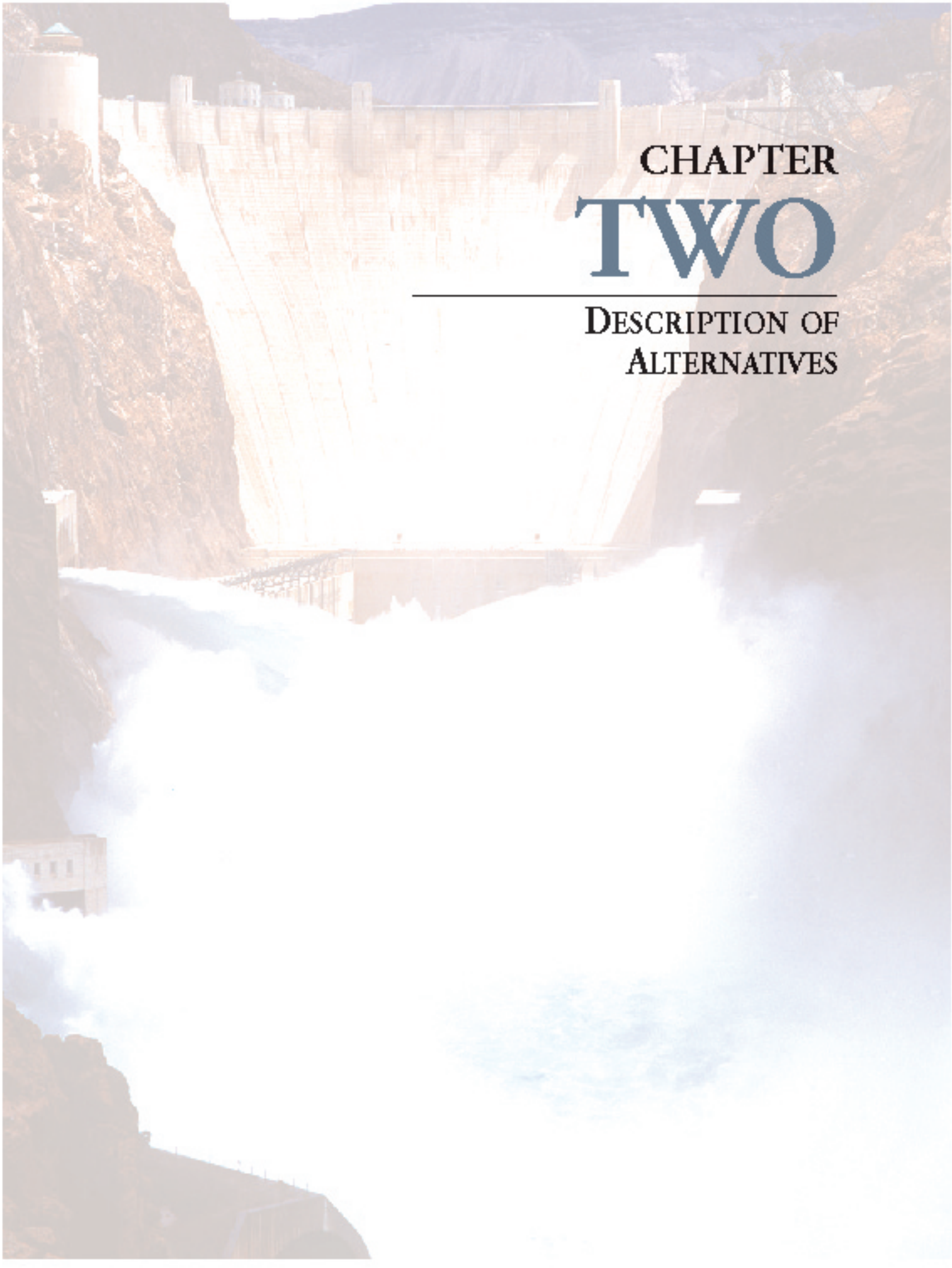


CHAPTER TWO

DESCRIPTION OF ALTERNATIVES

2 DESCRIPTION OF ALTERNATIVES

2.1 INTRODUCTION

This chapter discusses the process used to define the No Action Alternative and develop a range of reasonable interim surplus criteria alternatives, and summarizes various alternatives that were considered but eliminated from further analysis. It then describes the alternatives analyzed in this FEIS. Modeling procedures and assumptions used to analyze the alternatives are discussed in Section 3.3. The end of this chapter presents a table of effects of all alternatives.

2.2 DEVELOPMENT OF ALTERNATIVES

This FEIS considers five interim surplus criteria alternatives as well as a No Action Alternative/baseline that was developed for comparison of potential effects. The five action alternatives considered include the Basin States Alternative (preferred alternative), the Flood Control Alternative, the Six States Alternative, the California Alternative, and the Shortage Protection Alternative (as described in Section 2.3). Section 2.2.1 discusses the strategies and origins of the action alternatives and describes alternatives that were considered but eliminated from further analysis.

