

RECLAMATION

Managing Water in the West

Finding of No Significant Impact for the Environmental Assessment for Development and Implementation of a Protocol for High-Flow Experimental Releases from Glen Canyon Dam, Arizona through 2020

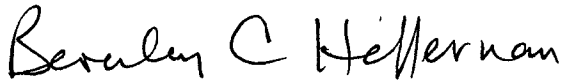


U.S. Department of the Interior
Bureau of Reclamation
Upper Colorado Regional Office
Salt Lake City, Utah

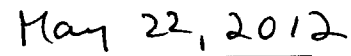
FINDING OF NO SIGNIFICANT IMPACT

Environmental Assessment for
Development and Implementation of a Protocol for
High-Flow Experimental Releases from Glen
Canyon Dam, Arizona, 2011 through 2020
Colorado River Storage Project
Coconino County, Arizona

Recommended by:

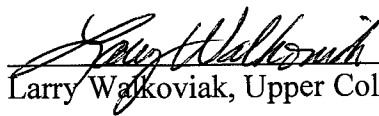


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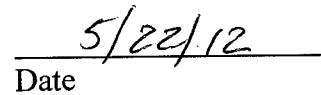


Date

Approved by:



Larry Warkoviak, Upper Colorado Regional Director



Date

FINDING OF NO SIGNIFICANT IMPACT

Development and Implementation of a Protocol for High-Flow Experimental Releases from Glen Canyon Dam, Arizona through 2020

Introduction

The Department of the Interior (Interior), acting through the Bureau of Reclamation (Reclamation), is proposing to develop and implement a protocol for high-flow experimental releases (HFEs) from Glen Canyon Dam to better determine whether and how sand conservation can be improved in the Colorado River corridor within Grand Canyon National Park. This protocol (HFE Protocol) will evaluate short-duration, high-volume dam releases during sediment¹-enriched conditions for a period of experimentation, through 2020, to determine whether and how multiple events can be used to better build sandbars and conserve sand over a long time period. Under the concept of HFEs, sand stored in the river channel is suspended by these high dam releases and a portion of the sand is redeposited downstream as sandbars and beaches, while another portion is transported downstream by river flows. The rebuilt and rejuvenated sand features and associated backwater habitats can provide key wildlife habitat, potentially reduce erosion of archaeological sites, enhance riparian vegetation, maintain or increase camping opportunities, and improve the wilderness experience along the Colorado River in Grand Canyon National Park. Monitoring and mitigation will ensure that other resources will not be unacceptably impacted by implementation of the HFE Protocol.

Scientific information gained through implementation of the HFE Protocol will improve future decision-making regarding operations of Glen Canyon Dam, which will be integrated into future environmental compliance processes. At this time, Interior is embarking on the first major comprehensive analysis of Glen Canyon Dam operations since 1996 with the initiation of the Glen Canyon Dam Adaptive Management Program (GCDAMP) Long-Term Experimental and Management Plan (LTEMP; 76 FR 39435-46, July 6, 2011). Interior has determined that it is appropriate and timely to undertake a new environmental impact statement (EIS) that reviews and analyzes a broad scope of Glen Canyon Dam operations and other related activities. Given that it has been over 15 years since completion of the 1996 Record of Decision on the Operation of Glen Canyon Dam (1996 ROD), Interior will study new information that has been developed through the GCDAMP, including information developed through the HFE Protocol, to more fully inform future decisions regarding the operation of Glen Canyon Dam and other management and experimental actions. The information obtained through implementation of the experimental HFE Protocol on the downstream effects of high-flow releases cannot be fully developed without actually implementing the experimental high-flow releases from Glen Canyon Dam.

¹ For the purpose of the HFE Protocol EA and FONSI, the term “sediment” means the solid inorganic and organic material that comes from weathering of rocks and vegetation and is carried by and settled in water (Webster’s Unabridged Dictionary). In this case, sediment consists of a mixture of varying coarseness of clay, silt, and sand (inorganic material) and fine and coarse particulate organic matter (organic material consisting mostly of plant matter). The terms sand and sediment are used interchangeably in this FONSI, unless otherwise specified.

Purpose of Proposed Action

The purposes of this action are: (1) to develop and implement a protocol that determines when and under what conditions to conduct experimental high-flow releases from Glen Canyon Dam, and (2) to evaluate the parameters of high-flow releases in conserving sediment to benefit downstream resources in Glen, Marble, and Grand Canyons.

This action is the logical next step under active adaptive management experimentation to build upon knowledge gained during previous individual high-flow experimental releases from Glen Canyon Dam beginning in 1996. It is needed to take advantage of future sediment-enriched conditions in the Colorado River with experimental high-flow tests that will improve the understanding of the relationships between sediment conservation and high dam releases of up to 45,000 cubic feet per second (cfs) for a duration of up to 96 hours. The information developed through this action will assist Interior in making future decisions on when and how to conduct multi-year, multi-event, high-flow experimental releases and how to evaluate benefits to downstream resources.

The protocol for high-flow experimental releases is part of the ongoing implementation of the GCDAMP, and is a component of Interior's compliance with the Grand Canyon Protection Act of 1992 (Public Law 102-575, GCPA). Implementation of the protocol will assist in determining whether the Desired Future Conditions for sediment and other resources developed through the GCDAMP can be achieved. The timing of high-flow releases will be March-April and October-November, the magnitude may range from 31,500 cfs to 45,000 cfs, and the duration may range from one hour to 96 hours. The proposed action is tiered from two environmental impact statements—Reclamation's 1995 EIS on the operation of Glen Canyon Dam and the associated 1996 Record of Decision (1996 ROD); and Reclamation's 2007 EIS on Colorado River Interim Guidelines for Lower Basin Shortages and Coordinated Operations for Lakes Powell and Mead and the associated 2007 Interior Record of Decision (2007 ROD). Annual release volumes (the volume of water released in a water year²) are governed by the 2007 ROD. In addition, releases are governed by the Modified Low Fluctuating Flow (MLFF) preferred alternative as described in the 1996 ROD.

The proposed HFE Protocol is a decision-making process that consists of three components: (1) planning and budgeting, (2) modeling, and (3) decision and implementation. First, planning will occur such that an HFE can be conducted if conditions are appropriate. An important aspect of planning is the development and implementation of research and monitoring activities appropriate to measure the effects of the HFEs as described in a science plan produced by the Grand Canyon Monitoring and Research Center (GCMRC) of the U.S. Geological Survey. An annual scientific review and report conducted in the early part of each calendar year prior to a decision on an HFE will evaluate the information on the status and trends of key resources. Second, a hydrology model and sand budget model will be used to evaluate the available volume of water for release from the dam and the sand availability, as delivered primarily by the Paria River, at the onset of each release window. This step in the decision process will ensure that the

² A water year is the 12-month period from October through September. The water year is designated by the calendar year in which it ends and which includes 9 of the 12 months. For example, the year ending September 30, 2007 is called the "2007 water year."

sediment mass balance is coupled appropriately with the dam release to produce effective and efficient sandbar building and sand conservation. Finally, the decision to conduct an HFE will be based on a determination by knowledgeable scientists and resource managers of the suitability of the hydrology, sediment, and other resource conditions, and a recommendation to Interior through the GCDAMP. The effectiveness of the parameters of HFE releases in conserving sediment and benefitting downstream resources will be evaluated through monitoring before, during, and after an HFE and subsequent analyses.

Impacts of the proposed action were identified and evaluated in comparison to an environmental baseline for four affected resource categories: physical, biological, cultural, and socio-economic. The impacts were assessed relative to the timing, magnitude, duration, and frequency of HFEs. Most identified impacts are minor and short-term, but some may be larger and longer without mitigation and monitoring. In particular, two previous spring HFEs, in 1996 and 2008, have resulted in increased rainbow trout production in the Colorado River, especially in the 16-mile reach below the dam (Lees Ferry reach). These non-native fish are known predators on and competitors with native fish, which include the endangered humpback chub (*Gila cypha*). Whether future spring HFEs will produce the same result is less certain, but an increase in trout numbers, coupled with their dispersal downstream into waters occupied by the endangered fish could produce a larger and longer sustained impact on humpback chub. This potential impact is addressed through mitigation and monitoring identified in the Non-native Fish Control Environmental Assessment (NNFC EA) prepared by Reclamation and in the 2011 Biological Opinion prepared by the U.S. Fish and Wildlife Service (USFWS) under Section 7 of the Endangered Species Act of 1973 (ESA) to address both of Reclamation's proposed actions.

Proposed Action

The proposed action is to supplement the existing operation of Glen Canyon Dam in accordance with prior National Environmental Policy Act (NEPA) decisions, with the added inclusion of a protocol for high-flow experimental releases from Glen Canyon Dam for the period through 2020. The proposed action is intended to meet the need for high-flow experimental releases in limited periods of the year when the highest volumes of sediment are most likely available.

As previously approved in accordance with NEPA, dam releases presently follow the MLFF preferred alternative as described in the 1996 ROD (with the added refinement of steady flows in September through October for the years of 2008-2012). Annual release volumes from Lake Powell to Lake Mead are governed by the 2007 ROD.

Under the proposed action, the timing of high-flow releases will be March-April and October-November, the magnitude will be from 31,500 cfs to 45,000 cfs, and the duration will be from one hour to 96 hours. As identified in the HFE Protocol EA, dam equipment replacement and maintenance may limit the magnitude of these releases during part of the experimental period. Frequency of HFEs will be determined by tributary sediment inputs, resource conditions, and a decision process carried out by Interior that consists of three components: (1) planning and budgeting, (2) modeling, and (3) decision and implementation. The decision process will be carried out through the GCDAMP and with input from the Adaptive Management Work Group federal advisory committee. Reclamation will not implement an HFE that is inconsistent with the 2007 Interior Record of Decision on the Colorado River Interim Guidelines for Lower Basin

Shortages and Coordinated Operations for Lake Powell and Lake Mead and will consult with the Basin States prior to conducting an HFE. Additional consultation will occur with USFWS, American Indian tribes, and parties to the Protocol Memorandum of Agreement (Protocol MOA; see Appendix A) consistent with the terms of the MOA.

Developing this HFE Protocol is important to implement a strategy for high-flow releases over a period of time longer than one year or one event. In the past, Reclamation has done a variety of single-event high-flow experiments and the benefit to sandbar and beach maintenance has been temporary and variable. One purpose for this HFE Protocol is to assess whether multiple, potentially sequential, predictable HFEs conducted under consistent criteria can better conserve sediment resources while not negatively impacting other resources. The experimental window through 2020 provides opportunities for multiple HFEs to be conducted and analyzed and the protocol to be modified as appropriate. Since necessary sediment and hydrology conditions may not occur every year, the multi-year window assures that multiple events can be conducted. It also provides the flexibility to respond to sediment inputs during limited windows of opportunity.

A protocol in science, by definition, is a formal set of rules and procedures to be followed during a particular research experiment. These experimental HFEs will lead to a better understanding of how to conserve sediment in the Grand Canyon by building on knowledge acquired from previous adaptive management experiments. In the historic pre-dam Colorado River ecosystem, sand was both eroded and deposited as sandbars during floods. Determining how sediment conservation can be achieved in areas within Grand Canyon National Park downstream from Glen Canyon Dam is a high priority of the GCDAMP and Interior. Previous HFEs from Glen Canyon Dam were conducted in 1996, 2004, and 2008. Other high-flow releases, at or near powerplant capacity, were conducted in 1997 and 2000. These HFEs provided valuable information and have increased our understanding of responses by physical and biological resources to high-flow releases. For the purpose of this proposed action, all dam releases from 31,500 cfs to 45,000 cfs fall within the range of HFEs.

