

SUMMARY

S.1 INTRODUCTION AND BACKGROUND

S.1.1 INTRODUCTION

The Secretary of the U.S. Department of the Interior (Secretary), acting through the U.S. Bureau of Reclamation (Reclamation), is considering the adoption of specific interim criteria under which surplus water conditions may be declared in the lower Colorado River Basin during an interim period that would extend through 2015. This Draft Environmental Impact Statement (DEIS) has been prepared to present the specific interim surplus criteria alternatives under consideration and to identify the potential environmental effects of implementing such criteria.

Reclamation is the lead Federal agency for the purposes of National Environmental Policy Act (NEPA) compliance in the development and implementation of the proposed interim surplus criteria. The National Park Service (NPS) and the United States Section of the International Boundary and Water Commission (USIBWC) are cooperating agencies for purposes of assisting with the environmental analysis.

The alternatives addressed in this DEIS are those Reclamation has determined would meet the purpose of and need for the project, and represent a reasonable range of alternatives. A preferred alternative has not been selected at this time.

S.1.2 PROPOSED FEDERAL ACTION

The proposed federal action is the adoption of specific interim surplus criteria pursuant to Article III(3)(b) of the *Criteria for Coordinated Long-Range Operation of the Colorado River Reservoirs Pursuant to the Colorado River Basin Project Act of September 30, 1968* (Long-Range Operating Criteria [LROC]). The interim surplus criteria would be used annually to determine whether the conditions exist under which the Secretary may declare the availability of “surplus” water, as defined, for use within the states of Arizona, California and Nevada. The criteria must be consistent with both the Decree entered by the U.S. Supreme Court in 1964 in the case of *Arizona v. California* (Decree) and the LROC. The interim surplus criteria would remain in effect through calendar year 2015, subject to five-year reviews, concurrent with the LROC reviews, and applied each year as part of the Annual Operating Plan (AOP).

S.1.3 BACKGROUND

The Colorado River serves as a source of water for irrigation, domestic and other uses in the Colorado River Basin States of Arizona, California, Colorado, Nevada, New Mexico, Utah and Wyoming (collectively referred to as “Basin States”) and in

the United Mexican States (Mexico). The Colorado River also serves as a source of water for a variety of recreational and environmental uses.

The Secretary is vested with the responsibility of managing the mainstream waters of the lower Colorado River pursuant to applicable federal law. This responsibility is carried out consistent with a collection of documents known as the *Law of the River*. Acting on behalf of the Secretary, Reclamation prepares an AOP for Colorado River reservoirs. The AOP describes how Reclamation will manage the reservoirs over a 12-month period, consistent with the LROC and the 1964 Decree. Reclamation consults annually with the Basin States, Indian Tribes and other parties as required by Federal Law in the development of the AOP. As part of the AOP process, the Secretary makes annual determinations regarding the availability of Colorado River water for deliveries to the Lower Division states of Arizona, California and Nevada.

The Secretary is required to determine when normal, surplus or shortage conditions occur in the lower Colorado River, based on various factors including storage and hydrologic conditions in the Colorado River Basin. Normal conditions exist when sufficient mainstream water is available to satisfy 7.5 million acre-feet (maf) of annual consumptive use in the Lower Division states. Surplus conditions exist when the Secretary determines that there is sufficient mainstream water available for release to satisfy consumptive use in the Lower Division states in excess of 7.5 maf annually. Shortage conditions exist when the Secretary determines that insufficient mainstream water is available to satisfy 7.5 maf of annual consumptive use in the Lower Division states.

S.1.4 PURPOSE OF AND NEED FOR THE ACTION

To date, on an annual basis, the Secretary has applied factors, including but not limited to those found in Article III(3)(b)(i-iv) of the LROC, in annual determinations of the availability of surplus quantities of water for pumping or release from Lake Mead. As a result of actual operating experience through preparation of AOPs, the Secretary has determined that there is a need for more specific surplus criteria, consistent with the Decree and applicable Federal law, to assist in the Secretary's annual decision making.

For many years, California has been diverting more than its 4.4 maf apportionment. Prior to 1996, California drew on unused apportionments of other Lower Division states made available by the Secretary. Since 1996, California has also drawn on surplus water made available by Secretarial determination. California is in the process of developing the means to reduce its annual use of Colorado River water to 4.4 maf. Arizona is approaching use of its apportionment and Nevada is expected to reach its apportionment in 2000.

