return--

(1) the costs of each unit of the projects or separable feature thereof authorized pursuant to subchapter III of this chapter which are allocated to irrigation, commercial power, or municipal and industrial water supply, pursuant to this chapter within a period not exceeding fifty years from the date of completion of each such unit or separable feature, exclusive of any development period authorized by law: *Provided*, That return of the costs, if any, required by section 616aa-1 of this title shall not be made until after the payout period of the Central Arizona Project as authorized herein; and

(2) interest (including interest during construction) on the unamortized balance of the investment in the commercial power and municipal and industrial water supply features of the project at a rate determined by the Secretary of the Treasury in accordance with the provisions of subsection (h) of this section, and interest due shall be a first charge.

(g) Repayment of costs

All revenues credited to the development fund in accordance with clause (c)(2) of this section (excluding only those revenues derived from the sale of power and energy for use in Arizona during the payout period of the Central Arizona Project as authorized herein) and such other revenues as remain in the development fund after making the payments required by subsections (d) and (f) of this section shall be available (1) to make payments, if any, as required by sections 616aa-1 and 620d-1 of this title, (2) for repayment to the general fund of the Treasury the costs of each salinity control unit or separable feature thereof the costs of measures to replace incidental fish and wildlife values foregone, and the costs of on-farm measures payable from the Lower Colorado River Basin Development Fund in accordance with sections 1595(a)(2), 1595(a)(3), and 1595(b) of this title and (3) upon appropriation by the Congress, to assist in the repayment of reimbursable costs incurred in connection with units hereafter constructed to provide for the augmentation of the water supplies of the Colorado River for use below Lee Ferry as may be authorized as a result of the investigations and recommendations made pursuant to sections 1511 and 1513(a) of this title.

(h) Interest rate

The interest rate applicable to those portions of the reimbursable costs of each unit of the project which are properly allocated to commercial power development and municipal and industrial water supply shall be determined by the Secretary of the Treasury, as of the beginning of the fiscal year in which the first advance is made for initiating construction of such unit, on the basis of the computed average interest rate payable by the Treasury upon its outstanding marketable public obligations which are neither due nor callable for redemption for fifteen years from the date of issue.

(i) Annual budgets; submission to Congress

Business-type budgets shall be submitted to the Congress annually for all operations financed by the development fund.

(Pub.L. 90-537, Title IV, § 403, Sept. 30, 1968, 82 Stat. 894; Pub.L. 93-320, Title II, § 205(b)(2), June 24, 1974, 88 Stat. 273; Pub.L. 98-381, Title I, § 102, Aug. 17, 1984, 98 Stat. 1333; Pub.L. 98-569, § 4(f)(2), Oct. 30, 1984, 98 Stat. 2939.)

1984 Amendments Subsec. (b). Pub.L. 98-381, § 102(a), designated existing provisions as par. (1) and added par. (2). Subsec. (c)(1). Pub.L. 98-381, § 102(b), substituted "until completion of repayment requirements of the Central Arizona project;" for "including revenues which, after completion of payout of the Central Arizona project as required herein are surplus, as determined by the Secretary, to the operation, maintenance, and replacement requirements of said project;". Subsec. (c)(2). Pub.L. 98-381, § 102(c), added two provisos, the first relating to the inclusion of the equivalent of 4½ mills per kilowatthour in the rates charged to purchaser in Arizona for application to the purposes specified in subsection (f) of this section and to the inclusion of the equivalent 2½ mills per kilowatthour in the rates charged to purchasers in California and Nevada for application to the purposes of subsection (g) of this section as amended and supplemented, and the second providing that, after the repayment period for said Central Arizona project, the equivalent of 2½ mills per kilowatthour shall be included by the Secretary of Energy in the rates charged to purchasers in Arizona, California, and Nevada to provide revenues for application to the purposes of said subsection (g) of this section.. Subsec. (g). Pub.L. 98-569 added "the costs of measures to replace incidental fish and wildlife values foregone, and the costs of on-farm measures" before "payable from".

1974 Amendment. Subsec. (g). Pub.L. 93-320 added cl. (2), and redesignated former cl. (2), authorizing the use of revenues to assist in the repayment of reimbursable costs incurred in connection with units constructed after Sept. 30, 1968, to provide for the augmentation of water supplies of the Colorado River for use below Lee Ferry, as cl. (3).

Legislative History. For legislative history and purpose of Pub.L. 90-537, see 1968 U.S. Code Cong. and Adm.News, p. 3666. See, also, Pub.L. 93-320, 1974 U.S. Code Cong. and Adm.News, p. 3327; Publ. L. 98-381, 1984 U.S. Code Cong. and Adm.News, p. 2479; Pub.L. 98-569, 1984 U.S. Code Cong. and Adm. News, p. 4901.

Cross References

Availability of main stream water at same cost to all users to satisfy stated amount of consumptive use, see section 1525 of this title.

Credit of certain appropriations to Lower Colorado River Basin Development Fund, see section 1528 of this title.

Repayment of costs from-

Development fund of each salinity control unit as modifying provisions for salinity control of Colorado River Basin, see section 1597 of this title.

Funds available to Arizona under this section for cost of excess capacity in Granite Reef aqueduct, see section 1521 of this title.

Salinity control unit costs payable from Lower Colorado River Basin Development Fund, see section 1595 of this chapter.

Transfers to Upper Colorado River Basin Fund from Lower Colorado River Basin Development Fund, see section 620d-1 if this title.

§ 1544. Annual report to Congress

On January 1 of each year the Secretary shall report to the Congress, beginning with the fiscal year ending June 30, 1969, upon the status of the revenues from and the cost of constructing, operating, and maintaining each lower basin unit of the project for the preceding fiscal year. The report of the Secretary shall be prepared to reflect accurately the Federal investment allocated at that time to power, to irrigation, and to other purposes, the progress of return and repayment thereon, and the estimated rate of progress, year by year, in accomplishing full repayment. (Pub.L. 90-537, Title IV, § 404, Sept. 30, 1968, 82 Stat. 896.)

Subchapter V-GENERAL PROVISIONS

§ 1551. Construction of Colorado River Basin Act

(a) Effect on other laws

Nothing in this chapter shall be construed to alter, amend, repeal, modify, or be in conflict with the provisions of the Colorado River Compact (45 Stat. 1057), the Upper Colorado River Basin Compact (63 Stat. 31), the Water Treaty of 1944 with the United Mexican States (treaty Series 994; 59 Stat. 1219), the decree entered by the Supreme Court of the United States in Arizona against California and others (376 U.S. 340), or, except as otherwise provided herein, the Boulder Canyon Project Act (45 Stat. 1057) [43 U.S.C.A. § 617 et seq.], the Boulder Canyon Project Adjustment Act (54 Stat. 774) [43 U.S.C.A. § 618 et seq.], or the Colorado River Storage Project Act (70 Stat. 105) [43 U.S.C.A. § 620 et. seq.].

(b) Reports to Congress

The Secretary is directed to —

(1) make reports as to the annual consumptive uses and losses of water from the Colorado River system after each successive five-year period, beginning with the five-year period starting on October 1, 1970. Such reports shall include a detailed breakdown of the beneficial consumptive use of water on a State-by-State basis. Specific figures on quantities consumptively used from the major tributary streams flowing into the Colorado River shall also be included on a State-by-State basis. Such reports shall be prepared in consultation with the States of the lower basin individually and with the Upper Colorado River Commission, and shall be transmitted to the President, the Congress, and to the Governors of each State signatory to the Colorado River Compact; and

(2) condition all contracts for the delivery of water originating in the drainage basin of the Colorado River system upon the availability of water under the Colorado River Compact.

(c) Compliance of Federal officers and agencies

All Federal officers and agencies are directed to comply with the applicable provisions of this chapter, and of the laws, treaty, compacts, and decree referred to in subsection (a) of this section, in the storage and release of water from all reservoirs and in the operation and maintenance of all facilities in the Colorado River system under the jurisdiction and supervision of the Secretary, and in the operation and maintenance of all works which may be authorized hereafter for the augmentation of the water supply of the Colorado River system. In the event of failure of any such officer or agency to so comply, and affected State may maintain an action to enforce the provisions of this section in the Supreme Court of the United States and consent is given to the joinder of the United States as a party in such suit or suits, as a defendant or otherwise.
(Pub.L. 90-537, Title VI, § 601, Sept. 30, 1968, 82 Stat. 899.)

§ 1552. Criteria for long-range operation of reservoirs

(a) Promulgation by Secretary; order of priorities

In order to comply with and carry out the provisions of the Colorado River Compact, the upper Colorado River Basin Compact, and the Mexican Water Treaty, the Secretary shall propose criteria for the coordinated long-range operation of the reservoirs constructed and operated under the authority of the Colorado River Storage Project Act [43 U.S.C.A. § 620 et seq.], the Boulder Canyon Project Act [43 U.S.C.A. § 617 et seq.], and the Boulder Canyon Project Adjustment Act [43 U.S.C.A. § 618 et seq.]. To effect in part the purposes expressed in this paragraph, the criteria shall make provision for the storage of water in storage units of the Colorado River storage project and releases of water from Lake Powell in the following listed order of priority:

(1) releases to supply one-half the deficiency described in article III(c) of the Colorado River Compact, if any such deficiency exists and is chargeable to the States of the Upper Division, but in any event such releases, if any, shall not be required in any year that the Secretary makes the determination and issues the proclamation specified in section 1512 of this title;

(2) releases to comply with article III(d) of the Colorado River Compact, less such quantities of water delivered into the Colorado River below Lee Ferry to the credit of the States of the Upper Division from other sources; and

(3) storage of water not required for the releases specified in clauses (1) and (2) of this subsection to the extent that the Secretary, after consultation with the Upper Colorado River Commission and representatives of the three Lower Division States and taking into consideration all relevant factors (including, but not limited to, historic streamflows, the most critical period of record, and probabilities of water supply), shall find this to be reasonably necessary to assure deliveries under clauses (1) and (2) without impairment of

annual consumptive uses in the upper basin pursuant to the Colorado River Compact: *Provided*, That water not so required to be stored shall be released from Lake Powell: (i) to the extent it can be reasonably applied in the States of the Lower Division to the uses specified in article III(e) of the Colorado River Compact, but no such releases shall be made when the active storage in Lake Powell is less than the active storage in Lake Mead, (ii) to maintain, as nearly as practicable, active storage in Lake Mead equal to the active storage in Lake Powell, and (iii) to avoid anticipated spills from Lake Powell.

(b) Submittal of criteria for review and comment; publication; report to Congress

Not later than January 1, 1970, the criteria proposed in accordance with the foregoing subsection (a) of this section shall be submitted to the Governors of the seven Colorado River Basin States and to such other parties and agencies as the Secretary may deem appropriate for their review and comment. After receipt of comments on the proposed criteria, but not later than July 1, 1970, the Secretary shall adopt appropriate criteria in accordance with this section and publish the same in the Federal Register. Beginning January 1, 1972, and yearly thereafter, the Secretary shall transmit to the Congress and to the Governors of the Colorado River Basin States a report describing the actual operation under the adopted criteria for the preceding compact water year and the projected operation for the current year. As a result of actual operating experience or unforeseen circumstances, the Secretary may thereafter modify the criteria to better achieve the purposes specified in subsection (a) of this section, but only after correspondence with the Governors of the seven Colorado River Basin States and appropriate consultation with such State representatives as each Governor may designate.

(c) Powerplant operations

Section 7 of the Colorado River Storage Project Act [43 U.S.C.A. § 620f] shall be administered in accordance with the foregoing criteria.
(Pub.L. 90-537, Title VI, § 602, Sept. 30, 1968, 82 Stat. 900.)

§ 1553. Upper Colorado River Basin; rights to consumptive uses not to be reduced or prejudiced; duties and powers of Commission not impaired

(a) Rights of the upper basin to the consumptive use of water available to that basin from the Colorado River system under the Colorado River Compact shall not be reduced or prejudiced by any use of such water in the lower basin.

(b) Nothing in this chapter shall be construed so as to impair, conflict with, or otherwise change the duties and powers of the Upper Colorado River Commission.
(Pub.L. 90-537, Title VI, § 603, Sept. 30, 1968, 82 Stat. 901.)

Cross References

Construction of Grand Canyon National Park Enlargement Act with this section, see section 228h of Title 16, Conservation.

§ 1554. Federal reclamation laws

Except as otherwise provided in this chapter, in constructing, operating, and maintaining the unites of the projects herein and hereafter authorized, the Secretary shall be governed by the Federal reclamation laws (act of June 17, 1902; 32 Stat. 388, and Acts amendatory thereof or supplementary thereto) to which laws this chapter shall be deemed a supplement.
(Pub.L. 90-537, Title VI, § 604, Sept. 30, 1968, 82 Stat. 901.)

Notes of Decisions

1. Sales of excess power-
Under section 1523 of this title, direction to Secretary of the Interior to recommend the most feasible plan for acquiring power does not comprehend right to sell excess power in manner that is in conflict with Reclamation Act, as amended, section 371 et seq. of this title, even though Secretary may seek to de-nominate such sales as part of the most feasible plan which he otherwise has authority to put into effect. Arizon

Power Pooling Ass'n v. Morton, C.A.Ariz.1975, 527 F.2d 721, certiorari denied 96 S.CT. 1506, 425 U.S. 911, 47 L.Ed.2d 761.

§ 1555. Federal Power Act inapplicable to Colorado River between Hoover Dam and Glen Canyon Dam

Part I of the Federal Power Act [16 U.S.C.A. § 791a et seq.] shall not be applicable to the reaches of the main stream of the Colorado River between Hoover Dam and Glen Canyon Dam until and unless otherwise provided by Congress.
(Pub.L. 90-537, Title VI, § 605, Sept. 30, 1968, 82 Stat. 901.)

Historical Note

References in Text. The Federal Power Act, referred to in text, is Act June 10, 1920, c. 285, 41 Stat. 1063, as amended. Part I of the Federal Power Act is classified generally to subchapter I (section 791a et seq.) of chapter 12 of Title 16, Conservation. For complete classification of this Act to the Code, see section 791a of Title 16 and Tables volume.

§ 1556. Definitions

As used in this chapter, (a) all terms which are defined in the Colorado River Compact shall have the meanings therein defined;

(b) "Main stream" means the main stream of the Colorado River downstream from Lee Ferry within the United States, including the reservoirs thereon;

(c) "User" or "water user" in relation to main stream water in the lower basin means the United States or any person or legal entity entitled under the decree of the Supreme Court of the United States in Arizona against California, and others (376 U.S. 340), to use main stream water when available thereunder;

(d) "Active storage" means that amount of water in reservoir storage, exclusive of bank storage, which can be released through the existing reservoir outlet works;

(e) "Colorado River Basin States" means the States of Arizona, California, Colorado, Nevada, New Mexico, Utah, and Wyoming;

(f) "Western United States" means those States lying wholly or in part west of the Continental Divide; and

(g) "Augment" or "augmentation", when used herein with reference to water, means to increase the supply of the Colorado River or its tributaries by the introduction of water into the Colorado River system, which is in addition to the natural supply of the system.
(Pub.L. 90-537, Title VI § 606, Sept. 30, 1968, 82 Stat. 901.)

LONG-RANGE OPERATING CRITERIA

CRITERIA FOR COORDINATED LONG-RANGE OPERATION OF COLORADO RIVER RESERVOIRS PURSUANT TO THE COLORADO RIVER BASIN PROJECT ACT OF SEPTEMBER 30, 1968 (P.L. 90-537)

These Operating Criteria are promulgated in compliance with Section 602 of Public Law 90-537. They are to control the coordinated long-range operation of the storage reservoirs in the Colorado River Basin constructed under the authority of the Colorado River Storage Act (hereinafter "Upper Basin Storage Reservoirs") and the Boulder Canyon Project Act (Lake Mead). The Operating Criteria will be administered consistent with applicable Federal laws, the Mexican Water Treaty, interstate compacts, and decrees relating to the use of the waters of the Colorado River.

The Secretary of the Interior (hereinafter the "Secretary") may modify the Operating Criteria from time to time in accordance with Section 602(b) of P.L. 90-537. The Secretary will sponsor a formal review of the Operating Criteria at least every 5 years, with participation by State representatives as each Governor may designate and such other parties and agencies as the Secretary may deem appropriate.

I. Annual Report

(1) On January 1, 1972, and on January 1 of each year thereafter, the Secretary shall transmit to the Congress and to the Governors of the Colorado River Basin States a report describing the actual operation under the adopted criteria for the preceding compact water year and the projected plan of operation for the current year.

(2) The plan of operation shall include such detailed rules and quantities as may be necessary and consistent with the criteria contained herein, and shall reflect appropriate consideration of the uses of the reservoirs for all purposes, including flood control, river regulation, beneficial consumptive uses, power production, water quality control, recreation, enhancement of fish and wildlife, and other environmental factors. The projected plan of operation may be revised to reflect the current hydrologic conditions, and the Congress and the Governors of the Colorado River Basin States shall be advised of any changes by June of each year.

II. Operation of Upper Basin Reservoirs

(1) The annual plan of operation shall include a determination by the Secretary of the quantity of water considered necessary as of September 30 of each year to be in storage as required by Section 602(a) of P.L. 90-537 (hereinafter "602(a) Storage"). The quantity of 602(a) Storage shall be determined by the Secretary after consideration of all applicable laws and relevant factors, including, but not limited to, the following:

(a) Historic streamflows;
(b) The most critical period of record;
(c) Probabilities of water supply;
(d) Estimated future depletions of the upper basin, including the effects of recurrence of critical periods of water supply;
(e) The "Report of the Committee on Probabilities and Test Studies to the Task Force on Operating Criteria for the Colorado River, "dated October 30, 1969, and such additional studies as the Secretary deems necessary;
(f) The necessity to assure that upper basin consumptive uses not be impaired because of failure to store sufficient water to assure deliveries under Section 602(a)(1) and (2) of P.L. 90.537.

(2) If in the plan of operation, either:

(a) the Upper Basin Storage Reservoirs active storage forecast for September 30 of the cur year is less than the quantity of 602(a) Storage determined by the Secretary under Article II(hereof, for that date; or
(b) the Lake Powell active storage forecast for that date is less than the Lake Mead active storage forecast for that date:

the objective shall be to maintain a minimum release of water from Lake Powell of 8.23 million acre-feet for that year. However, for the years ending September 30, 1971 and 1972, the release may be greater than 8.23 million acre-feet if necessary to deliver 75,000,000 acre-feet at Lee Ferry for the 10-year period ending September 30, 1972.

(3) If, in the plan of operation, the Upper Basin Storage Reservoirs active storage forecast for September 30 of the current water year is greater than the quantity of 602(a) Storage determination for that date, water shall be released annually from Lake Powell at a rate greater than 8.23 million acre-feet per year to the extent necessary to accomplish any or all of the following objectives:

(a) to the extent it can be reasonably applied in the States of the Lower Division to the uses specified in Article III(e) of the Colorado River Compact, but no such releases shall be made when the active storage in Lake Powell is less than the active storage in Lake Mead,
(b) to maintain, as nearly as practicable, active storage in Lake Mead equal to the active storage in Lake Powell, and
(c) to avoid anticipated spills from Lake Powell.

(4) In the application of Article II(3)(b) herein, the annual release will be made to the extent that it can be passed through Glen Canyon Powerplant when operated at the available capability of the powerplant. A water thus retained in Lake Powell to avoid bypass of water at the Glen Canyon Powerplant will released through the Glen Canyon Powerplant as soon as practicable to equalize the active storage in Lake Powell and Lake Mead.

(5) Releases from Lake Powell pursuant to these criteria shall not prejudice the position of either the upper or lower basin interests with respect to required deliveries at Lee Ferry pursuant to the Colorado River Compact.

III. Operation of Lake Mead

(1) Water released from Lake Powell, plus the tributary inflows between Lake Powell and Lake Mead, shall be regulated in Lake Mead and either pumped from Lake Mead or released to the Colorado River to meet requirements as follows:

(a) Mexican Treaty obligations;
(b) Reasonable consumptive use requirements of mainstream users in the Lower Basin;
(c) Net river losses;
(d) Net reservoir losses;
(e) Regulatory wastes.

(2) Until such time as mainstream water is delivered by means of the Central Arizona Project, the consumptive use requirements of Article III(1)(b) of these Operating Criteria will be met.

(3) After commencement of delivery of mainstream water by means of the Central Arizona Project, the consumptive use requirements of Article III(1)(b) of these Operating Criteria will be met to the followir

extent:

(a) Normal: The annual pumping and release from Lake Mead will be sufficient to satisfy 7,500,000 acre-feet of annual consumptive use in accordance with the decree in *Arizona v. California*, 376 U.S. 340 (1964).
(b) *Surplus:* The Secretary shall determine from time to time when water in quantities greater than "Normal" is available for either pumping or release from Lake Mead pursuant to Article II(b)(2) of the decree in *Arizona v. California* after consideration of all relevant factors, including, but not limited to, the following:

(i) the requirements stated in Article III(1) of these Operating Criteria;
(ii) requests for water by holders of water delivery contracts with the United States, and of other rights recognized in the decree in *Arizona v. California*;
(iii) actual and forecast quantities of active storage in Lake Mead and the Upper Basin Storage Reservoirs; and
(iv) estimated net inflow to Lake Mead.

(c) *Storage:* The Secretary shall determine from time to time when insufficient mainstream water is available to satisfy annual consumptive use requirements of 7,500,000 acre-feet after consideration of all relevant factors, including, but not limited to, the following:

(i) the requirements stated in Article III(1) of these Operating Criteria;
(ii) actual and forecast quantities of active storage in Lake Mead;
(iii) estimate of net inflow to Lake Mead for the current year;
(iv) historic streamflows, including the most critical period of record;
(v) priorities set forth in Article II(A) of the decree in *Arizona v. California*; and
(vi) the purposes stated in Article I(2) of these Operating Criteria.

The storage provisions of Article II(B)(3) of the decree in *Arizona v. California* shall thereupon become effective and consumptive uses from the mainstream shall be restricted to the extent determined by the Secretary to be required by Section 301(b) of Public Law 90-537.

IV. Definitions

(1) In addition to the definitions in Section 606 of P.L. 90-537, the following shall also apply:

(a) "Spills," as used in Article II(3)(c) herein, means water released from Lake Powell which cannot be utilized for project purposes, including, but not limited to, the generation of power and energy.
(b) "Surplus," as used in Article III(3)(b) herein, is water which can be used to meet consumptive use demands in the three Lower Division States in excess of 7,500,000 acre-feet annually. The term "surplus" as used in these Operating Criteria is not to be construed as applied to, being interpretive of, or in any manner having reference to the term "surplus" in the Colorado River Compact.
(c) "Net inflow to Lake Mead," as used in Article III(3) (b)(iv) and (c)(iii) herein, represents the annual inflow to Lake Mead in excess of losses from Lake Mead.
(d) "Available capability," used in Article II(4) herein, means that portion of the total capacity of the powerplant that is physically available for generation.

GRAND CANYON PROTECTION ACT
(PUBLIC LAW NO. 102-575)
October 30, 1992

SECTION 1801. SHORT TITLE.

This Act may be cited as the "Grand Canyon Protection Act of 1992".

SECTION 1802. PROTECTION OF GRAND CANYON NATIONAL PARK

(a) IN GENERAL.-The Secretary shall operate Glen Canyon Dam in accordance with the additional criteria and operating plans specified in section 1804 and exercise other authorities under existing law in such a manner as to protect, mitigate adverse impact to, and improve the values for which Grand Canyon National Park and Glen Canyon National Recreation Area were established, including, but not limited to natural and cultural resources and visitor use.

(b) COMPLIANCE WITH EXISTING LAW.-The Secretary shall implement this section in a manner fully consistent with and subject to the Colorado River Compact, the Upper Colorado River Basin Compact, the Water Treaty of 1994 with Mexico, the decree of the Supreme Court in Arizona vs. California, and the provisions of the Colorado River Storage Project Act of 1956 and the Colorado River Basin Project Act of 1968 that govern allocation, appropriation, development, and exportation of the waters of the Colorado River Basin.

(c) RULES OF CONSTRUCTION.-Nothing in this title alters the purposes for which the Grand Canyon National Park or the Glen Canyon National Recreation Area were established or affects the authority and responsibility of the Secretary with respect to the management and administration of the Grand Canyon National Park and Glen Canyon National Recreation Area, including natural and cultural resources and visitor use, under laws applicable to those areas, including, but not limited to, the Act of August 25, 1916 (39 Stat. 535) as amended and supplemented.