2.2.1 OPERATING STRATEGIES FOR SURPLUS DETERMINATION

2.2.1.1 THE R STRATEGY

In 1986, Reclamation developed an operating strategy for distributing surplus water and avoiding spills (Reclamation, 1986). That analysis established the Spill Avoidance or "R" strategy. The development of this strategy was an outcome of sustained flood control releases at Lake Mead from 1983 through 1986. The R strategy assumes a particular percentile historical runoff, along with normal 7.5 maf delivery to Lower Division states, for the next year. Applying these values to 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.

Two alternatives considered in this FEIS use variations of the R strategy. The 70R strategy uses an annual runoff of 17.4 maf whereas the 75R strategy uses 18.1 maf. The 70R strategy was used to represent the baseline as described in Section 2.3.1.

2.2.1.2 THE A STRATEGY

In the early and mid-1990s, Reclamation continued discussing surplus criteria strategies with the Colorado River Management Work Group (CRMWG), which formed a technical committee was formed to investigate additional surplus criteria strategies.

One of the strategies developed through the CRMWG analysis was the Flood Control avoidance or "A" strategy. This strategy determines when there is insufficient storage space in Lake Mead and upstream reservoirs, in order to avoid flood control releases from Lake Mead with a particular percent assurance.

The most common usage became the 70 percent assurance level (70A strategy). This alternative was eliminated because the modeling results were so similar to the Flood Control Alternative and the No Action/baseline (70R strategy) that it was not necessary to analyze it.

2.2.1.3 THE P STRATEGY

Another strategy is the Shortage Protection or "P" strategy. This strategy is based on making surplus water available while maintaining storage sufficient to meet a 7.5 maf Lake Mead release requirement, while avoiding the likelihood of a future shortage determination at a specified assurance level. Through a separate modeling study, Reclamation determined the Lake Mead storage needed in each future year to meet Lower Basin and Mexico demands, with a specified percent assurance that Lake Mead would not drop below a specified elevation. Water stored in Lake Mead in excess of that storage requirement is deemed surplus to be made available to the Lower Basin states. The Shortage Protection Alternative used in this FEIS, commonly referred to as the 80P strategy, is described in more detail in Section 2.3.6.

2.2.1.4 FLOOD CONTROL STRATEGY

Under a flood control strategy, surplus conditions are determined only when flood control releases from Lake Mead are occurring or projected to occur in the subsequent year. In the 1998, 1999 and 2000 Annual Operating Plans (AOPs), Reclamation used the projection of flood control releases as the basis for making surplus water available to the Lower Division States. The Flood Control Alternative in this FEIS uses this strategy and is described in Section 2.3.3.

2.2.2 ORIGINS OF THE CALIFORNIA, SIX STATES, AND BASIN STATES ALTERNATIVES

On December 17, 1997, California presented to the other Basin States its draft 4.4 Plan (CRBC, 1997), a plan to achieve a reduction in its dependence on surplus water from the Colorado River, through various conservation measures, water exchanges and conjunctive use programs. One of the elements of the draft 4.4 Plan was the expectation that the Secretary would continue to determine surplus conditions on the Colorado River until 2015. California proposed criteria on which the Secretary would base his determinations of surplus conditions during the interim period.

In 1998, in response to California's 1997 proposal of interim surplus criteria, the other six states within the Colorado River Basin (Six States) submitted a proposal with

surplus criteria that were similar in structure to those in California's proposal. Under the proposal from the Six States, use of surplus water supplies would be limited depending on the occurrence of various specified Lake Mead surface elevations. The interim surplus criteria proposed by the Six States, presented in Attachment E, were used to formulate the "Six States Alternative" presented in Section 2.3.4.

California subsequently proposed specific interim surplus criteria which were attached to the October 15, 1999 *Key Terms for Quantification Settlement Among the State of California, Imperial Irrigation District, Coachella Valley Water District, and Metropolitan Water District of Southern California* (See Attachment F). California also updated, renamed and re-released its 4.4 Plan in May 2000. The revised plan is now known as the California Colorado River Water Use Plan (CA Plan). The interim surplus criteria proposal stemming from the CA Plan and Quantification Settlement was used to formulate the "California Alternative" detailed in Section 2.3.5.

In July 2000, during the public comment period on the DEIS, Reclamation received a draft proposal for interim surplus criteria from the seven Colorado River Basin States (Seven States). After a preliminary review of that proposal, Reclamation published it in the August 8, 2000 *Federal Register* for review and consideration by the public during the public review period for the DEIS. Reclamation published minor corrections to the proposal in a *Federal Register* notice of September 22, 2000. Copies of the *Federal Register* notices are in Chapter 5. Reclamation derived the Basin States Alternative in this FEIS from the draft Seven States Proposal.