Additionally, through adoption of specific surplus criteria, the Secretary will be able to afford mainstream users of Colorado River water, particularly users in California

who currently utilize surplus flows, a greater degree of predictability with respect to the likely existence, or lack thereof, of surplus conditions on the river in a given year. The surplus criteria may identify the specific amount of surplus water to be made available in a given year, based upon factors such as the elevation of Lake Mead. The increased level of predictability, both with respect to the prospective existence of surplus conditions and the potential quantity of water available on an annual basis, will assist planning and operations of the entities that receive surplus Colorado River water pursuant to contracts with the Secretary.

S.1.5 RELATED AND ONGOING ACTIONS

A number of ongoing and future actions by Reclamation and other entities are related to the development of interim surplus criteria and the analysis contained in this document. These actions include:

The California Colorado River Water Use Plan. California has formulated a plan to enable it to reduce its dependency on surplus Colorado River water. The plan (known as the California 4.4 Plan or the 4.4 Plan) contains numerous water conservation projects and intrastate water exchanges. The California 4.4 plan is related to the implementation of the interim surplus criteria. Implementation of the Plan will enable California to use no more than its 4.4-maf apportionment of Colorado River water during years when the Secretary determines via the AOP process that surplus conditions do not exist. California views the increased predictability of surplus water availability to be a precondition to the successful implementation of its plan. Similarly, the other six Basin States view successful implementation of the California 4.4 Plan as a precondition for the application of the interim surplus criteria.

Glen Canyon Dam Operations. Glen Canyon Dam is operated consistent with the Colorado River Storage Project Act and the LROC, which were promulgated in compliance with Section 602 of the Colorado River Basin Project Act of 1968. Glen Canyon Dam is also operated consistent with the 1996 Record of Decision (ROD) on the Operation of Glen Canyon Dam Final EIS, developed as directed under the Grand Canyon Protection Act of 1992.

Actions Related to the Biological and Conference Opinion on Lower Colorado River Operations and Maintenance. Reclamation prepared a Biological Assessment (BA) for effects of ongoing and projected routine lower Colorado River operations and maintenance (Reclamation, 1996). After formal consultation, a Biological and Conference Opinion (BCO) was issued by the United States Fish and Wildlife Service (Service) (Service, 1997). Pursuant to the reasonable and prudent alternative and the 17 specific provisions provided in the BCO, Reclamation is taking various conservation actions to benefit the riparian region of the lower Colorado River and associated species.

Lower Colorado River Multi-Species Conservation Program (LCRMSCP).

Following the designation of critical habitat for three endangered fish on nearly all of the lower Colorado River in April of 1994, the three Lower Basin states of Arizona, California and Nevada and Interior agencies, including Reclamation and the Service, initiated the LCRMSCP. The purpose of the LCRMSCP is to obtain long-term (50-year) Federal Endangered Species Act (ESA) compliance for both federal and non-federal water and power interests. Concurrently, Reclamation acquired interim (5-year) ESA compliance for its ongoing and projected routine water and power operations and maintenance activities via a 1996 BA (Reclamation, 1996) and a 1997 BCO (Service, 1997).

S.2 ALTERNATIVES

This DEIS considers four interim surplus criteria alternatives as well as a No Action Alternative (baseline) that was developed for comparison of potential effects. The four action alternatives considered are the Flood Control Alternative, Six States Alternative, California Alternative, and Shortage Protection Alternative. Additional alternatives were considered but eliminated from further analysis and summarized in this DEIS.

S.2.1 NO ACTION ALTERNATIVE AND BASELINE CONDITION

As required by NEPA, a No Action alternative must be considered during the environmental review process. The approach used in this DEIS for analyzing the hydrologic aspects of the interim surplus criteria alternatives involved using a computer model to simulate specific operating parameters and constraints. In order to follow Council on Environmental Quality (CEQ) guidelines calling for a No Action alternative for use as a “baseline” against which to compare project alternatives, Reclamation selected a specific operating strategy that represents possible future operating conditions in the absence of interim surplus criteria and could be described mathematically in the model, for use as a baseline condition.