SECTION 1803. INTERIM PROTECTION OF GRAND CANYON NATIONAL PARK

(a) INTERIM OPERATIONS.-Pending compliance by the Secretary with section 1804, the Secretary shall, on an interim basis, continue to operate Glen Canyon Dam under the Secretary's announced interim operating criteria and the Interagency Agreement between the Bureau of Reclamation and the Western Area Power Administration executed October 2, 1991 and exercise other authorities under existing law, in accordance with the standards set forth in section 1802, utilizing the best and most recent scientific data available.

(b) CONSULTATION.-The Secretary shall continue to implement Interim Operations in consultation with-

(1) Appropriate agencies of the Department of the Interior, including the Bureau of Reclamation, United States Fish and Wildlife Service, and the National Park Service;
(2) The Secretary of Energy;
(3) The Governors of the States of Arizona, California, Colorado, Nevada, New Mexico, Utah, and Wyoming;
(4) Indian Tribes; and
(5) The general public, including representatives of the academic and scientific communities, environmental organizations, the recreation industry, and contractors for the purchase of Federal power produced at Glen Canyon Dam.

(c) DEVIATION FROM INTERIM OPERATIONS.-The Secretary may deviate from Interim Operations upon

a finding that deviation is necessary and in the public interest to-

(1) comply with the requirements of Section 1804(a);
(2) respond to hydrologic extremes or power system operation emergencies;
(3) comply with the standards set forth in Section 1802;
(4) respond to advances in scientific data; or
(5) comply with the terms of the Interagency Agreement.

(d) TERMINATION OF INTERIM OPERATIONS.-Interim operations described in this section shall terminate upon compliance by the Secretary with section 1804.

SECTION 1804. GLEN CANYON DAM ENVIRONMENTAL IMPACT STATEMENT; LONG-TERM OPERATION OF GLEN CANYON DAM.

(a) FINAL ENVIRONMENTAL IMPACT STATEMENT.-Not later than 2 years after the date of enactment of this Act, the Secretary shall complete a final Glen Canyon Dam environmental impact statement, in accordance with the National Environmental Policy Act of 1969 (42 U.S.C. 4321 et seq.).

(b) AUDIT.-The Comptroller General shall-

(1) audit the cost and benefits to water and power users and to natural, recreational, and cultural resources resulting from management policies and dam operations identified pursuant to the environmental impact statement described in subsection (a); and
(2) report the results of the audit to the Secretary and the Congress.

(c) ADOPTION OF CRITERIA AND PLANS.-

(1) Based on the findings, conclusions, and recommendations made in the environmental impact statement prepared pursuant to subsection (a) and the audit performed pursuant to subsection (b), the Secretary shall- (A) adopt criteria and operating plans separate from and in addition to those specified in section 602(b) of the Colorado River Basin Project Act of 1968; and (B) exercise other authorities under existing law, so as to ensure that Glen Canyon Dam is operated in a manner consistent with section 1802.

(2) Each year after the date of the adoption of criteria and operating plans pursuant to paragraph (1), the Secretary shall transmit to the Congress and to the Governors of the Colorado River Basin States a report, separate from and in addition to the report specified in section 602(b) of the Colorado River Basin Project Act of 1968 on the preceding year and the projected year operations undertaken pursuant to this Act.

(3)In preparing the criteria and operating plans described in section 602(b) of the Colorado River Basin Project Act of 1968 and in this subsection, the Secretary shall consult with the Governors of the Colorado River Basin States and with the general public, including-

(A) representatives of academic and scientific communities;
(B) environmental organizations;
(C) the recreation industry; and
(D) contractors for the purpose of Federal power produced at Glen Canyon Dam.

(d) REPORT TO CONGRESS.-Upon implementation of long-term operations under subsection (c), the Secretary shall submit to the Congress the environmental impact statement described in subsection (a) and a report describing the long-term operations and other reasonable mitigation measures taken to protect, mitigate adverse impacts to, and improve the condition of the natural, recreational, and cultural resources of th

Colorado River downstream of Glen Canyon Dam.

(c) ALLOCATION OF COSTS.-The Secretary of the Interior, in consultation with the Secretary of Energy, is directed to reallocate the costs of construction, operation, maintenance, replacement and emergency expenditures for Glen Canyon Dam among the purposes directed in section 1802 of this Act and the purposes established in the Colorado River Storage Project Act of April 11, 1956 (70 Stat. 170). Costs allocated to section 1802 purposes shall be nonreimbursable. Except that in fiscal year 1993 through 1997 such costs shall be nonreimbursable only to the extent to which the Secretary finds the effect of all provisions of this Act is to increase net offsetting receipts; Provided, That if the Secretary finds in any such year that the enactment of this Act does cause a reduction in net offsetting receipts generated by all provisions of this Act, the costs allocated to section 1802 purposes shall remain reimbursable. The Secretary shall determine the effect of all the provisions of this Act and submit a report to the appropriate House and Senate committees by January 31 of each fiscal year, and such report shall contain for that fiscal year a detailed accounting of expenditures incurred pursuant to this Act, offsetting receipts generated by this Act, and any increase or reduction in net offsetting receipts generated by this Act.

SECTION 1805. LONG-TERM MONITORING

(a) IN GENERAL.-The Secretary shall establish and implement long-term monitoring programs and activities that will ensure that Glen Canyon Dam is operated in a manner consistent with that of section 1802.

(b) RESEARCH.-Long-term monitoring of Glen Canyon Dam shall include any necessary research and studies to determine the effect of the Secretary's actions under section 1804(c) on the natural, recreational, and cultural resources of Grand Canyon National Park and Glen Canyon National Recreation Area.

(c) CONSULTATION.-The monitoring programs and activities conducted under subsection(a) shall be established and implemented in consultation with-

(1) the Secretary of Energy;
(2) the Governors of the States of Arizona, California, Colorado, Nevada, New Mexico, Utah, and Wyoming;
(3) Indian tribes; and
(4) the general public, including representatives of academic and scientific communities, environmental organizations, the recreation industry, and contractors for the purchase of Federal power produced at Glen Canyon Dam.

SECTION 1806. RULES OF CONSTRUCTION.

Nothing in this title is intended to affect in any way-

(1) the allocations of water secured to the Colorado Basin States by any compact, law, or decree; or
(2) any Federal environmental law, including the Endangered Species Act. (16 U.S.C. 1521 et seq.).

SECTION 1807. STUDIES NONREIMBURSABLE

All costs of preparing the environmental impact statement described in section 1804, including supporting studies, and the long-term monitoring programs and activities described in section 1805 shall be nonreimbursable. The Secretary is authorized to use funds received from the sale of electric power and energy from the Colorado River Storage Project to prepare the environmental impact statement described in section 1804, including supporting studies, and the long-term monitoring programs and activities described in section 1805, except that such funds will be treated as having been repaid and returned to the general fund of the Treasury as costs assigned to power for repayment under section 5 of the Act of April 11, 1956 (70 Stat. 170). Except that in fiscal year 1993 through 1997 such provisions shall take effect only to the extent to which the Secretary finds the effect of all the provisions of

this Act is to increase net offsetting receipts; Provided, That if the Secretary finds in any such year that the enactment of this Act does cause a reduction in net offsetting receipts generated by all provisions of this Act, all costs described in this section shall remain reimbursable. The Secretary shall determine the effect of all provisions of this Act and submit a report to the appropriate House and Senate committees by January 31 of each fiscal year, and such report shall contain for that fiscal year a detailed accounting of expenditures incurred pursuant to this Act, offsetting receipts generated by this Act, and any increase or reduction in net offsetting receipts generated by this Act.

SECTION 1808. AUTHORIZATION OF APPROPRIATIONS.

There are authorized to be appropriated such sums as are necessary to carry out this title.

SECTION 1809. REPLACEMENT POWER.

The Secretary of Energy in consultation with the Secretary of the Interior and with representatives of the Colorado River Storage Project power customers, environmental organizations and the States of Arizona, California, Colorado, Nevada, New Mexico, Utah, and Wyoming shall identify economically and technically feasible methods of replacing any power generation that is lost through adoption of long-term operational criteria for Glen Canyon Dam as required by section 1804 of this title. The Secretary shall present a report of the findings, and implementing draft legislation, if necessary, not later than two years after adoption of long-term operating criteria. The Secretary shall include an investigation of the feasibility of adjusting operations at Hoover Dam to replace all or part of such lost generation. The Secretary shall include an investigation of the modifications or additions to the transmission system that may be required to acquire and deliver replacement power.

ATTACHMENT 5

Programmatic Agreement on Cultural Resources

PROGRAMMATIC AGREEMENT
AMONG
THE BUREAU OF RECLAMATION, THE ADVISORY COUNCIL ON HISTORIC PRESERVATION, THE NATIONAL PARK SERVICE,
THE ARIZONA STATE HISTORIC PRESERVATION OFFICER, HAVASUPAI TRIBE, HOPI TRIBE, HUALAPAI TRIBE, KAIBAB PAIUTE TRIBE, NAVAJO NATION, SAN JUAN SOUTHERN PAIUTE TRIBE, SHIVWITS PAIUTE TRIBE AND ZUNI PUEBLO
REGARDING
OPERATIONS OF THE GLEN CANYON DAM

WHEREAS, the Secretary of Interior has directed the preparation of an Environmental Impact Statement (EIS) on the effects of the operation of the Glen Canyon Dam on the downstream environmental and ecological resources, and historic properties of Glen Canyon and Grand Canyon; and

WHEREAS, the Grand Canyon Protection Act of 1992 (PL 102-575 Title XVIII) mandates the continued monitoring and management of resources located within the area of impact covered by this agreement and requires completion of the EIS by October 1994; and

WHEREAS, the purpose of the EIS is to ". . . reevaluate the operation of the Glen Canyon Dam to determine specific options that could be implemented to minimize—consistent with law—adverse impacts on the downstream environmental and cultural resources and Native American interests in Glen and Grand Canyons." (Interim Preliminary Draft EIS 7/92); and

WHEREAS, the Bureau of Reclamation (Reclamation), Upper Colorado Regional Office, administers the releases of water from the Glen Canyon Dam and has determined that the operation of the Dam (the Program) may have effects upon properties included in or eligible for inclusion in the National Register of Historic Places and has consulted with the Advisory Council on Historic Preservation (Council), the National Park Service (NPS), and the Arizona State Historic Preservation Officer (SHPO) pursuant to 36 CFR § 800.13 of the regulations (36 CFR Part 800) implementing Section 106 of the National Historic Preservation Act (ACT) (16 U.S.C. 470f); and

WHEREAS, Reclamation is the lead Federal agency for the Program for purposes of Section 106; and

WHEREAS, the NPS is responsible for the administration and management of historic properties within the boundaries of the Glen Canyon National Recreation Area and the Grand Canyon National Park pursuant to Section 110 of the Act; and

WHEREAS, given their mutual responsibilities Reclamation and the NPS have determined to coordinate their respective roles in the management and consideration of historic properties which may be affected by the Program: and

WHEREAS, the Hualapai Tribe is responsible for the administration and management of historic properties within the boundaries of its reservation lands affected by the Program; and WHEREAS, prior to performing any work required under the terms of this Agreement within the boundaries of the Hualapai Indian Reservation, Reclamation or the NPS shall notify the Hualapai Tribe of such work

and obtain appropriate Tribal permits before entering the boundaries of the Hualapai Indian Reservation. The Tribe will require that a Hualapai Tribe member monitor be present when ...ssa for any culturally sensitive work, as determined by the Tribe.

WHEREAS, the Navajo Nation is responsible for the administration and management of historic properties within the boundaries of the Navajo Nation pursuant to the Cultural Resources Protection Act (CMY-19-88); and

WHEREAS, the Navajo Nation agrees to NPS administration and management of any Navajo Nation historic properties which may be included under the terms of this agreement until such time as the Navajo Nation assumes such responsibility; and

WHEREAS, the Havasupai Tribe, Hopi Tribe, Hualapai Tribe, Kaibab Paiute Tribe, Navajo Nation, San Juan Southern Paiute Tribe, Shivwits Paiute Tribe and the Zuni Pueblo (the Tribes) participated in consultation and are signatories to this Programmatic Agreement;

NOW, THEREFORE, Reclamation, the Council, NPS, SHPO, and the Tribes agree that the Program shall be administered in accordance with the following stipulations to satisfy Reclamation's Section 1(responsibilities for all individual aspects of the Program.

Stipulations

Reclamation, as lead Federal agency for purposes of the Program, shall ensure that the following stipulations are carried out.

1. IDENTIFICATION AND EVALUATION

a. The NPS has identified a total of 313 contributing properties, referred to as the Grand Canyon River Corridor District (District), within the Area of Potential Effects (APE). Nine additional properties within the boundaries of the District remain unevaluated. The NPS shall assist Reclamation in obtaining the necessary information to complete the evaluation of these nine sites for determining their eligibility for listing on the Nationa, Register as contributing properties to the District or as eligible on their own merits. Reclamation shall submit such evaluations to the SHPO for determinations of eligibility. In the event that Reclamation and SHPO do not agree on the eligibility of any property, or if the Council or Keeper so request, Reclamation shall obtain a formal determination of eligibility from the Keeper of the National Register in accordance with 36 CFR § 800.4(c). Determinations of eligibility for the remaining nine properties shall be completed by August 1993.

b. Reclamation and the NPS, in consultation with SHPO, shall identify and evaluate historic properties in the remaining 37 miles of the APE not previously intensively inventoried (Attachment A). Properties identified within the 37 mile corridor shall be evaluated on their own merits and as contributing elements to the District pursuant to 36 CFR § 800.4(c). An intensive inventory of the entire APE shall be completed by August 1993. Ongoing identification and evaluation efforts shall be a part of the management program identified at Stipulations 2 and 3.

c. In consultation with the Tribes and SHPO, Reclamation and the NPS shall identify and evaluate properties within the APE which retain traditional cultural values. Such properties shall be evaluated under criteria A, B, C, and D of the National Register Criteria pursuant to 36 CFR P... and taking into consideration "National Register Bulletin 38, Guidelines for Evaluating and Documenting Traditional Cultural Properties".

(1) Traditional Cultural Properties shall be identified by Reclamation and the NPS through the conduct of ethnographic studies. Ethnographic studies shall solicit and include the participation of and consultation with the Tribes to collaborate in the identification and evaluation of traditional cultural properties.

(2) Reclamation shall submit such evaluations to the SHPO for determinations of eligibility. In the event that Reclamation and SHPO do not agree on the eligibility of any property, or if the Council or Keeper so request, Reclamation shall obtain a formal determination of eligibility from the Keeper of the National Register in accordance with 36 CFR § 800.4(c). Such study and evaluations shall be completed by October 1994.

2. MONITORING AND REMEDIAL ACTION

a. Within three months of the execution of this Programmatic Agreement, Reclamation and the NPS, in consultation with the SHPO and Tribes, shall develop a Plan for monitoring the effects of the Glen Canyon Dam operations on historic properties within the APE and for carrying out remedial actions to address the effects of ongoing damage to historic properties. The purpose of the Monitoring and Remedial Action Plan shall be to generate data regarding the effects of Dam operations on historic properties, identify ongoing impacts to historic properties within the APE, and develop and implement remedial measures for treating historic properties subject to damage. Such data shall be incorporated into Reclamation's Long-term Operating and Monitoring Plans governing dam releases identified in the EIS, The EIS is scheduled for completion in October 1994.

b. The Monitoring and Remedial Action Plan (Plan) shall provide for the identification and evaluation of previously unrecorded properties overlooked by previous surveys or exposed subsequent to the surveys, and include measures by which any adverse effects identified during the monitoring effort shall be avoided or minimized. Remedial measures shall be implemented to mitigate ongoing adverse effects and may include, but not be limited necessarily to, bank stabilization, check dam construction and data recovery, as appropriate. The Plan shall specify an expedited consultation process among the parties to this agreement to accommodate situations requiring remedial actions.

c. Reclamation shall submit a draft of the Plan to the parties in this agreement for review and comment. Each party shall have 60 days from receipt of the Plan to comment. Reclamation may assume the concurrence of any party which does not issue comments within 60 days of their receipt of the Plan.

(1) Reclamation shall take into consideration all comments received in their development of a final draft Plan, and submit the final draft Plan to the reviewing parties for a second review opportunity. Each reviewing party shall have 2O days from receipt to review the final draft Plan and issue comments to Reclamation.

(2) If any reviewing party objects to the adequacy of the final draft Plan, Reclamation shall consult with the objecting party, and the other parties to this Programmatic Agreement as necessary to resolve the objection pursuant to Stipulation.

(3) When all objections are resolved, Reclamation shall implement the Monitoring and Remedial Action Plan.

3. MANAGEMENT

a. Reclamation and the NPS shall incorporate the results of the identification, evaluation, and monitoring and remedial action efforts into a Historic Preservation Plan (HPP) for the long-term management of the Grand Canyon River Corridor District and any other historic properties within the APE. The HPP shall be developed in consultation with the parties to this Programmatic Agreement.

The HPP shall integrate Reclamation's lead agency role pursuant to Section 106 of the Act a NPS's stewardship role pursuant to Section 110 of the Act. Specifically, the HPP shall provi management direction responsive to the NPS's responsibilities under Sections 110(a)(1) and 110(a)(2), and NPS's and Reclamation's responsibilities under Sections 110(b) and 110(d).

b. The HPP shall establish consultation and coordination procedures, long term monitoring an mitigation strategies, management mechanisms and goals for long term management of historic properties within the APE.

c. Reclamation and the NPS shall submit a draft of the HPP to the parties to this agreement for 60 days review. The parties to this agreement shall have 60 days from receipt to issue comments to Reclamation and the NPS regarding the adequacy of the HPP. Reclamation and the NPS may assum the concurrence of any party which does not issue comments within 60 days of receipt of the HPP.

(1) Reclamation and the NPS shall take into consideration all comments received in their development of a final draft HPP, and submit the final draft HPP to the reviewing parties for a secon review opportunity. Each reviewing party shall have 30 days from receipt to review the final draft HPP and issue comments to Reclamation and the NPS.

(2) If any reviewing party objects to the adequacy of the final draft HPP, Reclamation and the NPS shall consult with the objecting party, and the other parties to this agreement as necessary to resolve the objection pursuant to Stipulation 4. When all objections have been resolved, Reclamation and the NPS shall implement the HPP.

d. The development, and review of the HPP shall be completed prior to the issuance of a ord of Decision for the GCD-EIS, or December 1994, whichever comes first. Upon issuance of a Re Decision, the HPP shall be reviewed by the parties to this agreement and revised, if necessary, based on the decision. The review of a revised HPP shall be conducted in accordance with the procedures of Stipulation 3.C.1. and 2.

4. DISPUTE RESOLUTION

a. Should any party to this agreement object within 30 days to any plans, specifications, or actions proposed pursuant to this agreement, Reclamation and the NPS shall consult with the objecting party to resolve the objection. If any party involved in the dispute determines that the dispute cannot be resolved, Reclamation shall forward all documentation relevant to the dispute to the Council. Within 30 days after receipt of all pertinent documentation, the Council will either:

(1) Provide Reclamation and the NPS with recommendations, which Reclamation will take into account in reaching a final decision regarding the dispute; or

(2) Notify Reclamation and the NPS that it will comment pursuant to 36 CFR § 800.6(c)(2) with reference to the subject of the dispute.

Any recommendation or comment provided by the Council will be understood to pertain only to the subject of the dispute; Reclamation's responsibility to carry out all actions under this agreement that are not the subjects of the dispute shall remain unchanged.

b. At any time during implementation of the measures stipulated in this agreement should an objection to any such measure or its manner of implementation be raised by a member of the p Reclamation and the NPS shall take the objection into account and consult as needed with the objecting party, SHPO, the Tribes, or the Council to resolve the objection.

5. REVIEW OF THE AGREEMENT

a. The Council, SHPO, NPS and Tribes may review activities carried out pursuant to this Programmatic Agreement. and the Council will review such activities if so requested. Reclamation will cooperate with the Council, SHPO, NPS and Tribes in carrying out their reviewing activities.

b. Reclamation and the NPS shall cooperatively provide bi-annual summary reports of their progress toward completing the terms of this agreement to each of the parties to this agreement. The biannual reports shall identify accomplishments and actions completed and provide schedules completion of all remaining tasks. The first biannual report shall be submitted to the parties of this agreement six (6) months after the date of the Council's signature on this agreement and every six months thereafter until the HPP has been implemented.

c. A yearly meeting will be held among the signatories to review the agreement and the results of the monitoring and remedial actions.

6. AMENDMENT

Any party to this Programmatic Agreement may request that it be amended, whereupon the parties will consult in accordance with 36 CFR § 800.13 to consider such amendment.

7. TERMINATION

Any party to this Programmatic Agreement may terminate this agreement by providing 30 days written notice to the other parties, provided that the parties will consult during the period prior to termination to seek agreement on amendments or other actions that would avoid termination. In the event of termination, Reclamation will comply with 36 CFR § § 800.4 through 800.6 with regard to individual undertakings covered by this Programmatic Agreement.

8. FAILURE TO CARRY OUT TERMS

In the event Reclamation and the NPS do not carry out the terms of this Programmatic Agreement, Reclamation will comply with 36 CFR § § 800.4 through 800.6 with regard to individual undertakings covered by this Programmatic Agreement.

ADVISORY COUNCIL ON HISTORIC PRESERVATION

BY: Robert D. Bush Date: 2/8/94

Title: Executive Director

BUREAU OF RECLAMATION

BY: Robert Peterson Date: 8/12/93

Title: Regional Director

ARIZONA STATE HISTORIC PRESERVATION OFFICER

BY: James W. Garrison Date: 8/17/93

Title: State Historic Preservation Officer

NATIONAL PARK SERVICE, WESTERN REGION

BY: Stanley T. Albright DATE: 11/23/93

Title: Regional Director, Western Region

NATIONAL PARK SERVICE, ROCKY MOUNTAIN REGION

BY: R. Thomas Jr DATE: DEC 7 1993

Title: Robert M. Baker, Regional Director, RMR

HAVASUPAI TRIBE

BY: _____ Date: _____

Title: _____

HOPI TRIBE

BY: [signature] Date: 8-30-94

Title: Chairman

HUALAPAI TRIBE

BY: Robert Havatone Date: 02-15-94

Title: Chairman, Hualapai Tribal Council

KAIBAB PAIUTE TRIBE

BY: Gloria Bowers-Benson Date: 4/12/94

Title: Tribal Chairperson

NAVAJO NATION

BY: _____ Date: 1/3/94

Title: Historic Preservation Officer

SAN JUAN SOUTHERN PAIUTE TRIBE

BY: _____ Date: _____

Title: _____

PAIUTE INDIAN TRIBE OF UTAH FOR:
SHIVWITS PAIUTE TRIBE

BY: Edward D. Stump Date: April 29, 1994

Title: Tribal Chairman

ZUNI PUEBLO

BY: Robert E. Lewis Date: 7-6-93

Title: Governor, Pueblo of Zuni

REASONABLE AND PRUDENT ALTERNATIVE

Regulations implementing section 7 define reasonable and prudent alternatives as alternative actions, identified during formal consultation, that (1) can be implemented in a manner consistent with the intended purpose of the action, (2) can be implemented consistent with the scope of the Federal agency's legal authority and jurisdiction, (3) are economically and technologically feasible, and (4) would, the Service believes, avoid the likelihood of jeopardizing the continued existence of listed species or resulting in the destruction or adverse modification of critical habitat.

The Service believes that elements of the reasonable and prudent alternative developed for this consultation meet the above four tests due to the following:

(1) There is an unique opportunity to conserve and protect endangered and other native fish fauna in an ecosystem designated as National Park Service lands for the preservation of these and other natur resource protection values from Glen Canyon Dam to Lake Mead. The Grand Canyon Protection Act of 1992 requires the Secretary of the Interior to "... protect, mitigate adverse impacts to, and improve values for which Grand Canyon National Park and Glen Canyon National Recreation Area were established ..."

(2) Providing water storage and annual water releases of at least 8.23 maf to the lower basin States is primary function of Glen Canyon Dam. The reasonable and prudent alternative will not conflict with this annual delivery of water. All flows requested in the reasonable and prudent alternative that are not part of the proposed action are within powerplant capacity. Lower basin deliveries of water are met from releases from Hoover Dam and, to a lesser extent, from Lake Mead and do not depend on daily or monthly releases from Glen Canyon Dam. Elements previously defined as conservation measures by Reclamation and the Service are presently being conducted within Reclamation's authority. A structure similar to the selective withdrawal structure identified here has been built and is being operated by Reclamation on Flaming Gorge Dam on the Green River.