This HFE Protocol is intended to be experimental in nature, and is designed to achieve a better understanding of how and when to incorporate high releases into future dam operations in a manner that effectively conserves sediment and sediment-dependent resources in the long term. A number of hypotheses may be tested through this experimental protocol. These hypotheses could be directed at varying the timing, magnitude, duration, and frequency of HFEs to determine the effectiveness of sandbar building and sand conservation. Two approaches described in the HFE Protocol EA were proposed with respect to timing of a high release in response to the delivery of sediment into the river channel (see Section 2.2.1 of EA). The “store and release” approach was developed by the U.S. Geological Survey and was first introduced as the basis for the HFE Protocol in a June 2010 modeling workshop. The “rapid response” approach was proposed by the Western Area Power Administration.

Mitigation Measures

The following measures have been designed to prevent, avoid, or mitigate potentially negative effects of the proposed action. In addition to the mitigation measures set forth in this section, an

additional mitigation element, regarding temporary deferral of spring HFEs through 2014, has been included to reduce risk to and improve protection for listed native fish, particularly the endangered humpback chub, as discussed further in the Decision section of this finding of no significant impact (FONSI). Reclamation has committed to working with USFWS to further define the triggering criteria that will be cause for additional actions over the life of the proposed action based on continuing research and related analyses. Reclamation also may take action, such as immediate removal of non-native fish in either the Paria-to-Badger Rapid (PBR) Reach or the Little Colorado River (LCR) Reach of the Colorado River, if new information shows there is a threat from non-native fish to the endangered fish. For example, there is currently a very large cohort of rainbow trout in Lees Ferry, and should monitoring data indicate that these trout are moving downstream to the LCR, immediate control actions may be implemented.

Decision Matrix – The decision matrix leading to a determination of whether or not a given HFE will be conducted contains redundancies and checks to ensure that all aspects of the experiment and its potential effects are taken into consideration. The HFE Protocol will incorporate annual resource status reviews conducted by knowledgeable scientists and managers through the GCDAMP (as well as the consultation commitments identified herein) as part of the HFE Protocol decision process to ensure that unacceptable impacts do not occur. Sand mass balance modeling will be used to ensure that the duration and magnitude of an HFE dam release are best matched with the mass of sand present in the system during a particular release window. Recommendations for HFEs developed by knowledgeable scientists and resource managers, including those in the GCDAMP, will be acted upon by Interior, as described above, with due consideration to the full breadth of resources that might be affected by the high flow. Reclamation will take a conservative approach and will re-evaluate, and suspend if necessary, the HFE Protocol, if it anticipates that significant impacts could occur that cannot be mitigated. If a specific key resource is identified as being in decline, it is reasonable to expect that this will be detected through the monitoring program of the GCDAMP and fully and appropriately considered in the HFE decision-making process. Interior will conduct a comprehensive review of the Protocol after multiple events (at least 3) have occurred. Reclamation will work with GCDAMP stakeholders to document and standardize planning tools and information sharing approaches as part of the implementation of the HFE Protocol decision matrix.

Re-Evaluation Points – Conservation measures have been agreed to as part of ESA Section 7 consultation with the USFWS and are described in the December 23, 2011, final Biological Opinion that addresses the effects assessed in the HFE EA and in the NNFC EA also produced by Reclamation. Some of these conservation measures are pre-existing measures designed to address the effects of ongoing dam operations and the independent need for non-native fish control. Others have been developed to provide mitigation and monitoring for increased production of non-native fish, primarily rainbow trout in the Lees Ferry reach, resulting from implementation of the proposed action.

Pursuant to 50 CFR § 402.16 (c), reinitiation of formal consultation is required and shall be requested by the Federal agency or by the USFWS where discretionary Federal involvement or control over the action has been retained or is authorized by law and if new information reveals effects of the action that may affect listed species or critical habitat in a manner or to an extent not previously considered. Reclamation and USFWS have agreed to meet at least once every

three years specifically to review the need for reinitiation based on humpback chub status and other current and relevant information. Reclamation will undertake a review in 2014 of the first two years of implementation of the proposed action through a workshop with scientists to assess what has been learned; this review will also serve as the first re-evaluation point. Reclamation will also produce a written report of each evaluation and either USFWS or Reclamation may determine the need for reinitiation of formal consultation on the proposed action to re-evaluate the effects of the action.

Non-native Fish Control – As explained above, Reclamation has identified that HFEs can improve conditions for non-native fish, in particular rainbow trout that prey upon and compete with native fishes, including humpback chub. Reclamation has developed a proposed program of non-native fish control that has been analyzed in the NNFC EA completed on December 30, 2011, and evaluated in the December 23, 2011, Biological Opinion that addresses implementation of the MLFF in combination with the HFE Protocol and non-native fish control through 2020. Implementation of non-native fish control therefore provides an essential mitigation measure regarding implementation of the HFE Protocol addressed in this decision document. The actions analyzed in the NNFC EA will quantify and mitigate negative impacts on endangered fish from non-native fish that could occur as a result of some HFEs, particularly March-April HFEs, and from the potential impacts of high steady equalization flows as identified in the December 23, 2011, Biological Opinion.

Humpback Chub Translocation – Reclamation will continue to assist the National Park Service (NPS) and the GCDAMP in funding and implementation of translocating humpback chub in the LCR and into tributaries of the Colorado River in Grand Canyon, and in monitoring the results of these translocations. Non-native fish control in these tributaries will be an essential element to translocation, so Reclamation will help fund control of both cold water and warm water non-native fish in tributaries, in conjunction with efforts to translocate humpback chub into these tributaries. Havasu, Shinumo, and Bright Angel creeks will continue to be the focus of translocation efforts, although other tributaries may be considered.

Humpback Chub Nearshore Ecology Study – Through the Natal Origins Study, in coordination with other GCDAMP participants and through the GCDAMP, Reclamation will continue research efforts on nearshore ecology of the LCR Reach to better understand the importance of mainstem nearshore habitats to humpback chub recruitment and the effect of non-native fish predation on humpback chub survival and recruitment. This study will monitor the trend in annual survival of young humpback chub in the mainstem for use in determining the need for non-native fish control.

Humpback Chub Refuge – Reclamation will continue to assist USFWS in maintenance of a humpback chub refuge population at a Federal hatchery (Reclamation has assisted the USFWS in creating a humpback chub refuge at Dexter National Fish Hatchery and Technology Center [DNFHTC]) or other appropriate facility by providing funding to assist in annual maintenance (including the collection of additional humpback chub from the LCR for this purpose). In the unlikely event of a catastrophic loss of the Grand Canyon population of humpback chub, the humpback chub refuge will provide a permanent source of sufficient numbers of genetically representative stock for repatriating the species.

Humpback Chub Monitoring and Mainstem Aggregation Monitoring – Reclamation will, through the GCDAMP, continue to conduct annual monitoring of humpback chub and, every three years, conduct the Age-Structured Mark-Recapture population estimation. Reclamation will also monitor the abundance of humpback chub and fish species composition at the eight mainstem aggregations of humpback chub in Marble and Grand Canyon annually.

Bright Angel Creek Brown Trout Control – Reclamation will continue to fund efforts of the NPS to remove brown trout from Bright Angel Creek and will work with GCMRC and NPS to expand this effort to be more effective at controlling brown trout in Grand Canyon. This issue has been prioritized based on emerging information on the particular risk that brown trout pose to native fish, particularly in the LCR Reach.

High-Flow Experiment Assessments – Reclamation will conduct pre- and post-HFE assessments of existing data on humpback chub status and other factors to both determine if a HFE should be conducted and to inform decisions to conduct future HFEs. Consideration will be given to minimize effects to humpback chub in defining the timing, duration, and magnitude of each HFE conducted within the framework established by the HFE Protocol.

Dexter National Fish Hatchery Genetic Study – Reclamation will fund an investigation of the genetic structure of the humpback chub refuge housed at the DNFHTC that will include: (1) a genotype of the refuge population using microsatellites; (2) an estimate of humpback chub effective population size; and (3) a calculation of pairwise relatedness of all individuals in the DNFHTC refuge population.

Conservation of Mainstem Aggregations – Reclamation will also, as part of its proposed action, work within its authority through the GCDAMP to ensure that a stable or upward trend of humpback chub mainstem aggregations can be achieved. Ongoing and additional efforts will be coordinated to: (1) explore and potentially implement flow and non-flow measures to increase the amount of suitable humpback chub spawning habitat in the mainstem Colorado River (additional environmental compliance may be required); (2) secure numbers of humpback chub in a wider distribution in the mainstem Colorado River by supporting the number of young-of-year (y-o-y) recruiting to aggregations; (3) expand the role of tributaries and their ability to contribute to the growth and expansion of mainstem aggregations; and (4) develop and implement a protocol for “maintenance control” of rainbow trout through appropriate means to ensure low levels of trout in the LCR Reach by, for example, implementing PBR control every year, in coordination with the FWS and other partners.

Reasonable and Prudent Measures for Humpback Chub - The December 23, 2011, Biological Opinion also provided the following reasonable and prudent measures and terms and conditions, which are necessary and appropriate to minimize incidental take of humpback chub.

1. Reclamation has committed to develop, with GCDAMP and stakeholder involvement, additional non-native fish control options during the first two years of the proposed action to reduce recruitment of non-native rainbow trout at, and emigration of those fish from, Lees Ferry. Reclamation will coordinate the development of these actions with the

on-going NPS Management Plan, now being developed, for native and non-native fish downriver of Glen Canyon Dam in both the Glen Canyon National Recreation Area and Grand Canyon National Park. Both flow and non-flow experiments focused on the Lees Ferry reach may be conducted in order to experiment with actions that will reduce the recruitment of trout in Lees Ferry, and lower emigration of trout. Additional environmental compliance may be necessary for implementation of the following types of experiments that will be considered.

- A. Within two years, Reclamation will include an assessment of the feasibility to disadvantage reproduction of rainbow trout as described in Treatment #3 and Treatment #4 as described below.

Treatment 3: Increase Daily Down-Ramp to Strand or Displace Age-0 Trout

This treatment will use dam releases during June through August to strand or displace age-0 trout and reduce rainbow trout survival. Increased down-ramp rates could reduce survival of age-0 trout by stranding them in exposed dewatered areas or by displacing them into less favorable habitats where they are subject to increased predation. Increased fluctuations will be most effective if they occur daily from June through August when young fish occupy habitats that are more affected by fluctuating flows, i.e., shallow, low-angle habitats. This treatment may only need to be done once a week.

Several dam release options may be used to achieve this treatment including (1) a wider range in flows (higher maximum, lower minimum, e.g., summer normal 16,000 to 10,000 cfs could be modified to 16,000 to 5,000 cfs and kept at 5,000 cfs for 3 hrs), (2) lower minimum flow than ROD flows (e.g., 3,000 cfs) for a short period of time (e.g., 1 hr) with a step up to a higher minimum that is within the ROD (e.g., 8,000 cfs); and (3) same range as ROD with faster ramp rates.

Treatment 4: High Flow Followed by Low Flow to Strand or Displace Age-0 Trout

Under this treatment, flows will be held high and steady (about 20,000 cfs) for a few days during June and July. Recently emerged trout tend to migrate to the lower edge of the varial zone, and steady flows are expected to produce an aggregation of fish in near-shore habitats. This will be followed by a quick down-ramp to a minimum flow (about 8,000 cfs) which will be held for 12-14 hours. This operation will be done every 2-3 weeks in June and July. Because this operation might not need to be done every day during the summer, there should be less impact to other resources compared to Treatment # 3. However, it could be used more frequently.

- B. Explore flow and non-flow options for controlling trout movement downstream (such as coordination with angling community, NPS, Arizona Game and Fish Department, American Indian tribes, and other groups, to better manage the Lees Ferry trout fishery through such actions as changing fishing regulations).
2. Reclamation shall protect y-o-y and juvenile humpback chub, monitor the incidental take resulting from the proposed action, and report to the USFWS the findings of that monitoring.

A. Reclamation shall monitor the action area and ensure the long-term protection of the humpback chub as established by the GCDAMP.