The baseline condition uses a spill avoidance (75R) strategy. The “75R” notation refers to the value for which 75 percent of the historic natural flow at Lee Ferry is less than this value (18.1 maf). Spill avoidance strategies assume a particular percentile historical runoff, along with normal depletion projections, for the next year. Applying these values to the current reservoir storage, the projected reservoir storage at the end of the next year is calculated. If the calculated space available at the end of the next year is less than the space required by flood control criteria, then a surplus condition is determined to exist. The effect of simulating operations with the 75R strategy is that surplus conditions would exist only when Lake Mead is relatively full. The 75R strategy was selected and used for modeling because it represents the range of factors used as surplus criteria for recent operational decisions made by the Secretary.

S.2.2 FLOOD CONTROL ALTERNATIVE

Under the Flood Control Alternative, a surplus condition is determined to exist when flood control releases from Lake Mead are required. The method of determining need for flood control releases is based on flood control regulations published by the Los Angeles District of the United States Army Corps of Engineers (Corps). Under the Flood Control Alternative, the average triggering Lake Mead elevation is approximately 1211 feet above mean sea level (msl). When a flood control surplus is determined, surplus water would be made available for all established uses by contractors for surplus water in the Lower Division states.

S.2.3 SIX STATES ALTERNATIVE

The Six States Alternative has several tiers of Lake Mead water surface elevations for determining the availability of surplus water through 2015. The elevation ranges are coupled with uses of surplus water in such a way that, if Lake Mead's surface elevation were to decline, the permitted uses of surplus water would become more restrictive, thereby reducing delivery of surplus water.

The surplus determination elevations under the Six States Alternative consist of the following tiered Lake Mead water surface elevations, each of which is associated with certain stipulations on the purposes for which surplus water could be used.

- Tier 1 - 75R trigger line
- Tier 2 - 1145 feet msl
- Tier 3 - 1125 feet msl

S.2.4 CALIFORNIA ALTERNATIVE

The California Alternative specifies several tiers of Lake Mead surface elevations for determining the availability of surplus water through 2015. The elevation ranges are coupled with uses of surplus water in such a way that, if Lake Mead's surface elevation declines, the permitted uses of surplus water would become more restrictive, thereby reducing deliveries of surplus water.

The triggering Lake Mead elevations above which surplus conditions would be determined under the California Alternative would gradually increase through the year 2015 as indicated below:

Tier 1 - 1160 feet msl to 1166 feet msl

Tier 2 - 1116 feet msl to 1125 feet msl

Tier 3 - 1098 feet msl to 1102 feet msl

Under the California Alternative, each tier would be subject to adjustment during the interim period based on changes in Upper Basin demand projections or other factors during the five-year reviews or as a result of actual operating experience.

S.2.5 SHORTAGE PROTECTION ALTERNATIVE

The Shortage Protection Alternative is based on maintaining an amount of water in Lake Mead necessary to provide an annual Lower Division normal supply of 7.5 maf, 1.5 maf for Mexico, plus storage necessary to provide an 80 percent probability of avoiding future shortages.

S.2.6 MONITORING

The interim surplus criteria would be in effect through 2015, after which annual determinations of surplus conditions would revert to the current procedure. Under each of the alternatives, California's progress in achieving its intended goal of reducing dependence on surplus flows would be monitored during the interim period while surplus criteria are in effect. The continuation of the interim surplus criteria through 2015 may be contingent upon satisfactory progress.

S.3 AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

S.3.1 INTRODUCTION TO IMPACT ANALYSIS

Potential effects were evaluated based on modeling of potential future system conditions (summarized below). Modeling provided a range of potential future reservoir elevations, dam releases and river flows that were used to compare the alternatives to baseline conditions and to evaluate potential environmental effects. Due to unknown factors associated primarily with future system hydrology, the analysis is based upon probabilistic trends and ranges indicated by the modeling results.

S.3.2 POTENTIALLY AFFECTED AREA

Water supply to the states of Arizona, California and Nevada is achieved primarily through releases and pumping from Lake Mead. As a result of Lake Powell and Lake Mead equalization requirements, interim surplus criteria effects on Lake Mead surface elevations could also influence Lake Powell surface elevations. Consequently, the potentially affected area considered in this DEIS includes Lake Powell and Lake Mead, and the Colorado River downstream to the Northernly

International Boundary (NIB). Potential effects in Mexico are being considered in this DEIS.

S.3.3 ANALYSIS OF RIVER SYSTEM OPERATION

The analysis presented in this DEIS is based on a computer simulation of the operation of the Colorado River system under baseline conditions and the four interim surplus alternatives. The Colorado River Simulation System model implemented in the RiverWare modeling software was used for this purpose; this model has been used extensively in the past for Colorado River operation analyses. The model was configured to simulate the operation of the Colorado River system.