(3) Elements of the reasonable and prudent alternative that address operations have been reviewed and included in the draft EIS as viable alternatives. Additional NEPA compliance would be necessary for a selective withdrawal structural element.

(4) The Service believes, that to prevent jeopardy to the endangered fish of Grand Canyon, restoration of the aquatic ecosystem by reducing, to the extent possible, known limiting factors and conducting appropriate research to identify and reduce suspected limiting factors will be necessary and can be accomplished with cooperation, innovative approaches, and elements of the following reasonable and prudent alternative.

ELEMENTS OF THE REASONABLE AND PRUDENT ALTERNATIVE

The following reasonable and prudent alternative contains elements that will focus on the community of endangered and native fish present in the Grand Canyon. The Service believes that actions for one native species should be supportive of other native species in the ecosystem. As the trend of more species becoming endangered or threatened continues in the Colorado River, the difficulties of recovering an ecosystem that is losing functional parts may become insurmountable. Therefore, the health of the entire native fish community will be crucial to the removal of jeopardy for the humpback chub and razorback sucker. We realize that not all of the elements can be implemented at once, and an implementation schedule has been noted for some elements. Those elements that can be accomplished without further verification or NEPA compliance should be implemented without delay. For some elements, such as the selective withdrawal structure, a schedule will be determined. Reclamation and the Service will meet at least annually to coordinate reasonable and prudent alternative activities. Such meetings will provide the Service an opportunity to determine whether sufficient progress is being made in accomplishing those actions set forth to remove jeopardy to federally-listed species impacted by operation of Glen Canyon Glen Canyon Dam.

Refinement of specific flows is dependent on continued studies, including a period of experimental flows, that identify mainstem habitats affected by flows and responses by endangered fishes to those habitats. Successful completion of the reasonable and prudent alternative is necessary to remove jeopardy to the humpback chub and razorback sucker from the proposed action. The reasonable and prudent alternative will be accomplished when all elements of the selected alternative have been effected and studies confirm compatibility between these species requirements and the operation of Glen Canyon Dam.

The draft EIS has seven elements common to all but the unrestricted fluctuating flow alternatives. Six of those EIS common elements that would influence native and endangered fish are adaptive management, flood frequency reduction measures, habitat and beach building flows, establishing a new population of humpback chub, further study of selective withdrawal, and emergency operations exception criteria. Three of the EIS common elements that were identified by Reclamation and the Service as conservation measures (see BACKGROUND) are research or long-term monitoring (adaptive management), flood frequency reduction, and the second spawning population of humpback chub. Development of a management plan for the LCR was another conservation measure being conducted by Reclamation through GCES.

Because of the importance of the EIS common elements and conservation measures to the continued existence of the humpback chub, razorback sucker, and other Colorado River native fish, many of the elements and measures are included below as elements of the reasonable and

prudent alternative to assist in identification of actions necessary to be included in any future modification of the preferred alternative.

1. Attainment of riverine conditions that support all life stages of endangered and native fish species is essential to the Colorado River ecosystem. Therefore, Reclamation shall develop an adaptive management program that will include implementation of studies required to determine impact of flows on listed and native fish fauna, recommend actions to further their conservation, and implement those recommendations as necessary to increase the likelihood of both survival and recovery of the listed species.

The Adaptive Management Program, an EIS common element, was still being formulated as we prepared this biological opinion. The Service supports adaptive management as an iterative approach to resource management. We recognize that the aquatic and terrestrial ecosystems below Glen Canyon Dam are still adjusting to impacts from dam operations that will continue into the future. Thus, the need for adaptive management. Actions taken through this approach must be based on integrated resource approach, and, as discussed by Hilborn (1992), an active rather than a passive learning system that includes deliberate experimental design.

A. A program of experimental flows will be carried out to include high steady flows in the spring and low steady flows in summer and fall during low water years (releases of approximately 8.23 maf) to verify an effective flow regime and to quantify, to the extent possible, effects on endangered and native fish. Studies of high steady flows in the spring may include studies of habitat building and habitat maintenance flows. Research design and hypotheses to be tested will be based on a flow pattern that resembles the natural hydrograph, as described for those seasons in the SASF.

Information from final GCES endangered fish reports, researchers who conducted those studies, and other knowledgeable individuals will be used to assist in determining an experimental flow regime of high spring flow and low summer and fall flow for endangered fishes and to develop hypotheses and studies to accompany those flows with final review and approval by the Service. Reclamation will provide technical assistance and funding.

Design of the experimental flows and associated studies will begin as soon as possible and be targeted for completion by October 1996. Unless the Service determines information provided seriously

questions the validity of experimental designs developed or contribution of the resulting data to remove jeopardy to the federally-listed aquatic fauna of the Grand Canyon, experimental flows wil initiated in April 1997. If sufficient progress and good faith effort is occurring towards initiating experimental flows, implementation of experimental flows may occur later in 1997. If the Service believes there is not sufficient progress, Glen Canyon Dam would be operated as SASF flows durin spring through fall (April to October) beginning in 1998. If the Service determines a study design not be developed that is expected to provided information to support removal of jeopardy to the razorback sucker and humpback chub populations in the Grand Canyon and associated tributaries, such will be considered new information and may be grounds for reinitating formal consultation.

This element is based on low release years (8.23 maf) occurring approximately 50% of the time. Further improvement of the means for determining a low water year that would initiate the implementation of research flows in a given year will be developed by Reclamation with concurren by the Service. This may include, for example, methods based on content of water in Lake Powell given date. When implemented, experimental flows will be conducted for a sufficient period of tim to allow for experimental design, biological processes to function, and for variability inherent in riverine ecosystems to be expressed. The number of years to conduct the experimental flows is, therefore, indeterminate.

During moderate and high release years, Reclamation shall operate Glen Canyon Dam according to requirements of the MLFF. Operations during moderate and high water years would assist in achieving some of the variability that was always present in the historic Colorado River and under which the endangered and other native fish evolved.

Following analysis of the data, appropriate operational flows will be determined by the Service and implemented by Reclamation in compliance with section 7(a)(2), Endangered Species Act.

B. Reclamation shall implement a selective withdrawal program for Lake Powell waters and determine feasibility using the following guidelines.

i. Review historic information and employ existing modeling with possible updates using alternative reservoir and operating conditions to prepare a set of possible scenarios of temperatu changes in the mainstem.

ii. Determine from the literature, experimentation, and consultation with the AGFD, Native American Tribes, National Park Service, Service, and other native fish species experts the anticipated effects on native fish populations which may result from implementation of temperature changes from a selective withdrawal structure. Determine the range of temperature for successful larval fish development and recruitment and the relationship between larval/juver growth and temperature.

iii. Assess the temperature induced interactions between native and non-native fish competitors and predators.

iv. Assess the effects of temperature, including seasonality and degree, on *Cladophora* and associated diatoms, *Gammarus*, aquatic insects, and fish parasites and disease.

v. Evaluate effects of withdrawing water on the heat budget of Lake Powell, effects of potential warmer inflow into Lake Mead, and the concomitant effects on the biota within both reservoirs. Evaluate the temperature profiles along with heat budget for both reservoirs.

vi. Evaluate effects of reservoir withdrawal level on fine particulate organic matter and importar plant nutrients to understand the relationship between withdrawal level and reservoir and downstream resources.

Installation of a selective withdrawal structure at Glen Canyon Dam may be essential in order to increase water temperatures downstream. Warmer mainstem temperatures are needed to ensure successful spawning and recruitment of endangered and native fishes in the mainstem. Research identified for this element should be integrated or combined with the research program specified in Element C. A selective withdrawal structure would provide considerable flexibility in managing the aquatic ecosystem downstream of Glen Canyon Dam. Management options, such as when to release warmer temperature water, seasonal pattern of releases to avoid establishment of permanent backwater areas, and use of floods, would all be available to limit expansion or invasion of non-native fish species.

The Service cautions the selective withdrawal structure should not be considered the only action needed to provide successful mainstem spawning and recruitment and ultimate recruitment for the humpback chub and razorback sucker. Aspects of the natural hydrograph, including low, steady releases in the summer, are considered necessary based on our present knowledge of the temperature capabilities of a selective withdrawal structure and habitat requirements of the species. Future studies might identify opportunities to operate Glen Canyon Dam in a manner that would alleviate conditions that jeopardize the continued existence of listed fish in the Grand Canyon and minimize impacts on water utilization for power production and other purposes. This program also is one of the EIS common elements.

C. Determine responses of native fishes in Grand Canyon to various temperature regimes and river flows of the experimental flows and other operations of Glen Canyon Dam. Studies will emphasize collection of information necessary to remove jeopardy to federally-listed species and identify actions necessary to enhance their recovery. Reclamation will provide technical assistance and funding for research to accomplish the following studies.

i. Determine the effects of water temperature on reproductive success, growth, and survivorship of Grand Canyon fishes.

ii. Determine relationships among tributary hydrology, reproductive success of fishes, and the abundance of fishes in mainstem rearing habitats.

iii. Determine the effects of mainstem hydrology on the number of nearshore rearing habitats, environmental conditions in these habitats, and their successful utilization by fishes.

iv. Assess biotic interactions between native and non-native fishes, particularly those that occur in nearshore rearing habitats affected by dam operations.

v. Determine humpback chub life history schedule for populations downstream of Glen Canyon Dam.

vi. Determine origins of fish food resources, energy pathways, and nutrient sources important to their production, and the effects of Glen Canyon Dam operations on these resources.

vii. Determine the effects of dam operations, including modifications to regulate water temperatures, on the parasites and disease organisms of endangered and native fishes in Grand Canyon.

Emphasis to be placed on experimental approaches using various flow and temperature scenarios to determine cause and effect relationships between dam operations and responses of the community of endangered and native fishes endemic to the Grand Canyon. Efforts should be hypothesis driven and specific in objectives. Explanation of the above research efforts is provided in Appendix 1 along with suggested hypotheses. The success of these research efforts will require sufficient flexibility in operations to design and carry out the experiments. Wherever feasible, off-site experiments should be

considered as a means of generating or supporting the testing of hypotheses to reduce on-site stud time and complexity. Long-term measurements should more appropriately be incorporated into th monitoring program, but there must be an active synergism between the two efforts.

The long-term monitoring plan should define objectives and methods for tracking the status of nati fishes in Grand Canyon. Relevant indices should be developed and measured in support of the lor term monitoring plan. A major advantage of the current intensive marking studies using passive integrated transponder tags is the ability to measure future movements, growth rates, and populati sizes of these fishes. This legacy, and others made available by this period of intensive research eff should be effectively incorporated into the long-term monitoring program for fishes. Adaptive management, an EIS common element, would likely include a number of the above research objectives.

2. Protect humpback chub spawning population and habitat in the LCR by being instrumental in developing a management plan for this river.

This element remains very important to the survival of the humpback chub in Grand Canyon. Reclamation has, through contracts with the Navajo Nation, developed an extensive database for us in developing the plan. Reclamation will work with the Service, Navajo Nation, Hopi Tribe, Natior Park Service, Bureau of Indian Affairs, AGFD, and others to develop a management plan that inclu actions to avoid possible adverse impacts to humpback chubs and their spawning and rearing habit in the LCR. The principle objective of this plan shall be the protection of humpback chub habitat ir the Colorado River and LCR. A draft plan will be prepared within 2 years from the date of this biological opinion and transmitted to agencies, parties, and others having authority to implement th plan.

3. Develop actions that will help ensure the continued existence of the razorback sucker by first sponsoring a workshop within 1 year following the biological opinion to enlist the advise of species experts, endangered fish researchers in Grand Canyon, Native Fish Work Group biologists, and oth such as Colorado River Recovery Team members, to develop a management plan for the species in Grand Canyon. Following review of the workshop results, the Service will recommend a course of action and develop a Memorandum of Understanding with Reclamation and other entities who may wish to participate. The memorandum will provide detail on development of the management plan and implementation of actions identified in the plan.

Activities establishing razorback suckers in the Grand Canyon might include development of spawning and rearing areas that would function like flooded river bottom lands. Opportunities for such actions could be at (1) Lee's Ferry in a former gravel storage area along the mainstem and Pari River or (2) near the inflow area of the Colorado River into Lake Mead (Lake Mead National Recreation Area and Hualapai Indian Reservation). Cooperation of land managing agencies, such as the National Park Service and Hualapai Indian Tribe would be necessary.

4. Establish a second spawning aggregation of humpback chub downstream of Glen Canyon Dam.

Baseline information on possible tributary use or suitability for use by spawning humpback chub is being collected. Using that information, information from other Grand Canyon endangered fish research, and information from studies of *Gila* taxonomy, Reclamation, in consultation with the Service, National Park Service, AGFD, and land management agencies such as the Havasupai Tribe, will make every reasonable effort through funding, facilitating, and provide technical assistance to establish a program for additional spawning aggregations (or populations depending on genetic status) in the mainstem or tributaries. This effort has been identified as one of the EIS common elements.

ANALYSIS OF JEOPARDY AND ADVERSE MODIFICATION

The Service's biological opinion on operation of Glen Canyon Dam is based the current status of the species, environmental baseline, effects of the proposed action, and cumulative effects on listed species. To jeopardize the continued existence of a species, as defined in regulations implementing section 7 of the Act, is to engage in an action that would be expected, directly or indirectly, to reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by further reducing the reproduction, numbers, or distribution of that species. Survival is defined as the ability of a species to persist into the future with sufficient resilience to recover from endangerment. Conditions of survival are found in the LCR for the humpback chub: sufficiently large population, represented by all age classes, genetic heterogeneity, and a number of sexually mature individuals producing viable offspring, that exists in an environment providing all requirements for completion of the species' entire life cycle. The concern with the LCR is that all humpback chub use is in the lower 14.5 km of the LCR; thus, the species and its habitat are extremely vulnerable to chronic or catastrophic threats. The 470 km reach of the mainstem Colorado River downstream of Glen Canyon Dam (to upstream boundary of Lake Mead National Recreation Area) apparently does not provide for survival all age classes nor an environment for successful spawning and recruitment of young to adult humpback chub. For the razorback sucker, only minimal support for the adult life stage has been identified in the mainstem reach downstream of Glen Canyon Dam.

Jeopardy also relates to recovery. Recovery is the process by which the quality and quantity of ecosystems are restored so they can support self-sustaining and self-regulating populations of listed species as persistent members of native biotic communities. The proposed action is anticipated to improve conditions over NA for the humpback chub, but the likelihood of recovery in the mainstem Colorado River is still appreciably reduced. While limited evidence of mainstem spawning has occurred during interim flows, survival and recruitment of those larvae is not known. Studies by GCES during NA and interim flow (similar to MLFF) conditions report occurrence of humpback chub in the mainstem is primarily limited to the reach centered on the LCR.

The final analysis of whether an action is likely to jeopardize a species is to consider the aggregate effects of everything that has led to the species' current status, all future non-Federal activities, and the proposed action. Determination if an action is likely to destroy or adversely modify critical habitat is an assessment of whether all the aggregate effects on the critical habitat and its constituent elements will appreciably diminish the value of critical habitat in sustaining its role in the survival and recovery of the species. Thus, while other actions may be responsible for the humpback chub and razorback sucker being in decline before Glen Canyon Dam, or that cold water releases and reduction in sediment further impacted the native fishery, the Department of the Interior, with the Bureau of Reclamation as lead, is still responsible for the impacts of the proposed action of operation of Glen Canyon Dam as MLFF.

United States Department of the Interior

BUREAU OF RECLAMATION
Upper Colorado Regional Office
125 South State Street, Room 6107
Salt Lake City, Utah 84138-1102

IN REPLY REFER TO

UC-326
ENV-6.00

OCT 25 1996

To: All on the Enclosed List

Subject: Record of Decision (ROD) on the Operation of Glen Canyon Dam Final Environmental Impact Statement (EIS)

We are pleased to provide you with the enclosed copy of the subject ROD which was signed by the Secretary of the Interior on October 9, 1996. We are deeply appreciative of your participation in this long, but highly successful process.

You will note that only two of the attachments to the ROD are included in the enclosed copy. Attachment 3, the GCES Non-Use Values Final Study Summary Report, is available on the Internet at **http://www.uc.usbr.gov** which is the Upper Colorado Region's home page. Attachment 4, the General Accounting Office's Final Audit Report (GAO/RCED-97-12) may be obtained by calling (202) 512-6000, or on the Internet at **http://www.gao.gov** which is the General Accounting Office's home page.

If you have any questions about the ROD, please contact either Bruce Moore at (801) 524-5415, or Gordon Lind at (801) 524-3216.

Sincerely,

Charles A. Calhoun
Regional Director

Enclosure

RECORD OF DECISION

OPERATION OF GLEN CANYON DAM

Final Environmental Impact Statement

October 1996

Approved

Commissioner, U.S. Bureau of Reclamation Date OCT 08 1996

Secretary of the Interior Date OCT 09 1996

RECORD OF DECISION

OPERATION OF GLEN CANYON DAM
FINAL ENVIRONMENTAL IMPACT STATEMENT

I. INTRODUCTION

This record of decision (ROD) of the Department of the Interior, Bureau of Reclamation (Reclamation), documents the selection of operating criteria for Glen Canyon Dam, as analyzed in the final Environmental Impact Statement (EIS), dated March 21, 1995 (FES 95-8). The EIS on the operation of Glen Canyon Dam was prepared with an unprecedented amount of scientific research, public involvement, and stakeholder cooperation.

Scientific evidence gathered during Phase I of the Glen Canyon Environmental Studies (GCES) indicated that significant impacts on downstream resources were occurring due to the operation of Glen Canyon Dam. These findings led to a July 1989 decision by the Secretary of the Interior for Reclamation to prepare an EIS to reevaluate dam operations. The purpose of the reevaluation was to determine specific options that could be implemented to minimize, consistent with law, adverse impacts on the downstream environment and cultural resources, as well as Native American interests in Glen and Grand Canyons. Analysis of an array of reasonable alternatives was needed to allow the Secretary to balance competing interests and to meet statutory responsibilities for protecting downstream resources and producing hydropower, and to protect affected Native American interests.

In addition, the Grand Canyon Protection Act of 1992 was enacted on October 30, 1992. Section 1802 (a) of the Act requires the Secretary to operate Glen Canyon Dam:

> "...in such a manner as to protect, mitigate adverse impacts to, and improve the values for which Grand Canyon National Park and Glen Canyon National Recreation Area were established, including, but not limited to natural and cultural resources and visitor use."

Alternatives considered include the No Action Alternative as well as eight operational alternatives that provide various degrees of protection for downstream resources and hydropower production.

II. DECISION

The Secretary's decision is to implement the Modified Low Fluctuating Flow Alternative (the preferred alternative) as described in the final EIS on the Operation of Glen Canyon Dam with a minor change in the timing of beach/habitat building flows (described below). This alternative was selected because it will reduce daily flow fluctuations well below the no action levels (historic pattern of releases) and will provide high steady releases of short duration which will protect or enhance downstream resources while allowing limited flexibility for power operations.

The Modified Low Fluctuating Flow Alternative incorporates beach/habitat-building flows which are scheduled high releases of short duration designed to rebuild high elevation sandbars, deposit nutrients, restore backwater channels, and provide some of the dynamics of a natural system. In the final EIS, it was assumed that these flows would occur in the spring when the reservoir is low, with a frequency of 1 in 5 years.

The Basin States expressed concern over the beach/habitat-building flows described in the final EIS because of the timing of power plant by-passes. We have accomodated their concerns, while maintaining the objectives of the beach/habitat-building flows. Instead of conducting these flows in years in which Lake Powell storage is low on January 1, they will be accomplished by utilizing reservoir releases in excess of power plant capacity required for dam safety purposes. Such releases are consistent with the 1956 Colorado River Storage Project Act, the 1968 Colorado River Basin Project Act, and the 1992 Grand Canyon Protection Act.

Both the Colorado River Management Work Group and the Transition Work Group, which participated in the development of the Annual Operating Plan and the EIS, respectively, support this change as it conforms unambiguously with each member's understanding of the Law of the River. These groups include representatives of virtually all stakeholders in this process.

The upramp rate and maximum flow criteria were also modified between the draft and final EIS. The upramp rate was increased from 2,500 cubic feet per second per hour to 4,000 cubic feet per second per hour, and the maximum allowable release was increased from 20,000 to 25,000 cubic feet per second. We made these modifications to enhance power production flexibility, as suggested by comments received. These modifications were controversial among certain interest groups because of concerns regarding potential impacts on resources in the Colorado River and the Grand Canyon. However, our analysis indicates that there would be no significant differences in impacts associated with these changes ("Assessment of Changes to the Glen Canyon Dam EIS Preferred Alternative from Draft to Final EIS", October 1995).

The 4,000 cubic feet per second per hour upramp rate limit will be implemented with the understanding that results from the monitoring program will be carefully considered. If impacts differing from those described in the final EIS are identified, a new ramp rate criterion will be considered by the Adaptive Management Work Group and a recommendation for action forwarded to the Secretary.

The maximum flow criterion of 25,000 cubic feet per second will be implemented with the understanding that actual maximum daily releases would only occasionally exceed 20,000 cubic feet per second during a minimum release year of 8.23 million acre-feet. This is because the maximum allowable daily change constraint overrides the maximum allowable release and because monthly release volumes are lower during minimum release years. If impacts differing from those described in the final EIS are identified through the Adaptive Management Program, the maximum flow restriction will be reviewed by the Adaptive Management Work Group and a recommendation for action will be forwarded to the Secretary.

III. DESCRIPTION OF ALTERNATIVES

Nine alternative methods of operating Glen Canyon Dam (including the No Action Alternative) were presented in the final EIS. The eight action alternatives were designed to provide a reasonable range of alternatives with respect to operation of the dam. One alternative would allow unrestricted fluctuations in flow (within the physical constraints of the power plant) to maximize power production, four would impose varying restrictions on fluctuations, and three others would provide steady flows on a monthly, seasonal, or annual basis. The names of the alternatives reflect the various operational regimes. In addition, the restricted fluctuating flow and steady flow alternatives each include seven elements which are common to all of them. These common elements are: 1) Adaptive Management, 2) Monitoring and Protecting Cultural Resources, 3) Flood Frequency Reduction Measures, 4) Beach/Habitat-Building Flows, 5) New Population of Humpback Chub, 6) Further Study of Selective Withdrawal, and 7) Emergency Exception Criteria. A detailed description of the alternatives and common elements can be found in Chapter 2 of the final EIS. A brief description of the alternatives is given below.

UNRESTRICTED FLUCTUATING FLOWS

No Action: Maintain the historic pattern of fluctuating releases up to 31,500 cubic feet per second and provide a baseline for impact comparison.

Maximum Power plant Capacity: Permit use of full power plant capacity up to 33,200 cubic feet per second.

RESTRICTED FLUCTUATING FLOWS

High: Slightly reduce daily fluctuations from historic levels.

Moderate: Moderately reduce daily fluctuations from historic levels; includes habitat maintenance flows.

Modified Low (Preferred Alternative): Substantially reduce daily fluctuations from historic levels; includes habitat maintenance flows.

Interim Low: Substantially reduce daily fluctuations from historic levels; same as interim operations except for addition of common elements.

STEADY FLOWS

Existing Monthly Volume: Provide steady flows that use historic monthly release strategies.

Seasonally Adjusted: Provide steady flows on a seasonal or monthly basis; includes habitat maintenance flows.

Year-Round: Provide steady flows throughout the year.

Table 1 shows the specific operational criteria for each of the alternatives.

IV. SIGNIFICANT ISSUES AND ALTERNATIVES

The Glen Canyon Dam EIS scoping process was initiated in early 1990 and the public was invited to comment on the appropriate scope of the EIS. More than 17,000 comments were received during the scoping period, reflecting the national attention and intense interest in the EIS.

As a result of the analysis of the oral and written scoping comments, the following were determined to be resources or issues of public concern: beaches, endangered species, ecosystem integrity, fish, power costs, power production, sediment, water conservation, rafting/boating, air quality, the Grand Canyon wilderness, and a category designated as "other" for remaining concerns. Comments regarding interests and values were categorized as: expressions about the Grand Canyon, economics, nonquantifiable values, nature versus human use, and the complexity of Glen Canyon Dam issues.

The EIS team consolidated and refined the public issues of concern, identifying the significant resources and associated issues to be analyzed in detail. These resources include: water, sediment, fish, vegetation, wildlife and habitat, endangered and other special status species, cultural resources, air quality, recreation, hydropower, and non-use value.