B. Reclamation shall submit annual monitoring reports to the Arizona Ecological Services Office of the USFWS beginning in 2012 in collaboration with other GCDAMP participants including GCMRC, Arizona Game and Fish Department, NPS, and other cooperators to complete this monitoring and reporting. These reports shall briefly document for the previous calendar year the effectiveness of the terms and conditions and locations of listed species observed, and, if any are found dead, suspected cause of mortality. The report shall also summarize tasks accomplished under the proposed minimization measures and terms and conditions.

Reasonable and Prudent Measures for Kanab Ambersnail – Reclamation implemented conservation measures for the HFEs conducted in 2004 and 2008 to protect habitat for the Kanab ambersnail at Vasey’s Paradise. However, due to the pending taxonomic evaluation (discussed below), the USFWS and Reclamation have agreed to forgo this conservation measure for future HFEs and to study the effect of the HFE Protocol on the population of Kanab ambersnail at Vasey’s Paradise through continued monitoring. USFWS has analyzed the effect of the potential loss of habitat over the life of the proposed action. They concluded that the conservation measure is not necessary to maintain a healthy population of Kanab ambersnail at Vasey’s Paradise because the amount of habitat and snails that will be unaffected by the proposed action is sufficient to maintain the population. Reclamation will continue, through the GCDAMP, to monitor the population on a periodic basis to assess the population over the life of the proposed action.

Economic Mitigation – Reclamation has identified in the HFE Protocol EA that there are potential economic impacts to the Hualapai Tribe’s recreation business from HFEs. Reclamation has committed to working with the Hualapai Tribe to study these potential impacts and to identify mitigation for them if appropriate. There also will be short-term interruptions of river recreation, e.g., fishing in the Lees Ferry reach and some boating. Previous HFEs affected these resources to some degree, but impacts were generally minor and of short duration.

Cultural Mitigation – Reclamation has committed to the following actions to mitigate impacts to historic properties in a Memorandum of Agreement for the Glen Canyon Dam High-Flow Experimental Protocol (Protocol MOA) under the National Historic Preservation Act:

1. Reclamation will, in consultation with the parties to the Protocol MOA, determine whether, prior to the first HFE, any actions are necessary to protect against direct adverse effects of HFE-induced changes on the historic properties with the area of potential effect as defined in the Protocol MOA.
2. Reclamation will consult with the parties to the Protocol MOA each time an HFE is planned, in order to have minimum potential for adverse effects on tribal access to and uses of the Colorado River, including spiritual, subsistence, and traditional economic

uses. Reclamation will use the information provided from these consultations to improve monitoring and efforts to minimize adverse effects for the HFE.

3. Reclamation will notify all the parties to the Protocol MOA as soon as possible, or at a minimum of 30 days in advance of each HFE, and consult with American Indian tribes to resolve any conflicts with tribal access to or uses of the Colorado River.
4. After each HFE event, Reclamation will conduct a reporting meeting describing the effects of the HFE, use the results of this meeting to inform monitoring for future HFEs, and design and implement any measures necessary to prevent or control adverse effects of future HFEs.
5. Within two years of completing the HFE Protocol, and in consultation with parties to the Protocol MOA, Reclamation will analyze the results of monitoring over the life of the Protocol and produce a report on the cumulative effects of the HFEs on the historic properties of the Colorado River, including the Colorado River. Reclamation will use this report, in consultation with the parties to the Protocol MOA, in designing any future HFE Protocol.
6. Over the life of the Protocol, Reclamation will seek and facilitate coordination among the NPS, GCMRC, tribal, and any other monitoring programs as necessary in order to determine effects from the HFE Protocol.
7. Over the life of the Protocol, Reclamation, in consultation with the parties to the Protocol MOA, will use its best efforts to ensure that the monitoring programs efficiently and effectively gather the data needed by the American Indian tribes to assess the effects of HFEs on the Colorado River and Canyons as perceived by the American Indian tribes, on traditional tribal uses of the Colorado River, and on tribal access to locations of cultural and religious importance to them.
8. Cultural resource reviews will be conducted by Reclamation, in consultation with NPS, GCMRC, and American Indian tribes, as part of the planning and approval process for each HFE. If there is concern over potential effects, including but not limited to access to sacred sites, Reclamation will consult further with the parties to the Protocol MOA, including face to face meetings with interested American Indian tribes, before conducting the HFE. If, over the life of the Protocol, Reclamation, in consultation with the parties to the Protocol MOA, determines that there is newly identified potential for adverse effect as a result of an HFE, then Reclamation will carry out the following measures to avoid or mitigate the possible effects of HFE-induced changes on specific identified and not yet identified historic properties:
 - a. Should any of the parties to the Protocol MOA notify Reclamation of a historic property that such party believes may be adversely affected by a forthcoming HFE, Reclamation, in consultation with such party and any land managers responsible for such historic property, will work with such party and other parties to this MOA who express interest to establish and implement measures to protect

the historic property against adverse effect, including consideration in the decision to design and implement the HFE, and in development and implementation of a treatment plan. Such treatment measures may include, but are not limited to, soil and stream bank stabilization, vegetation work, and placement of protective coverings, and ethnographic/ethnohistorical/ethnobotanical research and interpretation. Reclamation will fund or conduct archaeological excavations of adversely affected historic properties only if other measures are inadequate to protect the properties and with the concurrence of the land manager where the affected historic properties are located. In all cases, Reclamation will consult with the American Indian tribes, NPS, and the State Historic Preservation Office before funding, developing treatment measures, or conducting excavations.

- b. Should monitoring reveal that a specific previously identified or unidentified historic property, including but not limited to the associative values of an American Indian Tribe with such property, has been or is in imminent danger of being adversely affected by erosion or other landscape changes resulting from HFES, Reclamation will consult with the parties to this MOA to determine what remedial measures, if any, should be undertaken. Such measures may include, but are not limited to those listed above.

Analysis Regarding Whether the Proposed Action Will Have a Significant Effect on the Human Environment

As defined in 40 CFR § 1508.27, a determination of whether the proposed action will have a significant effect on the human environment requires considerations of both “context” and “intensity”:

(a) Context. This means that the significance of an action must be analyzed in several contexts such as society as a whole (human, national), the affected region, the affected interests, and the locality. Significance varies with the setting of the proposed action. For instance, in the case of a site-specific action, significance will usually depend upon the effects in the locale rather than in the world as a whole. Both short- and long-term effects are relevant.

(b) Intensity. This refers to the severity of impact. Responsible officials must bear in mind that more than one agency may make decisions about partial aspects of a major action. The following elements should be considered in evaluating intensity:

1. Impacts that may be both beneficial and adverse (1508.27(b)(1)).
2. Degree to which the selected alternative affects public health or safety (1508.27(b)(2)).
3. Unique characteristics of the geographic area of the proposed action (1508.27(b)(3)).
4. Degree to which the effects of the proposed action on the quality of the human environment are likely to be highly controversial (1508.27(b)(4)).
5. Degree to which the effects of the proposed action on the human environment are highly uncertain or involve unique or unknown risks (1508.27(b)(5)).
6. Degree to which the proposed action sets a precedent for future actions with significant effects or represents a decision in principle about a future consideration (1508.27(b)(6)).

7. Whether the action is related to other actions with individually insignificant but cumulatively significant impacts (1508.27(b)(7)).
8. Degree to which the action may adversely affect sites, districts, buildings, structures, and objects listed in or eligible for listing in the National Register of Historic Places or cause loss or destruction of significant cultural resources (1508.27(b)(8)).
9. Degree to which the action may adversely affect an endangered or threatened species or its habitat that has been determined to be critical under the Endangered Species Act of 1973 (1508.27(b)(9)).
10. Whether the action threatens a violation of federal, state, local, or tribal law, regulation, or policy imposed for the protection of the environment (1508.27(b)(10)).

Each element is discussed as follows:

Context:

The proposed action will be limited in geographic context (40 CFR 1508.27(a)). Project activities will be implemented in a finite area, as discussed in the EA in Section 3.1 (also see EA Figure 1), that is, the 294-mile reach of the Colorado River corridor from Glen Canyon Dam downstream to the Lake Mead inflow near Pearce Ferry. The environmental effects as described in the EA in Section 3 are local and will not be noticed beyond the local scale, and this local area should be considered the locality and affected region. Affected interests have been analyzed in the EA in Section 3, and no effects beyond the locality and regional area were identified, and no effects to society as a whole were identified. However, global climate change may affect human health, and is the result of incremental effects from many small actions. While climate change is a concern nationally and world-wide, the contribution of this action to those concerns is also minor. The proposed HFES with the attendant requirement for replacement power are expected to have minor short-term impacts on air quality and climate change, and the long-term impact is not expected to be substantial because the effects to air quality would be expected to be minor due to the low volume of emissions from replacement power.

Intensity:

(1) Impacts that may be both beneficial and adverse.—The proposed action, including conservation and mitigation measures, is expected to have beneficial impacts to sediment resources and to endangered species such as the humpback chub. The long-term expected outcome of the proposed action is to benefit sand conservation by rebuilding and rejuvenating sandbars, beaches, and associated backwater habitats that can provide key wildlife habitat, potentially reduce erosion of archaeological sites, enhance riparian vegetation, maintain or increase camping opportunities, and improve the wilderness experience in the Colorado River in Grand Canyon National Park and its riparian corridor. A portion of the floodplain and some wetland plants will be inundated and likely scoured by the high experimental flows. The plant species affected by the high flow recolonize quickly, however, and the effect will only be temporary. The proposed action could affect soils and biotic communities, and trout and other non-native fishes. There could be some negative impacts associated with increased numbers of trout, particularly with regard to implementation of spring HFES, as discussed in more detail below. There will be short-term disruptions of some small businesses, such as recreational

boating and angling enterprises that operate on the Colorado River below Glen Canyon Dam during HFEs, and to individual recreational users, but these interruptions are expected to be minor and temporary. Adverse impacts to hydropower will occur for most HFEs. Under some conditions, additional power likely will need to be purchased. As set forth in Table 15 of the EA, the range of costs of the proposed action over a ten-year period is \$8.1 million to \$122.2 million (in 2010 dollars), but there is a large amount of variability in this analysis because each year brings a different combination of sand and hydrological conditions. Actual impacts to hydropower are anticipated to be slightly less than identified in the EA, given the period of implementation (through 2020) and the deferral of potential spring HFEs in 2013 and 2014. Although there are adverse impacts to some resources from the proposed action, most are short-term and minor. In the long-term, the experiments being undertaken under the HFE Protocol will provide important information upon which to base future decisions so that no resource is unduly or inappropriately impacted.

(2) Degree to which the selected alternative will affect public health or safety.—The only potential effects on public health or safety could occur during recreational angling and boating on the Colorado River in conjunction with some HFEs, particularly HFEs with higher flow magnitudes and longer durations. All daily fluctuations, minimum flows, and maximum flows in the proposed action are within the range experienced by recreationists in the past, and Reclamation and NPS will work together to ensure that safety measures, including restricting access immediately below the dam during an HFE, continue to be implemented. NPS Boating Safety Rules will continue to apply to boaters. The rapid response approach, which will have a much shorter notice prior to occurrence, will not be implemented until appropriate measures have been taken to ensure sufficient warning to protect public health and safety. An incident command center has been established by the NPS for previous high-flow experiments and will be operational for any HFE. NPS and Reclamation will work collaboratively to put in place appropriate measures, which will be used whenever necessary to further protect public health or safety.³

(3) Unique characteristics of the geographic area of the proposed action.—The proposed action will occur within the confines of Glen Canyon National Recreation Area and Grand Canyon National Park. No designated wild and scenic rivers occur in the project area. No Indian Trust Assets are found in the project area.

