

Operating Criteria for Glen Canyon Dam
In accordance with the
Grand Canyon Protection Act of 1992 and
the Record of Decision for the Glen Canyon Dam Long-Term Experimental and Management Plan Final
Environmental Impact Statement, December 2016

These Operating Criteria are promulgated in compliance with section 1804 of Public Law 102-575, the Grand Canyon Protection Act of 1992 (GCPA) and the Record of Decision for the Glen Canyon Dam Long-Term Experimental and Management Plan Final Environmental Impact Statement, December 2016 (LTEMP ROD). They are to guide the hourly, daily and monthly releases from Glen Canyon Dam, constructed under the authority of the Colorado River Storage Project Act. The 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. The original Operating Criteria were signed by the Secretary of Interior on February 24, 1997. These Operating Criteria are a modification of the original Criteria based on the LTEMP ROD. These Operating Criteria replace and supersede in total the original Operating Criteria of 1997.

I. Annual Report

Annually, as required in the GCPA, Reclamation shall prepare a report to be submitted to Congress that describes the operation of Glen Canyon Dam for the preceding water year and the projected operation for the upcoming water year.

2. Review of Criteria

The Secretary of the Interior may review these Operating Criteria at appropriate intervals as the result of actual operating experiences to determine if the Operating Criteria should be modified to better accomplish the purposes of the ROD. Such a review may be made in consultation with the appropriate entities as determined by the Secretary. Operations stated in these Operating Criteria were analyzed and consulted on in the LTEMP EIS.

3. Development of Annual Hydrograph

Annually, Reclamation will develop a hydrograph of projected monthly releases for water year based on characteristics described in Section 1.1 - Base Operations Under Alternative D, Attachment B of the LTEMP ROD. Reclamation seeks consensus on the annual hydrograph through monthly operational coordination calls with governmental entities, and regular meetings of the Glen Canyon Dam Adaptive Management Program (GCDAMP) Technical Working Group (TWG) and Adaptive Management Working Group (AMWG).

4. Operational Flexibilities

Reclamation retains the authority to utilize operational flexibility at Glen Canyon Dam because hydrologic conditions of the Colorado River Basin (or the operational conditions of Colorado River reservoirs) cannot be completely known in advance. Implementation of experimental releases will also require flexibility to adjust the monthly release patterns under the annual hydrograph pattern. Consistent with current operations, Reclamation, in consultation with Western Area Power Administration (WAPA), will make adjustments to daily and monthly release volumes during the water

year. Monthly release volumes may be rounded for practical implementation or adjusted for maintenance needs. In addition, when releases are actually implemented, minor variations may occur regularly for a number of operational reasons that cannot be projected in advance. Examples of these adjustments may be found in Section 1.2 of Attachment B to the ROD.

In addition, Reclamation may make modifications that may include operations that are prudent or necessary for the safety of dams, public health and safety, other emergency situations, or other unanticipated or unforeseen activities arising from actual operating experience (including, in coordination with the Basin States, actions to respond to low reservoir conditions as a result of drought in the Colorado River Basin).

Further details of Reclamation's operational flexibility can be found in Section 1.2 – Operational Flexibility Under Alternative D of Attachment B of the LTEMP ROD.

5. Specific Operational Constraints

The plan of operations will follow the description of the base operations in the Section 1.1 - Base Operations Under Alternative D, Attachment B of the LTEMP ROD. The specific criteria are as follows:

Minimum Releases - Minimum releases will be 8,000 cfs between 7 a.m. and 7 p.m. and 5,000 cfs between 7 p.m. and 7 a.m.

Maximum Releases - Maximum normal, non-experimental, releases will be 25,000 cfs. Maximum releases are for normal operations and may be exceeded as necessary for experimental releases, emergency operations, and equalization purposes. Higher releases would be necessary to avoid spills or flood flow releases from Glen Canyon Dam, as well as in high volume water years as dictated by hydrologic factors and the 2007 Interim Guidelines or their replacement. If such high releases above 25,000 cfs are required for hydrologic or equalization purposes, they shall be made at constant daily flow rates. Experimental Releases are described below.

Allowable Daily flow Fluctuations - Equal to 10 x monthly volume in thousands of acre-feet (kaf) in Jun.- Aug., and 9 x monthly volume (in kaf) in other months; daily range not to exceed 8,000 cfs. The daily fluctuation is based on the scheduled monthly volume at the beginning of the month, or as the monthly volume may be adjusted during the month, and may be rounded for practical implementation.

Maximum Ramp Rate - 4,000 cfs/hour when increasing, and 2,500 cfs/hour when decreasing.