Further meetings were held with representatives from the cooperating agencies and public interest groups who provided comments on the criteria for development of reasonable alternatives for the EIS. The public also had an opportunity to comment on the preliminary selection of alternatives at public meetings and through mailings. The final selection of alternatives took into consideration the public's views.

V. COMMENTS RECEIVED ON THE FINAL EIS

Many comments and recommendations on the final EIS were received in the form of pre-printed postcards and letters that addressed essentially the same issues. The comments are summarized below along with Reclamation's responses.

COMMENT: Maintain Draft EIS flows. Modifying the upramp rate and maximum flows

Table 1.—Operating limits of alternatives identified for detailed analysis

	Unrestricted Fluctuating Flows		Restricted Fluctuating Flows				Steady Flows		
	No Action	Maximum Powerplant Capacity	High	Moderate	Modified Low	Interim Low	Existing Monthly Volume	Seasonally Adjusted	Year-Round
Minimum releases (cfs)[1]	1,000 Labor Day-Easter [2]3,000 Easter-Labor Day	1,000 Labor Day-Easter [2]3,000 Easter-Labor Day	3,000 5,000 8,000 depending on monthly volume, firm load, and market conditions	5,000	8,000 between 7 a.m. and 7 p.m. 5,000 at night	8,000 between 7 a.m. and 7 p.m. 5,000 at night	8,000	[3]8,000 Oct Nov 8,500 Dec 11,000 Jan-Mar 12,500 Apr 18,000 May-Jun 12,500 Jul 9,000 Aug Sep	Yearly volume prorated[4]
Maximum releases (cfs)[5]	31,500	33,200	31,500	31,500 (may be exceeded during habitat maintenance flows)	25,000 (exceeded during habitat maintenance flows)	20,000	Monthly volumes prorated	18,000 (exceeded during habitat maintenance flows)	Yearly volume prorated[4]
Allowable daily flow fluctuations (cfs/24 hours)	30,500 Labor Day-Easter 28,500 Easter-Labor Day	32,200 Labor Day-Easter 30,200 Easter-Labor Day	15,000 to 22,000	±45% of mean flow for the month not to exceed ±6,000	[6]5,000 6,000 or 8,000	[6]5,000 6,000 or 8,000	[7]±1,000	[7]±1,000	[7]±1,000
Ramp rates (cfs/hour)	Unrestricted	Unrestricted	Unrestricted up 5,000 or 4,000 down	4,000 up 2,500 down	4,000 up 1,500 down	2,500 up 1,500 down	2,000 cfs/day between months	2,000 cfs/day between months	2,000 cfs/day between months
Common elements	None	None	Adaptive management (including long-term monitoring and research) Monitoring and protecting cultural resources Flood frequency reduction measures Beach/habitat-building flows New population of humpback chub Further study of selective withdrawal Emergency exception criteria						

[1] In high volume release months, the allowable daily change would require higher minimum flows (cfs).
[2] Releases each weekday during recreation season (Easter to Labor Day) would average not less than 8,000 cfs for the period from 8 a.m. to midnight.
[3] Based on an 8.23-million-acre-foot (maf) year; in higher release years, additional water would be added equally to each month, subject to an 18,000-cfs maximum.
[4] For an 8.23-maf year, steady flow would be about 11,400 cfs.
[5] Maximums represent normal or routine limits and may necessarily be exceeded during high water years.
[6] Daily fluctuation limit of 5,000 cfs for monthly release volumes less than 600,000 acre-feet; 6,000 cfs for monthly release volumes of 600,000 to 800,000 acre-feet; and 8,000 cfs for monthly volumes over 800,000 acre-feet.
[7] Adjustments would allow for small power system load changes.

between the draft and final EIS has neither been open for public review nor subjected to serious scientific scrutiny. These changes should have been addressed in the draft EIS and made availal for public comment at that time. Credible proof, based on the testing of a specific scientific hypothesis, that alterations in operating procedures at Glen Canyon Dam follow the spirit and intent of the Grand Canyon Protection Act needs to be provided. The burden of proof that there will be no impact on downstream resources rests with those proposing changes.

RESPONSE: The modification of the preferred alternative, which incorporated changes in the upramp rate and maximum flows, was made after extensive public discussion. The new preferred alternative was discussed as an agenda item during the May, June, August, and November 1994 public meetings of the Cooperating Agencies who assisted in the development of the EIS. A wide range of public interest groups received advance mailings and agendas and were represented at the public meetings. The environmental groups attending these meetings included: America Outdoors, American Rivers, Desert Flycasters, Environmental Defense Fund, Friends of the River, Grand Canyon River Guides, Grand Canyon Trust, Sierra Club, and Trout Unlimited. Meeting logs indicate that representatives from at least some of these groups attended all but the May meeting. In addition, approximately 16,000 citizens received periodic newsletters throughout the EIS process. This included a newsletter outlining the proposed changes issued several months prior to the final EIS. The environmental groups mentioned above were included on the newsletter mailing list.

Reclamation's research and analysis has been thorough with regards to changes in flows and ramping rates and potential impacts upon downstream resources. A complete range of research flows was conducted from June 1990 to July 1991. These included high and low fluctuating flows with fast and slow up and down ramp rates. Glen Canyon Environmental Studies Phase II identified cause and effect relationships between downramp rates and adverse impacts to canyon resources. However, no cause and effect relationships between upramp rates and adverse impacts to canyon resources were identified. The draft EIS, (a public document peer reviewed by GCES and the EIS Cooperating Agencies) states that upramp rates have not been linked to sandbar erosion (page 95) and that "Rapid increases in river stage would have little or no effect on sandbars." (page 190).

With respect to potential impacts occurring with the change in flows, it should be noted that sand in the Grand Canyon is transported almost exclusively by river flows. The amount of sand transported increases exponentially with increases in river flow. Maintaining sandbars over the long term depends on the amount of sand supplied by tributaries, monthly release volumes, range of flow fluctuations, and the frequency and distribution of flood flows. Conversely, occasional flows between 20,000 and 25,000 cubic feet per second may cause minor beach building, and may provide water to riparian vegetation.

As part of the EIS, the effects of each alternative on long-term sand storage in Marble Canyon (river miles 0 to 61) were analyzed. The Marble Canyon reach was chosen for analysis because it is more sensitive to impacts from dam operations than downstream reaches. For each fluctuating flow alternative, the analysis used 20 years of hourly flow modeled by Spreck Rosekrans of the Environmental Defense Fund and 85 different hydrologic scenarios (each representing 50 years of

monthly flow data). This analysis was documented in the draft EIS on page 182, and Appendix D, pages 4-5. The analyses relating to the probability of net gain in riverbed sand for each alternative is documented in the draft EIS on pages 54-55, 184, 187, and 194.

Specific peer reviewed studies relating to the above analyses are listed in Attachment 1.

COMMENT: Do not change the upramp rate and maximum flow criteria at the same time. While acknowledging Reclamation's good efforts to identify and establish optimum operating criteria for all users of Glen Canyon Dam, changing two flow criteria (upramp rate and maximum flow criterion of preferred alternative) does not make prudent scientific sense. It will not result in reliable data. Not enough information is at hand to predict the outcome of these proposals.

RESPONSE: Viewed from the purely scientific viewpoint, it would be preferable to change variables one at a time in a controlled experiment. However, many uncontrolled variables already exist, and from a resource management standpoint the interest lies in measuring the possible resource impact, if any, which might result from jointly changing both criteria. The best available information suggests that the long-term impact of changing both criteria at once will be difficult, if not impossible to detect.

Even though both parameters would change, for 8 months of an 8.23 million acre foot year (minimum release year), only the upramp rate will be used. The ability to operationally exceed 20,000 cubic feet per second only exists in months in which releases are in excess of 900,000 acre feet. In a minimum release year, flows above 20,000 cubic feet per second will most likely occur in December, January, July, and August. Evaluation of the upramp rates can be initiated immediately with the evaluation of the increase in maximum flow relegated to the months with the highest volumes. New upramp and maximum flow criteria would be recommended through the Adaptive Management Program should monitoring results indicate that either of these criteria are resulting in adverse impacts to the natural, cultural, or recreational (human safety) resources of the Grand Canyon differing from those shown in the final EIS.

COMMENT: "Habitat/Beach Building Floods" designed to redeposit sediment and reshape the river's topography much like the Canyon's historic floods should be conducted. An experimental release based on this premise is critical to restore some of the river's historic dynamics; without it, any flow regime will result in continued loss of beach and backwater habitat. This "spike" should be assessed and implemented for the spring of 1996, subject to a critical evaluation of its flow size, timing, impact on fisheries, and completion of a comprehensive monitoring plan. Recent side-canyon floods underscore the need for restoring natural processes.

RESPONSE: Reclamation and the Cooperating Agencies continue to support this concept. The preferred alternative supports such a flow regime. A test flow was conducted this spring. The results of this flow are currently being analyzed. We expect to conduct more of these flows in the future.

COMMENT: Endorse the Fish & Wildlife Service's Biological Opinion and implement

experimental steady flows to benefit native fishes, subject to the results of a risk/benefit analysis now in progress.

RESPONSE: The preferred alternative provides for experimental steady flows through the Adaptive Management Program for the reasons put forth in the Biological Opinion.

COMMENT: Fund and implement immediately an Adaptive Management Program. This is the appropriate forum to address important issues. It is imperative that resource management rely on good science to monitor, and respond to possible adverse effects resulting from changes in dam operations.

RESPONSE: The preferred alternative provides for implementation of an Adaptive Management Program.

COMMENT: Interior Secretary Babbitt should issue a Record of Decision by December 31, 1995, and conduct an efficient and timely audit by the General Accounting Office as mandated by the Grand Canyon Protection Act.

RESPONSE: In compliance with the Grand Canyon Protection Act, Interior Secretary Babbitt could not issue the Record of Decision until considering the findings of the General Accounting Office. Those findings were issued on October 2, 1996.

OTHER COMMENTS: Another set of comments were received from municipalities and other power user groups. These letters made up about 3 percent of the total received and were essentially identical in content. Although the authors were not totally in agreement with the preferred alternative because of the reduction in peaking power, they believe it is a workable compromise. These letters characterized the final EIS as ". . .a model for resolving complex environmental issues among divergent interests." They also urged the government to protect the integrity of the process, resist efforts to overturn the FEIS, and allow the scientists' assessment to stand, in as much as the Adaptive Management Process will give Reclamation an opportunity to evaluate the effects of operational changes over time and make modifications according to scientific findings.

RESPONSE: While the preferred alternative may not satisfy all interests, Reclamation believes it is a workable compromise and meets the two criteria set out in the EIS for the reoperation of the dam, namely restoring downstream resources and maintaining hydropower capability and flexibility.

A letter of comment from the Environmental Protection Agency (EPA) indicates that EPA's comments on the draft EIS were adequately addressed in the final EIS. It also expresses their support for the preferred alternative.

Samples of the comment letters and cards, and a copy of EPA's comment letter are included as Attachment 2.

VI. ENVIRONMENTAL COMMITMENTS AND MONITORING

The following environmental and monitoring commitments will be carried out under the preferred alternative or any of the other restricted fluctuating or steady flow alternatives described in the final EIS. A detailed description of these commitments can be found on pages 33 - 43 of that document. All practicable means to avoid or minimize environmental harm from the preferred alternative have been adopted.

1. Adaptive Management: This commitment includes the establishment of an Adaptive Management Workgroup, chartered in accordance with the Federal Advisory Committee Act; and development of a long-term monitoring, research, and experimental program which could result in some additional operational changes. However, any operational changes will be carried out in compliance with NEPA.

2. Monitoring and Protection of Cultural Resources: Cultural sites in Glen and Grand Canyons include prehistoric and historic sites and Native American traditional use and sacred sites. Some of these sites may erode in the future under any EIS alternative, including the no action alternative. Reclamation and the National Park Service, in consultation with Native American Tribes, will develop and implement a long-term monitoring program for these sites. Any necessary mitigation will be carried out according to a programmatic agreement written in compliance with the National Historic Preservation Act. This agreement is included as Attachment 5 in the final EIS.

3. Flood Frequency Reduction Measures: Under this commitment, the frequency of unanticipated floods in excess of 45,000 cubic feet per second will be reduced to an average of once in 100 years. This will be accomplished initially through the Annual Operating Plan process and eventually by raising the height of the spillway gates at Glen Canyon Dam 4.5 feet.

4. Beach/Habitat-Building Flows: Under certain conditions, steady flows in excess of a given alternative's maximum will be scheduled in the spring for periods ranging from 1 to 2 weeks. Scheduling, duration, and flow magnitude will be recommended by the Adaptive Management Work Group and scheduled through the Annual Operating Plan process. The objectives of these flows are to deposit sediment at high elevations, re-form backwater channels, deposit nutrients, restore some of the natural system dynamics along the river corridor, and help the National Park Service manage riparian habitats.

5. New Population of Humpback Chub: In consultation with the U.S. Fish and Wildlife Service (FWS), National Park Service, and Arizona Game and Fish Department (AGFD), Reclamation will make every effort (through funding, facilitating, and technical support) to ensure that a new population of humpback chub is established in the mainstem or one or more of the tributaries within Grand Canyon.

6. Further Study of Selective Withdrawal: Reclamation will aggressively pursue and support research on the effects of multilevel intake structures at Glen Canyon Dam and use the results of this research to decide whether or not to pursue construction. FWS, in consultation with AGFD,

will be responsible for recommending to Reclamation whether or not selective withdrawal should be implemented at Glen Canyon Dam. Reclamation will be responsible for design, NEPA compliance, permits, construction, operation, and maintenance.

7. **Emergency Exception Criteria:** Operating criteria have been established to allow the Western Area Power Administration to respond to various emergency situations in accordance with their obligations to the North American Electric Reliability Council. This commitment also provides for exceptions to a given alternative's operating criteria during search and rescue situations, special studies and monitoring, dam and power plant maintenance, and spinning reserves.

VII. BASIS FOR DECISION

The goal of selecting a preferred alternative was not to maximize benefits for the most resources, but rather to find an alternative dam operating plan that would permit recovery and long-term sustainability of downstream resources while limiting hydropower capability and flexibility only to the extent necessary to achieve recovery and long-term sustainability.

Based on the impact analysis described in the final EIS, three of the alternatives are considered to be environmentally preferable. They are: the Moderate Fluctuating Flow Alternative, the Modified Low Fluctuating Flow Alternative, and the Seasonally Adjusted Steady Flow Alternative. Modified Low Fluctuating Flow is selected for implementation because it satisfies the critical needs for sediment resources and some of the habitat needs of native fish, benefits the remaining resources, and allows for future hydropower flexibility, although there would be moderate to potentially major adverse impacts on power operations and possible decreases in long-term firm power marketing. Nearly all downstream resources are dependent to some extent on the sediment resource. This alternative meets the critical requirements of the sediment resource by restoring some of the pre-dam variability through floods and by providing a long-term balance between the supply of sand from Grand Canyon tributaries and the sand-transport capacity of the river. This, in turn, benefits the maintenance of habitat. The critical requirements for native fish are met by pursuing a strategy of warming releases from Glen Canyon Dam, enhancing the sediment resource, and substantially limiting the daily flow fluctuations.

The decision process for selecting the preferred alternative for the EIS followed a repetitive sequence of comparisons of effects on downstream resources resulting from each alternative. Alternatives resulting in unacceptable adverse effects on resources (such as long-term loss of sandbars leading to the destruction of cultural resource sites and wildlife habitat) were eliminated from further comparisons. Comparisons continued until existing data were no longer available to support assumed benefits.

All resources were evaluated in terms of both positive and adverse effects from proposed alternatives. Once it was determined that all alternatives would deliver at least 8.23 million acre feet of water annually, water supply played a minor role in subsequent resource evaluations. (One of the objectives of the "Criteria for Coordinated Long-Range Operation of Colorado River Reservoirs" is a minimum annual release of 8.23 million acre feet of water from Glen Canyon

Dam.) The alternatives covered a range of possible dam operations from maximum utilization of peaking power capabilities with large daily changes in downstream river levels (Maximum Powerplant Capacity Alternative) to the Year-Round Steady Flow Alternative that would have eliminated all river fluctuations and peaking power capabilities. Within this range, the Maximum Powerplant Capacity, No Action, and High Fluctuating Flow alternatives were eliminated from consideration as the preferred alternative because they would not meet the first criterion of resource recovery and long-term sustainability. Data indicated that while beneficial to hydropower production, these alternatives would either increase or maintain conditions that resulted in adverse impacts to downstream resources under no action. For example, under these alternatives, the sediment resource would not likely be maintained over the long-term.

At the other end of the range, the Year-Round Steady Flow Alternative was also eliminated from consideration as the preferred alternative. This alternative would result in the greatest storage of sand within the river channel, the lowest elevation sandbars, the largest potential expansion of riparian vegetation, and the highest white-water boating safety benefits. However, it would not provide the variability on which the natural processes of the Grand Canyon are dependent (e.g. beach building, unvegetated sandbars, and backwater habitats). A completely stable flow regime would encourage the growth of vegetation thereby reducing bare-sand openings and patches of emergent marsh vegetation. This would limit beach camping and reduce the habitat value of these sites. With respect to other resources, this alternative did not provide any benefits beyond those already provided by other alternatives. Steady flows could also increase the interactions between native and non-native fish by intensifying competition and predation by non-natives on native fish. Such interactions would reach a level of concern under steady flows. Finally, this alternative would have major adverse impacts on hydropower (power operations and marketing).

The Existing Monthly Volume Steady Flow Alternative was eliminated from selection as the preferred alternative for reasons similar to those discussed above for the Year-Round Steady Flow Alternative.

Although the Interim Low Fluctuating Flow Alternative performed well over the interim period (August 1991 to the present), long-term implementation of this alternative would not restore some of the pre-dam variability in the natural system. The selected Modified Low Fluctuating Flow Alternative is an improved version of the Interim Low Fluctuating Flow Alternative because it would provide for some pre-dam variability through habitat maintenance flows.

The three remaining alternatives--the Moderate Fluctuating, Modified Low Fluctuating, and Seasonally Adjusted Steady Flow Alternatives-- provide similar benefits to most downstream resources (e.g.. vegetation, terrestrial wildlife, and cultural resources) with respect to increased protection or improvement of those resources (see Table II-7 in the EIS). The Moderate Fluctuating Flow Alternative provided only minor benefits to native fish over no action conditions because of the relative similarity in flow fluctuations; and the benefits from the Seasonally Adjusted Steady Flow Alternative were uncertain given the improvement in habitat conditions for non-native fish this alternative would provide. Seasonally adjusted steady flows also would create conditions significantly different from those under which the current aquatic ecosystem has developed in the last 30 years and would adversely affect hydropower to a greater extent than the

other two alternatives. The Modified Low Fluctuating Flow could substantially improve the aquatic food base and benefit native and non-native fish. The potential exists for a minor incre in the native fish population.

Although the Moderate Fluctuating, Modified Low Fluctuating, and Seasonally Adjusted Steady Flow Alternatives provide similar benefits to most downstream resources, the Modified Low Fluctuating Flow Alternative was selected as the preferred alternative because it would provide the most benefits with respect to the original selection criteria, given existing information. This alternative would create conditions that promote the protection and improvement of downstream resources while maintaining some flexibility in hydropower production. Although there would be a significant loss of hydropower benefits due to the selection of the preferred alternative (between $15.1 and $44.2 million annually) a recently completed non-use value study conducted under the Glen Canyon Environmental Studies indicates that the American people are willing to pay much more than this loss to maintain a healthy ecosystem in the Grand Canyon. The results of this non-use value study are summarized in Attachment 3 of the ROD.

The results of a General Accounting Office (GAO) audit mandated by the Grand Canyon Protection Act are in Attachment 4 of the ROD. This audit generally concludes that Reclamation used appropriate methodologies and the best available information in determining the potential impact of various dam flow alternatives on important resources. However, GAO identified some shortcomings in the application of certain methodologies and data, particularly with respect to the hydropower analysis. Reclamation's assumptions do not explicitly include the mitigating effect of higher electricity prices on electricity demand (price elasticity). GAO also determined that Reclamation's assumptions about natural gas prices were relatively high and that two computational errors were made during the third phase of the power analysis. According to GAO, these limitations suggest that the estimated economic impacts for power are subject to uncertainty. GAO also found limitations with some of the data used for impact analysis. Certain data was incomplete or outdated, particularly data used in assessing the economic impact of alternative flows on recreational activities. Nevertheless, the National Research Council peer reviewed both the Glen Canyon Environmental Studies and the EIS, and generally found the analysis to be adequate. The GAO audit concluded that these shortcomings and limitations are not significant and would not likely alter the findings with respect to the preferred alternative and usefulness of the document in the decision-making process. The audit also determined that most of the key parties (83 percent of respondents) support Reclamation's preferred alternative for dam operations, although some concerns remain.

ATTACHMENT 1.

Specific peer reviewed sediment studies:

Beus, S. and C. Avery. 1993. The influence of variable discharge regimes on Colorado River sand bars below Glen Canyon Dam. Glen Canyon Environmental Studies, Report PHY0101, Chapters 1 through 7. Northern Arizona University, Flagstaff, AZ

Beus, S., M.A. Kaplinski, J.E. Hazel, L. A. Tedrow, and L. H. Kearsley. 1995.. Monitoring the effects of interim flows from Glen Canyon Dam on sand bar dynamics and campsite size in the Colorado River corridor, Grand Canyon National Park, AZ. Glen Canyon Environmental Studies, Report PHY 0112. Northern Arizona University, Flagstaff, AZ

Budhu, M and R. Gobin. 1994. Monitoring of sand bar instability during the interim flows: a seepage erosion approach. Glen Canyon Environmental Studies, Report PHY 0400. University of Arizona, Tucson, AZ

Carpenter, M., R. Carruth, Fink, D. Boling, and B. Cluer. 1995. Hydrogeology of sand bars 43.1 and 172.3L and the implications on flow alternatives along the Colorado River in the Grand Canyon. Glen Canyon Environmental Studies, Report PHY 0805. U.S. Geological Survey, Tucson, AZ

Cluer, B. 1993. Annual Report. Sediment mobility within eddies and the relationship to rapid erosion events. Glen Canyon Environmental Studies, Report PHY 011. National Park Service, Ft. Collins, CO

Cluer, B. and L. Dexter. 1994. An evaluation of the effects of the interim flows from Glen Canyon Dam on the daily change of beach area in Grand Canyon, AZ. Glen Canyon Environmental Studies, Report PHY 0109. Northern Arizona University, Flagstaff, AZ

Nelson, J., N. Andrews, and J. MacDonald. 1993. Movement and deposition of sediments from the main channel to the eddies of the Colorado River in the Grand Canyon. Glen Canyon Environmental Studies, Report PHY 0800. U.S. Geological Survey, Boulder, CO

Randle, T.J., R.I. Strand, and A. Streifel. 1993. Engineering and environmental considerations of Grand Canyon sediment management. In: Engineering Solutions to Environmental Challenges: Thirteenth Annual USCOLD Lecture, Chattanooga, TN. U.S. Committee on Large Dams, Denver, CO.

Schmidt, J. 1994. Development of a monitoring program of sediment storage changes in alluvial banks and bars, Colorado River, Grand Canyon, AZ. Glen Canyon Environmental Studies, Report PHY 0401. Utah State University.

Smith, J. and S. Wiele. 1994. Draft report. A one-dimensional unsteady model of discharge waves

in the Colorado River through the Grand Canyon. Glen Canyon Environmental Studies, Report PHY 0805. U.S. Geological Survey, Boulder, CO

Werrell, W., R. Ingliss, and L. Martin. 1993. Beach face erosion in Grand Canyon National Park: A response to ground water seepage during fluctuating flow releases from Glen Canyon Dam. Glen Canyon Environmental Studies, Report PHY 0101, Chapter 4 in The influence of variable discharge regimes on Colorado River sandbars below Glen Canyon Dam, Report PHY 0101. National Park Service, Ft. Collins, CO

CHARTER

ADAPTIVE MANAGEMENT WORK GROUP

Establishment of a Federal Advisory Committee
to Advise the Secretary of the Interior
on the Impacts of
Glen Canyon Dam Operations

1. **Official Designation:** Glen Canyon Dam Adaptive Management Work Group.