(4) Degree to which the effects of the proposed action on the quality of the human environment are likely to be highly controversial.—Under NEPA, the degree to which the effects of the proposed action on the quality of the human environment are likely to be highly controversial is determined by whether there are substantial questions that are raised by experts as to whether a project may cause significant degradation of some human environmental factor

³Consistent with commitments previously described in the HFE Protocol EA, Reclamation has begun analysis to address other remaining questions on the feasibility and safety of the “rapid response” approach. The first study to be completed and published by Reclamation investigated the feasibility of predicting a large flood event in the Paria River with existing data from two gaging stations for the period 2002-2010 (<http://www.usbr.gov/uc/envdocs/reports/PariaRiverRapidResponse-Final.pdf>). Following issuance of this FONSI, further analysis will be undertaken and reports will be released as they are peer reviewed and completed pursuant to fulfilling the EA commitments regarding assessment of the feasibility and safety of this approach.

or there is a substantial dispute among the experts about the size, nature, or effect of the action. No effects on the quality of the human environment from the action have been identified that can be considered highly controversial.

Reclamation recognizes that some members of the public may object to aspects of the proposed action based on perceptions of its effects to the human environment. This type of public opposition does not make a project “highly controversial,” under NEPA, but those concerns are addressed here for completeness. First, several American Indian tribes consider the Grand Canyon to be sacred, and are concerned about potential adverse impacts from high-flow experiments. This portion of the proposed action is designed to benefit the natural ecosystem in Grand Canyon and should result in positive benefits. The proposed high flows are well within historic flows, both pre-dam and post-dam and the magnitude and duration of these experimental high flows are within the limits of previous HFEs. Effects from the proposed action in the reach around the confluence of the Colorado River and LCR are not anticipated to be greater than those experienced from previous HFEs.

Second, the Hualapai Tribe is concerned with potential adverse economic impacts to their boating industry and boat docking structures about 275 miles downstream of the dam as a result of HFEs. Reclamation has agreed to review and assess whether such impacts will occur and to determine whether mitigation is appropriate.

The third area of public opposition relates to impacts to the recreational fishery and the fishing industry in the Lees Ferry reach due to HFEs. Past HFEs have affected these resources to some degree, but impacts were generally minor and of short duration. Recent research has revealed a positive population response by rainbow trout in the upper reach of the river below the dam to spring HFEs and to high steady equalization flows, resulting in increased survivorship and, potentially, emigration downstream where the trout may prey upon endangered humpback chub. Actions that will be implemented under the NNFC EA and FONSI, and under the USFWS 2011 Biological Opinion, are intended to reduce the downstream predation and competition on endangered fish. The same mitigation and monitoring measures also will assist successful management of the desired Lees Ferry rainbow trout fishery by reducing conflict in achieving management objectives for both the trout and the endangered fish.

Another concern that was expressed during the NEPA process for the NNFC EA is the potential effect to historic properties. The Hopi, Hualapai, Navajo, Kaibab Paiute, and Zuni Pueblo have identified the Colorado River and canyons below Glen Canyon Dam as a traditional cultural property, and the Arizona State Historic Preservation Office has concurred with this determination of eligibility. Reclamation has determined that the taking of life associated with past non-native fish control efforts constitutes an adverse effect to these historic properties under NHPA. In the Non-Native Fish Control FONSI, Reclamation has committed to several measures to avoid or mitigate for this adverse effect, which is also intended as a mitigation element of the HFE Protocol.

Lastly, concern has been expressed for the loss of hydropower and the costs incurred by the necessity of replacing that power from other sources. Although these costs, estimated between \$8.1 and \$122.2 million over the experimental HFE Protocol period, may seem large when

viewed independently, they are less so when seen in the context of the total hydropower generated from Glen Canyon Dam and the revenues generated from that hydropower. Experiments under the HFE Protocol are being conducted to better understand whether further modifications to dam operations are necessary to achieve the desired balance between project purposes and resource protection.

(5) Degree to which the effects of the proposed action on the human environment are highly uncertain or involve unique or unknown risks.—The purpose of the proposed action is to test hypotheses and develop scientific information to reduce existing uncertainty regarding the long-term efficacy of high-flow experimental releases to improve conservation of sediment and downstream resources below Glen Canyon Dam.

The proposed action is being carried out as part of the GCDAMP in furtherance of the Department of the Interior's implementation of the Grand Canyon Protection Act. The adaptive management process recognizes uncertainty and relies on implementation of scientific investigations (such as the HFE Protocol adopted in this FONSI) to improve knowledge and reduce the uncertainty of actions that are proposed to improve resource conditions downstream of Glen Canyon Dam.

The proposed action builds on previous single-event experiments and will be implemented as a multi-year multi-event experiment that will be monitored under the auspices of the GCMRC using a science plan developed specifically to assess this action. As an experiment, the proposed action operates on hypotheses constructed from the best available scientific information after years of study by researchers in the Grand Canyon. As with all experiments, this action has some uncertainty in outcomes, such as whether multiple high-flow experiments will better retain sand over the long-term and the extent to which trout populations will be affected by multiple experiments. Given the knowledge that has been gained through implementation of previous single HFEs, the primary new area of knowledge will be derived from the planned implementation of multiple, sequential HFEs linked to sediment input over a long-term period (i.e., through 2020).

Further, the information needed to resolve the uncertainty can only be obtained through implementation of the HFE Protocol. In addition, the risks of significant adverse impacts resulting from multiple HFEs is further reduced by the three-step process of planning, modeling and decision-making that will precede implementation of any HFE and through planned reviews of the Protocol to evaluate its impacts and effectiveness. Within this process are evaluations that will provide updated reviews during the term of the experiment regarding the status of resources that could be negatively impacted by implementation of individual or multiple HFEs.

The level of uncertainty for the proposed action, particularly given the prior experiments conducted under adaptive management and the extensive scientific foundation that forms the basis of the HFE Protocol, coupled with the feedback system to resource managers built into accompanying research and monitoring, does not rise to the level of highly uncertain, unique or unknown risks.

(6) Degree to which the proposed action sets a precedent for future actions with significant effects or represents a decision in principle about a future consideration.—The GCDAMP operates under the principles of adaptive management in which lessons learned by doing, through scientific experiments, are built into present and future management decisions. The iterative approach taken in this process helps to ensure that changes in management direction are not so large as to have a significant adverse effect on the system and its resources. Neither does any single outcome represent a decision in principle about a future consideration because the outcome of each experiment is added to the knowledge gained in previous experiments in making prospective management decisions. Implementation of the proposed action is not a formal interpretation of existing law, nor does implementation predetermine in any manner, the means of operation of Glen Canyon Dam in the future following implementation of the proposed action or the design and implementation of future experimental actions.

The research element of the proposed action will develop additional scientific information and better inform future GCDAMP adaptive management decisions including the analysis contained in the LTEMP EIS. The LTEMP EIS is the first major, comprehensive analysis of the GCDAMP since the initiation in 1996 of the adaptive management program.

(7) Whether the action is related to other actions with individually insignificant but cumulatively significant impacts.—No other actions beyond those evaluated in the HFE Protocol EA and the NNFC EA have been proposed that will affect the operation of Glen Canyon Dam during the period of the proposed HFE Protocol. Actions being undertaken by the NPS, in cooperation with Reclamation and the USFWS, to remove non-native fish and translocate endangered humpback chub into tributary streams in Grand Canyon National Park are likely to improve the status of the endangered fish and help to offset any negative impacts from implementation of the HFE Protocol. In addition, Reclamation’s proposed action to implement non-native fish control in the Colorado River below Glen Canyon Dam will further reduce the potential impact of non-native fish on the endangered fish.

Reclamation has concluded that the adoption of the HFE Protocol will have both significant beneficial and adverse impacts. In conjunction with previously described conservation measures, the proposed action for non-native fish control is expected to mitigate the potential adverse impact of implementation of the HFE Protocol such that the impacts will not have a significant cumulative impact.

Both the actions considered in this decision notice and those of the NNFC EA and FONSI include important research components, with the expectation that they will produce knowledge that will improve resource conditions, and thereby provide important additional information for improving future decision-making by Interior. These actions do not constitute “cumulative actions” necessitating review in a single NEPA document as defined by 40 C.F.R. § 1508.25(a)(2). Reclamation analyzed the cumulative effects from both actions in the affected environment section of each EA, under the topical discussion for each resource. Cumulative actions, connected actions, and similar actions area also discussed in section 1.12 of the HFE Protocol EA. There are relatively few actions that cumulatively impact the affected environment because the location of the proposed action is the Colorado River in Glen, Marble, and Grand Canyons, an area almost entirely in national parks protected and managed for their natural

resources and scenic beauty and thus not likely to be subject to many project impacts. Thus, Reclamation has properly considered the cumulative effects from these two actions and other actions in both NEPA documents. Consistent with these analyses, Reclamation concludes that the actions do not have “cumulatively significant impacts.”

(8) Degree to which the action may adversely affect sites, districts, buildings, structures, and objects listed in or eligible for listing in the National Register of Historic Places or cause loss or destruction of significant cultural resources.—With the probability of multiple HFEs occurring sequentially during the period of HFE Protocol implementation, historic properties may be adversely affected based upon uncertainty associated with the experimental nature of the undertaking over the period of implementation. An alteration in the deposition or removal of sediment from sites will constitute changes in the character of the eligible properties or possible changes in essential physical features that contribute to the property’s significance. At least five federally-recognized American Indian tribes, the Hopi, Hualapai, Navajo, Kaibab Paiute, and the Zuni Pueblo, recognize the Colorado River and Grand Canyon as a traditional cultural property and they have identified what they consider to be sacred sites in the same area. The HFEs could result in restrictions on tribal access to their sacred site or sites during the events. In the absence of notification procedures and final consultations with American Indian tribes regarding access, the effect on Indian sacred sites will be considered adverse. Reclamation has agreed to further consult with these American Indian tribes prior to the implementation of any HFE and to take into consideration any interruption of their ability to visit sacred sites. These commitments are identified above in sections under Economic Mitigation and Cultural Mitigation.

(9) Degree to which the action may adversely affect an endangered or threatened species or its habitat that has been determined to be critical under the Endangered Species Act of 1973.—Five federally listed species, two of which have designated critical habitat, occur in the action area. In our biological assessment, we determined that the proposed action may affect and is likely to adversely affect three of those species—the Kanab ambersnail (*Oxyloma haydeni kanabensis*), razorback sucker (*Xyrauchen texanus*), and humpback chub—due to potential take of individuals during and following the high-flow test. Razorback sucker and humpback chub critical habitats also are expected to be adversely affected. We determined that the southwestern willow flycatcher (*Empidonax traillii extimus*) may be affected, but is not likely to be adversely affected because the species is not likely to be in the project area and HFEs will not likely adversely affect their potential nesting habitat. We determined that there would be no effect on California condor (*Gymnogyps californianus*) from the proposed action. Identified adverse effects on listed species or their critical habitat are expected to be short term, and long-term consequences of the proposed action are expected to be beneficial. Conservation measures have been identified in previous consultations for razorback sucker and humpback chub to assist in the conservation of these species and to reduce potential negative effects. Additional conservation measures are identified in the December 23, 2011, Biological Opinion issued by the USFWS on this proposed action and the proposed non-native fish control action. Reclamation implemented conservation measures for the HFEs conducted in 2004 and 2008 to protect habitat for the Kanab ambersnail at Vasey’s Paradise. The USFWS and Reclamation have agreed to forgo the conservation measure for future HFEs and study the effect of the HFE Protocol on the population

of Kanab ambersnail at Vasey's Paradise through continued monitoring, as explained in the USFWS 2011 Biological Opinion.

The remaining impacts to listed species or their critical habitat are expected to be negligible to minor.

(10) Whether the action threatens a violation of federal, state, local, or tribal law, regulation, or policy imposed for the protection of the environment.—The proposed action violates no federal, state, tribal, or local environmental protection laws.

Findings Required by Other Authorities

The HFE Protocol EA and project file provide information sufficient to evaluate the proposed action in order to ensure compliance with NEPA and to meet other appropriate laws and regulations.