Reservoir Water Levels. The model results indicated that under baseline conditions, Lake Mead water levels are likely to decline over the 50-year period of analysis. This trend, indicated on Table S-1 by median water levels, is attributed to increasing Upper Basin depletions. Lake Powell water levels are also likely to decline during the first half of the period of analysis. However, this trend would likely end during the second half of the period of analysis and slightly reverse. The Flood Control Alternative would produce essentially the same potential for lower water levels as baseline conditions. The other three alternatives would result in increased potential for Lake Mead water levels to decline, with median elevations between 15 feet and 28 feet lower than the baseline by 2015, after which modeled median water levels are similar to the baseline. The corresponding difference in median Lake Powell elevations is 13 feet to 25 feet by 2015, with a similar gradual return to baseline levels following 2015.

The end-of-calendar year median water levels shown on Table S-1 are subject to the following interpretations. The tabulated values represent the medians of all water level fluctuations generated by the model for the year shown. Throughout each year, water levels generally fluctuate from month to month, producing a range of 15- to 20-foot surface elevation fluctuations. Consequently, the elevations would vary seasonally from the values listed in the table. Also, the reservoir levels would not change gradually over time, but would tend to fluctuate above and below the median elevations in response to variations in natural runoff

River Flows. River flows would be affected only to a minor degree by the implementation of the interim surplus criteria.

**Table S-1
Modeled End-of-Calendar Year Lake Mead and Lake Powell Water Levels
(Median Values in Selected Years)**

Alternative	Lake Mead (feet msl)				Lake Powell (feet msl)			
	2015	2025	2035	2050	2015	2025	2035	2050
Baseline Conditions	1171	1157	1143	1123	3663	3652	3654	3662
Flood Control Alternative	1171	1160	1145	1123	3664	3654	3654	3662
Six States Alternative	1156	1152	1142	1123	3650	3649	3653	3662
California Alternative	1147	1148	1142	1123	3642	3645	3653	3662
Shortage Protection Alternative	1144	1148	1142	1123	3638	3644	3653	3662

Note: Tops of spillway gates are: Hoover Dam – 1221 feet msl; Glen Canyon Dam – 3700 feet msl.

S.3.4 WATER SUPPLY

The future annual amounts of Colorado River water available to each of the Lower Division States under baseline conditions and the four alternatives were determined by the model. The demand projections of each state were input to the model to establish water supply objectives for the state corresponding to the three water supply conditions specified in the AOP—surplus, normal and shortage conditions. The results were expressed as the probability that various annual amounts of water would be available for consumptive use in each state. Generally, the results indicated that the Six States, California and Shortage Protection alternatives would provide three to eight years more of expected surplus deliveries than baseline conditions or the Flood Control Alternative through 2015.

Mexico would receive its Treaty apportionment of Colorado River water under baseline conditions and all alternatives. The average probability of Mexico receiving its surplus entitlement of 200,000 af during any given year of the interim surplus criteria period is highest under the Flood Control Alternative (approximately 37 percent). The lowest average probability occurs under the shortage protection alternative (approximately 30 percent). The average probabilities of surplus deliveries to Mexico during any given year of the interim surplus criteria period under the baseline conditions and the Six States and California alternatives are 34, 32, and 30 percent, respectively.

S.3.5 WATER QUALITY

The water quality analysis conducted for this DEIS addresses the salinity of the Colorado River and mainstream reservoirs, and the quality of Lake Mead water available at the Southern Nevada Water Authority (SNWA) intake at Saddle Island in Lake Mead.

Salinity effects were determined based on the median salinity values calculated by the operational model. Model results were not available for the flood control alternative. However, the results would be similar to baseline conditions. For the other alternatives, the effects of lower Lake Mead surface elevations result in salinity concentrations slightly lower at Hoover Dam and slightly higher at Imperial Dam, as compared to baseline conditions.