2. **Background and Purpose:** The Grand Canyon Protection Act (Act) of October 30, 1992, embodied in Public Law 102-575, directs the Secretary of the Interior (Secretary), among others to operate Glen Canyon Dam in accordance with the additional criteria and operating plans specified in section 1804 of the Act and to exercise other authorities under existing law in such a manner as to protect, mitigate adverse impacts to, and improve the values for which Grand Canyon National Park and the Glen Canyon National Recreation Area were established, including but not limited to the natural and cultural resources and visitor use. The Secretary shall implement this section in a manner fully consistent with and subject to section 1802 of the Act. Section 1805 of the Act calls for implementation of long-term monitoring programs and activities that will ensure that Glen Canyon Dam is operated in a manner consistent with that of section 1802. As part of long-term monitoring, the Secretary's Record of Decision (ROD) mandates development and initiation of an Adaptive Management Program (AMP). The AMP provides for monitoring the results of the operating criteria and plans adopted by the Secretary and changes to those operating criteria and plans. The AMP includes an Adaptive Management Work Group (AMWG). The AMWG will facilitate the AMP, recommend suitable monitoring and research programs, and make recommendations to the Secretary as required to meet the requirements of the Act. The AMWG may recommend research and monitoring proposals outside the Act which complement the AMP process, but such proposals will be funded separately, and do not deter from the focus of the Act.

3. **Duration:** It is the intent that the AMWG shall continue indefinitely, unless otherwise terminated by the Secretary. In accordance with the Federal Advisory Committee Act (FACA), 5 U.S.C. App., this charter will terminate 2 years from the date of filing unless renewed by the Secretary prior to that time.

4. **Agency To Whom The AMWG Reports:** The AMWG reports to the Secretary through the Secretary's designee who shall serve as the chairperson of the AMWG.

5. **Administrative Support:** The logistical and support services for the meetings of the AMWG shall be provided by the Bureau of Reclamation (Reclamation).

6. **Duties:** The duties or roles and functions of the AMWG are to:

a. Establish AMWG operating procedures.

b. Advise the Secretary in meeting environmental and cultural commitments of the EIS as requested.

c. Recommend the framework for the AMP policy, goals, and direction.

d. Develop recommendations for modifying operating criteria and other resource management actions pursuant to the Act.

e. Define and recommend resource management objectives for development and implementation of a long-term monitoring plan, and any necessary research and studies required to determine the effect of the operation of Glen Canyon Dam on the natural, recreational, and cultural resources of the Grand Canyon National Park and Glen Canyo National Recreation Area.

f. Review and provide input to the Secretary on the reports required in Sections 1804 (c)(2) and 1804 (d).

g. Facilitate input and coordination of information from stakeholders to the Secretary to assist in meeting consultation requirements under Sections 1804 (c)(3) and 1805 (c) of th Act.

h. Monitor and report on compliance of all program activities with applicable laws, permitting requirements, and the Act. The duties and functions of the AMWG are in an advisory capacity only.

7. **Meetings:** The AMWG is expected to meet biannually. The Secretary's designee, who will serve as the designated Federal Official, may call additional meetings as deemed appropriate. Fifteen members must be present at any meeting of the AMWG to constitute a quorum.

The Secretary's designee shall be responsible for preparation of meeting agendas and scheduling meetings of the AMWG. The Secretary's designee shall attend and chair all meetings of the AMWG. In accordance with FACA, a notice of each meeting of the AMWC shall be published in the Federal Register at least 15 days prior to the meeting advising the date, time, place, and purpose of the meeting. If it becomes necessary to postpone or cancel an announced meeting, a subsequent notice shall be published in the Federal Register as early as possible and shall explain the reasons for the postponement or cancellation. A simil notice of each meeting, postponement, or cancellation shall also be published in selecte newspapers in Phoenix and Flagstaff, Arizona, Denver, Colorado, and Salt Lake City, Utah.

In accordance with FACA, all meetings of the AMWG shall be open to the general public. Any organization, association, or individual may file a written statement or, at the discretion of the AMWG, provide verbal input regarding topics on a meeting agenda in accordance with FACA.

8. **Minutes:** The minutes of each AMWG meeting; reports; related documents; and copies of all documents received, issued, or approved by the AMWG shall be available for public inspection and duplication during regular business hours within 30 working days after the meeting at the:

Upper Colorado Regional Office
Bureau of Reclamation
125 South State Street, Room 6107
Salt Lake City, Utah 84138-1102
(801) 524-6096, Extension 1

The Secretary's Designee shall approve AMWG meeting agendas and minutes.

9. **Estimated Operating Costs:** The operating costs are estimated at $154,000 annually for the establishment and support of the AMWG. This includes costs for required staff support of about 0.3 of a person year. Expenses would also include the travel and per diem of some members and employees of the Department of the Interior while attending meetings of the AMWG, and for expenses incurred in the recording and reproduction of the minutes, reports, notices, etc.

10. **Allowances:** While engaged in the performance of approved business away from home or their regular places of business, members of the AMWG (tribal, environmental, recreation, and Contractors who purchase Federal power) shall be reimbursed for travel expenses, including per diem in lieu of subsistence.

11. **Membership:** Members of the AMWG to be appointed by the Secretary shall be comprised of:

a. Secretary's Designee, who shall serve as chairperson for the AMWG.

b. One representative each from the 12 cooperating agencies associated with the EIS:

(1) Bureau of Reclamation
(2) Bureau of Indian Affairs
(3) U.S. Fish and Wildlife Service
(4) National Park Service
(5) Western Area Power Administration
(6) Arizona Game and Fish Department

(7) Hopi Tribe
(8) Hualapai Tribe
(9) Navajo Nation
(10) San Juan Southern Paiute Tribe
(11) Southern Paiute Consortium
(12) Pueblo of Zuni

c. One representative each from the seven basin states:

(1) Arizona
(2) California
(3) Colorado
(4) Nevada
(5) New Mexico
(6) Wyoming
(7) Utah

d. Two representatives each from:

(1) Environmental groups
(2) Recreation interests
(3) Contractors who purchase Federal power from Glen Canyon Powerplan

Members will be appointed to the AMWG by the Secretary, with input and recommendations from the cooperating agencies, States, tribes, contractors for Federal power from Glen Canyo Dam, environmental representatives, and other stakeholders. To be eligible for appointment the AMWG, a person must (a) be qualified through education, knowledge, or experience to give informed advice on water supply, diversion and delivery facilities, and their operation a management, or the environmental aspects of such operation; and (b) have the capability to constructively work in a group setting toward a common objective of structuring a mechanism for program implementation.

Members of the AMWG will be appointed for a 4-year term. At the discretion of the Secretary, members may be reappointed to additional terms. Vacancies occurring by reason o resignation, death, or failure to regularly attend meetings will be filled by the Secretary for th balance of the vacating member's term using the same method by which the original appointment was made. Failure to attend two consecutive meetings will substantiate grounds for dismissal.

To avoid conflict of interest issues arising from entities having representatives on the AMWG and also submitting responses to request for proposals to perform work, the Federal procurement process shall be strictly adhered to. While members of the AMWG may

advice to the Secretarial Designee, all decisions in the procurement process shall be made by Federal procurement officials free of influence from AMWG members.

Secretary of the Interior

JAN 15 1997

Date

FEB 04 1997

Date charter filed:

THE SECRETARY OF THE INTERIOR

WASHINGTON

FEB 24 1997

Honorable Fife Symington
Governor of Arizona
Phoenix, Arizona 85007

Dear Governor Symington:

The Bureau of Reclamation has established Operating Criteria and the 1997 Annual Plan of Operations (APO) for Glen Canyon Dam as required by the Grand Canyon Protection Act. Copies of these documents are enclosed. This action was taken after distributing draft copies of the proposed Operating Criteria and the proposed 1997 Plan of Operations to representatives of the Governors of the Colorado River Basin States, the Upper Colorado River Commission, appropriate Federal agencies, tribal, academic, scientific and recreation representatives, and others interested in Colorado River operations, and after holding a consultation meeting on November 21, 1996, with these same entities. The Operating Criteria and APO reflect the implementation of the Record of Decision (ROD) for the Glen Canyon Dam Environmental Impact Statement and meet the requirements of the 1992 Grand Canyon Protection Act.

The Operating Criteria specify the requirements for an annual report of operations under the Grand Canyon Protection Act, a periodic review of the Operating Criteria, and details regarding operational constraints. These constraints include maximum, minimum, and daily fluctuation flow rates, maximum ramp rates, emergency exception criteria, flood frequency reduction measures, habitat maintenance flows, and beach/habitat building flows.

The recommended 1997 Plan of Operations reflects the operation of Glen Canyon Dam consistent with the Operating Criteria. Monthly releases are expected to vary between 600,000 acre-feet and 1,500,000 acre-feet with daily flow fluctuations likely between 6,000 cfs/day and 8,000 cfs/day depending on monthly release volumes. The maximum daily flow rate of 25,000 cfs and the maximum upramp rate of 4,000 cfs/hr during fluctuating flow conditions, as described in the Final Environmental Impact Statement and ROD, will be placed into effect.

During the preparation of the 1996 Annual Operating Plan prepared under the 1968 Colorado River Basin Project Act, operating guidelines were agreed to which attempt to accomplish the intent of the Beach/Habitat Building Flow of the Glen Canyon Dam Environmental Impact Statement developed in cooperation with the Basin States. With this commitment from all parties, a test of this "spike flow" was conducted in March/April 1996. It is my intention that Glen Canyon Dam will continue to be operated in conformance with the agreement in the 1996 Annual Operating Plan regarding Beach/Habitat Building Flows.

Every measure will be taken to prevent a powerplant bypass during 1997 in order to preserve the environmental enhancement accomplished by the 1996 beach/habitat building flow. Should releases

in excess of powerplant capacity occur, they will be managed consistent with all of the Secretary's authorities to benefit to the greatest degree possible, the downstream environment of the Grand Canyon. On January 1, 1997, Lake Powell contents exceeded 19 million acre-feet; therefore, a habitat maintenance flow will not be scheduled this year.

Sincerely,

Enclosures

cc: Ms. Rita Pearson
Director, Arizona Department of
Water Resources

Operating Criteria for Glen Canyon Dam
In accordance with the
Grand Canyon Protection Act of 1992

These Operating Criteria are promulgated in compliance with section 1804 of Public Law 102-575, the Grand Canyon Protection Act of 1992. They are to control the operation of Glen Canyon Dam, constructed under the authority of the Colorado River Storage Project Act. These Operating Criteria are separate and apart from the Criteria for Coordinated Long-Range Operation of Colorado River Reservoirs prepared in compliance with the Colorado River Basin Project Act of 1968.

1. Annual Report

As required in the Grand Canyon Protection Act, a report shall be prepared and submitted to Congress annually that describes the operation of Glen Canyon Dam for the preceding water year and the expected operation for the upcoming water year. The annual plan of operations shall include such detailed rules and quantities as are required by the Operating Criteria contained herein. It shall provide a detailed explanation of the expected hydrologic conditions for the Colorado River immediately below Glen Canyon Dam.

2. Review of Criteria

The Secretary of the Interior shall review these Operating Criteria as the result of actual operating experiences to determine if the Operating Criteria should be modified to better accomplish the purposes of the Grand Canyon Protection Act. Such a review shall be made at least every 5 years in consultation with the appropriate Federal agencies, Governors of the Colorado River Basin States, Indian Tribes, representatives of academic and scientific communities, environmental organizations, the recreation industry, and contractors for the purchase of Federal power produced at Glen Canyon Dam.

3. Specific Operational Constraints

The plan of operations will follow the description of the preferred alternative (Modified Low Fluctuating Flow) in the Operation of Glen Canyon Dam Final Environmental Impact Statement and its Record of Decision. The specific criteria are as follows:

Minimum Releases-- 8,000 cfs between 7 a.m. and 7 p.m. 5,000 cfs at night

Maximum Releases-- 25,000 cfs. Several circumstances warrant exception to this restriction. These are the Beach/Habitat Building Flows and the Habitat Maintenance Flows (both described below) and the release of large volumes of water to avoid spills or floodflow releases from Glen Canyon Dam. These latter releases would most likely result from high snowmelt runoff into Lake Powell; if such high releases above 25,000 cfs are required, they shall be made at constant daily flow rates.

Allowable Daily Flow Fluctuations-- 5,000 cfs/24 hours for monthly release volumes less than 600,000 acre feet; 6,000 cfs/24 hours for monthly release volumes of 600,000 to 800,000 acre feet; and 8,000 cfs/24 hours for monthly release volumes over 800,000 acre feet.

Maximum Ramp Rates-- 4,000 cfs/hour when increasing, and 1,500 cfs/hour when decreasing.

Emergency Exception Criteria--Normal powerplant operations will be altered temporarily to respond to emergencies. These changes in operations typically would be of short duration (usually less than 4 hours) and would be the result of emergencies at the dam or within the interconnected electrical system. Examples of system emergencies include:

- Insufficient generating capacity
- Transmission system: overload, voltage control, and frequency
- System restoration
- Humanitarian situations (search and rescue)

Flood Frequency Reduction Measures-- The frequency of unanticipated flood flows in excess of 45,000 cfs will be reduced to no more than 1 year in 100 years as a long-term average. This will be accomplished initially through the Annual Operating Plan process and eventually by raising the height of the spillway gates at Glen Canyon Dam 4.5 feet.

Habitat Maintenance Flows-- Habitat maintenance flows are high, steady releases within powerplant capacity (33,200 cfs) not to exceed 14 days in March, although other months will be considered under the Adaptive Management Program. Actual powerplant release capacity may less 33,200 cfs under low reservoir conditions. These flows will not be scheduled when projected storage in Lake Powell on January 1 is greater than 19,000,000 acre feet, and typically would occur when annual releases are at or near the minimum objective release of 8,230,000 acre-feet. Habitat maintenance flows differ from beach/habitat-building flows because they will be within powerplant capacity, and will occur nearly every year when the reservoir is low.

Beach/Habitat-Building Flows-- These controlled floods will occur as described in the EIS (steady flow not to exceed 45,000 cfs, duration not to exceed 14 days, up-ramp rates not to exceed 4,000 cfs/hour, and down-ramp rates not to exceed 1,500 cfs/hour) except instead of conducting them in years in which Lake Powell storage is low on January 1, they will be accomplished by utilizing reservoir releases in excess of powerplant capacity required for dam safety purposes. Such releases are consistent with the 1956 Colorado River Storage Project Act, the 1968 Colorado River Basin Project Act, and the 1992 Grand Canyon Protection Act.

Secretary of the Interior

FEB 24 1997

Date

Glen Canyon Dam 1997 Annual Plan of Operations
prepared in accordance with the Operating Criteria
developed for the Grand Canyon Protection Act (GCPA)

Under most probable inflow conditions in water year 1997, Glen Canyon Dam is expected to release about 10.2 MAF through the Grand Canyon to Lake Mead. This is about 2 MAF greater than the minimum objective release and is the result of storage equalization with Lake Mead as required under the 1968 Colorado River Basin Project Act. Lake Powell is expected to peak at elevation 3686 feet, 14 feet from full.

Monthly release volumes from Glen Canyon Dam during 1997 are expected to range from 600,000 AF to 1,200,000 AF as discussed in the 1997 Annual Operating Plan prepared under the 1968 Colorado River Basin Project Act . Projected daily allowable fluctuations therefore will be 6,000 cfs or 8,000 cfs (see criteria). With the projected monthly release volumes, it is likely that peak daily releases will exceed 20,000 cfs only during the months of July and August, when monthly release volumes are at their highest for the year. Minimum releases of 5,000 cfs at night and 8,000 cfs during the day and ramping rates of 4,000 cfs/hr increasing and 1,500 cfs/hr decreasing will be followed. All of the above is outlined in the Record of Decision implementing the preferred alternative of the Glen Canyon Dam Environmental Impact Statement.

Since the hydrologic condition of the Colorado River basin and the projected operation of Lake Powell are not expected to create a dam safety condition this year (i.e. no flood releases), a beach/habitat building flow is not planned in 1997. In addition, every measure will be taken to prevent a powerplant bypass this spring in order to preserve the environmental enhancement accomplished by the beach/habitat building flow test in April 1996. Water year 1997 will have a January 1, 1997, Lake Powell storage content of greater than 19 MAF, therefore a beach/habitat maintenance flow of powerplant capacity is also not planned.

This plan is prepared in conformance with Section 1804(c)(1)(A) of the GCPA. Any changes to the plan would require reconsultation in accordance with this Act. Because this is the initial year for this plan of operations, it will be implemented on December 1, 1996, and run through September 30, 1997.

DRAFT (11/3/97)

Glen Canyon Dam 1998 Annual Plan of Operations
prepared in accordance with the Operating Criteria
developed for the Grand Canyon Protection Act (GCPA)

Under the most probable inflow conditions in water year 1998, Glen Canyon Dam is expected to release about 11.8 MAF through the Grand Canyon to Lake Mead. This is about 3.6 MAF greater than the minimum objective release and is the result of high reservoir storage in both Lakes Powell and Mead. Lake Powell is expected to fill in July.

Monthly release volumes from Glen Canyon Dam during 1998 are expected to range from 600,000 AF to 1,200,000 AF. Projected daily allowable fluctuations therefore will be between 6,000 cfs and 8,000 cfs (see criteria). Minimum releases of 5,000 cfs at night and 8,000 cfs during the day and ramping rates of 4,000 cfs/hr increasing and 1,500 cfs/hr decreasing will be followed. All of the above is outlined in the Record of Decision implementing the preferred alternative of the Glen Canyon Dam Environmental Impact Statement.

With current projected monthly release volumes, daily releases likely will exceed 20,000 cfs from October through the month of January and again during the summer peak months of July and August, when monthly release volumes are at their highest for the year. If releases above 25,000 cfs are made, they will be made as steady flows. With the strong current El Nino Southern Oscillation anomaly, there is some indication that winter precipitation could be higher than normal in the southern portion of the Upper Colorado River Basin and that spring precipitation could also be higher than normal in the northern portion of the Basin. Since there are concerns for resulting high releases from Glen Canyon Dam, Lake Powell is being drawn down about 0.5 MAF more than usual by January 1, 1998, and releases throughout the year will be made in such a way to reduce the risk of uncontrolled spring releases that could result from large forecast errors similar to 1983.

Every measure will be taken to prevent such an uncontrolled powerplant bypass this spring in order to protect the Grand Canyon ecosystem downstream of Lake Powell. Discussions are continuing regarding the hydrologic triggering mechanisms under which Beach/Habitat Building Flows could be released from Glen Canyon Dam. Since water year 1998 is expected to have a January 1, 1998, Lake Powell storage content greater than 19 MAF, a beach/habitat maintenance flow of powerplant capacity is not planned.

This plan is prepared in conformance with Section 1804(c)(1)(A) of the GCPA. Any changes to the plan would require reconsultation in accordance with this Act.

Interagency Agreement No. 97-SLC-0333
AUTHENTICATED COPY

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION
UPPER COLORADO REGION

AND

UNITED STATES
DEPARTMENT OF ENERGY
WESTERN AREA POWER ADMINISTRATION
CRSP CUSTOMER SERVICE CENTER

OPERATING AGREEMENT ASSOCIATED WITH GLEN CANYON DAM OPERATING CRITERIA

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION
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OPERATING AGREEMENT ASSOCIATED WITH GLEN CANYON DAM OPERATING CRITERIA

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AND

UNITED STATES
DEPARTMENT OF ENERGY
WESTERN AREA POWER ADMINISTRATION
CRSP CUSTOMER SERVICE CENTER

OPERATING AGREEMENT ASSOCIATED WITH GLEN CANYON DAM OPERATING CRITERIA

1. PREAMBLE

This Interagency Agreement (Agreement) is made this 7th day of July 1997, pursuant to the Acts of Congress approved June 17, 1902 (32 Stat. 388); April 11, 1956 (70 Stat. 105); August 4, 1977 (91 Stat. 565); the Transfer of Functions and Property Agreement, dated March 26, 1980; and the Acts amendatory or supplementary to the foregoing Acts; between the UNITED STATES DEPARTMENT OF ENERGY, Western Area Power Administration, hereinafter called "Western," represented by the officer executing this Agreement or a duly appointed successor, and THE UNITED STATES DEPARTMENT OF THE INTERIOR, Bureau of Reclamation, hereinafter called "Reclamation," represented by the officer executing this Agreement or a duly appointed successor; each sometimes hereinafter individually called Party, or both sometimes hereinafter collectively called the Parties.

2. EXPLANATORY RECITALS

2.1 Reclamation is a Federal agency with management responsibilities for dam and power operations at Glen Canyon Dam.

2.2 Western is a Federal agency responsible for the marketing and delivery of power and energy from Glen Canyon Dam.

2.3 Reclamation and Western have entered into the aforementioned Transfer of Functions and Property Agreement which, among other things, delineates each Party's responsibilities for power system operations including provision of operating reserves, development of schedules, optimizing reserve generation, and cooperation in controlling system voltage.

2.4 Western has entered into firm electric service contracts with various entities committing the sale of Colorado River Storage Project (CRSP) firm power and energy surplus to Reclamation project power loads.

2.5 On October 21, 1991, Western and Reclamation entered into Interagency Agreement No. 91-SLC-0180 which outlined the Exception Criteria and associated operational procedures during the preparation of the Operation of Glen Canyon Dam Final Environmental Impact Statement, the Glen Canyon Dam research flows and subsequent interim operations.

2.6 On February 24, 1997, the Secretary of the Interior signed the Operating Criteria for Glen Canyon Dam, in accordance with the Grand Canyon Protection Act, hereinafter called "Operating Criteria," attached as Exhibit B.

2.7 This Agreement is written to implement the Operating Criteria and to assure adequate, reliable, and secure services from Glen Canyon Dam.

3. AGREEMENT

The Parties agree to the terms and conditions set forth herein.

4. TERM OF AGREEMENT

4.1 This Agreement shall become effective on the date of execution and shall remain in effect unless and until canceled by either party by written notice given not less than one year in advance of the intended termination date.

4.2 The Parties shall periodically review, not less often than every 12 months, operations under this Agreement, and the Parties hereto shall put into effect necessary modifications, which shall be evidenced by written amendment to this Agreement.

5. DEFINITIONS

5.1 Available Generating Capacity means net operable capacity (i.e., total installed nameplate capacity at rated power factor less inoperable capacity).

5.2 Average Integrated Value Across the Hour with respect to generation and water releases, means the sum of the instantaneous values taken across the hour divided by the number of instantaneous values taken.

5.3 Emergency Exception Criteria means that part of the Operating Criteria designed to cover events which will result in the temporary alteration of normal powerplant operations. Examples of these conditions are illustrated in the Operating Criteria and further in Exhibit D, attached, which are guidelines based on North American

Electric Reliability Council Criteria. These guidelines are illustrative of reliability criteria that are developed and modified from time to time.

5.4 Environmental Impact Statement (EIS) means the Final Environmental Impact Statement on the operations of Glen Canyon Dam filed with the Environmental Protection Agency March 21, 1995, and the subsequent Record of Decision signed October 9, 1996.

5.5 North American Electric Reliability Council (NERC) means the organization formed in 1968 to promote the reliability of bulk electric supply by the electric systems of North America; to conduct interregional studies which relate to the reliability of the bulk electric systems and to make information appropriately available; to encourage and assist the development of interregional reliability arrangements among Regional Electric Reliability Councils and their members; to exchange information with respect to planning and operating matters relating to the reliability of bulk electric supply; to review periodically regional and interregional activities on reliability; and to enforce reliability standards. Western is required to report monthly to NERC as to system control performance.

5.6 Regulation Control means the use of automatic generation control to adjust the power output of electric generators within a prescribed area in response to changes in the system frequency, time error, and tie-line loading, so as to maintain the Scheduled Level of generation in accordance with prescribed-NERC criteria. This can result in instantaneous changes in the Glen Canyon Dam generation in support of system frequency and time error control.

Regulation Control is used at Glen Canyon Dam as a real-time-computer-driven change to the hourly schedule. These changes which occur many times during the hour are both positive and negative in relation to the schedule. The resulting output from Glen Canyon generators is an envelope of generation swings that are frequent, small in magnitude, the average of which approximates the original schedule.

5.7 Scheduled Level means the amount of generation established for hourly programming of the Glen Canyon Dam.

5.8 System Emergency means any condition caused by or affecting transmission or generation which requires immediate action to prevent loss of firm load, equipment damage, or tripping of system elements. Examples of System Emergencies include, but are not limited to; the loss of either a significant generation resource or a significant transmission resource that leads to an imbalance in the delivery, frequency, or voltages of power supply.

5.9 Unloaded Capacity means operable capacity at Glen Canyon which is available but not presently serving load.

5.10 Western Systems Coordinating Council (WSCC) means the regional electric reliability council of NERC that covers most of 11 western states, two Canadian provinces, and a small portion of Mexico.