Endangered Species Act

See item 9 above in the “Analysis Regarding Whether the Proposed Action Will Have a Significant Effect on the Human Environment” section.

National Historic Preservation Act, Archaeological Resources Protection Act, Native American Graves Protection and Repatriation Act

See item 8 above in the “Analysis Regarding Whether the Proposed Action Will Have a Significant Effect on the Human Environment” section.

Environmental Justice (Executive Order 12898)

This Order requires consideration of whether projects would disproportionately impact minority or low-income populations. This decision complies with this Order. Public involvement for this project did not identify any adversely impacted local minority or low-income populations except for the tribes whose access to sacred sites would be temporarily restricted during a high flow event, possible economic impacts to the Hualapai's tribe's enterprise, and possible minor effects to rates for electricity paid by Western's tribal, rural, and low-income customers. This decision is not expected to significantly adversely impact minority or low-income populations, as explained in Section 3.9 of the EA.

Decision

The decision is to implement the HFE Protocol with the mitigation described above, and to include an additional mitigation measure requiring deferral of spring HFEs in 2013 and 2014 as discussed in more detail below.

The decision is based on careful research and intensive monitoring developed by the GCMRC over the last fifteen years for the implementation of previous single-event high-flow experiments. These experiments have shown that HFEs can help build sandbars and conserve sand. However, as described in the EA, the benefits of these isolated HFEs have not been retained over longer periods of time.

The HFE Protocol is the next logical step in adaptive management, and will provide essential scientific information to assess whether multiple, sequential HFEs implemented over a multi-year period when enriched sediment conditions exist do in fact result in the predicted longer-term sediment conservation benefits.

As described above, there continues to be some uncertainty associated with implementation of the HFE protocol, particularly with regard to the trout response to spring HFEs. The HFE Protocol EA identifies increased rainbow trout production as a result of two previous spring HFEs in 1996 and 2008, and the 2011 Biological Opinion also identified increases in rainbow trout at Lees Ferry associated with the 2011 spring high steady flows. Rainbow trout are documented predators on and competitors with the endangered humpback chub and their dispersal downstream could result in losses of the endangered fish as a consequence of the proposed action. The extent of trout movement downstream into areas occupied by humpback chub and the precise conditions under which that movement occurs are not well understood. To address this uncertainty, Reclamation is simultaneously implementing new research and monitoring activities to better understand non-native fish movement and the interactions with native fish downstream of Lees Ferry, with a focus on the PBR Reach of the Colorado River.

Recent increases in trout numbers downstream of Glen Canyon Dam highlight the need for ongoing non-native fish control as a component of the GCDAMP, as recognized in the 2011 Biological Opinion. However, in order to address concerns identified by American Indian tribes and other stakeholders, Reclamation is taking a new approach to non-native fish control that focuses on: (1) non-lethal removal of trout intercepted in their downstream movement in the PBR Reach of the river and (2) scientific investigations to better understand the interactions among trout, humpback chub and the aquatic food base. Reclamation is also undertaking an assessment, again with stakeholder input, of the potential to address non-native fish population numbers by modifying flow releases from Glen Canyon Dam to disadvantage trout. This assessment will be conducted over a two-year period following this decision and the related NNFC FONSI.

While the HFE could be implemented in full compliance with NEPA and the ESA without additional mitigation, Reclamation has decided to add a mitigation measure to the first two years of the HFE Protocol. This decision incorporates an additional element of protection for the endangered humpback chub to minimize the risk of an adverse effect to the population, which has experienced significant increases in numbers for more than a decade. This extra element of mitigation is in addition to the protections identified in the HFE Protocol EA and the 2011 Biological Opinion and complements other research and non-native control activities undertaken as part of the GCDAMP.

Specifically, Reclamation will defer implementation of spring HFEs in calendar years 2013 and 2014. This two-year deferral of spring HFEs takes a conservative approach to the initial phase of implementation of HFEs. This two year period will provide Reclamation with initial research and monitoring results regarding non-native fish control at the PBR Reach without the potential complicating factor of increased trout production resulting from a spring HFE. The two-year period coincides with the period for development of non-native fish suppression flows as noted

above. This approach also allows the adaptive management program to gain valuable initial experience implementing the HFE Protocol without the added concerns associated with further enhancing the current high trout population levels.

Fall HFEs are unaffected by this mitigation element and will be undertaken pursuant to the Protocol. The best available information suggests that fall HFEs may not lead to a trout population increase and will have reduced impacts on endangered fish as compared with spring HFEs. The most pressing current research needs concerning the interactions among trout, humpback chub and the aquatic food base are related to fall HFEs. Further, the largest sediment inputs can be expected during the fall monsoon season, so opportunities to improve the sediment resource will not be entirely lost during the first two years of the HFE Protocol.

The proposed action will not have a significant adverse effect on the human environment. The proposed action is designed to benefit the environment by improving the conservation of sediment and by building and rejuvenating sandbars and beaches, along with their associated backwater habits and riparian communities. Negative environmental impacts will be associated with potential increases in trout populations and resulting impacts to endangered native fish. As described in this FONSI, appropriate mitigation and monitoring is provided to ensure that these impacts do not rise to the level of significant impacts. No highly uncertain or controversial impacts, unique or unknown risks, significant cumulative effects, or elements of precedence were identified. Implementation of the proposed action will not violate any federal, state, tribal, or local environmental protection law. No significant unmitigated adverse impacts on public health, public safety, threatened or endangered species, historic properties, or other unique characteristics of the region have been identified as a result of analysis of the proposed action. As discussed above, and consistent with commitments set forth in accordance with Section 106 of the National Historic Preservation Act through a memorandum of agreement with the tribes and other consulting parties, Reclamation will undertake continued tribal consultation as part of implementation of the HFE Protocol.

Based upon the HFE Protocol EA, an analysis of all oral and written comments received on the EA, and the foregoing findings of this document, a finding of no significant impact (FONSI) is justified for the proposed action. The decision, therefore, is to proceed with implementation of the HFE Protocol as needed research, but to also incorporate appropriate mitigation to retain a “conservative” approach to endangered fish conservation as has been done previously with experiments conducted under the GCDAMP. This decision also recognizes new information on the effects of equalization flows that was included in the December, 23, 2011, Biological Opinion, which is addressed in avoidance of spring HFEs through 2014.

Additional NEPA compliance is not required for continuation of MLFF and the proposed action continues under the 1996 ROD. The action approved in this FONSI is tiered from two Reclamation EISs, the 1995 EIS on the operation of Glen Canyon Dam and the associated 1996 ROD, and the 2007 Colorado River Interim Guidelines EIS and the associated 2007 ROD. Specific comments were received in the public reviews of the HFE Protocol EA that the proposed action required an environmental impact statement (see Appendix B). Those comments were considered and addressed in revisions of the document, particularly in Chapter 1 of the HFE EA. Following further evaluation and extensive consideration of the proposed action and its

expected impacts, Reclamation concludes that an environmental impact statement is not necessary to further analyze the environmental effects of the proposed action. Accordingly, with adoption of this HFE Protocol and associated research, operation of Glen Canyon Dam will include these flow operations and provide the baseline for further actions and future decision making, as well as for future environmental compliance analyses (e.g., in the context of the ongoing Long-Term Experimental and Management Plan).

MEMORANDUM OF AGREEMENT

GLEN CANYON DAM HIGH FLOW EXPERIMENTAL PROTOCOL

WHEREAS the Bureau of Reclamation (Reclamation), U.S. Department of the Interior, manages the release of water out of Glen Canyon Dam down the Colorado River through the Glen Canyon, Marble Canyon, and Grand Canyon in Arizona (Canyons), in accordance with the Colorado River Storage Project Act of 1956 (CRSPA), the Grand Canyon Protection Act (GCPA) and other authorities collectively known as the "Law of the River;" and

WHEREAS Reclamation has previously conducted three high flow experiments (HFEs) to examine whether relatively high flows of water (up to 45,000 cubic feet/second [cfs]) have beneficial effects on sedimentation and the resources that depend on sediment in the Canyons; and

WHEREAS Reclamation now proposes an undertaking consisting of a High Flow Experimental Protocol (HFEP) under which HFEs with releases up to 45,000 cubic feet per second (cfs) for periods ranging from 1 to 96 hours at a time, may be implemented during two two-month windows each year, over a ten-year period of time; and

WHEREAS Reclamation has determined that implementation of the HFEP may have adverse effects on the historic and cultural character of the Colorado River, the Canyons, and specific identified and not-yet identified historic properties; and

WHEREAS the area of potential effects (APE) for this undertaking, within which historic properties might be directly affected, is defined in lineal distance as following the Colorado River from below the Dam downstream as far as Pearce Ferry, with the lateral extent defined as the high water mark of 45,000 cfs constituting an area of about 10 square miles (approximately 6,400 acres), and

WHEREAS the area of potential effects (APE) for this undertaking also includes the area within which historic properties might be indirectly affected and is uncertain due to the experimental nature of the undertaking, and

WHEREAS the National Park Service (NPS), U.S. Department of the Interior, protects and manages units of the national park system within Grand Canyon National Park (GRCA), Glen Canyon National Recreation Area (GLCA), and Lake Mead National Recreation Area (LAKE), including the lands and waters in the Canyons, and is responsible for identifying, managing, and preserving historic properties within GRCA, GLCA, and LAKE pursuant to §§ 110 and 106 of the National Historic Preservation Act of 1966 (NHPA), as amended; and

WHEREAS Reclamation and the NPS recognize that Reclamation is the lead federal agency for purposes of compliance with § 106 of the NHPA for the proposed HFEP that is the subject of this agreement; and

WHEREAS Western Area Power Administration, under the Act of Congress approved August 4, 1977 (91 Stat. 565) is responsible for marketing power and energy and transmitting electric power generated at the facilities of the Colorado River Storage Project, including Glen Canyon Dam, to preference customers in various states, and also has responsibility for managing the Upper Colorado River Basin Fund which funds various work related to historic properties protection within the APE, and is authorized as part of the Colorado River Storage Project Act of 1956 (70 Stat. 105), consistent with sound business principles to ensure repayment of Colorado River Storage Project construction and operation expenses to the United States Treasury (36 CFR 800.2(c)(5)); and

WHEREAS the Hopi Tribe, the Hualapai Tribe, the Kaibab Band of the Paiute Indians, the Navajo Nation, the Paiute Indian Tribe of Utah for Shivwits Band, and the Pueblo of Zuni (collectively, "the Tribes") are federally recognized Indian tribes that attach religious or cultural significance to historic properties located within the Canyons, including the entire Grand Canyon, and also regard the Canyons including the Colorado River as constituting a Traditional Cultural Property (TCP) eligible for the National Register of Historic Places (National Register); and

WHEREAS the Navajo Indian Reservation and the Hualapai Indian Reservation adjoin the Colorado River corridor, and the undertaking may affect historic properties on the two reservations; and

WHEREAS the Navajo Nation and the Hualapai Indian Tribe have Tribal Historic Preservation Officers (THPOs) responsible for implementing the NHPA on their respective reservations; and

WHEREAS NPS, the Grand Canyon Monitoring and Research Center (GCMRC), (which contributes to scientific monitoring and research in the Canyons), and Tribes maintain ongoing programs that monitor the effects of water releases on historic properties below Glen Canyon Dam; and

WHEREAS Reclamation has consulted with the public through the National Environmental Policy Act process; and

WHEREAS Reclamation, in consultation with NPS and the Tribes, has determined that the Colorado River and the Canyons are eligible for the National Register as a TCP, and the Arizona State Historic Preservation Officer (SHPO) and NPS have concurred in so regarding them (see Appendix A); and

WHEREAS Reclamation, in consultation with the NPS, and the Tribes, have also identified additional historic properties within the APE; and

