
ATTACHMENT D

Glen Canyon Dam Operation Record of Decision

This attachment is the October 8, 1996 Record of Decision prepared for the Operation of Glen Canyon Dam Final Environmental Impact Statement, March 1995.

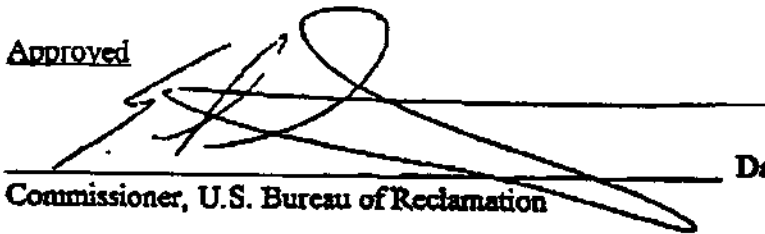
RECORD OF DECISION

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

OCT 09 1996

Date

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 accommodated 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	1,000 Labor Day-Easter	3,000	5,000	8,000 between 7 a.m. and 7 p.m.	8,000 between 7 a.m. and 7 p.m.	8,000	*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 ²	
Maximum releases (cfs) ³	*3,000 Easter-Labor Day	*3,000 Easter-Labor Day	depending on monthly volume, firm load, and market conditions	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 ²	
Allowable daily flow fluctuations (cfs/24 hours)	30,500 Labor Day-Easter	32,200 Labor Day-Easter	15,000 to 22,000	±45% of mean flow for the month not to exceed ±6,000	±5,000 up or 5,000 down	±5,000	±1,000	±1,000	±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 available 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