6. POWER SYSTEM OPERATIONS

6.1 Pursuant to Reclamation's water schedules and maintenance activities, Western's firm electric service contractual commitments, and consistent with the guidelines and criteria of the NERC and WSCC, Available Generating Capacity must be sufficient to meet system regulation needs, maintain transmission reliability, maintain power operating reserve requirements, and to serve firm load requirements.

6.2 In consideration of the power operating guidelines and criteria described in Section 6.1 of this Agreement, and in accordance with the provisions of this Agreement, Reclamation will make Unloaded Capacity available from the Glen Canyon Dam Powerplant to the power system under emergency situations so that Western can continue to operate within utility industry standards.

6.3 Reclamation or Western shall, in all instances when the requirements to invoke Emergency Exception Criteria are known sufficiently in advance, notify the other party and the parties will collectively determine the appropriate action.

7. EMERGENCY SITUATIONS

7.1 The Available Generating Capacity at Glen Canyon Dam shall respond to CRSP System Emergencies as well as to applicable interconnected System Emergencies pursuant to the NERC and WSCC guidelines and criteria.

7.2 If a power resource becomes unavailable to Western, or if additional generation is needed, Available Generating Capacity at Glen Canyon Dam will be available to support firm load until another source of energy can be found. The generation at

Glen Canyon Dam will be increased only if other available CRSP generation has been utilized. Under an unavailable resource scenario, Western will call for replacement resources from other interconnected utilities and/or generation from other Western offices in accordance with standard utility practice.

7.3 Western and Reclamation will continue to respond to requests for changes in releases for humanitarian reasons (i.e., rescue and recovery activities).

7.4 Should conditions arise, including, but not limited to those described in Sections 7.1, 7.2, or 7.3 of this Agreement, or the Emergency Exception Criteria, which require changes to Glen Canyon Dam generation outside of the Minimum and Maximum Releases and Allowable Daily Fluctuations defined in the Specific Operational Constraints of the Operating Criteria for periods greater than 1 hour, generation will be restored at Glen Canyon Dam in accordance with the provisions of Exhibit A, attached hereto, of this Agreement.

7.5 If, as a result of an emergency situation, generation at Glen Canyon is lost, generation will be restored as soon as possible. (Many times this can be accomplished within 15 minutes, and only under extraordinary conditions would this require more than 1 hour). Releases without generation will be made through by-pass valves to restore the minimum-release level only after it has been determined that generation cannot be restored within a 1-hour timeframe.

7.6 If it is anticipated that Glen Canyon Dam generation will be needed to operate under Emergency Exception Criteria for more than 1 hour, Western dispatchers

and Reclamation's operators will consult with each other and with others as appropriate.

8. REGULATION

8.1 The Parties agree and recognize that Regulation Control is an essential part of operations and is required under all circumstances. Adequate generation for regulation purposes will be provided at Glen Canyon Dam and also may be provided at other CRSP facilities pursuant to power system operation practices, and generation will be measured as an Average Integrated Value Across the Hour.

8.2 Western will determine which CRSP plants will be placed on Regulation Control by Reclamation, taking into consideration sufficient water and associated generation that must be made available to maintain control area needs on an hourly basis. Western and Reclamation will consult as needed on water and plant availability.

8.3 For purposes of monitoring compliance with this Agreement, the Page Supervisory Control and Data Acquisition System will be the measure of all release flows from Glen Canyon Dam.

9. PERFORMANCE, AND COORDINATION

9.1 Western will make every effort to adhere to the Minimum and Maximum Releases and Allowable Daily Fluctuations defined in the Specific Operational Constraints of the Operating Criteria under normal system-operating conditions.

9.2 On occasions when the need to operate under Emergency Exception Criteria can be anticipated by Western, every effort will be made to avoid such operations during periods of special resource sensitivity. A listing of sensitive resources and periods of vulnerability are described in Exhibit C to this Agreement.

9.3 Reclamation and Western agree that Basin Fund revenues will be used to fund a long-term monitoring program and associated research program regarding dam operations, as provided by law.

9.4 At least annually, the CRSP Manager of Western and the Upper Colorado Regional Director of Reclamation will meet to discuss the Operating Criteria and the effects of the Operating Criteria on Western's and Reclamation's operations and maintenance budgets. Analysis of future net expenses and available cash resources may indicate the potential for violation of the Anti-Deficiency Act. When this potential exists, appropriate measures must be considered and taken so that the Basin Fund is not deficient.

9.5 Western and Reclamation operations personnel will coordinate and as necessary meet to identify any use of Emergency Exception Criteria and the impact and effects of specific occurrence(s).

9.6 Operational communications between Western and Reclamation will continue through daily morning reports submitted by Western. These morning reports list any system disturbances that may have affected CRSP operations during the preceding 24 hours. Reclamation will be notified when use of Emergency Exception Criteria occurs so that evaluation of the effects can be noted.

10. SAFETY

Human safety will not be compromised in order to preserve Operating Criteria.

11. EXHIBITS

Inasmuch as certain provisions of this Agreement may change during the term hereof, they may be set forth in exhibits from time-to-time agreed upon by the Parties in writing. The initial Exhibits A, B, C, and D and all future exhibits shall be attached hereto and made a part hereof, and each shall be in full force and effect in accordance with its terms unless superseded by a subsequent Exhibit.

IN WITNESS WHEREOF, the Parties hereto have caused this Agreement to be duly executed by day and year first above written.

BUREAU OF RECLAMATION

By: Rick L. Gold

Title: _____

Date: _____

WESTERN AREA POWER ADMINISTRATION

By: _____

CRSP Manager
Colorado River Storage Project
Customer Service Center
Western Area Power Administration
Salt Lake City, Utah 84147-0606

Approved

Reg. Solicitor's Office

EXHIBIT A

PROCEDURES TO RESUME OPERATIONS FOLLOWING AN EMERGENCY EXCEPTION CRITERIA EVENT

1. This Exhibit A is made this 7th day of July, 1997, to be effective under and as part of Interagency Agreement No. 97-SLC-0333, dated July 7, 1997, hereinafter called the "Agreement," shall remain in effect until superseded by another Exhibit A in accordance with the provisions of the Agreement; Provided, That this Exhibit A or any superseding Exhibit A shall be terminated by the expiration of the Agreement.

2. When an event causing releases to be less than minimum flows for periods exceeding 1 hour's duration occurs, Then:

   First: If generation cannot follow upramp rate, use by-pass valves to achieve or maintain a 5,000 (or 8,000 depending on time of day) cfs minimum flow (release below a 5,000 cfs minimum for humanitarian emergencies may be an exception).

   Second: Return to the current Scheduled Level as quickly as possible if the Scheduled Level can be attained in less than 4 hours. If return to the current Scheduled Level is initiated after 4 hours, ramp up at no greater than 4,000 cfs per hour or at an appropriate rate for resource benefits as agreed upon between Western and Reclamation operations personnel.

3. When an event causing releases to exceed maximum flows for periods exceeding 1 hour's duration occurs:

   a. Return to the current Scheduled Level as quickly as possible if the Scheduled Level can be attained in less than 2 hours. If return to the current Scheduled Level is initiated after 2 hours, ramp down at no greater than 1,500 cfs per hour or an appropriate rate for resource benefits as agreed upon between Western and Reclamation operations personnel.

   b. If generation cannot follow downramp rate, the by-pass valves may be used to meet downramp requirements.

EXHIBIT B

Operating Criteria for Glen Canyon Dam
In accordance with the
Grand Canyon Protection Act of 1992

These Operating Criteria are promulgated in compliance with section 1804 of Public Law 102-575, the Grand Canyon Protection Act of 1992. They are to control the operation of Glen Canyon Dam, constructed under the authority of the Colorado River Storage Project Act. These Operating Criteria are separate and apart from the Criteria for Coordinated Long-Range Operation of Colorado River Reservoirs prepared in compliance with the Colorado River Basin Project Act of 1968.

1. Annual Report

As required in the Grand Canyon Protection Act, a report shall be prepared and submitted to Congress annually that describes the operation of Glen Canyon Dam for the preceding water year and the expected operation for the upcoming water year. The annual plan of operations shall include such detailed rules and quantities as are required by the Operating Criteria contained herein. It shall provide a detailed explanation of the expected hydrologic conditions for the Colorado River immediately below Glen Canyon Dam.

2. Review of Criteria

The Secretary of the Interior shall review these Operating Criteria as the result of actual operating experiences to determine if the Operating Criteria should be modified to better accomplish the purposes of the Grand Canyon Protection Act. Such a review shall be made at least every 5 years in consultation with the appropriate Federal agencies, Governors of the Colorado River Basin States, Indian Tribes, representatives of academic and scientific communities, environmental organizations, the recreation industry, and contractors for the purchase of Federal power produced at Glen Canyon Dam.

3. Specific Operational Constraints

The plan of operations will follow the description of the preferred alternative (Modified Low Fluctuating Flow) in the Operation of Glen Canyon Dam Final Environmental Impact Statement and its Record of Decision. The specific criteria are as follows:

Minimum Releases– 8,000 cfs between 7 a.m. and 7 p.m. 5,000 cfs at night

Maximum Releases– 25,000 cfs. Several circumstances warrant exception to this restriction. These are the Beach/Habitat Building Flows and the Habitat Maintenance Flows (both described below) and the release of large volumes of water to avoid spills or floodflow releases from Glen Canyon Dam. These latter releases would most likely result from high snowmelt runoff into La Powell; if such high releases above 25,000 cfs are required, they shall be made at constant daily flow rates.

Allowable Daily Flow Fluctuations– 5,000 cfs/24 hours for monthly release volumes less than 600,000 acre feet; 6,000 cfs/24 hours for monthly release volumes of 600,000 to 800,000 acre feet; and 8,000 cfs/24 hours for monthly release volumes over 800,000 acre feet.

Maximum Ramp Rates-- 4,000 cfs/hour when increasing, and 1,500 cfs/hour when decreasing.

Emergency Exception Criteria–Normal powerplant operations will be altered temporarily to respond to emergencies. These changes in operations typically would be of short duration (usually less than 4 hours) and would be the result of emergencies at the dam or within the interconnected electrical system. Examples of system emergencies include:

- Insufficient generating capacity
- Transmission system: overload, voltage control, and frequency
- System restoration
- Humanitarian situations (search and rescue)

Flood Frequency Reduction Measures– The frequency of unanticipated flood flows in excess of 45,000 cfs will be reduced to no more than 1 year in 100 years as a long-term average. This will be accomplished initially through the Annual Operating Plan process and eventually by raising the height of the spillway gates at Glen Canyon Dam 4.5 feet.

Habitat Maintenance Flows– Habitat maintenance flows are high, steady releases within powerplant capacity (33,200 cfs) not to exceed 14 days in March, although other months will be considered under the Adaptive Management Program. Actual powerplant release capacity may be less 33,200 cfs under low reservoir conditions. These flows will not be scheduled when projected storage in Lake Powell on January 1 is greater than 19,000,000 acre feet, and typically would occur when annual releases are at or near the minimum objective release of 8,230,000 acre-feet. Habitat maintenance flows differ from beach/habitat-building flows because they will be within powerplant capacity, and will occur nearly every year when the reservoir is low.

Beach/Habitat-Building Flows– These controlled floods will occur as described in the EIS (steady flow not to exceed 45,000 cfs, duration not to exceed 14 days, up-ramp rates not to exceed 4,000 cfs/hour, and down-ramp rates not to exceed 1,500 cfs/hour) except instead of conducting them in years in which Lake Powell storage is low on January 1, they will be accomplished by utilizing reservoir releases in excess of powerplant capacity required for dam safety purposes. Such releases are consistent with the 1956 Colorado River Storage Project Act, the 1968 Colorado River Basin Project Act, and the 1992 Grand Canyon Protection Act.

Secretary of the Interior

FEB 24 1997

Date

EXHIBIT C

CRITICAL ECOSYSTEM ELEMENTS
GLEN AND GRAND CANYON

1. This Exhibit C is made this 7th day of July, 1997, to be effective under and as part of Interagency Agreement No. 97-SLC-0333, dated July 7, 1997, hereinafter called the "Agreement," shall remain in effect until superseded by another Exhibit C in accordance with the provisions of the Agreement; Provided, That this Exhibit C or any superseding Exhibit C shall be terminated by the expiration of the Agreement.

2. The Operating Criteria have been designed to reduce the impact of Glen Canyon Dam operations on the natural resources in the Glen Canyon National Recreation Area and Grand Canyon National Park. Operations under Emergency Exception Criteria may affect the resources of concern. The level of impact will vary depending upon the magnitude, duration, timing, and frequency of flows.

3. The information presented below is to be used by the operators of both Western and Reclamation in their decision process.

4. Listed below are the critical periods of time for selected natural resources in the Glen and Grand Canyons.

Deviations Lower Than the Minimum (5,000 cfs)

Resource	Impact	Critical Period
Trout	Stranding adults	December - March
	Stranding eggs	December - March
Cladaphora	Freezing	December - February
	Desiccation	June - August
Native Fish	Larval stranding	May - August
Vegetation	Desiccation	May - September

Deviations Higher Than the Maximum (25,000 cfs)

Resource	Impact	Critical Period
Vegetation	Flooding	May - June
Insects	Flooding	May - September
Waterfowl	Flooding Nests	May - June
Passerine Birds	Flooding Nests	May - June
Native Fish	Washed out of backwaters	March - October
Reptiles	Flooding	May - September

5. The resources and impacts listed above represent both critical resources and indicators for the ecosystem. The Procedure to Resume Operations Following an Emergency Exception Criteria Event (Exhibit A) should be used in general to return to the Scheduled Level.

6. As additional data from research and long-term monitoring are collected and analyzed, modification of the above stated resources will be made as appropriate.

EXHIBIT D
Emergency Operating Policies

Inflow Forecasting

National Weather Service inflow projections, received twice a month, are used to project a 3- to 4-month period. This data comes from a satellite telemetered network of more than 100 Upper Colorado River Basin data collection points. These points gather snow water content, precipitation, temperature, and streamflow information. The water year begins in October, with later adjustments made for anticipated targets such as annual volumes and flood control elevations. Starting on January 1, forecasts are made for the April through July inflow, the peak runoff period. These early forecasts may contain large errors due to climatic variability as well as modeling and data uncertainties. Uncertainty decreases as the snow accumulation period progresses into the runoff season. As the runoff season progresses, monthly scheduled releases are modified to accommodate projected runoff changes.

Operational Emergencies

The North American Electrical Reliability Council (NERC) has established guidelines for emergency operations of interconnected systems. These guidelines apply to Glen Canyon Dam operations and may account for operational changes outside of those identified in descriptions of the alternatives. These changes in operations are intended to be of short duration as a result of emergencies at the dam or within the transmission network. NERC provides operating policies for system emergencies, and only examples are given here.

Insufficient Generation Capacity. When a control area has an operating capacity emergency, it must promptly balance its generation and interchange schedules to its load, without regard to financial cost, to avoid prolonged use of the assistance provided by interconnection frequency bias. The emergency reserve inherent in frequency deviation is intended to be used only as a temporary source of emergency energy and must be promptly restored so the interconnected systems can withstand the next contingency. A control area unable to balance its generation and interchange schedules to its load must remove sufficient load to permit correction of its Area Control Error.

If a control area anticipates an operating capacity emergency, it must bring on all available generation, postpone equipment maintenance, schedule interchange purchases well in advance, and prepare to reduce load.

An example of insufficient generation capacity and the appropriate response would be as follows: if any coal-fired powerplant in Western's load control area were unexpectedly lost, the response would be an increase in Colorado River Storage Project (CRSP) generation or imports to cover the change in anticipated generation within the control area.

Transmission (Overload, Voltage Control). If a transmission facility becomes overloaded or if voltage levels are outside of established limits and the condition cannot be relieved by normal means (such as adjusting generation or interconnection schedules) and a credible contingency under these conditions would adversely impact the interconnection, appropriate relief measures, including load shedding, shall be implemented promptly to return the transmission facility to within established limits. This action shall be taken by the system, control area, or pool causing

the problem if it can be identified; or by other systems or control areas, as appropriate, if identification cannot be readily determined.

An example of a response to all overloaded transmission system would be automatic relay tripping and taking a transmission line, such as the Glen Canyon-Flagstaff 345-kV line, out of service. This action would cause Glen Canyon powerplant generation to be reduced instantaneously to a predetermined level based on the capacity of the line taken out of service.

Load Shedding. After taking all other steps, a system or control area whose integrity is in jeopardy due to insufficient generation or transmission capacity shall shed customer load rather than risk an uncontrolled failure of interconnection components.

An example requiring the extreme step of load shedding could occur if there were an interruption of the transmission capacity between the heavy load areas of Southern California and Arizona and the heavy generation areas of the Pacific Northwest, Colorado, Wyoming, and Montana. In this situation, Glen Canyon would be isolated with the heavy load areas. The response would be for Glen Canyon to swing from existing generation levels to maximum powerplant capacity. Then the automatic relay protection would open the transmission lines to the heavy load area, reducing the generation at Glen Canyon.

System Restoration. After a system collapse, restoration shall begin when it can proceed in an orderly and secure manner. Systems and control areas shall coordinate their restoration actions. Restoration priority shall be given to the station supply of powerplants and the transmission system. Even though the restoration should be expeditious, system operators should avoid premature action to prevent a recollapse of the system.

Customer load shall be restored as generation and transmission equipment becomes available, while keeping load and generation in balance at normal frequency as the system is restored.

Emergency Information Exchange. A system control area or pool experiencing or anticipating an operating emergency should communicate its current and future status to neighboring systems, control areas, or pools and throughout the interconnection. Systems able to provide emergency assistance must make known their capabilities.

Special System or Control Area. Because the facilities of each system may be vital to the interconnection's secure operation, systems and control areas shall make every effort to remain connected. However, if a system or control area determines that it is endangered by remaining interconnected, it may take action as necessary to protect its system.

If a portion of the interconnection becomes separated from the remainder of the interconnection, abnormal frequency and voltage deviations may occur. To permit resynchronizing, relief measures should be applied by those separated systems contributing to the frequency and voltage deviations.

An example of when Western might choose to disconnect the Glen Canyon Powerplant from the interconnected system would be in the case of a search and rescue operation in the canyon when there would be a need to control the releases.

Although the situations are infrequent, they do occur and require immediate, short-term changes in dam operation. In general, changes resulting from emergencies at Glen Canyon would result in

decreases in flows. Emergencies in the system away from the dam would result in increases in f

Humanitarian Situations

There are occasions when managing agencies and local authorities, such as the police, request that the flows from the dam be reduced so that search and rescue procedures can be conducted or fatalities can be recovered from the river. In these situations, flows will be reduced for an agreed upon period of time. When returning to normal operations, flows will be brought up quickly to the minimum flow identified in the alternative and then may be increased at the ramping rate identified in the alternative.

DRAFT 10/14/97

GLEN CANYON DAM
ADAPTIVE MANAGEMENT WORK GROUP
OPERATING PROCEDURES

FOREWORD

The Grand Canyon Protection Act (Act) of October 30, 1992, (Public Law 102-575) directs the Secretary of the Interior (Secretary) to "establish and implement long-term monitoring programs and activities that will ensure that Glen Canyon Dam is operated in a manner consistent with that of section 1802" of the Act. "The monitoring programs and activities shall be established and implemented in consultation with the Secretary of Energy; the Governors of the States of Arizona, California, Colorado, Nevada, New Mexico, Utah, and Wyoming; Indian tribes; and the general public, including representatives of academic and scientific communities, environmental organizations, the recreation industry, and contractors for the purchase of Federal power produced at Glen Canyon Dam." In order to comply with the consultation requirement of the Act, the Glen Canyon Dam EIS recommended formation of a Federal Advisory Committee. To fulfill this requirement the Glen Canyon Adaptive Management Work Group (AMWG) has been established. The AMWG Charter imposes the following criteria: (1) the AMWG shall operate under the Federal Advisory Committee Act (Public Law 92-463); (2) the Chairperson shall be the designated by the Secretary; (3) the Secretary's Designee, shall also serve as the Designated Federal Official under the Federal Advisory Committee Act; (4) the Bureau of Reclamation will provide the necessary support in taking accurate minutes of each meeting; and (5) the AMWG shall continue in operation until [redacted] termination or renewal by the Secretary under the Federal Advisory Committee Act.

OPERATION

1. Meetings. The AMWG is expected to meet semiannually. The Secretary's designee may call additional meetings as deemed appropriate. A minimum of one meeting will be held annually. All meetings shall be announced by notice in the Federal Register and by news release to local newspapers.

Fifteen members must be present at any meeting of the AMWG to constitute a quorum.

Robert's Rules of Order will be generally followed, except that some flexibility will be allowed as needs dictate.

The Bureau of Reclamation is responsible for arranging meetings and for other duties associated with operation of the AMWG. They will arrange for meeting location, provide staff for the Designee, minutes, Federal Register Notices and all other operational requirements of the AMWG.

Meetings of the AMWG shall be held in the following locations: Flagstaff, Las Vegas, Phoenix, and Salt Lake. Meetings shall be rotated between these four sites as decided upon by the workgroup.

2. Chairperson. The Chairperson will be the Secretary's Designee, who will preside over the meetings of the AMWG. In the absence of the Chairperson, the Chairperson will appoint an alternate. The Secretary's Designee or their alternate must be present before a meeting of the AMWG may convene. The Secretary's Designee may designate an alternate who is a member of the Department of the Interior. The Designee or their alternate is authorized to adjourn an AMWG meeting at any time.

3. Members. Membership shall follow guidelines in the AMWG Charter. Members of the AMWG will be designated by the Secretary of Interior. They shall serve for a term of four year. Current members may be designated for more than one term.

4. Alternate Committee Members. AMWG members may designate alternates for the same term as the member. Alternates must be identified to the Chairperson in writing. The member will notify the chairperson 15 days prior to the day of any meeting in which the alternate will represent the member. Alternates must meet the same qualifications as the member. Alternates will have authority to fully participate in AMWG business, including quorum and voting privileges. They may receive compensation for travel to AMWG meetings when representing the official member. Representation of an alternate does not remove the attendance requirement of the member described in the Charter. A list of members and alternates shall be maintained and made available to the Work Group.

5. Agenda. Sixty days prior to any meeting of the AMWG, a draft of the proposed agenda and related information will be sent to the group members. Members shall review the agenda and return comments and proposed agenda items to the Designee within two weeks of the agenda mailing date. The final agenda will be sent to the members 15 to 30 days prior to the meeting. The Secretary's Designee shall approve all agendas.

6. Voting. The maker of a motion must clearly and concisely state and explain their motion. Motions may be made verbal or submitted in writhing in advance of the meeting. Notice of motions to be made by the AMWG should be written notices both in the Federal Register and on the agenda. Motions may be proposed by a member in meetings where they are related to an agenda topic. After a motion there should be presentations by staff followed by discussion and a call for questions. The public will be given opportunity to comment during the question period as allowed by the Chairperson. Any member of the public asked to address the AMWG, shall have a minimum of 2 minutes to comment. The Chairperson can limit the total time allowed to the public for comments. Comments shall be applicable to the motion and not be repetitive to presentations, group discussions or other comments previously presented. The motion must be fully documented for the minutes and restated clearly by the Chairperson before the vote is taken.

The group should try to seek consensus but, in the event that consensus is not possible, a vote should be taken. Voting shall be by verbal indication or by raised hand. Approval of a motion will require a two-thirds majority of members present and voting. If there is a minority, they shall have the opportunity to send their opinion along with the formal recommendation to the Secretary. Voting shall occur only within the formal meetings of the group.

7. Minutes. Detailed minutes of each meeting will be kept. The minutes will contain a record of persons present and a description of pertinent matters discussed, conclusions reached, and actions taken on motions. Minutes shall be limited to approximately 5 to 15 pages. The corrections and adoption of the minutes will be by vote of the AMWG at the following meeting. The Secretary's Designee shall approve all minutes. The Bureau of Reclamation is responsible for recording and disseminating minutes to AMWG members within 30 days of the subject meeting.

9. Public Involvement. No later than fifteen days prior to each meeting a notice will be published in the Federal Register. Meetings will be open to the public and advertised in local newspapers. Interested persons may appear in person, or file written statements to the AMWG. Public comments can be on any issue related to operation of the Glen Canyon Dam. A specific time for public comment will be identified in the agenda. Advance approval for oral participation may be prescribed, and speaking time may be limited. Minutes of AMWG meetings and copies of reports submitted to the AMWG will be maintained for public review at the Bureau of Reclamation's Upper Colorado Regional Office in Salt Lake City, Utah and at the Library of Congress in Washington, DC.