WHEREAS pursuant to Section 106 of the NHPA and its implementing regulations (36 CFR Part 800), Reclamation has consulted with parties interested in the protection of historic properties during implementation of the undertaking, including the NPS, the U.S. Fish and Wildlife Service (FWS), the GCMRC, the Bureau of Indian Affairs (BIA), Western Area Power Administration, Colorado River Energy Distributors' Association, the Navajo Nation and its THPO, the Pueblo of Zuni, the Hopi Tribe, the Hualapai Tribe and its THPO, the Paiute Indian Tribe of Utah for Shivwits Band, and the Kaibab Band of Paiute Indians, and invited these parties to sign or concur in this memorandum of agreement (MOA) pursuant to 36 CFR § 800.6(c); and

WHEREAS Reclamation has consulted with the Arizona SHPO and the NPS, the FWS, the GCMRC, the BIA, Western Area Power Administration, Colorado River Energy Distributors' Association, the Navajo Nation, the Pueblo of Zuni, the Hopi Tribe, the Hualapai Tribe, the Paiute Indian Tribe of Utah for Shivwits Band, and the Kaibab Band of Paiute Indians, to seek ways to avoid, minimize, or mitigate adverse effects to historic properties, if any result from the undertaking and to develop this MOA; and

WHEREAS in accordance with 36 C.F.R. § 800.6(a)(1), Reclamation has notified the Advisory Council on Historic Preservation (ACHP) of its adverse effect determination providing the specified documentation, and the ACHP has chosen to be a signatory; and

WHEREAS Reclamation has invited the ACHP to participate in consultation, and the ACHP has participated to seek ways to avoid, minimize, or mitigate adverse effects to historic properties resulting from the undertaking and to develop this MOA;

NOW, THEREFORE the signatories agree that should Reclamation decide to proceed with the HFEP, Reclamation will ensure that the following stipulations are implemented to provide a means to resolve any adverse effects of the HFEP on historic properties if any occur as a result of the undertaking.

Stipulations

In consultation and collaboration with all parties to this MOA, Reclamation shall ensure the following stipulations are carried out:

- I. **Immediate Actions:** Within 120 days after execution of this MOA, Reclamation will, in consultation with the parties to this MOA, determine whether, prior to the first HFE, any actions are necessary to protect against direct adverse effects of HFE-induced changes on the historic properties determined to lie within the APE, as detailed in Appendix A. These sites were identified by NPS as being potentially affected by Glen Canyon Dam releases of 45,000 cfs, although prior high flow release tests resulted in no effects to most of these sites.

- II. **Consultation:**

- a. Reclamation will consult with the Tribes and other consulting parties each time an HFE is planned, in order to have minimum potential for adverse effects on tribal access to and uses of the Colorado River, including spiritual, subsistence, and traditional economic uses. Reclamation will use the information provided from these consultations to improve monitoring and efforts to minimize adverse effects for the HFE.
- b. Reclamation will notify all the consulting parties of planned HFEs as soon as possible or at a minimum of 30 days in advance of each HFE, and consult with tribes to resolve any conflicts with tribal access to or uses of the Colorado River.
- c. In coordination with all the consulting parties, after each HFE event, Reclamation will conduct a reporting meeting describing the effects of the HFE, use the results of this meeting to inform monitoring for future HFEs, and to design and implement any measures necessary to prevent or control adverse effects of future HFEs.
- d. In consultation with all parties to this MOA, Reclamation will analyze the results of monitoring over the ten-year life of the HFEP and produce a report on the cumulative effects of the HFEs on the historic properties of the Colorado River, including the Colorado River, within two years.
- e. In consultation with the other parties to this MOA, Reclamation will use the report provided for above in designing any future HFEP.

III. Monitoring to Identify Effects:

- a. Over the life of the HFEP, Reclamation will seek and facilitate coordination among the NPS, GCMRC, Tribal, and any other monitoring programs as necessary in order to determine effects from the HFEP.
- b. Over the life of the HFEP, Reclamation, in consultation with the other parties to this MOA, will use its best efforts to ensure that the monitoring programs efficiently and effectively gather the data needed by the tribes to assess the effects of HFEs, on the Colorado River and Canyons as perceived by the tribes, on traditional Tribal uses of the Colorado River, and on Tribal access to locations of cultural and religious importance to them.

IV. Site-Specific Impact Avoidance or Mitigation: The proposed undertaking is designed to avoid adverse effects to any resources. Cultural resource reviews would be conducted by Reclamation, in consultation with NPS, GCMRC, and Tribes, as part of the planning and approval process for each HFE. If there is concern over potential effects, including but not limited to access to sacred sites, Reclamation will consult further with all parties, including face to face meetings with interested Tribes, before conducting the HFE. If, over the life of

the HFEP, Reclamation, in consultation with all parties of this MOA, determines that there is newly identified potential for adverse effect as a result of the undertaking, then Reclamation will carry out the following measures to avoid or mitigate the possible effects of HFE-induced changes on specific identified and not-yet identified historic properties:

- a. Should any party to this MOA notify Reclamation of a historic property that such party believes may be adversely affected by a forthcoming HFE, Reclamation, in consultation with such party and any land managers responsible for such historic property, will work with such party and other parties to this MOA who express interest to establish and implement measures to protect the historic property against adverse effect, including consideration in the decision to design and implement the HFE, and in development and implementation of a treatment plan. Such treatment measures may include, but are not limited to, soil and stream bank stabilization, vegetation work, and placement of protective coverings, and ethnographic/ethnohistorical/ethnobotanical research and interpretation. Reclamation will fund or conduct archaeological excavations of adversely affected historic properties only if other measures are inadequate to protect the properties and with the concurrence of the land manager where the affected historic properties are located. In all cases, Reclamation will consult with the Tribes, NPS, and SHPO before funding, developing treatment measures, or conducting excavations.
- b. Should monitoring reveal that a specific previously identified or unidentified historic property, including but not limited to the associative values of a Tribe with such property, has been or is in imminent danger of being adversely affected by erosion or other landscape changes resulting from HFEs, Reclamation will consult with the parties to this MOA to determine what remedial measures, if any, should be undertaken. Such measures may include, but are not limited to those listed in Stipulation VI.a above.


V. Administration:

- a. Resolving Objections: should any party to this MOA object in writing or electronically to Reclamation regarding any action carried out or proposed with respect to the HFEP or implementation of this MOA, Reclamation will consult with the objecting party to resolve the objection. Reclamation will notify the SHPO if they are not the objecting party. If after initiating such consultation Reclamation determines that the objection cannot be resolved through consultation, Reclamation will forward all documentation relevant to the objection to the ACHP, including Reclamation's proposed response to the objection.
 - i. Within 30 days after receipt of all pertinent documentation, the ACHP will exercise one of the following options:


1. Advise Reclamation that the ACHP concurs in Reclamation's proposed response to the objection, whereupon Reclamation will respond to the objection accordingly;
 2. Provide Reclamation with recommendations, which Reclamation will take into account in reaching a final decision regarding its response to the objection; or
 3. Notify Reclamation that the objection will be referred for comment pursuant to 36 CFR 800.7(a)(4), and proceed to refer the objection and comment. Reclamation will take the resulting comment into account in accordance with 36 CFR 800.7(c)(4) and Section 110(l) of NHPA.
- ii. Should the ACHP not exercise one of the above options within 30 days after receipt of all pertinent documentation, Reclamation may assume the ACHP's concurrence in its proposed response to the objection.
 - iii. Reclamation will take into account any ACHP recommendation or comment provided in accordance with this stipulation with reference only to the subject of the objection; Reclamation's responsibility to carry out all actions under this MOA that are not the subjects of the objection will remain unchanged.
 - iv. At any time during implementation of the measures stipulated in this MOA, should an objection pertaining to this MOA or the effect of the HFEP on historic properties be raised by a member of the public, Reclamation will notify the parties to this MOA and take the objection into account, consulting with the objector and, should the objector so request, with any of the parties to this MOA to resolve the objection.
- b. Amendments: This MOA may only be amended by mutual written consent of the signatories. Amendments shall not be effective until approved by all signatories.
 - c. Termination: Any signatory may terminate this agreement in accordance with 36 C.F.R. § 800.6(c)(8) and by providing the other signatories with 60 days advance written notice of its intention to do so. If any signatory provides the other signatories with notice of its intention to terminate this agreement, then the signatories agree to meet to discuss the issues that prompted the notice and to try to resolve them through further consultation or by amending this agreement. In order to be considered a "signatory" for purposes of this

SIGNATORIES:

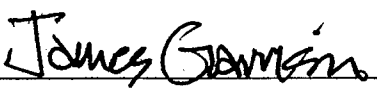
BUREAU OF RECLAMATION

By:  Date: 3/23/2012
Larry Walkoviak, Director, Upper Colorado Region

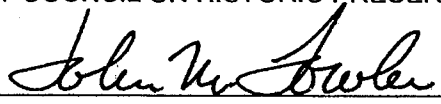
NATIONAL PARK SERVICE

By:  Date: 4/12/12
John Wessels Regional Director, Intermountain Region


ARIZONA STATE HISTORIC PRESERVATION OFFICE

By:  Date: 5/18/12
James Garrison, Arizona State Historic Preservation Officer


ADVISORY COUNCIL ON HISTORIC PRESERVATION

By:  Date: 5/22/12
John M. Fowler, Executive Director


NAVAJO NATION TRIBAL HISTORIC PRESERVATION OFFICE

By:  Date: 3.14.12
Alan Downer, Tribal Historic Preservation Officer (THPO)

HUALAPAI TRIBE

By:  Date: 3.3.2012
Louise Benson, Chair

HUALAPAI TRIBAL HISTORIC PRESERVATION OFFICE

By:  Date: 3/3/2012
Loretta Jackson-Kelly, THPO

SIGNATORIES:

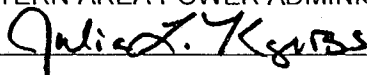
KAIBAB BAND OF PAIUTE INDIANS

By:  Date: 4.19.2012
Manuel Savala, Chairperson

PUEBLO OF ZUNI

By:  Date: 03-28-12
for: Governor Arlen Quetawki, Sr.


WESTERN AREA POWER ADMINISTRATION

By:  Date: March 16, 2012
Julia L. Kyriss, Colorado River Storage Project Manager

High Flow Experimental Protocol
Memorandum of Agreement

CONCURRING PARTIES:

BUREAU OF INDIAN AFFAIRS

By:  Date: 3/20/12
Bryan Bowker, Regional Director, Western Region



United States Department of the Interior

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

SHPO-2011-0844(92776)
AE

IN REPLY REFER TO:
ENV-3.00
UC-720

JUN 27 2011

RECEIVED

JUL 01 2011

JC

Mr. James Garrison
State Historic Preservation Officer
Arizona State Parks
1300 West Washington
Phoenix, AZ 85007

Subject: Determination of Eligibility and Effect on Historic Properties Regarding Proposed Adoption of a High Flow Protocol for Glen Canyon Dam, Coconino and Mohave Counties, AZ

Dear Mr. Garrison:

As agency official for purposes of compliance with Section 106 of the National Historic Preservation Act of 1966, I wish to consult your office regarding the Bureau of Reclamation, Upper Colorado Region's proposed undertaking, which is consideration and adoption of a high flow protocol for experimental releases from Glen Canyon Dam (Dam) with the potential to affect the Colorado River in both Glen Canyon National Recreation Area (GCNRA) and Grand Canyon National Park (GCNP). While a programmatic agreement (PA) has been in effect since 1994 for operations of the Dam, concerns of the Pueblo of Zuni and other Indian tribes regarding the proposed undertaking are such that I have elected to follow the 36 CFR 800 process.