2.2.3 PACIFIC INSTITUTE PROPOSAL

On February 15, 2000, a consortium of environmental organizations led by the Pacific Institute for Studies in Development, Environment and Security (Pacific Institute) presented an interim surplus criteria proposal for consideration by the Secretary. Their proposal (as clarified by the Pacific Institute's September 8, 2000 letter of comment on the DEIS), contains interim surplus criteria that are similar to the criteria in the Six States Alternative with respect to Lower Basin surplus determinations. The proposal and excerpts from the September 8 letter are included as Attachment G to this FEIS. The Pacific Institute Proposal also suggested that, during years when Lake Mead's surface elevation exceeds 1120.4 feet mean sea level (msl), at least 32,000 af of additional water (i.e. water in excess of Mexico's treaty deliveries) be delivered to Mexico for the purpose of restoring and/or maintaining habitat in the upper reaches of the Colorado River delta. The proposal also included 260,000 af of additional water to be delivered to the Colorado River delta for ecological restoration purposes when reservoir elevations are high.

This proposal is beyond the purpose and need for the proposed action because it would expand the proposed action by prescribing releases of Colorado River water stored in Lake Mead to Mexico. The proposed adoption of surplus criteria for use in Arizona, California and Nevada does not, by definition, apply to determinations of surplus to the

United Mexican States (Mexico). Water delivery to Mexico is governed by the United States-Mexico Water Treaty of 1944. Releases of water to Mexico are not addressed by Section III(3) of the LROC or Article II(B)(2) of the Decree and are therefore not part of the proposed action analyzed in this EIS. From its initiation of this proposed action on May 18, 1999, Reclamation has clearly stated that its undertaking was intended to "identify those circumstances under which the Secretary of the Interior ("Secretary") may make Colorado River water available for delivery to the States of Arizona, California, and Nevada …." (64 *Federal Register* 27008, May 18, 1999). The proposed action only involves determinations of domestic surplus conditions pursuant to Article III(3) of the LROC (64 *Federal Register* 27009). Section 1.1.4 of the DEIS (page 1-4) states that "This proposed action is not intended to identify conditions when Mexico may schedule [its] 0.2 maf [surplus under Article 10(b) of the Treaty]." The United States, in its consultation with Mexico conducted through the Department of State, has consistently informed Mexico that the proposed action does not address determinations of surplus conditions to Mexico under the 1944 Treaty, and is limited to declarations of surplus conditions for the Lower Division states.

In addition to changing and expanding the proposed action in a manner inconsistent with the purpose and need for the action, the Pacific Institute's proposed alternative would also require that Reclamation make releases of water from Lake Mead to Mexico in a manner that is inconsistent with the mandatory injunction issued to the Secretary by the United States Supreme Court in Article II of the Arizona v. California Decree (1964). Pacific Institute's proposal calls for releases of water from Lake Mead in excess of the amount of water that would be released to Mexico "in satisfaction of [the United States] obligations to the United States of Mexico under the treaty dated February 3, 1944 …." Reclamation does not believe that the range of reasonable alternatives includes alternatives that would violate the United States Supreme Court's Decree and injunction. For the foregoing reasons, Reclamation concluded that the proposed alternative was not a reasonable alternative and it accordingly was not analyzed in this EIS.

Because the Lower Basin surplus determinations of the Pacific Institute's proposed interim surplus criteria are similar to, and within the range of, those contained in the alternatives already being analyzed, and because the proposed delivery of additional water to Mexico is beyond the purpose and need for interim surplus criteria, the Pacific Institute's proposal is not analyzed in this FEIS.

2.2.4 FORMULATION OF ALTERNATIVES

In response to the CA Plan and the Six States proposal, and the dialogue among Reclamation and the seven Basin States, Reclamation initiated a NEPA process to provide structure to evaluating potential interim surplus criteria alternatives and to determine and disclose the potential effects of these interim surplus criteria. At the initiation of the NEPA process, Reclamation began a public scoping process. Under that process, Reclamation conducted a series of public meetings in 1999 to inform

interested parties of the consideration being given to the development of interim surplus criteria, to show options and proposals developed up to that time, and to solicit public and agency comments and suggestions regarding the formulation and evaluation of alternatives for the criteria.

The alternatives below were presented at the public meetings:

Flood Control Alternative
Spill Avoidance Alternative (70R)
Flood Control Avoidance Alternative (70A)
Multi-tier Alternative (based on the Six States Plan)
Shortage Protection Alternative (80P)

The scoping process and issues identified, including those associated with alternatives development, are discussed in Chapter 5 of this FEIS. Following the scoping meetings, and in consideration of comments received, Reclamation included the interim surplus criteria proposals of the Six States and California for evaluation in the DEIS. It should be noted that while the California and Six States alternatives analyzed in the DEIS and in this FEIS were based on criteria proposed by California and the Six States, the respective alternatives presented in this FEIS do not contain all the specific elements of those plans.