10. Payment for Travel. Members of the AMWG may receive compensation for travel expenses, including travel and per diem. Compensation for those expenses will made under federal guidelines. Alternates representing the official committee member may also receive compensation for travel expenses.

11. Open/Closed Meetings. If an entity proposes discussion of a sensitive issue they feel requires a closed session they should so state in a proposal submitted to AMWG members in sufficient time to include it in the agenda published in the Federal Register Notice announcing the next meeting. An executive session could be held during a regular meeting, but should be used rarely. Any sensitive cultural issues will require consultation with Native Americans prior to meeting.

Telephone conference meetings must have a notice in the Federal Register 15 days prior to the call. There must be adequate opportunity for the general public to listen to the conference call.

The AMWG may conduct business outside of formal meetings through telephone polls conducted by the Chairperson or his/her designee. In emergency situations, telephone polls can be requested by the AMWG member to act on clearly defined written motions for AMWG approval. Following approval by the Chairperson, a telephone poll will be conducted within 7 working days. During a telephone poll, all members will be contacted and requested to vote. Approval of a motion will be by at least a two-thirds majority of all members voting. The Chairperson is responsible for documenting in writing how each member voted and distributing the record to all AMWG members.

12. Reports and Record Keeping. The Annual Report (AR) required by the Grand Canyon Protection Act shall be written by the AMWG. The State of the Natural and Cultural Resources in the Colorado River Ecosystem report developed by the Grand Canyon Monitoring and Research Center will be attached to the AR and shall contain information on the condition of the resources impacted by the operation of Glen Canyon Dam. The AR shall be concise, containing critical resource issues and recommendations to the Secretary on future dam operations.

AMWG staff will supply GSA the required information to complete the summary report for Federal Advisory Committees.

13. Committee Expenses and Cost Accounting.
An accounting of the expenses for operation of the AMWG shall be maintained by Reclamation. Expenses and other information will be submitted to GSA as required by FACA. Committee expenses are limited to approximately $154,000 annually.

SUB-GROUPS

1. Formation. -The AMWG may form sub-groups in order to facilitate the mission of the AMWG as identified in the Act and the AMWG Charter. Sub-groups will be formed for completion of specific tasks or for specified periods of time. Sub-group members will be named by the members of the AMWG. Upon formation of a sub-group, the Chairperson of the AMWG, with the advice of AMWG members, will approve nominated members to serve on the sub-group. Effort shall be made to keep sub-groups small. Sub-group will be formed or dissolved by a vote of the AMWG.

2. Requirements. -Sub-groups may choose their chairman from the AMWG named group members. The chairperson of any sub-group may convene group meetings at their discretion. Sub-groups may develop their own operating procedures. Sub-group meetings must follow requirements of FACA, except they need not be chartered. The Glen Canyon Technical Work Group membership shall consist of one representative named from each organization represented in the AMWG, with the exception of two members from the National Park Service representing the Grand Canyon National Park and the Glen Canyon Recreational Area, and one representative from the US Geological Survey. The sub-group will elect its own officers. Names of sub-group members will be announced to the AMWG at regular meetings and will be attached to the minutes. Sub-group members may designate alternates subject to approval of the Designee and the AMWG.

3. Charge. -Subgroups will receive their charge from the AMWG. Subgroups will work only on issues that were assigned them by the AMWG. They should not have the ability to follow other issues on their own. They are encouraged to submit issues to the AMWG they feel worthy of consideration and discussion. The AMWG would need to approve work on new issues. The AMWG may require the sub-groups to develop plans and direct them to come to a consensus or majority opinion at their discretion. Sub-groups shall determine their own operating procedures.

4. Reporting. -Committees will report at least annually to the AMWG at the request of the Chairperson. Sub-groups shall report only to the AMWG. They shall provide information as necessary for preparing annual resource reports and other reports as required for the AMWG.

5. Ad Hoc Groups. Ad hoc groups shall consist of members of the sub-group only. These groups may meet to discuss assignments from the sub-group. Ad hoc meetings will not require federal register notices. Minutes are recommended but, not required. Ad hoc groups shall report only to the main body of the sub-group. On a case by case basis the AMWG will provide direction to the subgroups on the flexibility they have in forming Ad hoc groups.

Approved: _____ _____
Chairperson Date

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GLEN CANYON DAM
TECHNICAL WORK GROUP
OPERATING PROCEDURES

FOREWORD

The Grand Canyon Protection Act (Act) of October 30, 1992, (Public Law 102-575) directs the Secretary of the Interior (Secretary) to "establish and implement long-term monitoring programs and activities that will ensure that Glen Canyon Dam is operated in a manner consistent with that of section 1802" of the Act. "The monitoring programs and activities shall be established and implemented in consultation with the Secretary of Energy; the Governors of the States of Arizona, California, Colorado, Nevada, New Mexico, Utah, and Wyoming; Indian tribes; and the general public, including representatives of academic and scientific communities, environmental organizations, the recreation industry, and contractors for the purchase of Federal power produced at Glen Canyon Dam." In order to comply with the consultation requirements of the Act, the Glen Canyon Dam EIS recommended formation of a Federal Advisory Committee and a Technical Work Group. To fulfill this requirement, the Glen Canyon Adaptive Management Work Group (AMWG) was established. The AMWG held their first meeting on September 10-11, 1997, in Phoenix, Arizona and officially formed the Glen Canyon Technical Work Group (TWG) as a subgroup. The TWG is comprised of technical representatives representing the various stakeholders on the AMWG. The TWG shall perform those tasks charged to them by the AMWG. Additional responsibilities of the TWG are to develop criteria and standards for monitoring and research programs and provide periodic reviews and updates, develop resource management questions for the design of monitoring and research by or under the direction of the Grand Canyon Monitoring and Research Center (GCMRC), and provide information as necessary for preparing annual resource reports and other reports as required for the AMWG. The TWG shall comply with all regulations of the Sunshine Act and the Federal Advisory Committee Act pertaining to sub-committees. (See 41 CFR 101-6.10 Federal Advisory Committee Management) Staff resources for the TWG shall be provided by the Grand Canyon Monitoring and Research Center and Reclamation.

OPERATION

1. Meetings. - TWG meetings will be held quarterly or more frequently as required. Where possible meetings will be scheduled for 2-3 months in advance. Information will be provided to all interested parties. The Bureau of Reclamation (Reclamation) will be responsible for submitting meeting notices to be published in the Federal Register 15 days prior to meetings. Federal register notices may provide information on up to 3 meetings at a time. The Chairperson will draft a reminder meeting notice to the TWG members and the staff will distribute it at least 10 days prior to the meeting. Meeting format will be in accordance with these operating Procedures. Sixteen members must be present at any meeting of the AMWG to constitute a quorum.

2. Officers. - The TWG will elect it's own Officers. The Chairperson will be elected for a 1-year term. The Chairperson will be selected by a vote of the TWG. A Vice-chair will be selected to assist the Chairperson and will be an employee of Reclamation to ensure requirements of federal regulations are met and to provide assistance. Reclamation and GCMRC will provide staff and meeting resources. Reclamation shall be responsible for, and shall assure compliance with, the applicable federal regulations

including those referenced above. The Chairperson shall be elected in the December meeting of the TWG or the meeting just prior to the first calendar year meeting of the AMWG. The new Chairperson will take office at the first meeting of the TWG following the first meeting of the AMWG of the year.

Chairperson responsibilities:

- Convene, facilitate and adjourn meetings;
- Prepare draft and final agendas and forward to staff for distribution;
- Actively participates in TWG discussions;
- Entertains input from the public on issues and recognizes the public at appropriate times;
- Follows up with TWG members and sub-groups to verify that tasks are on schedule by conducting a pre-meeting conference call or individual contacts 3-5 days prior to meeting.

Vice-Chair responsibilities include:

- Provides logistics and staff support to the Chairperson to accomplish tasks (Reclamation/GCMRC);
- Publish Federal Register Notice of meetings, including generic agenda;
- Convene, facilitate and adjourn TWG meetings when the Chairperson is absent;
- Assists the Chairperson and helps facilitate meetings;

3. Members. - The TWG membership shall consist of one representative named from each organization represented in the AMWG, with the exception of two members from the National Park Service representing the Grand Canyon National Park and the Glen Canyon Recreational Area, and one representative from the US Geological Survey. The TWG organizational membership was nominated by the AMWG, with the USGS representative having been nominated by the Secretary's Designee. Members were selected by the respective organization's representatives. A list of TWG members will be distributed to the AMWG at regular meetings. TWG members may designate alternates.

4. Alternate committee members. - Members shall notify the Chairperson or Vice-chair of an alternate attending for them at least one day prior to the meeting. Alternates shall be designated by TWG members. The member will notify the Chairperson of the alternate's name before the start of the meeting in which the alternate will represent the member. Members can designate an alternate for any TWG or Ad Hoc group meeting they will be unable to attend, or for which the alternate is better prepared to represent the organization's interests. Alternates shall sign-in on the attendance sheet next to the TWG member's name for whom they are representing. Alternates shall be considered official representatives of their agency/affiliation, may vote on TWG issues and be counted in the quorum.

5. Agenda. - Members, and others, requesting an item be added to the agenda should notify the Chairperson in writing (by mail, fax, or E-mail) at least 15 days prior to the meeting. The following information should be provided with each request: a discussion topic or title, the nature of the topic (e.g., sharing of information, discussion of an issue, or a proposed action), name(s) of the presenter(s), total amount of time required for presentation, and any other relevant points for meeting planning. The agenda will be finalized when the schedule is filled or when the pre-meeting briefing documents are distributed.

Requests received after the agenda is finalized may be considered under new business (time permitting), or may have to be postponed until a future meeting. An agenda will be prepared and approved by the Chairperson and forwarded to the TWG secretary. The secretary will distribute the final agenda (by e-mail and/or by other means) to the TWG members and others on the distribution list. Reclamation is responsible for compliance with federal regulations. Reclamation will include in the Federal Register Notice: meeting dates, times, location, and a list of meeting agenda items.

6. Guidelines for Discussions. - The following ground rules will guide all discussions while the meeting is in session: Members will endeavor to arrive, return from breaks, and depart the meeting on schedule. Any person needing to continue private discussions after the meeting has been called to order will take their business outside the conference room. Members, alternates and visitors wishing to address the TWG will wait to be recognized by the Chairperson or designated discussion leader before speaking. Speakers will make their points succinctly and yield the floor to the next speaker, waiting to again be recognized for rebuttals. Comments are to be applicable to the motion and not repetitive to presentations, group discussion or other comments previously presented. Discussions of new or unrelated business will be postponed until the appointed time on the agenda.

7. Voting. - The maker of a motion must clearly and concisely state and explain their motion. Motions may be made verbal or submitted in writing in advance of the meeting. Motions may be proposed by a member in meetings where they are related to an agenda topic. After a motion and a second to the motion there shall be presentations by staff, where they are necessary or desired. Presentations shall be followed by discussion and a call for questions. The public will be given opportunity to comment during the question period as provided for in these operating procedures. Any member of the public who has asked to address the TWG, shall be provide a reasonable time to comment. The Chairperson may limit the total time allowed to the public for comments. Comments shall be applicable to the motion and not be repetitive of prior presentations, group discussions or other comments. The motion shall be fully documented for the minutes and restated clearly by the Chairperson before seeking a determination of consensus or a vote is taken.

Consensus is the desired result. All reasonable efforts will be made to bring the group to a consensus decision or recommendation. If consensus cannot be achieved, a vote will be taken on motions and recommendations to be forwarded to the AMWG. Only members of the TWG or their alternate may vote. A majority recommendation will go forward along with a minority opinion report (containing the alternate recommendation and identification of who constitutes the minority). Ad hoc groups consisting of the dissenting members may be formed as needed to prepare minority opinions. Each appointed TWG representative is expected to explain and/or clarify issues to their respective AMWG member.

Recommendations to the TWG or AMWG will be summarized in report form, will contain relevant background material on the issues, and will include a brief summary of previous discussions related to the issue (e.g. ad hoc group or TWG discussions). Requests for actions associated with a briefing document will be posed as a specific written recommendations that can be approved as written, approved with modification, or not approved. Reports and recommendations forwarded to the AMWG will be

identified as having been approved through consensus of the entire TWG, except when a minority opinion is submitted to the Chairperson in writing prior to the agreed date for forwarding TWG recommendations to the AMWG (generally 60 days before the next AMWG meeting). Members subscribing to the minority opinion will be listed in the minority report, which shall follow the same format outlined above for the consensus or majority report. The TWG Chairperson may invite a representative of the minority group to present the minority opinion to the AMWG.

8. Ad Hoc Groups and meetings. - Ad hoc groups may be formed by the TWG as needed with membership consisting of TWG members and alternates only. Groups may invite technical advisors to assist on some issues. These groups may meet to discuss assignments from the TWG. Ad hoc meetings will not require federal register notices. Minutes are recommended but, not required. Ad hoc groups shall report of their deliberations and findings to the TWG. Presentations of findings from Ad Hoc groups maybe given by individual members of the group. Ad hoc groups shall report only to the main body of the TWG. The AMWG may provide direction to the TWG on the flexibility they have in forming ad hoc groups. Ad hoc groups shall be formed by the consensus or vote of the TWG and shall terminate as soon as the assigned task is complete.

9. Minutes, Reports, and Record Keeping. - Minutes will be recorded by TWG staff support from GCMRC or Reclamation. Minutes will address the key topics of the TWG Meetings including proposals, motions, voting/approval of motions, majority/minority opinions, public comments, presentations, findings from Ad hoc groups, and other pertinent information. Minutes will not be a complete transcript of the discussions. An audio tape recording of the meeting will be kept for each meeting. The corrections and adoption of the minutes will be reached by consensus of the TWG at the following meeting.

Minutes, attachments, agendas and materials needed for upcoming TWG meetings will be distributed according to the schedule below:

A. Submittal of materials for upcoming TWG Meetings.

15 Business Days Prior to TWG Meeting:	Responsible Person	Submit To
• Agenda Items	TWG Members	Chairperson
• Materials for duplication and distribution	TWG Members	Staff

TWG members responsible for materials for an upcoming meeting shall forward them to the designated staff member in time to be included with the distribution which will occur 10 days prior to the meeting. Materials may be provided via e-mail or hard copy. Where copies of material are not provided to the designated staff member in time for normal distribution, the person or organization will be responsible for making their own copies and bringing them to the meeting. They may either: (1) e-mail, fax or other means; (2) duplicate prior to and distribute at the meeting. Staff, members, and public providing materials for distribution at the meeting should bring at least 40 copies. Meeting documents distributed at the meeting are to be provide first to the secretary,

TWG members, and GCMRC Chief. Copies of all handouts will be placed in a designated location for official visitors and the public. If action is anticipated to be taken on or as a result of that material, it is the TWG's expectation that all reasonable effort will be made to provide those materials to the members in advance of the meeting. In the event materials are not provided in advance of the meeting, action on this topic may be delayed at the Chairperson's discretion. Individuals making presentations at TWG meetings are shall notify TWG staff of any special audiovisual equipment or supply needs at least two weeks before the meeting.

A mailing list containing member's mailing address, phone number, and FAX number and E-mail address, as appropriate, will be maintained and distributed as needed. Updates will be prepared and the list re-distributed as appropriate. A copy of the roster of TWG members or alternates attending any meeting of the TWG shall be attached to the minutes, and shall include a list of all others in attendance.

B. Meeting material distribution to TWG Members

10 Calendar Days Prior to TWG Meeting:	Responsible:
• Minutes and attachments from the previous meeting	Staff
• Agenda for the upcoming meeting	Staff
• Materials needed for the upcoming meeting	Staff

E-mail, regular mail or other means shall be used for the distribution.

Reclamation will be responsible for reports and distribution of materials to AMWG, and providing copies of information to the Library of Congress. The TWG shall assist GCMRC in preparation of the draft Annual Report to Congress pursuant to the Grand Canyon Protection Act.

Minutes, documentation from meetings, and reports shall be made available to the public at the Library of Congress in Washington DC and the Upper Colorado Regional Office of the Bureau of Reclamation in Salt Lake City, Utah.

10. Arranging meetings and other duties associated with operation of the TWG. - Where possible meetings will be scheduled 2-3 months in advance. All meetings shall also have a Federal Register Notice published 15 days or more in advance of any meeting. Meetings locations will be determined by the group in a preceding meeting. The staff will arrange meeting rooms and audio-visual equipment, and block a number of hotel guest rooms. Meeting rooms will be arranged so that each of the 26 TWG members can all be seated around the table. Alternates representing an absent TWG member should take their place at the table. Additional seating will be provided around the margin or rear of the room for alternates who are attending with the member, for official visitors and for the general public.

11. Public, Visitors, and Open and Closed Meetings. - All meetings are open to the public. It is not anticipated the group will require closed sessions unless a provision is made to do so. Only members

of the TWG or their alternate may participate in discussions of the group. Appropriate staff of Reclamation and GCMRC shall provide pertinent information relevant to discussions when appropriate. A member or alternate may request a representative from their organization to respond to questions or make presentations when approved by the group. The public will be allowed to comment after discussion of each agenda item requiring a decision of the group and at the end of the TWG meeting or as provided in the agenda. Each person will be given up to ten minutes to address the TWG members at the time specified on the agenda for public comment. Greater consideration will be given to individuals submitting discussion issues and/or requesting time in advance of the meeting to the Chairperson. The Chairperson will control adherence to the time limit so the meeting is not unduly prolonged. Each speaker will be expected to provide their name and affiliation for the meeting minutes. The Chairperson will accept written comments from the public, and will allow their distribution if copies are available for all members (40 copies required). Written comments will be attached to the meeting minutes, if they are identified with the name, address, and affiliation of the provider .

Adopted by vote of the TWG on _____ in Phoenix, Arizona.

Approved: _____ _____

Chairperson Date

To: AMWG Members

From: Bruce Moore, Bureau of Reclamation

Subject: Program Formulation Process

At the AMWG meeting on September 10 and 11, Reclamation was requested to provide the members a description of the program formulation process they go through to get funding approved for the Glen Canyon environmental work. Attached is a chart showing the chronology of the process for FY 1999 and FY 2000. As discussed at the meeting, the FY 1999 budget is in the final stages of completion. We have some time to make impacts to the internal portions of the budget but the total funds available are set. The Technical Work Group (TWG) and the Grand Canyon Monitoring and Research Center (CENTER) are working hard on the internal portions to come to final program costs.

For FY 2000, Reclamation is in the process of preparing the budgets. The attached calender shows the Preliminary FY 2000 BOR Work Program due to the Colorado River Energy Distributors (CREDA) by mid April and the Commissioner's final budget to the Assistant Secretary for Water and Science by mid May. This means the TWG and AMWG need to have the total amount somewhat firm to allow Reclamation to move the budget process forward. The details of the FY 2000 budget can be worked on until sometime in the winter of 1998.

Reclamation will be prepared to answer any questions at the meetings in January.

BUREAU OF RECLAMATION (BOR)

FY 1999 & FY 2000 PROGRAM FORMULATION CALENDAR

1997

September	FY 1999 Budget to OMB
Early October	Commissioner's FY 2000 Program Formulation Guidance to Regions.
October 20	**Final FY 1999 Revenue Work Program due to CREDA.**
Late November	FY 1999 OMB Passback
Late November - Early December	OMB Appeal period on FY 1999
Early-December	DOI transmits Secretary's FY 1999 appeals to OMB

1998

Late January - Early February	Colorado River Storage Project (CRSP) Revenue Budget Meeting for FY 2000.
Late January - Early February	President submits FY 1999 Budget to Congress
February 3	FY 1999 Budget Justification to Congress
February/ March	**Answer questions, if any, posed by CREDA associated with the Final FY 1999 Revenue Work Program.**
February/March	FY 1999 House Appropriation Hearing
March/April	Potential FY 1999 Senate Hearing
March/April	FY 2000 BOR Budget Review Committee (BRC) Process
April 15	**Preliminary FY 2000 Revenue Work Program due to CREDA.**
May/June	FY 1999 House Action on Energy and Water Development Appropriation.

Mid May	Final decisions on FY 2000 Budget made by Commissioner.
Late May	FY 2000 Draft Budget Proposal submitted to AS-WS
June/July	Departmental Review of FY 2000 Budget Proposal.
June/July	**Answer questions, if any, posed by CREDA associated with the Preliminary FY 2000 Revenue Work Program.**
June/July	FY 1999 Senate Action on Energy and Water Development Appropriation.
July/August	FY 1999 House/Senate Markups of Energy and Water Development Appropriations.
Early September	FY 2000 Budget Estimates to OMB.
September 30	FY 1999 Appropriations finalized.

ACRONYMS

BOR - Bureau of Reclamation
OMB - Office Management & Budget
CREDA - Colorado River Energy Distributors Association
AS-WS - Assistant Secretary Water and Science
BRC - Budget Review Committee

WORK PROPOSED FOR FY 1998:

Water and Energy Management and Development - Continue 5-year review of the Coordinated Long-Range Operating Criteria of the Colorado River, and the determination of reservoir releases to allow the delivery of water. Energy retrofit activities include the installation of energy efficient lighting, heating, and facilities. Provide engineering and miscellaneous support. $1,382,000

Begin compliance with P.L. 104-127 authorizing cost sharing in lieu of repayment for the Salinity Program which is 4.5 percent of the total Colorado River Basin Salinity Program. $849,000

Land Management and Development - Continuation of land resources management activities and general liaison activities with land managing entities, Native Americans, other cooperating agencies, the public, and special interest groups. $495,000

Fish and Wildlife Management and Development - Continue work on three environmental impact statements for three Initial Units: Flaming Gorge, Wayne N. Aspinall, and Navajo. $1,861,000

Support is also provided for the endangered fish studies which are part of the RIP for the Colorado River. $2,295,000

Grand Canyon Monitoring and Research Center (GCMRC) - The Senate Committee Report 104-320 accompanying the FY 1997 Energy and Water Development bill required that costs associated with monitoring and research activities and the role of Glen Canyon Environmental Studies (GCES) in the future monitoring and research be submitted in Reclamation's budget justification documents. A very important part of the Adaptive Management Program outlined in the Environmental Impact Statement on the Operations of Glen Canyon Dam filed with EPA March 1995 is the establishment of a monitoring and research center. The GCMRC, which replaced the GCES, will formulate and implement long-term monitoring and research programs approved by the Secretary. The following is the estimated work program for 1998:

	Estimated Cost	
GCMRC	$ 1,128,000	(Including approx. 15 to 20 % overhead)
Independent Review Panel	84,000	
UC Region Support	256,000	(Including approx. 52 % overhead)
Denver Office Support	296,000	(Including approx. 48 % overhead)
Adaptive Mgmt Work Grp	312,000	
Technical Work Group	98,000	
Data Base Mgmt 1/	945,000	
Biological 2/	1,600,000	
Physical 3/	1,245,000	
Cultural 4/	929,000	
Total		$ 6,893,000

The following is the detailed work plan for FY 98 for the GCMRC:

INFORMATION MANAGEMENT AND TECHNOLOGY 1/
- *Integration report on riparian and aquatic biology
- *Completion of GIS maps
- *Bathymetry data collection for management needs

BIOLOGICAL 2/

AQUATIC SYSTEM MONITORING AND RESEARCH
- *Native and non-native fish monitoring
- *Drift studies to monitor food base assessment
- *Monitoring assessment of trout populations
- *Monitoring of algae and freshwater shrimp populations
- *Kanab Ambersnail monitoring
- *Development of T&E species information
- *Defining dam-induced changes in food base and changes due to ecological procession
- *Benthic and draft analysis for food base assessments

RIPARIAN RESOURCE MONITORING AND RESEARCH
- *Avifauna monitoring including endangered species
- *Riparian monitoring use sampling plan
- *Monitoring of the southwestern willow flycatcher
- *Kanab ambersnail monitoring

PHYSICAL SYSTEM MONITORING AND RESEARCH 3/
- *Conduct aerial photography of the Grand Canyon
- *Quantify the number of beaches, backwaters, and marsh habitat
- *Insert the stereo imagery and map image processing into a geographic information system
- *Monitor the distribution and volume of sediment in the Grand Canyon
- *Monitor the changes in beaches
- *Assessing the critical habitat areas resulting from the beach building flow
- *Evaluate changes in marshes and backwaters from the beach building flow
- *Evaluate water chemistry

CULTURAL MONITORING AND RESEARCH 4/
- *Continue cultural resource monitoring
- *Monitor all cultural resource areas identified in the Historic Preservation Plan of 1997
- *Continue monitoring prescribed in the Programmatic Agreement
- *Develop information technologies plan for tribal nation lands
- *Develop multi-resource mapping procedure for cultural resources on tribal lands

LAKE POWELL MONITORING AND RESEARCH

No funds are currently programmed for monitoring or research in Lake Powell in FY 98. An assessment of future monitoring and research efforts in Lake Powell will be completed by August 1, 1997.