The proposed undertaking is to develop and implement a protocol for high flow experimental releases (HFEs) from the Dam to better determine whether and how sand conservation can be improved in the Colorado River corridor within GCNP. This protocol would evaluate short-duration, high volume Dam releases during sediment-enriched conditions for a 10-year period of experimentation, 2011–2020, to determine how multiple HFEs can be used to better build sandbars and conserve sand over a long time period. Under the concept of HFEs, sand stored in the river channel is suspended by these Dam releases and a portion of the sand is redeposited downstream as sandbars and beaches, rebuilding these features that are continually lost from erosion. These sand features and associated backwater habitats can provide key wildlife habitat, potentially reduce erosion of archaeological sites, enhance riparian vegetation, and provide camping opportunities along the Colorado River in GCNP.

For this undertaking, the area of potential effects (APE) within which historic properties might be affected is defined in lineal distance as following the Colorado River from below the Dam downstream as far as Pearce Ferry. The lateral extent is defined by the high water mark of the Colorado River at 45,000 cubic feet per second. The area measures about 10 square miles.

In compliance with 36 CFR 800.2 and 800.4, Reclamation has reviewed existing information on historic properties within this APE and has sought new information from consulting parties, including the National Park Service, the federal agency that administers GCNRA and GCNP, and has consulted with Indian tribes likely to have knowledge of, or concerns with, historic properties in the APE. Based on NPS review of relevant documentation, the APE includes all or portions of approximately 19 sites listed in Table 1.

The APE includes two historic districts; one a National Register listed district at Lees Ferry in GCNRA, the other an historic district in GCNP that has been determined eligible for listing on the National Register through a consensus determination.

Table 1. Sites and districts potentially affected by the action. The sites labeled “GLCA” are located on lands managed by GCNRA. Those labeled NN are on Navajo Nation lands. Those labeled “GRCA” are on lands managed by GCNP. These Grand Canyon properties are considered contributing elements in an historic district previously determined eligible by the AZ SHPO. The tribal names indicate which tribe has identified the site as a contributing element in their traditional cultural property.

<i>Site#</i>	<i>Stage, Date</i>	<i>Type</i>	<i>Hopi</i>	<i>Hualapai</i>	<i>Paiute</i>	<i>Navajo</i>	<i>Zuni</i>	<i>Eligibility *</i>
AZ B:15:124 (GRCA)	Historic	Inscription USGS						E
AZ B:16:262 (GRCA)	Historic	Gauging Station						E
AZ C:2:11 (GLCA/NN)	Historic	District	x				x	L
AZ C:2:32 (GLCA)	unknown	Feature	x				x	E
AZ C:2:35 (GLCA)	PII	Campsite Cableways &	x				x	E
AZ C:2:58 (GLCA/NN)	1920's- 1930's	associated materials USGS						E
AZ C:2:59 (GLCA/NN)	1930's	gauging station						E
AZ C:2:75 (GLCA)	unknown	lithic scatter				x	x	E
AZ C:2:77 (GLCA)	unknown	lithic scatter				x	x	E
AZ C:2:98 (GRCA)	Archaic – Historic	Campsite					x	E
AZ C:6:2 (GRCA)	1889	Inscription						E
AZ C:6:4 (GRCA)	1923	Inscription						E
AZ C:6:5 (GRCA)	unknown	Petroglyph	x			x	x	E

AZ C:9:88 (GRCA)	1950's	Dam site				E
AZ C:13:9 (GRCA)	PII	Masonry rooms	x		x	E
AZ C:13:10 (GRCA)	PI-III	Masonry rooms	x	x	x	E
AZ C:13:291 (GRCA)	PII	Masonry rooms	x		x	E
AZ C:13:347 (GRCA)	PII	Feature		x	x	E
AZ C:13:371 (GRCA)	PII	Masonry rooms	x		x	E

*E=Eligible for purposes of Reclamation's 106 compliance with this undertaking; NE=Not Eligible; L-Listed.

In addition, Reclamation has been consulting with Indian tribes that may attach traditional religious or cultural significance to the Colorado River and adjacent properties below Glen Canyon Dam as traditional cultural properties. While these identification efforts are not yet complete, as documented in the enclosed site forms and reports, I have determined that the National Register Criteria for Evaluation are met as follows:

Site	Criteria for Evaluation	Eligibility
Hopi traditional cultural property	a,b,c,d	Eligible
Hualapai traditional cultural property	a,b,c,d	Eligible
Navajo traditional cultural property	a,b,c,d	Eligible
Zuni traditional cultural property	a,b,c,d	Eligible
Southern Paiute	a,b,c,d	Eligible

Historic properties that could be affected by 45,000 cfs flows were considered prior to the 1996, 2004, and 2008 high flow experiments conducted by Reclamation in coordination with Glen Canyon Adaptive Management Program participants. Based on these prior undertakings, I believe one HFE would not be expected to result in loss of integrity for any of the sites or contributing elements to the historic districts and would result in a finding of "no historic properties affected." However, with the probability of multiple HFEs occurring sequentially over the next 10 years, historic properties may be affected and the effect would be adverse per 36 CFR 800.5(2)(iv). Reclamation's finding is therefore adverse effect for the proposed undertaking.

The rationale for this finding of adverse effect stems primarily from the level of uncertainty associated with the experimental nature of the undertaking over a ten year period. The uses of certain properties by the tribes could be altered due to inundation in the area of direct effect and there is some unknown potential for changes in the patterns of visitation and use in the area of indirect effect. For the contributing elements to the historic district that are eligible under criterion d, the potential frequency of inundation over the next 10 years and the altered visitation patterns could result in loss of integrity and information value. The repeated inundation of the contributing elements to the districts could result in a loss of site structure as artifacts or features are entrained in currents. Furthermore, one of the purposes of the proposed action is to determine

how sediment might be moved downstream by high flows. An alteration in the deposition or removal of sediment from sites or contributing elements would constitute changes in the character of the eligible properties or possible changes in essential physical features that contribute to the property's significance.

Conversely, there is the possibility of some benefit to individual sites as a result of the undertaking. There is potential benefit in protecting some sites eligible under criterion d due to stabilization of terrain through sediment deposits and potential improvements to riparian vegetation, for example. Nevertheless, because of the uncertainties discussed above, we believe that an overall determination of adverse effect is appropriate for this undertaking.

As indicated above, Reclamation has coordinated with the NPS in determining eligibility and effects information for this undertaking, and we are continuing to consult with them. I understand that they will correspond with your office directly in the next few days.

I am seeking your concurrence on these determinations of eligibility and effect for Reclamation's section 106 compliance purposes. If I do not hear from you within 30 days, I shall assume your concurrence and proceed to the next step in the section 106 process which is resolution of effects pursuant to 36 CFR 800.6. If you have any questions, please contact Beverley Heffernan at 801-524-3712 or by email, bheffernan@usbr.gov.

Sincerely,

ja **CONCUR**
Ann G. Howard
 ARIZONA STATE HISTORIC PRESERVATION OFFICER
 ARIZONA STATE PARKS BOARD
 7-28-11

Larry Walkoviak

Larry Walkoviak
 Regional Director

Enclosure (CD containing 5 files)

IDENTICAL LETTER TO:

Dr. Alan Downer
 Navajo Tribal Historic Preservation Officer
 P.O. Box 4950
 Window Rock, AZ 86515

Mr. Todd Brindle, Superintendent
 Glen Canyon National Recreation Area
 P.O. Box 1507
 691 Scenic View Dr.
 Page, AZ 86040-1507

Mr. David Uberuaga, Superintendent
 Grand Canyon National Park
 PO Box 129
 Grand Canyon, AZ 86023

Appendix B. Summary of Responses to Public Comments on the Draft High Flow Experimental Protocol Environmental Assessment (HFE Protocol EA) for both comment periods January 14-March 18, 2011 and July 5-July 19, 2011, and on the Draft Finding of No Significant Impact (HFE Protocol FONSI) released to the general public on April 27, 2012.

These comments are composites from various reviews received on previous drafts of the HFE Protocol EA and on the draft HFE Protocol FONSI. Reclamation’s responses follow.

Comment	Response
<p>The High Flow Experimental Protocol EA and Non-native Fish Control EA should be combined into one EIS because the proposed action is a major federal action, there are important inadequately assessed interactions between dam operations and fish management, impacts to the endangered humpback chub (HBC) are large, and the experimental period through 2020 is too lengthy to be covered in an EA.</p>	<p>This comment has been addressed in the revised EAs. Reclamation has concurrently prepared two EAs related to the operation of Glen Canyon Dam and the fulfillment of obligations that arise from the Grand Canyon Protection Act (GCPA) and are being implemented through the Glen Canyon Dam Adaptive Management Program (GCDAMP). The HFE Protocol EA has a proposed action to develop and implement a high-flow experimental release protocol for Glen Canyon Dam operations, whereas the Non-native Fish Control EA (NNFC EA) has a proposed action to develop and implement non-native fish control in the Colorado River below Glen Canyon Dam. Both efforts are designed to include important research components, with the expectation that the actions will improve resource conditions, and thereby provide important additional information for future decision-making by Interior with input from stakeholders in the GCDAMP. Although both EAs relate to and are part of the overall GCDAMP, Reclamation has considered the content of both efforts and believes that it is appropriate to maintain separate National Environmental Protection Act (NEPA) processes because each activity under consideration serves a different and independent purpose, has independent utility, and includes very different on-the-ground activities and actions (rate, duration and timing of water releases as compared with non-native fish research, management and control actions).</p> <p>Reclamation has considered the most appropriate approach to NEPA compliance for these actions and has reached a conclusion in consideration of applicable NEPA regulations that it is not necessary or prudent to combine the EAs into a single NEPA document. Under NEPA’s implementing regulations, the question of whether the two actions must be analyzed in a single compliance document turns on whether the two actions are considered “connected actions,” “cumulative actions,” or “similar actions.” Pursuant to 40 C.F.R. § 1508.25(a)(1), connected actions are “closely related and therefore should be discussed in the same impact statement.” The regulations go on to provide that: “Actions are connected if they: (i)</p>

Comment	Response
	<p>Automatically trigger other actions which may require environmental impact statements. (ii) Cannot or will not proceed unless other actions are taken previously or simultaneously. (iii) Are interdependent parts of a larger action and depend on the larger action for their justification.” 40 C.F.R. § 1508.25(a)(1). Reclamation finds that the two proposed actions conveyed and analyzed in these EAs do not meet the standards identified in 40 C.F.R. § 1508.25(a)(1) and, therefore, an EIS that would combine the two actions is not required.</p>
<p>A separate cumulative effects analysis is needed for each EA.</p>	<p>This comment has been addressed in the revised HFE Protocol EA. The HFE Protocol EA describes the current environmental conditions in Glen, Marble, and Grand Canyons downstream from Glen Canyon Dam, and discloses the direct, indirect, and cumulative environmental impacts that could result from the proposed action and alternatives. It describes how the proposed action (i.e., protocol for high-flow experimental releases from Glen Canyon Dam) is designed to determine how sandbar building and sand conservation can best be achieved in the Colorado River corridor in Grand Canyon National Park and the impacts that would result from these high-flow releases.</p> <p>Reclamation does address the cumulative effects from both actions in the affected environment section of each EA, under the topical discussion for each resource (see appropriate sections, Chapter 3) and has properly considered the cumulative effects from these two actions, and other relevant related actions (see, e.g. Section 1.5 of the HFE Protocol EA), in both NEPA documents. No other actions beyond those evaluated in the HFE Protocol EA and the NNFC EA have been proposed that will affect the operation of Glen Canyon Dam during the period of the proposed HFE Protocol. Actions being undertaken by the National Park Service (NPS), in cooperation with Reclamation and the US Fish and Wildlife Service (USFWS), to remove non-native fish and translocate endangered humpback chub into tributary streams in Grand Canyon National Park are likely to improve the status of the endangered fish and help to offset any negative impacts from implementation of the HFE Protocol. In addition, Reclamation’s proposed action to implement non-native fish control in the Colorado River below Glen Canyon Dam will further reduce the potential impact of non-native fish on the endangered fish.</p>
<p>The MLFF should be analyzed as a cumulative effect for both the no action and proposed action alternatives.</p>	<p>This comment has been addressed in the revised HFE Protocol EA. The HFE Protocol EA is clear that the proposed action is focused on high-flow experimental releases from Glen Canyon Dam. During the course of the proposed action, the dam would be operated at all times in compliance with the MLFF preferred alternative for</p>