The draft Seven States proposal was discussed informally with the public during the public review period for the DEIS, and was the subject of comment in various letters received by Reclamation in response to the DEIS and the *Federal Register* notice of the proposal. Based on these discussions and comments, Reclamation formulated an alternative based on the Seven States proposal and identified it as the preferred alternative (the Basin States Alternative herein). It should be noted that the Basin States Alternative presented in this FEIS does not contain all the specific elements of the draft Seven States proposal.

2.2.5 UTILIZATION OF PROPOSALS FROM THE BASIN STATES

As discussed in Section 2.2.2, various proposals submitted by individual Colorado River Basin states or groups of states were used by Reclamation to formulate interim surplus criteria alternatives. In recognition of the need to limit the delivery of surplus water at lower Lake Mead water levels, these proposals specified allowable uses of surplus water at various triggering levels.

The Secretary will continue to apportion surplus water consistent with the applicable provisions of the Decree, under which surplus water is divided 50 percent to California, 46 percent to Arizona, and 4 percent to Nevada. The Secretary also intends to appropriately report the accumulated volume of water delivered to MWD under surplus conditions. The Secretary also intends to honor any forbearance arrangements made by

various parties for the delivery of surplus water or reparations for future shortage conditions.

2.2.6 NO ACTION ALTERNATIVE AND BASELINE CONDITION

As required by NEPA, a No Action alternative must be considered during the environmental review process. Under the No Action Alternative, determinations of surplus would continue to be made on an annual basis, in the AOP, pursuant to the LROC and the Decree as discussed in Chapter 1. The No Action Alternative represents the future AOP process without interim surplus criteria. Surplus determinations consider such factors as end-of-year system storage, potential runoff conditions, projected water demands of the Basin States and the Secretary's discretion in addressing year-to-year issues. However, the year-to-year variation in the conditions considered by the Secretary in making surplus water determinations makes projections of surplus water availability highly uncertain.

The approach used in this FEIS for analyzing the hydrologic aspects of the interim surplus criteria alternatives was to use a computer model that simulates specific operating parameters and constraints. In order to follow 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 for use as a baseline condition, which could be described mathematically in the model.

The baseline is based on a 70R spill avoidance strategy. Reclamation has utilized a 70R strategy for both planning purposes and studies of surplus determinations in past years. When Reclamation reviewed previous surplus determinations as part of the DEIS effort, the data indicated that the 1997 surplus determination did not precisely fit the 70R strategy. As a result, Reclamation selected the 75R strategy as representative of recent operational decisions, for use as the baseline condition in the DEIS. However, based on further review and analysis, public comment, and discussion with representatives of the states during the DEIS review period, Reclamation is using the 70R strategy for the baseline condition in this FEIS. While the 70R strategy is used to represent baseline conditions, it does not represent a decision by Reclamation to utilize the 70R strategy for determination of future surplus conditions in the absence of interim surplus criteria. It should be noted that the 70R strategy and 75R strategy yield very similar results for the purpose of determining impacts associated with the action alternatives analyzed in this FEIS. Figure 2-1 illustrates the close relationship between the 70R and 75R trigger lines (see Section 2.3.1.2).

2.3 DESCRIPTION OF ALTERNATIVES

This section describes the five interim surplus criteria alternatives analyzed in this FEIS, and No Action, which is represented by the baseline condition for comparison purposes. The Secretary would base his annual determination of surplus conditions on the criteria selected, if any, as part of the AOP process unless extraordinary

circumstances arise. Such circumstances could include operations necessary for safety of dams or other emergency situations, the failure of California to meet its commitment to reduce dependence on Colorado River water, or other activities arising from actual operating experiences. The interim surplus criteria would remain in effect for surplus determinations made through calendar year 2015, subject to five-year reviews concurrent with the LROC reviews. As noted in Section 1.4.1, implementation of interim surplus criteria would take into account the progress, or lack thereof, in the implementation of the CA Plan.

As noted above, the 70R operating strategy is not presented as an alternative for adoption. If an interim surplus criteria alternative is not implemented, the Secretary would determine surplus conditions using the same dynamic considerations currently used in the AOP.

Subsequent to the surplus determination for 2016, the interim surplus criteria would terminate and, in the absence of subsequently-specified surplus criteria, surplus determinations would be made by future Secretaries based on factors such as those that are considered in the AOP, as discussed in Chapter 1.

Because the selected baseline and the interim surplus criteria alternatives deal with operations, rather than construction or other physical Colorado River system changes, the alternatives are described below in terms of their operating rules. The Department and Reclamation intend to deliver water in accordance with Article II(B)2 of the Decree. The estimated volumes of surplus water projected to be available each year under baseline conditions and each alternative are tabulated to demonstrate the operation under the respective conditions. The projected volumes of surplus water vary over the interim period in response to various factors including the implementation of various components of the CA Plan.