Title: **The Operation of Glen Canyon Dam during spring runoff periods, within the Constraints of the 1968 Colorado River Basin Project Act and the 1992 Grand Canyon Protection Act**

Prepared by: **Bureau of Reclamation, Upper Colorado Region**

Introduction

Purpose

This document is a "working draft" discussion paper prepared by the Bureau of Reclamation. The purpose of this document is to encourage and facilitate discussion between and among the various stakeholders who have an interest in the operation of Glen Canyon Dam. The analysis and opinions expressed in this document are not intended to represent the formal position of the Bureau of Reclamation or the Department of the Interior. Reclamation welcomes comments on this document from all interested stakeholders. Comments should be directed to the Upper Colorado Regional Office of the Bureau of Reclamation.

Explain as background the 1968 and 1992 Acts

The series of legal documents known as the "Law of the River" have evolved from 1922 to the present, gradually defining in greater detail the operational parameters of the Colorado River system reservoirs. The first specific constraints on Glen Canyon Dam operations came with the 1968 Colorado River Basin Project Act (1968 Act), specifically Section 602 of that Act. While the 1968 Act primarily dealt with the authorization of the Central Arizona Project (CAP) and five Colorado projects, the politics of authorizing CAP led to statutory language regarding Glen Canyon Dam operations, including (1) a storage volume designed to protect the Upper Basin States from shortages, (2) the transfer of water to Lake Mead if required for Lower Basin use, (3) annual storage equalization between Lakes Powell and Mead, and (4) the avoidance of anticipated spills from Glen Canyon Dam. Formal Operating Criteria were prepared in 1970 to guide Colorado River system reservoir operations and subsequent Annual Operating Plans (AOP) prepared under these Criteria.

As part of an inclusive omnibus bill, the 1992 Grand Canyon Protection Act (GCPA) directed the Secretary of the Interior to prepare an Environmental Impact Statement on the operation of Glen Canyon Dam (GCDEIS) and adopt criteria (separate and apart from the 1968 Act Criteria) for the operation of the dam with respect to the ecological health of the Grand Canyon. According to language in the GCPA, this Act does not modify the 1968 Act. Practicably, a distinction that has been made is that the 1968 Act more directly affects the allocation of water between basins and the annual and monthly release volumes from Glen Canyon Dam, while the GCPA more directly affects powerplant releases and any beach/habitat building and habitat maintenance flows.

Describe the dispute over the 1996 Beach/Habitat Building Flow and the resulting "agreement". Where is the dividing line between the jurisdiction of these two Acts?

Interpretation of the legal meaning of the term "spills" was the heart of differing positions on the release of water at rates greater than powerplant capacity. The States believe that the 1968 Act provision of avoiding anticipated spills means avoiding releases greater than powerplant capacity, while others believe that such releases, if used for the environmental benefit of the Grand Canyon, are not spills but are actually releases used for project purposes. These positions have not changed appreciably over the last few years and essentially blocked the testing of such releases with threat of litigation.

In 1995, a proposal was offered by Reclamation to change the preferred alternative of the GCDEIS. According to that proposal, beach/habitat building flows would not take place in years when the reservoir was low, but rather when Lake Powell storage was high. Powerplant bypasses occur naturally under these latter conditions as a result of high runoff or large forecast errors. Such releases would then be managed to the greatest extent possible to benefit the Grand Canyon. The acceptance of this idea by all parties involved in the GCDEIS cooperating agency discussions led to the March/April 1996 test of the beach/habitat building flow and modification of the preferred alternative in the ROD.

The extent of interaction between the jurisdiction of these Acts is still not clear to all parties. Most acknowledge that they must coexist. The purpose of this paper is to clarify this issue and identify the processes for consultation, coordination and information sharing during the annual forecast and spring runoff period of January through July.

AOP Considerations

Is there a relationship between flood control operations at Hoover Dam and releases from Glen Canyon Dam? When are we in flood control operations? Is there a flood control diagram at Glen Canyon as at Hoover Dam?

The Corps of Engineers flood control diagram for Hoover Dam is a legally binding set of release curves that dictate Hoover Dam releases based on basinwide storage and runoff forecasts. Flood control diagrams are prepared by the Corps when projects have quantified flood control benefits as part of the project cost allocation. The purpose of the diagram is to protect the downstream inhabitants from large, controlled or uncontrolled releases. There is little, if any, flexibility in determining releases using this diagram. In the case of Hoover Dam, either downstream consumptive use requirements or the flood control parameters specify releases.

The Colorado River Storage Project has flood control as an authorized project purpose, but only Blue Mesa and Navajo Dams have actual flood control allocations and Corps flood control diagrams. Glen Canyon Dam has no such flood control diagram, but through the years an acceptable method of determining monthly release volumes has been developed though the AOP process. Because Glen Canyon Dam has no flood control diagram currently, it is appropriate to consider a process that will provide support to this AOP process and also flexibility to respond to the AMWG mission and goals, especially as relates to environmental opportunities associated with managing spring flows. Filling the reservoir while avoiding spills is a prime objective during full reservoir conditions. The 1970 Operating Criteria prepared in response to the 1968 Act further provided a minimum objective annual release volume of 8.23 MAF. When combined with the requirement to equalize storage, these constraints effectively provide limits on monthly release volumes and patterns.

Despite the lack of a formal flood control diagram, flood control operations at Glen do exist when the forecasted runoff is expected to fill Lake Powell. When the monthly release volumes approach powerplant capacity, release options are significantly reduced from the perspective of avoiding spills (bypasses). The issue of planning for beach/habitat building flows complicates this process. Various interpretations exist regarding the timing and the threshold level of initiating these bypasses under the 1995 agreement with the Basin States.

How do we use forecasts in our operation at Glen Canyon Dam? What is the frequency of forecasts? How are annual and monthly and daily release volumes determined?

Inflow forecasts which have been coordinated between the National Weather Service and the Natural Resource Conservation Service are issued monthly, usually the fifth working day of the month. Specific predictions for the critical April through July snow runoff period are made as part of the January through July forecasts. Additionally, the National Weather Service issues mid-month updates which reflect changed snowpack and runoff conditions. These forecasts are input into a monthly planning computer model which then accounts for upstream dam operation and regulation. Annual and monthly release volumes then are determined by Reclamation to accomplish the objectives cited above.

Annual release volumes are determined by either the storage equalization or minimum objective flow provisions of the 1968 Act or the practical necessity of safely controlling runoff during high reservoir conditions. Monthly release patterns are sometimes more flexible and can take into account such things as desirable flow levels for downstream sediment transport, power production, and recreation. An example of this circumstance occurred in the spring of 1995, when flows were purposely kept below 20,000 cfs because the risk of an anticipated spill was small and we believed larger releases could be avoided. The prime focus for this decision was to limit sediment transport. However, when the risks associated with uncontrolled spills and dam

safety become significant, options for release patterns become fewer. In general, monthly release volumes are kept above 550,000 AF and below 1,200,000 AF when possible. Mid-winter and mid-summer releases are often greater than other months due to higher firm power demands. In years of high snowpack, monthly releases are increased beginning in January to make space for the expected spring runoff.

Under existing practice, daily releases can range significantly within power plant capacity (max 33,200 cfs; min 5,000 cfs) in accordance with the limits established by the recently signed Operating Criteria for Glen Canyon Dam. Daily releases greater than 33,200 cfs bypass the generators and require use of four jet tubes which have a combined capacity rating of 15,000 cfs. Full generator and jet tube capacity is about 48,000 cfs and is viewed as the normal maximum release capacity of the dam, due to considerations for spillway protection. Passing greater than 48,000 cfs through the dam requires use of the spillways, which can lead to degradation of the concrete spillway lining.

What is the timeframe for development of each year's AOP?

The AOP should be issued by October 1 of each year, and is signed by the Secretary of the Interior. It contains projected operational information for the coming water year (October through September) for all the mainstream reservoirs in the Colorado River Basin. Reclamation sponsors a "work group" which provides an opportunity for public discussion. Reclamation then uses comments received at these meetings to recommend decisions for the Secretary's issuance. The group usually meets 4 or 5 times, beginning between January and April of the previous water year. Often, the topics for discussion also include policy-related issues such as surplus and shortage determinations, risks of spills, and banking and leasing. This group typically has not addressed powerplant operations at Glen Canyon.

What is the relationship between the 5-year review of the Operating Criteria and the AOP? How does the '68 Act apply to AOP-type issues?

In addition to the preparation of an AOP, the 1968 Act required a periodic review of the Operating Criteria. The review of the Criteria is sponsored by the Secretary at least every 5 years to determine "if as the result of actual operating experience or unforeseen circumstances" the Criteria should be modified. The Criteria has thus far been kept purposely broad to allow the resolution of yearly operating issues within the context of the AOP. Reviews have occurred in 1975, 1980, 1985, and 1990 after the establishment of the original Criteria in 1970. The current 1995 review is scheduled to be completed in the fall of 1997.

The AOP is prepared using the general guidance contained in the Operating Criteria. With respect to Glen Canyon Dam operation, the Criteria basically contains a restatement of the 1968 Act provisions. The releases for the coming water year are based on a most probable forecast (in

October this is akin to average) and sensitivity analyses are made to bracket the likely operations scenarios. Updates to the AOP are made monthly throughout the operating year based on revised forecasts, thus release patterns respond to a moving target. Each month's decisions must be made by Reclamation with the most current information, but with regard for the risk of future forecast changes.

GCPA Considerations

What objectives and purposes did GCPA place on Glen Canyon Dam operations?

The GCPA directs the Secretary of the Interior to operate Glen Canyon Dam, "in accordance with the additional criteria and operating plans specified in [the GCPA] and exercise other authorities under existing law in such a manner as to project [sic], mitigate adverse impacts to and improve the values for which the Grand Canyon National Park and the Glen Canyon National Recreation Area were established," while preserving the compacts, treaty, decree and statutes that "govern allocation, appropriation, development, and exportation of the waters of the Colorado River Basin."

The new objectives placed on Glen Canyon Dam operations are to operate the dam in a manner that protects and enhances natural, and cultural resources and visitor use. The law, in essence, mandates the responsible public entity operating the dam, the Bureau of Reclamation, to place these values in equal stature with original purposes for dam operation, i.e., water storage, allocation, delivery and power production.

The GCPA did not:

1. Abrogate or in any way nullify the Secretary's responsibility to fulfill obligations of Colorado River water storage and allocation as prescribed in various laws, decrees, compacts, treaties, etc., which comprise the Law of the River.

2. Change Reclamation's role as the operating entity responsible for Glen Canyon Dam.

What processes were changed by the GCPA as regards determining Glen Canyon Dam Operations?

Prior to passage of the GCPA, inputs to the Secretary on the operation of Glen Canyon Dam were derived via three processes.

1. The AOP process described earlier, which must accommodate the broad-based set of interests and constraints associated with the Law of the River and the annual dynamics of natural events and constituency demands.

2. The Review of the Operating Criteria Process which is conducted every five years and is currently underway.

3. Reclamation Operations Management Recommendations, formed by skilled specialists and managers who merge law, policy, constituency demands, and natural processes into formal decisions that provide annual, monthly, and even daily, management of releases.

Passage of the GCPA now requires incorporation of a fourth input to the Secretary as decisions are made on dam operations, as noted above. The new process is called for in the GCPA, and is given more definition in the GCDEIS.

This input is also directed to the Secretary and comes in the form of recommendations on dam operations from the Adaptive Management Work Group (AMWG), a Federal Advisory Committee Act (FACA) group appointed by the Secretary. Reclamation has full participation on the AMWG which also includes representatives from federal and state agencies, Native American tribes, environmental, power, water and recreation interests.

What groups have the task of implementing the GCPA and what are their relative roles?

Four groups have primary responsibility for implementing the GCPA, through what is referred to as the Adaptive Management Program (AMP). These are the Adaptive Management Work Group (AMWG), the Grand Canyon Monitoring and Research Center (GCMRC), the Bureau of Reclamation, and the National Park Service (NPS). Within the AMP, primary responsibility lies with the AMWG, which as noted above includes representatives of Reclamation, NPS, Native American Tribes, and environmental, power, water and recreation interests. The AMWG, using appropriate science and information from a Secretary-designated science center, evaluates the short and long-term impacts of dam operations on natural, cultural, power, water and recreation resources, and recommends to the Secretary potential changes in dam operations based on knowledge gained from resource monitoring. The Research Center (GCMRC) is charged to respond to the AMWG with state-of-art knowledge of resource impacts from differing dam operation criteria.

Once the Secretary has decided on final recommendations, Reclamation and NPS have the responsibility for implementation.

How are AMWG recommendations considered, especially as regards other seemingly parallel processes, i.e., AOP and Operating Criteria? Is there linkage to the AOP?

All recommendations are provided to and considered by the Secretary, i.e., those from the AMWG, AOP and Operations Criteria processes. The relative weight given each input source is not prescribed for any given issue, to give flexibility to the Secretary in the decision process. However, Congress stated in the GCPA that existing statutes and compacts would not be affected.

There is informal linkage from the AOP to the AMWG and vice versa. For example, many of the same organizations are involved in both processes. Further, each process is open, permitting formal and informal input to be received from any organization.

What process should be used to evaluate emergency or time-constrained operational issues relating to the operation of Glen canyon Dam and its effects on Grand Canyon Riverine Corridor Resources?

The Adaptive Management process established by the GCPA is specifically prescribed to address Glen Canyon Dam operations impacts on Glen and Grand Canyons riverine corridor resources. Protocols for issues relating to normal year operations are generally understood. Less clear are the protocols for emergency and time constrained flow events that could occur annually between January and July. Reclamation has the authority to operate the dam and decision point authorities must reside with Reclamation.

During the January through July period, a broader opportunity exists to interact with Colorado River stakeholders. The following paragraphs describe one possibility for this important interaction.

Suggestion for Interaction

Each year the GCMRC would present to the AMWG or the technical work group, a "State of the Canyon" report which would include the current condition of the critical resources below Glen Canyon Dam. This would include the condition of the following resources among others: sediment storage, elevated sand bars, backwater habitats, aquatic resources and habitats, mainstream geomorphology, endangered species, riparian vegetation and cultural resources.

Reclamation would update the AMWG on the current and expected reservoir levels of Lake Powell and Lake Mead for the following water year.

Reclamation would provide three scenarios for expected inflow to Lake Powell (probable maximum, most probable, probable minimum) to the AMWG. Similar information is currently used to inform the Colorado River Management Work Group within the Annual Operating Plan process.

The Technical Work Group, the GCMRC, and other participating scientists, would prepare and consider a set of potential spring release scenarios for Glen Canyon Dam based on: a) normal, high, and low inflow predictions, b) the risks of powerplant bypasses, and c) the information on the current reservoir and Grand Canyon ecosystem conditions. The objective of these scenarios is to simultaneously meet both dam safety and downstream ecosystem considerations.

The AMWG would then meet to discuss and prepare recommendations on release scenarios for a range of spring inflows. These recommendations would be included in the AMWG annual report to the Secretary and be available for use in the concurrent AOP process. Actual decisions on dam releases would remain with Reclamation based on the current hydrology and the recommendations for meeting statutory goals and objectives as provided to Reclamation.

Process for Mutual Implementation of the 1968 Act and GCPA

Initial Questions

- **What is the process for deciding on releases?**
- **Who should have input in making these decisions?**
- **How is information transferred to interested parties?**
- **How do we receive comments on our proposed actions related to GCPA?**

1. Decisionmaking entity

The Secretary of the Interior has the responsibility for the operation of Glen Canyon Dam in accordance with existing statutes and compacts. He has delegated this responsibility to the Bureau of Reclamation. While basic operational parameters should be broadly discussed within both the AOP work group and potentials for changing parameters among the AMWG, a single decisionmaker is essential to the safe and timely real-time operation of the dam. Decisions by a committee would not be responsive for the day-to-day decisions that are required for reservoir operations.

This necessity does not imply that Reclamation need not consider the viewpoints of the various public interests; in fact, statutory requirements make this consideration part of the AOP process. Further discussion should occur about the possible scenarios that might occur in the future and how best to cope with these scenarios.

2. Gaining technical input from Adaptive Management representatives

Two types of input are possible regarding reservoir operations: scenario planning and real-time operations. The AMWG should consider operations scenarios to understand the downstream implications of Glen Canyon releases. Members of either the AMWG as a whole or the technical work group should consider alternatives in a variety of situations. The GCMRC should take the lead in organizing these scenarios. It will be important for these groups to understand the constraints placed by other statutes such as the 1968 Act. Coordination with the AOP work group will facilitate this understanding.

During real-time operations, any comments on Glen Canyon Dam operations should be made directly to Reclamation under the AOP process of responding to changing forecasts. Randall Peterson (Upper Colorado Region, Reclamation) will be the point of contact for such comments.

3. Real-time information sharing

Some of the problems encountered during February 1997 were that stakeholders were not adequately informed about (1) the potential releases that could occur with a high forecasted runoff, (2) proposed powerplant release changes for monitoring purposes prior to increasing powerplant releases, and (3) the impact of changing forecast conditions on prudent operations. A portion of each AMWG meeting should be devoted to information sharing of hydrologic conditions. This should include consideration of extremes as well as the most probable forecasted runoff. The group should be informed of expected release patterns, the reasoning behind the releases, and potential risks associated with scheduled and alternative releases.

During real-time reservoir operations, significant changes in releases or forecasted inflow should be immediately communicated to all interested stakeholders. While options for these circumstances would preferably have been discussed beforehand, during flood control operations decisions will continue to be made by Reclamation using its best judgment. To encourage the prior discussion of these issues, the GCMRC should be involved in analyzing potential operations scenarios which might affect the ecology of the canyon; recommendations could result from that AMWG process.

In order to facilitate information transfer, an email/fax list will be developed by Reclamation to broadcast updated operations data. The parties should determine their level of interest in receiving this type of information. Reclamation's website is currently updated frequently with the latest reservoir operations information and expectations (Website address: www.uc.usbr.gov).

4. Linkage and coordination between GCPA and AOP issues

As was the case with the 1996 test of the Beach/Habitat Building Flow, there can be interaction between the AMWG and AOP work group with respect to legal or policy issues. This is especially true when proposed operations to benefit the Grand Canyon seem to conflict with interpretations of other statutes. Likewise, some broader AOP issues such as surplus determinations could have significant effects on reservoir or canyon resources.

We view the two groups as both operating on important topics. Broader allocation issues will likely originate in the AOP arena while canyon resource issues likely will likely originate in the AMWG. Major discussion items originating in either group should be coordinated with the other group. Since many individuals are involved in both groups this should not be difficult. In all cases, Reclamation will continue its role as the Secretary's operating entity at Glen Canyon Dam.

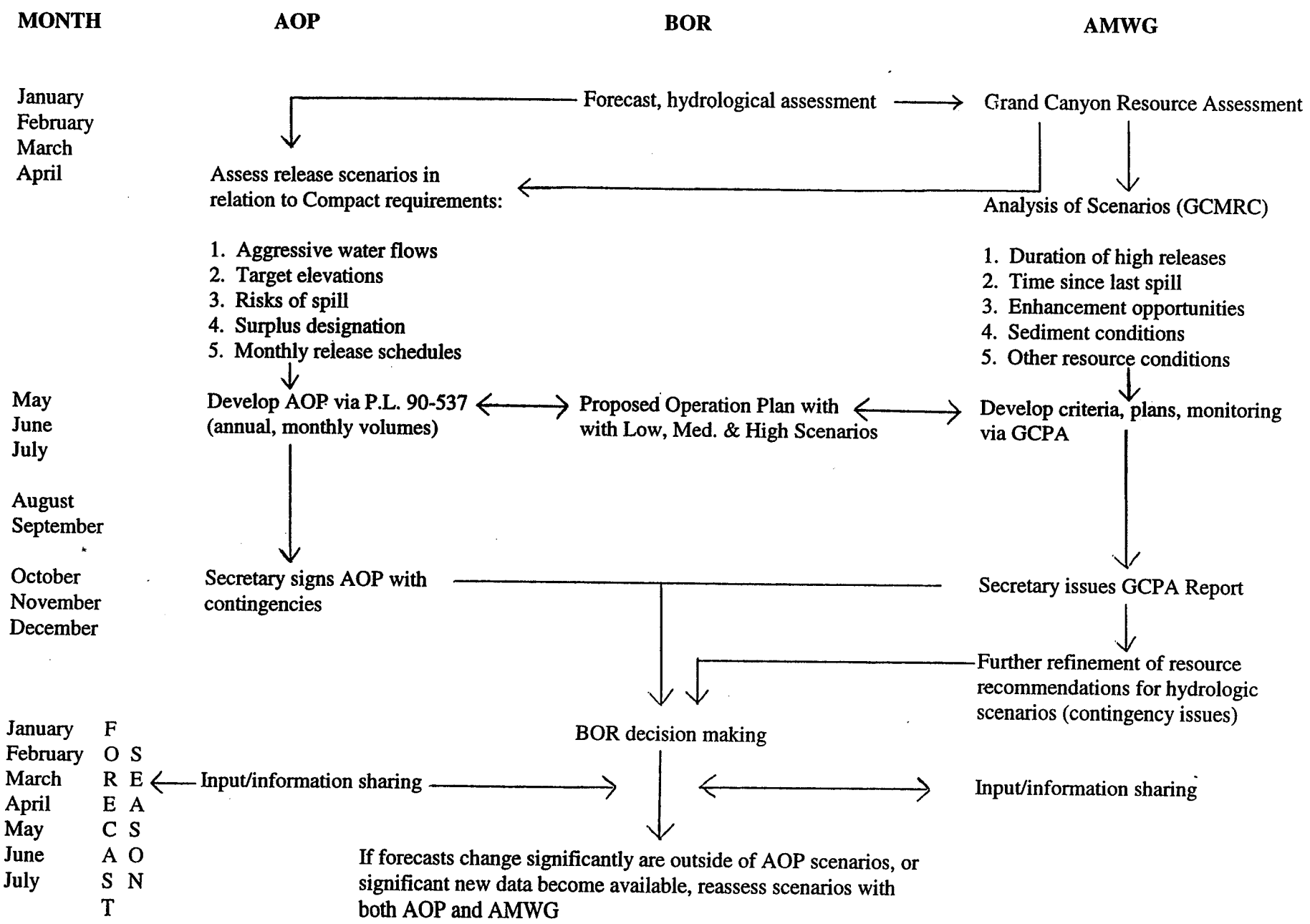
MONTH
AOP
BOR
AMWG
January
February
March
April
Forecast, hydrological assessment
Grand Canyon Resource Assessment
Assess release scenarios in relation to Compact requirements:
Analysis of Scenarios (GCMRC)
1. Aggressive water flows
2. Target elevations
3. Risks of spill
4. Surplus designation
5. Monthly release schedules
1. Duration of high releases
2. Time since last spill
3. Enhancement opportunities
4. Sediment conditions
5. Other resource conditions
May
June
July
Develop AOP via P.L. 90-537 (annual, monthly volumes)
Proposed Operation Plan with with Low, Med. & High Scenarios
Develop criteria, plans, monitoring via GCPA
August
September
October
November
December
Secretary signs AOP with contingencies
Secretary issues GCPA Report
Further refinement of resource recommendations for hydrologic scenarios (contingency issues)
BOR decision making
January
February
March
April
May
June
July
F O R E C A S T
Input/information sharing
Input/information sharing
If forecasts change significantly are outside of AOP scenarios, or significant new data become available, reassess scenarios with both AOP and AMWG

Figure 1

1999 AOP Meeting Schedule

- January 1998 distribute hydrology scenarios

- April initial meeting

- May and June technical discussion meetings

- July final consulation meeting

- August final AOP to Secretary of the Interior

- October issue AOP

1999 AOP Topics

- Surplus/Normal conditions for Lower Basin deliveries

- Use of apportioned but ususued allocations in Lower Basin

- Mexico deliveries

- Surplus criteria/guidelines

- CRSS model revisions