Comment	Response
	<p>monthly, daily, and hourly releases as identified in the 1996 Record of Decision on the Operation of Glen Canyon Dam and for annual releases with the 2007 Interior Record of Decision on Colorado River Interim Guidelines for Lower Basin Shortages and Coordinated Operations for Lake Powell and Lake Mead. Thus, MLFF releases will form the baseline dam operation for both the no action and proposed action alternatives, and there are no expected differences in cumulative effects attributable to MLFF between the no action and proposed action alternatives for both actions.</p> <p>MLFF has been evaluated under NEPA as part of several previous actions, beginning with the 1995 Environmental Impact Statement on the operation of Glen Canyon Dam and, most recently, the 2008 EA on experimental releases from the dam. MLFF has further been evaluated for its potential impacts on endangered species by the U.S. Fish and Wildlife Service (USFWS). Their determination for the two most recent proposed actions, which include continued operation of Glen Canyon Dam under MLFF with the inclusion of a protocol for high-flow experimental releases from Glen Canyon Dam and non-native fish control for the period through 2020, is that the actions are not likely to jeopardize the continued existence of the humpback chub, razorback sucker, or Kanab ambersnail and are not likely to destroy or adversely modify designated critical habitat for razorback sucker or humpback chub.</p>
<p>Reclamation has not resolved the adverse effects of the proposed action of implementing the HFE Protocol on cultural properties or completed tribal consultation on the proposed action.</p>	<p>Reclamation identifies in the HFE Protocol EA that mitigating measures were being developed to offset the direct, indirect, and cumulative impacts of the proposed action with the tribes per 36 CFR 800.6. Reclamation has remained committed to completing the process of resolving adverse effects with the American Indian Tribes and other interested parties prior to implementation of the proposed action. To fulfill that commitment Reclamation and Interior have worked with affected American Indian tribes and other agencies to address adverse effects to cultural properties and sacred sites. These efforts have culminated in Memoranda of Agreements that commit to actions that will be undertaken. These actions have been agreed to and agreements have been signed by the consulting parties.</p>
<p>The conclusion in both the HFE Protocol and Non-native Fish Control FONSI that taking of life associated with non-native fish control results in adverse impacts under NHPA should not be</p>	<p>Reclamation agrees with the comment and concurs that the adverse impact finding under NHPA does not constitute an independent basis for protecting the endangered fish. The adverse impact occurs as an indirect effect on historical properties covered by NHPA.</p>

Comment	Response
<p>regarded as implying the NHPA, in and of itself, provides an independent basis for protecting endangered fish.</p>	
<p>The HFE Protocol could result in increases of rainbow trout and the NNFC EA should analyze these potential effects.</p>	<p>The HFE Protocol EA identifies potential increases in rainbow trout from HFEs, particularly those that would occur in spring, and the NNFC EA considers these effects and identifies a set of control and research actions that would be undertaken if the decision is made to proceed. Reclamation recognizes the need to ensure that implementation of the HFE Protocol does not result in significant impacts to resources such as endangered humpback chub and will closely monitor both trout and chub populations to ensure that potential changes are monitored, detected, and analyzed as rapidly as possible. Reclamation will take a conservative approach and will reevaluate, and suspend if necessary, the protocol, if it anticipates that significant impacts could occur that cannot be mitigated. If a specific key resource is identified in decline, it is reasonable to expect that this will be detected through the monitoring program of the GCDAMP and fully and appropriately considered in the HFE decision-making process. The assessment of effects and the measures to address those effects were both revised as a result of public comments. The 2011 biological opinion on these proposed actions also identifies a set of conservation measures that would be undertaken to protect endangered species and would continue to improve knowledge of the interactions among dam operations, non-native fish predation on and competition with endangered fish, and the endangered fish responses to those effects. Finally, in consideration of scientific evidence that spring HFEs and sustained high spring flows can result in increased rainbow trout production, the HFE Protocol FONSI commits to not conduct spring HFEs until after 2014.</p>
<p>The analysis of potential economic effects of the proposed action should not rely on the 1995 EIS nonuse economic data.</p>	<p>The assessment of potential economic effects for the HFE Protocol was conducted for recreation resources and hydropower. The analysis for these resources was based on studies conducted by Reclamation and Western Area Power Administration, respectively. Effects to nonuse values were considered in the HFE Protocol EA, and a prior study developed as part of the 1995 EIS on Glen Canyon Dam Operations was referenced. Although the NPS is currently in the process of a new study of nonuse values for the park units along the Colorado River, which will likely update some of the findings of the 1995 study, the 1995 study and data were referenced in the EA because this information is the best available science.</p>
<p>Reclamation should clearly state that the 2007</p>	<p>This comment has been addressed in the revised EA by expanding the identification of the 2007 Colorado River Interim Guidelines in</p>

Comment	Response
Colorado River Interim Guidelines and ROD will not be affected by the proposed action.	several sections of the document. The EA makes it clear that under the proposed action, Glen Canyon Dam would continue to be operated under criteria adopted pursuant to the 1996 Record of Decision on operation of the dam and the 2007 Record of Decision on Colorado River Interim Guidelines for Lower Basin Shortages and Coordinated Operations for Lake Powell and Lake Mead.
Reclamation should explain the relationship of the proposed action to LTEMP.	This comment has been addressed in the revised EA by adding Section 1.3, Relationship between this EA and the Long-Term Experimental and Management Plan.
The effects of HFEs should be analyzed, and HFEs should not be conducted in the spring, to protect humpback chub. HFEs should be stopped if HBC decline.	This comment has been addressed in the revised HFE Protocol EA, the revised NNFC EA, the USFWS 2011 biological opinion, and the FONSI for both actions. The HFE Protocol EA commits to a review of resource status prior to any decision on implementing an HFE (see section 2.2.3 of the HFE Protocol EA), which would include a high emphasis on endangered species. Results of this review would be an integral part of the recommendation made by scientists and resource managers on whether or not to conduct an HFE. The NNFC EA contains commitments for additional mitigation and monitoring measures for non-native fish identified by Reclamation to offset any negative impacts from dam operations, including impacts from implementation of the HFE Protocol EA. These measures have further been identified in the 2011 USFWS biological opinion on the operation of Glen Canyon Dam. In consideration of scientific evidence that spring HFEs and sustained high spring flows can result in increased rainbow trout production, the HFE Protocol FONSI commits to not conduct spring HFEs until after 2014. This restriction in the proposed action does not constrain further research on fall HFEs and on non-native fish control actions that are intended to serve as mitigation for unintended increases in non-native fish, particularly rainbow trout. Reclamation has committed to consult with USFWS if scientific evidence emerges that the endangered HBC population is being affected by the proposed action. Reclamation also has identified that it may take immediate action to initiate non-native fish control actions if new information indicates there is a threat to HBC from increasing non-native fish numbers. It is important also to consider that HFEs are being conducted to better understand the relationships among dam operations, non-native fish, and the endangered HBC so that knowledge gained can be applied to ensure that the population will continue to thrive and increase in distribution and abundance.
The HFE Protocol EA is internally inconsistent in that it identifies adverse effects on HBC from the	The revised HFE Protocol EA identifies adverse effects on HBC as a finding under ESA Section 7 consultation. The assessment of impacts under NEPA is different, characterizing the consequences of the proposed action as having short-term negative impacts, but

Comment	Response
<p>proposed action, but also states the long-term consequences of the action are expected to be beneficial.</p>	<p>long-term beneficial effects. There are safeguards in the decision process leading up to each HFE which, when coupled with the extensive monitoring program conducted under the GCDAMP, will ensure that unanticipated consequences of HFEs are detected and incorporated into the decision process. The two findings, under ESA and NEPA, reflect the determination of effects under two separate laws.</p>
<p>Impacts to river runners from low flows less than 8,000 cfs and fluctuating flows on beaches are insufficiently identified. Although we see some merit to the rapid response concept, it lacks sufficient analysis in the HFE EA and a science plan must be developed prior to implementation. Sufficient advance warning must be given to river runners so that their safety is not compromised.</p>	<p>This comment has been addressed in the revised HFE Protocol EA. Dam operations will conform to the 1996 and 2007 Records of Decision identified above. There will be no change in the frequency or duration of low flows less than 8,000 cfs from implementing the HFE Protocol. Daily fluctuations in dam releases will conform to the 1996 Record of Decision and will not increase due to implementation of the HFE Protocol. Reclamation and the National Park Service have committed to development and implementation of a communication system to notify river runners and other recreationists of any decision to conduct an HFE. In particular, the rapid response approach to HFEs will not be implemented until a warning system is developed. As identified in the EA, an effective warning system will require coordination with dam operators and notices to anglers, boaters, rafters, and recreationists to ensure public safety. Consistent with commitments previously described in the HFE Protocol EA, Reclamation has begun analysis to address other remaining questions on the feasibility and safety of the “rapid response” approach. The first study to be completed and published by Reclamation investigated the feasibility of predicting a large flood event in the Paria River with existing data from two gaging stations for the period 2002-2010 (http://www.usbr.gov/uc/envdocs/reports/PariaRiverRapidResponse-Final.pdf). Following issuance of this FONSI, further analysis will be undertaken and reports will be released as they are peer reviewed and completed pursuant to fulfilling the EA commitments regarding assessment of the feasibility and safety of this approach.</p>
<p>The draft EA does not include target objectives, or desired future conditions. These desired future conditions would serve as the measuring stick as to whether future dam operations and water management actions are meeting their objectives and expectations.</p>	<p>The revised HFE Protocol EA identifies the process of reaching a recommendation on desired future conditions through the GCDAMP, and the FONSI indicates that the HFE Protocol implementation is an important step to determining the extent to which these conditions can be achieved. The process to arrive at the recommendation through the GCDAMP, with its depth of involvement by stakeholders representing a wide range of ideas on future resource conditions, has been instrumental in advising Interior of the vision the stakeholders hold for a future Colorado River ecosystem below Glen Canyon Dam. Monitoring conducted through the GCDAMP will help to ensure that stakeholders and the public are made aware of progress being made toward achieving</p>

Comment	Response
	these objectives and the role of the HFE Protocol implementation in those achievements.
Implementation of the HFE Protocol will have negative impacts on sand deposits and the aquatic food base in the GCNRA reach below Glen Canyon Dam.	The revised HFE Protocol EA acknowledges the potential for increased export rates of fine sediment and sand in the GCNRA because of the limited sediment inputs above the Paria River. At the same time, HFEs will help to maintain the coarse sediment composition in this reach that supports much of the aquatic food base. Impacts to the aquatic food base are expected to be largely short-term and, as has been evidenced in past HFEs, to result in improved quality of the fish food resource. A well-developed aquatic food base monitoring program will be implemented to determine whether successive HFEs have a larger impact than anticipated based on monitoring conducted during and following previous HFEs. Monitoring results will be incorporated into the resource assessment that will be conducted as part of the decision process for HFEs considered under the new protocol.
Impacts to hydropower from implementation of the HFE Protocol are inadequately assessed.	The revised HFE Protocol EA contains methods of estimating the impacts of HFEs to hydropower, both for loss of capacity and replacement of hydropower. The methods and assessment were developed by Western Area Power Administration, the agency that markets hydropower from Glen Canyon Dam. The evaluation considers the same hydrology and sediment scenarios as were used to project the magnitude, duration, and frequency of HFEs using the sediment budget modeling. Although some variation from these estimates certainly is possible in the future, the assessment that was conducted uses a well established approach and credible methods to estimate impacts to hydropower.