A common element of all alternatives is that in years in which the *Field Working Agreement between the Bureau of Reclamation and the Army Corps of Engineers for Flood Control Operation of Hoover Dam and Lake Mead* requires releases greater than the downstream beneficial consumptive use demands, the Secretary shall determine a "flood control surplus" will be declared in that year. In such years, releases will be made to satisfy all beneficial uses within the United States (see the estimated amounts under Flood Control for each alternative), and up to an additional 200,000 af will be made available to Mexico under the Treaty.

2.3.1 NO ACTION ALTERNATIVE AND BASELINE CONDITION

2.3.1.1 APPROACH TO SURPLUS WATER DETERMINATION

As discussed above in Section 2.2.6, the 70R operating strategy is being used as a baseline to show possible future operating conditions in the absence of interim surplus criteria. The primary effect of simulating operation with the 70R operating strategy

would be that surplus conditions would only be determined when Lake Mead is nearly full.

2.3.1.2 70R BASELINE SURPLUS TRIGGERS

The 70R baseline strategy involves assuming a 70-percentile inflow into the system subtracting out the consumptive uses and system losses and checking the results to see if all of the water could be stored or if flood control releases would be required. If flood control releases would be required, additional water is made available to the Lower Basin states beyond 7.5 maf. The notation 70R refers to the specific inflow where 70 percent of the historical natural runoff is less than this value (17.4 maf) for the Colorado River basin at Lee Ferry.

The 70R strategy is illustrated on Figure 2-1, which shows the average trigger elevation of Lake Mead's water surface above which a surplus would be determined. In practice, the 70R surplus determination would not be based on the trigger line shown, but would be made during the fall of the preceding year using projected available system space.

The 70R trigger line rises from approximately 1199 feet msl in 2002 to 1205 feet msl in 2050. The gradual rise of the 70R trigger line shown in Figure 2-1 is the result of increasing water use in the Upper Basin. Under baseline conditions, when a surplus condition is determined to occur, surplus water would be made available to fill all water orders by holders of surplus water contracts in the Lower Division states in estimated amounts on Table 2-1.