Assessment of potential effects on water quality of Lake Mead was qualitative, based on system modeling and limnological studies, and considered the effects of Las Vegas Wash inflow on the SNWA intake. The analysis considered the potential effects of reductions in Lake Mead surface elevations, volume and surface area that would have an increased potential to occur in the future under baseline conditions and each of the alternatives. Because contaminant dilution and lake water quality are directly proportional to lake volume, reduction in the volume of Lake Mead would likely have deleterious effects on lake water quality and, potentially, on water quality withdrawn by SNWA. These effects occur as a result of changes in mixing patterns in Boulder Basin. Given the hydrodynamics of Boulder Basin associated with the relatively confined nature of the embayment, effects of reduction in volume of Lake Mead would likely be disproportionately greater in Boulder Basin than in the lake as a whole. The Six States, California and Shortage Protection alternatives would each increase the potential for lowered water quality at the SNWA intake. The Flood Control Alternative would have potential for slightly higher water quality as compared with baseline conditions.

S.3.6 RIVERFLOW ISSUES

Three specific flow-related issues were analyzed based on specific release patterns from Glen Canyon and Hoover Dams: 1) BHBF releases from Glen Canyon Dam; 2) low steady summer flow releases from Glen Canyon Dam; and 3) flooding along the Colorado River downstream of Hoover Dam.

The potential for BHBF releases was essentially unaffected by the interim surplus criteria alternatives. Under the baseline, the prerequisite conditions for BHBF releases were found to decrease gradually over time, with an annual average occurrence of approximately one year in five until 2015 and one year in eight in the subsequent period through 2050. The alternatives would change the probability of occurrence by 1 or 2 percent.

The low steady summer flows were also essentially unaffected by the interim surplus criteria alternatives. All the alternatives would change the probability of occurrence by 1 or 2 percent.

The flood flows in the Colorado River downstream of Hoover Dam were affected to a minor degree by the interim surplus criteria alternatives. Flood flows were defined in terms of various flow rates above which flooding damages occur along the river. The lowest “threshold” flow rate at which flood damage occurs downstream of Davis Dam is 26,000 cubic feet per second (cfs). The lowest threshold rate at which flooding occurs downstream of Parker Dam is 19,500 cfs, which is less than the flow required to meet downstream summer requirements. The modeling runs indicate that through 2015, under baseline conditions and the Flood Control Alternative, there would be an approximate 13 percent probability that the threshold flows below Davis Dam would occur or be exceeded and a 14 percent probability that the threshold flows below Parker Dam would occur or be exceeded. Under the other three alternatives, the probabilities of the threshold flow rates occurring or being exceeded would be approximately 12 percent below Davis Dam and 13 percent below Parker Dam. The analysis accounted for future flow rates regardless of whether they would result from flood control operation or from peak summer water orders.

S.3.7 AQUATIC RESOURCES

The Aquatic Resources analysis considers the potential effects of changes in Lake Powell and Lake Mead surface elevations on lake habitat and sport fisheries. Modeling results indicate future habitat conditions at Lake Mead and Lake Powell will continue to be subjected to varying inflows and fluctuating lake levels. These conditions have resulted in lake habitat that is favorable to non-native species. Projections of increased potential for future reservoir surface declines in both Lake Powell and Lake Mead are not likely to result in substantial changes to lake habitat or sport fisheries under baseline conditions or any of the alternatives.

S.3.8 SPECIAL-STATUS SPECIES

The Special-Status Species analysis identifies potential effects to special-status plant, wildlife and fish species that could result from implementation of interim surplus criteria alternatives under consideration. Specifically, the section addresses only special-status species associated with Lake Powell, Lake Mead, the lower Grand Canyon along the Colorado River corridor, and the lower Virgin River. Consultation with the Service concerning federally-listed threatened and endangered species in these areas is ongoing.

Special-Status Plant Species. Although a number of special-status plant species occur within Glen Canyon National Recreation Area and the Lake Mead National Recreation Area, only four have been identified as occurring within the area potentially affected by Colorado River system changes associated with the interim

surplus criteria alternatives. These four species are Geyer's milkvetch, Grand Canyon evening primrose, Las Vegas bear poppy, and sticky buckwheat. Increased potential for reductions in Lake Mead elevations would likely result in a temporary increase of suitable beach habitat for these plant species around Lake Mead and in the lower Grand Canyon.

Special-Status Wildlife Species. Ten special-status wildlife species have been identified as having the potential to be affected by water level changes that may be associated with the interim surplus criteria. These species are Arizona Bell's vireo, California black rail, Clark's grebe, Cooper's hawk, elf owl, gilded flicker, Southwestern willow flycatcher, relict leopard frog, Yuma clapper rail and western yellow-billed cuckoo. Additional special-status wildlife species that occur from Glen Canyon Dam to the lower Grand Canyon (at approximately Separation Canyon) would either not be affected by interim surplus criteria or have been considered and are being monitored under the Glen Canyon Dam ROD (1996) and the Adaptive Management Program (AMP).