Emergency Exception Criteria - 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, but are not limited to:

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

6. Descriptions of Experimental Releases

The LTEMP ROD includes experiments to improve downstream resources within an adaptive management framework. Experimental Releases are scheduled in advance, implemented by Reclamation and coordinated with WAPA to ensure appropriate scheduling and to avoid unnecessary or

unplanned disturbance of the operation of the Salt Lake City Area Integrated Project (SLCA/IP) electrical operation. The selected alternative in the ROD includes several types of experimental releases/flows including High Flow Experiments (HFEs), Trout Management Flows (TMFs), Macroinvertebrate Production Flows (MPFs) and Low Summer Flows (LSFs). Pursuant to Sec. 1.4 of Attachment B of the ROD, to determine whether conditions are suitable for implementing or discontinuing experimental treatments or management actions, the DOI will schedule implementation/planning meetings or calls with the DOI bureaus (USGS, NPS, FWS, BIA, and Reclamation), WAPA, Arizona Game & Fish Department (AZGFD), and one liaison from each Basin State and from the UCRC, as needed or requested by the participants.

High-flow Experiments (HFEs) HFEs include GCD releases above normal operations for short periods and may require the use of powerplant capacity flows and the full use of the bypass tubes. Reclamation, in full coordination with WAPA, plans and implements the HFEs. Reclamation will attempt to arrange plant maintenance so that release volumes during HFEs are the maximum practicable as described in the protocol. Electrical regulation and responses by GCD to electrical emergencies and power-pool events are not affected by the implementation of HFEs, although WAPA will attempt to move those services to other facilities as is feasible. HFEs may occur in the fall or the spring and may be triggered by sediment inputs or by hydrology, when conditions warrant, and as described below.

Sediment-triggered fall HFEs. These HFEs may require full powerplant and bypass tube releases. Maximum release duration is up to 96 hours and is determined by sediment inputs and sand mass balance. The release window for sediment-triggered fall HFEs is October and November. Ramp up and down to and from the maximum release amount may vary for experimental purposes. Extended- duration fall HFEs are those beyond 96 hours, given sufficient sediment is available, with a maximum peak duration of up to 250 hours, and a phased in approach. These extended-duration HFEs are limited to a total of four over a 20-year period beginning in water year 2018.

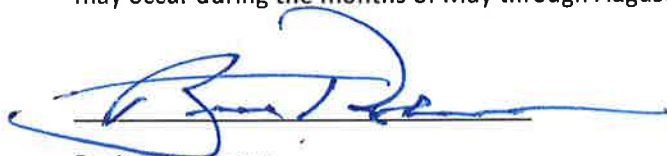
Sediment-triggered spring HFEs. These HFEs may require full powerplant and bypass tube releases. Maximum release duration is up to 96 hours and is determined by sediment inputs and mass balance. The release window for sediment-triggered spring HFEs is March and April. No spring sediment-triggered HFE is allowed in a water year that includes an extended duration fall HFE. Sediment-triggered spring HFEs may start to be scheduled in water year 2020.

Proactive spring HFEs. These HFEs may require full powerplant and bypass tube releases. These HFEs may be tested when the scheduled annual water volume to be released in a water year from GCD is equal to or exceeds 10 million acre feet. The release window for proactive spring HFEs is April through June. They may begin to be implemented in WY 2020. The first Proactive Spring HFE will have a peak duration of 24 hours. Subsequent experiments will have a maximum peak duration of 24 hours, but can be less. Proactive spring HFEs will not be conducted in years when there has been a spring HFE or an extended-duration fall HFE earlier in the same water year.

Low Summer Flows: Pursuant to section 2.2.4 and table 6 of Attachment B to the ROD, if tested, low summer flows would occur for 3 months (July, August, and September), and only in the second 10 years of the LTEMP period which begins October 1, 2028. Low summer flows will only be implemented in years when the projected annual release is less than 10 maf, and the target temperature at the Little Colorado River confluence of $\geq 14^{\circ}\text{C}$ can be achieved only with the use of low summer flows.

Trout management flows (TMF) - TMFs will consist of repeated fluctuation cycles of relatively high flow releases (e.g. 20,000 cfs) sustained for a period of time (potentially ranging in duration from 2 days to 1 week) followed by a rapid drop to a very low flow (e.g., 5,000 cfs to 8,000 cfs). The up-ramp rates would be the same as in normal operations (i.e., 4,000 cfs/hr). The down-ramp from peak to low flow will occur in a single hour. The low flow would be maintained for less than a day. As many as three TMF cycles/month in a period of up to 4 months during May through August could be tested. TMFs may be tested early in the experimental period, which begins October 1, 2018, and preferably in the first 5 years of the experimental period.

Macroinvertebrate production flows (bug flows) - Bug flows are steady releases during weekend days (Saturday and Sunday) at the minimum flow for that month. Normal operating ramp rates apply in conducting these flows. Normal operating parameters are adhered to during the week days. Bug flows may occur during the months of May through August.



Regional Director
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Date