Figure 2-1
Baseline Surplus Trigger Elevations

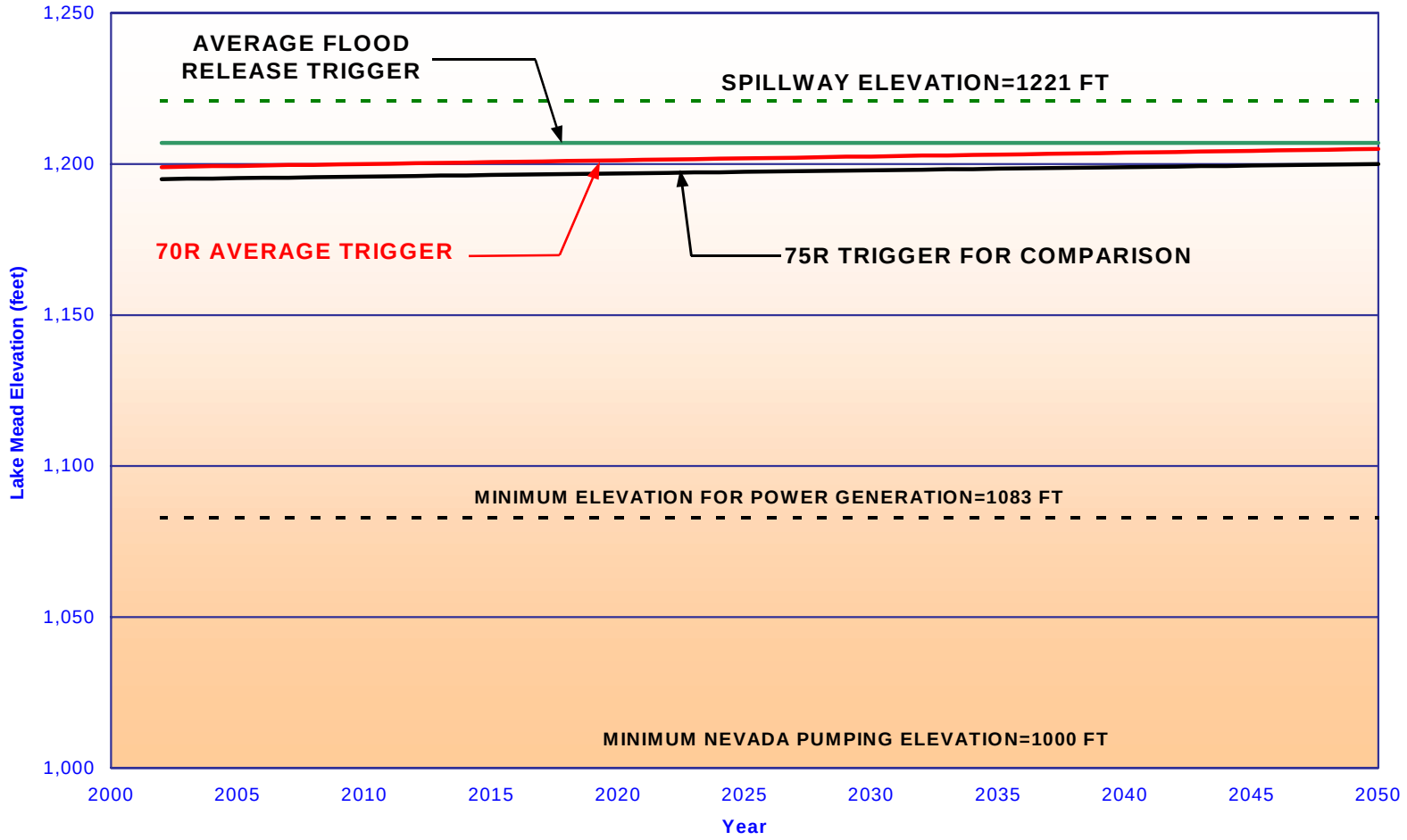


Table 2-1
Baseline Potential Surplus Water Supply
Unit : thousand acre-feet (kaf)

Year	Flood Control	70R Trigger
2002	1350	1350
2003	1350	1350
2004	1350	1350
2005	1350	1350
2006	1400	1400
2007	1450	1450
2008	1500	1500
2009	1550	1550
2010	1600	1600
2011	1600	1600
2012	1650	1650
2013	1650	1650
2014	1650	1650
2015	1700	1700
2016	1700	1700

2.3.2 BASIN STATES ALTERNATIVE (PREFERRED ALTERNATIVE)

Reclamation has identified the Basin States Alternative as the preferred alternative in this FEIS. The Basin States Alternatives is similar to, and based upon, information submitted to the Secretary by representatives of the governors of the states of Colorado, Wyoming, Utah, New Mexico, Arizona, Nevada and California. After receipt of this information (during the public comment period), Reclamation shared the submission with the public (through the *Federal Register* and Reclamation's surplus criteria web sites) for consideration and comment. Reclamation then analyzed the states' submission and crafted this additional alternative for inclusion in the FEIS. Some of the information submitted for the Department's review was outside of the scope of the proposed action for adoption of interim surplus criteria and was therefore not included as part of the Basin States Alternative (i.e., adoption of shortage criteria and adoption of surplus criteria beyond the 15-year period) as presented in this FEIS. With respect to the information within the scope of the proposed action, Reclamation found the Basin States Alternative to be a reasonable alternative and fully analyzed all environmental effects of this alternative in this FEIS. The identified environmental effects of the Basin States Alternative are well within the range of anticipated effects of the alternatives presented in the DEIS and do not affect the environment in a manner not already considered in the DEIS.

Reclamation selected the Basin States Alternative as its preferred alternative based on Reclamation's determination that it best meets all aspects of the purpose and need for the action, including the needs to remain in place for the entire period of the interim criteria, to garner support among the Basin States that will enhance the Secretary's ability to manage the Colorado River reservoirs in a manner that balances all existing needs for these precious water supplies, and to assist in the Secretary's efforts to insure that California water users reduce their over reliance on surplus Colorado River water.

Reclamation notes the important role of the Basin States in the statutory framework for administration of Colorado River Basin entitlements and the significance that a seven-state consensus represents on this issue. Thus, based on all available information, this alternative appears to be the most reasonable and feasible alternative.

2.3.2.1 APPROACH TO SURPLUS WATER DETERMINATION

The Basin States Alternative specifies ranges of Lake Mead water surface elevations to be used through 2015 for determining the availability of surplus water through 2016. The elevation ranges are coupled with specific uses of surplus water in such a way that, if Lake Mead's surface elevation were to decline, the amount of surplus water would be reduced. The interim criteria would be reviewed at five-year intervals with the LROC (and additionally as needed) and revised as needed based upon actual operational experience.

2.3.2.2 BASIN STATES ALTERNATIVE SURPLUS TRIGGERS

The surplus determination elevations under the preferred alternative consist of the tiered Lake Mead water surface elevations listed below, each of which is associated with certain stipulations on the purposes for which surplus water could be used. The elevation tiers (also referred to as levels) are shown on Figure 2-2. They are as follows, proceeding from higher to lower water levels:

Tier 1 - 70R Line (approximately 1199 to 1201 feet msl)
Tier 2 - 1145 feet msl
Tier 3 - 1125 feet msl

Table 2-2 lists the estimated maximum annual amounts of surplus water that would be available to contractors for surplus water in the Lower Division states under the Basin States Alternative, when Lake Mead is at or above each trigger. The table also lists the estimated amounts of surplus water that would be available to the Lower Division states when flood control releases are required.