As the probability for reservoir levels to decline increases over time under baseline conditions and each of the alternatives, an increase in the amount of sediment exposed in the Lake Mead delta and Virgin River delta would temporarily create more favorable conditions for establishment of woody riparian habitat. An increase in riparian habitat in the Colorado and Virgin rivers immediately above Lake Mead and along the Lake Mead and Virgin deltas would potentially benefit Arizona Bell's vireo, Cooper's hawk, elf owl, gilded flicker, western yellow-billed cuckoo and Southwestern willow flycatcher as additional nesting habitat.

Additionally, increased potential for lower Lake Mead levels would also increase potential sediment exposure that may create suitable conditions for marsh vegetation to develop and/or expand. This would in turn increase the amount of habitat preferred for nesting by California black rail, Clark's grebe and Yuma clapper rail. In addition, an increase in emergent marsh vegetation would provide potential habitat for the relict leopard frog. However, marsh vegetation may only develop as suitable wildlife habitat if the water table did not fall below what is requisite for marsh plant species to establish.

Special-Status Fish Species. Special-status fish species considered in the analysis are bonytail, Colorado pikeminnow, flannelmouth sucker, humpback chub and razorback sucker. The analysis also considers various programs designed to aid in the conservation and recovery of endangered native species in the Colorado River basin. These programs include Section 7 consultation under the ESA, the AMP and ROD (1996), the LCRMSCP and the Upper Colorado and San Juan River Basin Recovery Implementation Programs for endangered fish. Designated critical habitat for all four of the native endangered fish species has been identified. Protection of these habitats is required by the ESA. These programs and protections would remain

in effect under baseline conditions and each of the interim surplus criteria alternatives. Current lake conditions are not favorable for recovery of endangered fish, and increased potential for lower lake levels under baseline conditions and each of the interim surplus criteria are not expected to adversely affect these conditions. Lower lake levels could result in increased amounts of sheltered riverine habitat.

S.3.9 RECREATION

The recreation analysis considers potential effects of changes in Lake Powell and Lake Mead water surface elevations on shoreline recreation, reservoir navigation, sport fishing, whitewater boating (at areas within the reservoirs' full pool elevations) and costs of relocating shoreline facilities. As discussed above, increased potential for lower reservoir levels over time would occur under baseline conditions and each of the alternatives.

Several marinas, boat ramps and other recreation facilities are located on the shorelines of Lake Powell and Lake Mead. Lower reservoir elevations would require that shoreline recreation facilities be modified to accommodate continued use. It is anticipated that most facilities could undergo such modifications, and facility closures would not be expected. Lower Lake Powell and Lake Mead water levels could increase boating hazards through emergence of obstructions or reduced access to certain areas. Lower elevations could also affect the ability for whitewater boaters to access certain boat takeout locations at the upper ends of the two reservoirs. The Flood Control Alternative would have the lowest probability of lower reservoir elevations, with baseline conditions being only slightly higher. The Six States, California and Shortage Protection alternatives would have increasing probabilities (in the order listed) compared with baseline conditions for lower reservoir elevations to occur.

Potential effects on sport fishing in Lake Powell and Lake Mead were also considered. However, as discussed above, adverse effects on reservoir sport fisheries are not expected to occur as a result of lower reservoir levels. As such, effects to sport fisheries would not be expected to result from the implementation of the interim surplus criteria alternatives.

S.3.10 ENERGY RESOURCES

The Energy Resources analysis considers potential changes in hydropower production from Hoover Dam and Glen Canyon Dam and potential increases in energy requirements of the Southern Nevada Water System Lake Mead intake.

Hydropower Production. Annual average generating capacity and energy available from Glen Canyon Dam and Hoover Dam were determined using reservoir elevation and energy output quantities from system modeling, and the powerplant capability curves. The Six States Alternative, California Alternative, and Shortage Protection

Alternative would each allow for more energy production in the initial 15 years as compared with baseline, with the Flood Control Alternative producing slightly less energy than baseline conditions. In general, power customers could expect little change in electrical energy costs as a result of the interim surplus criteria alternatives under consideration. The quantities of capacity needed to replace the reductions are not significant when compared to the total capacity installed in the three Western States Coordinating Council regions in which power from the dams is sold.

Southern Nevada Water System Pumping Costs. Changes in pumping costs could occur as a result of potential differences in Lake Mead surface elevations under the alternatives as compared with baseline conditions. Estimates of pumping costs assumed a \$28,000 per year per foot increased cost associated with increases in net effective pumping head. Using these estimates and model output for the initial 15-year period of analysis, the Flood Control Alternative would result in average annual pumping costs \$34,909 lower than baseline conditions; the Six States Alternative would result in average annual pumping costs \$164,334 higher than baseline conditions; the California Alternative would result in average annual pumping costs \$249,828 higher than baseline conditions; and the Shortage Protection Alternative would result in average annual pumping costs \$281,973 higher than baseline conditions.

S.3.11 AIR QUALITY

The Air Quality analysis considers potential increases in fugitive dust emissions that could occur as a result of lower reservoir surface elevations and increased exposure of reservoir shoreline. Although each of the alternatives would result in increased potential for lower reservoir levels (as discussed in Section S.3.3, above), substantial increases in fugitive dust emissions are not expected under baseline conditions or any of the alternatives. Due to soils composition, Lake Powell and Lake Mead shorelines are expected to have a relatively low potential for fugitive dust emissions. However, delta areas are expected to have a higher potential for fugitive dust emissions when compared with other areas surrounding the reservoirs.

S.3.12 VISUAL RESOURCES

The visual resources of concern consist of the scenic vistas at Lakes Powell and Mead with their surroundings in the Lake Powell and Lake Mead Recreation Areas. These areas hold a great attraction for the public seeking water-based recreation opportunities, and the vistas formed by the combination of large water areas in contrast to the surrounding red-rock or other desert terrain add to that attraction. As described above in Section S.3.3, lower water levels are projected at both reservoirs in the future. Declines in water level will expose gravel margins or white calcium carbonate deposits along the shorelines when the reservoir levels decline which will detract from the scenic qualities. Compared to baseline conditions and the Flood

Control Alternative, these effects would occur sooner under the Six States, California, and Shortage Protection alternatives.

S.3.13 CULTURAL RESOURCES

Cultural resources relevant to the operation of the Colorado River System include prehistoric and historic districts, sites, buildings, structures, objects and landscapes within reservoir areas and along the river downstream of Glen Canyon Dam. Since filling in 1980, Lake Powell water surface elevations have fluctuated between 3708 and 3612 feet, and since 1940, Lake Mead has fluctuated between 1225 and 1083 feet. Sites located between these elevations have been repeatedly inundated and exposed. These sites can be expected to have suffered moderate to severe levels of inundation damage and are unlikely to have qualities that would qualify them for consideration as historic properties eligible for listing on the National Register of Historic Places. In addition, minor changes in flow of the Colorado River do not have the potential to affect historic properties along the river, since flow rates are projected to be lower than historically, and the river is typically entrenched or confined to its channel by a system of levees. Thus, Reclamation considers development and implementation of interim surplus criteria to be an undertaking without the potential to affect historic properties.

S.3.14 ENVIRONMENTAL JUSTICE

This analysis addresses the fair treatment of people of all races, income and cultures with respect to the development, implementation and enforcement of environmental laws, regulations and policies. No minority or low-income communities are expected to be affected in any disproportionate way as a result of any of the action alternatives considered in this DEIS.

S.3.15 INDIAN TRUST ASSETS

Indian trust assets relevant to the interim surplus criteria consist primarily of the water supplies available to Indian tribes in two geographic groups. The first consists of tribes whose reservations are along the Colorado River and various tributaries and who are members of the Ten Tribes Partnership. The supply of Colorado River water available to these tribes would not be affected by the interim surplus criteria because their water rights have priorities sufficiently early in time. The second group consists of various Indian reservations and communities in central Arizona that obtain Colorado River water through the Central Arizona Project (CAP) system. This group obtains Colorado River water under contractual rights that have a CAP priority. Consequently, these tribes and communities may face shortages when shortage conditions reduce the amount of water available for diversion by CAP, depending on the effects of shortage condition on CAP.

Based on the modeling assumptions used for this analysis, the following effects were estimated. Under baseline conditions and the Flood Control Alternative, the central Arizona tribes may experience shortages in approximately 10 of the years through 2050. The shortages would occur in the latter part of the period of analysis. Under the Six States Alternative, shortages would occur in approximately 11 years. Under the California and Shortage Protection alternatives, shortages would occur in approximately 12 years.