Figure 2-2
Basin States Alternative Surplus Trigger Elevations

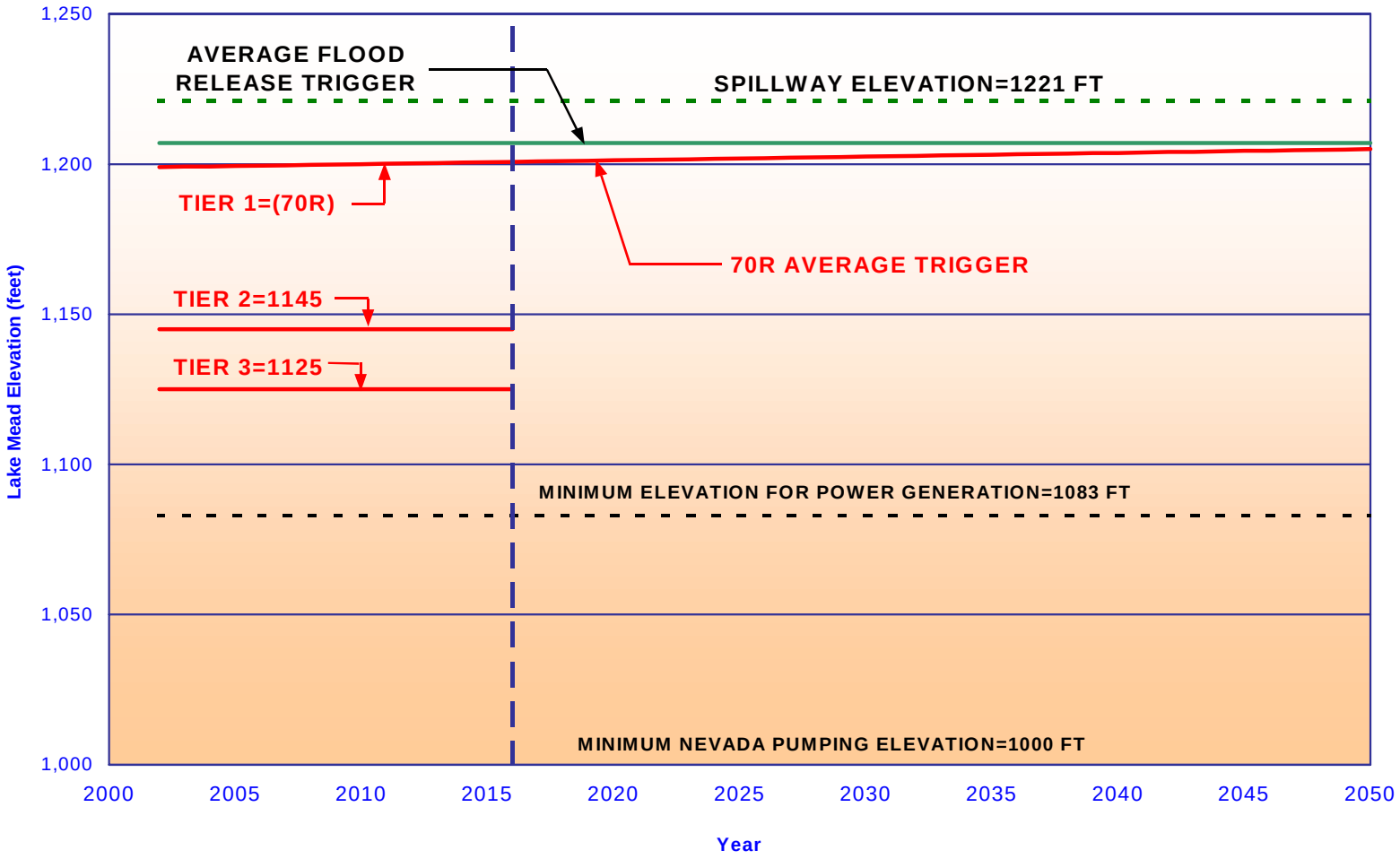


Table 2-2
Basin States Alternative Potential Surplus Water Supply
Unit: thousand acre-feet (kaf)

Year	Flood Control	Tier 1 (70R)	Tier 2 (1145 feet)	Tier 3 (1125 feet)
2002	1350	1150	650	200
2003	1350	1150	600	200
2004	1350	1050	550	150
2005	1350	1050	550	150
2006	1400	1050	500	150
2007	1450	1050	500	150
2008	1500	1100	450	150
2009	1550	1100	450	150
2010	1600	1150	450	150
2011	1600	1150	450	200
2012	1650	1200	450	200
2013	1650	1200	450	250
2014	1650	1200	450	250
2015	1700	1200	450	300
2016	1700	1200	450	300