S.3.16 TRANSBOUNDARY IMPACTS

Through coordination with the USIBWC, informational presentations were made to the National Water Commission of Mexico and other representatives of Mexico, and Mexico conveyed its concerns to the USIBWC and Reclamation. As discussed above in Sections S.3.3 and S.3.4, the effects of the interim surplus criteria on water delivery to Mexico and river flow in Mexico were analyzed together with those in the United States. The potential effects of changes in river flow in Mexico include potential effects on special-status waterfowl and fish species of the Gulf of California.

S.4 OTHER NEPA CONSIDERATIONS

S.4.1 INTRODUCTION

Other issues addressed in this DEIS pursuant to NEPA include cumulative impacts, the relationship between short-term uses of the environment and long-term productivity, and irreversible and irretrievable commitments of resources.

S.4.2 CUMULATIVE IMPACTS

Ongoing activities that influence Colorado River system conditions were incorporated into the modeling. Assumptions of future actions were developed and also incorporated into the modeling. Consequently, the effects identified in this DEIS (as summarized above) are considered to be inclusive of other present and future actions and, therefore, also represent potential cumulative effects.

S.4.3 RELATIONSHIP BETWEEN SHORT-TERM USES OF THE ENVIRONMENT AND LONG-TERM PRODUCTIVITY

The resources that may be affected in the short term would primarily be those affected by lower reservoir levels. The Flood Control Alternative would result in insignificant changes in reservoir levels from baseline conditions. The other three alternatives would tend to cause average water levels lower than baseline conditions by 2015 and for a limited period of time thereafter. This is because those three alternatives would have a greater probability of surplus water than the Flood Control Alternative or baseline. Long-term benefits that would be realized due to interim

surplus criteria would include increased opportunities for making more efficient use of Colorado River water supplies.

S.4.4 IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES

The application of interim surplus criteria would include reviews at five-year intervals to consider the workability of the criteria in light of the multiple purposes served by the operation of the Colorado River system, including environmental maintenance. Based on those reviews, interim surplus criteria could be revised or eliminated as needed. If the State of California fails to meet its water conservation and management goals throughout the stipulated term of implementation of the criteria (through 2015), the Secretary may choose to terminate the interim criteria and revert to the current method. After 2015, determinations of the availability of surplus will revert to the current method.

None of the resources assessed in this DEIS would experience a deterioration in condition such that the resource would be destroyed or removed as a result of the adoption of the proposed surplus criteria, or under the baseline conditions. There would be no construction of facilities needed to facilitate the Secretary's determination of surplus water under the criteria.

All of the resources assessed in the DEIS would continue to be available for production or use under any of the alternatives. However, application of the interim surplus criteria may result in a determination for any given year that surplus water is available from the Colorado River. That water may not have been determined to be surplus in the absence of the proposed interim surplus criteria. Although water is a renewable resource, the delivery of surplus water under all of the alternatives, including no action, would irretrievably commit (to beneficial consumptive uses) the water declared to be surplus.

S.5 CONSULTATION AND COORDINATION

Reclamation conducted an active public involvement program for the formulation of the interim surplus criteria alternatives and development of this DEIS. The process began with a series of regional public scoping meetings to explain the need for and formulation process of the interim surplus criteria, and to obtain public input to the process. These meetings were held in four cities in the Colorado River Basin and were publicized by Federal Register notices, regional newspaper releases and letters to agencies and members of the general public. As cooperating agencies, the NPS and the USIBWC were included in the process of organizing the DEIS.

Reclamation also coordinated various issues involved in this DEIS with representatives of the Service, Bureau of Indian Affairs, Environmental Protection Agency, the Ten Tribes Partnership, other tribes, the Upper Colorado River

Commission, the water resources departments of Basin States and environmental groups. In addition to the above coordination, Reclamation has, through the guidance of the USIBWC, presented the proposed alternatives and its preliminary analysis of effects on water supply and river operation to the government of Mexico and has invited Mexico to provide an analysis of potential impacts in Mexico.

Federally-listed threatened and endangered species are the subject of a separate Section 7 consultation under the ESA. For the purposes of NEPA compliance, other species of concern to states are included in the DEIS. Should the ESA consultation identify other information or effects, they will be fully addressed in the FEIS. The FEIS will include the Service's determination on the interim surplus criteria.