The surplus amounts quantified for each tier in Table 2-2 are estimated annual quantities of water and are the Secretary's best estimate of the amounts of surplus water that could be made available during the 15-year period of the interim surplus guidelines. These estimates are based on the most current available data regarding projected Colorado River water use demands by existing contractors. The methodology that was used to prepare the demand schedules that underlie the surplus tables in this section is based upon the definitions of "domestic," "Direct Delivery Domestic Use" and "Off-Stream Banking," as used in the information submitted to the Secretary by the Colorado River Basin states (65 *Federal Register* 48531, 48535 [Aug. 8, 2000]). The quantities in each Tier are developed by using these definitions as set forth in the Basin States submission (see Table 2-2). Under these definitions, the quantity of estimated surplus quantities is based, in part, on supplying particular types of uses within the Lower Division states, with a higher priority for supplying domestic uses than that for irrigation uses or groundwater banking activities to supply future uses.

While the Secretary, as an initial matter, would make surplus water available in amounts consistent with the percentages identified in Article II(B)(2) of the Decree, it is expected that water orders from Colorado River contractors will be submitted to reflect forbearance arrangements made by Lower Division states and individual contractors. The Secretary will deliver water to contractors in a manner consistent with these arrangements, to the extent that the water orders from contractors reflect these arrangements. The Secretary expects to make the specified quantities of water available during the 15-year period. However, the precise annual surplus quantities will continue to be reviewed on an annual basis during the preparation of the AOP, as required by applicable federal law, based on actual operating experience and updated information on the demand for Colorado River water by Lower Division contractors.

2.3.2.1.1 Basin States Alternative Tier 1 (70R)

The Basin States Alternative Tier 1 Lake Mead surplus trigger elevations are based on the 70R strategy and range from approximately 1199 feet msl to 1201 feet msl. In years when the Secretary determines that water should be released for beneficial consumptive use to reduce the risk of potential flood control releases based on the 70R operating strategy, the Secretary would determine the quantity of surplus water available and allocate it as follows: 50 percent to California, 46 percent to Arizona and 4 percent to Nevada.

Regardless of the quantity of surplus water determined under Tier 1, surplus deliveries under Tier 2 (discussed below) would be met.

2.3.2.1.2 Basin States Alternative Tier 2 (1145 feet msl)

The Basin States Alternative Tier 2 Lake Mead surplus trigger elevation is 1145 feet msl. At or above this Tier 2 elevation (and below the Tier 1 elevation), surplus water would be available for use by the Lower Division states in the estimated amounts in Table 2-2.

2.3.2.1.3 Basin States Alternative Tier 3 (1125 feet msl)

The Basin States Alternative Tier 3 Lake Mead surplus trigger elevation is 1125 feet msl. At or above this Tier 3 elevation (and below the Tier 2 elevation), surplus water would be available for use by the Lower Division states in the estimated amounts on Table 2-2. At Lake Mead levels below the Tier 3 trigger surplus water would not be made available.

2.3.2.2 DRAFT GUIDELINES

Draft guidelines for implementation of the Basin States Alternative are presented in Attachment I. These guidelines describe in more detail the relationships between the implementation of interim surplus criteria under this alternative and the AOP process through which the Secretary would determine whether surplus water is available and how much is available.

2.3.3 FLOOD CONTROL ALTERNATIVE

2.3.3.1 APPROACH TO SURPLUS WATER DETERMINATION

Under the Flood Control Alternative, a surplus condition is determined to exist when flood control releases from Lake Mead are occurring or projected to occur in the subsequent year. The method of determining need for flood control releases is based on flood control regulations published by the Los Angeles District of the Corps and the Field Working Agreement between the Corps and Reclamation, which are discussed in Section 1.3.6, Flood Control Operation.

2.3.3.2 FLOOD CONTROL ALTERNATIVE SURPLUS TRIGGERS

Under the flood control strategy, a surplus is determined when the Corps flood control regulations require releases from Lake Mead in excess of downstream demand. The specific operating provisions are described in Section 1.3.6, Flood Control Operation. If flood control releases are required, surplus conditions are determined to be in effect. This strategy is illustrated on Figure 2-3, which shows the average Lake Mead water surface elevation that would trigger flood control releases. The average triggering elevation is a level line at approximately 1211 feet msl. In practice, flood control releases are not based on the average trigger line shown, but would be determined each month by following the Corps regulations. The graph is a visual representation to illustrate the differences between the alternatives. 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. Table 2-3 lists the annual amounts of surplus water estimated to be available under the Flood Control Alternative.

Table 2-3
Flood Control Alternative
Potential Surplus Water Supply
Unit: thousand acre-feet (kaf)

Year	Flood Control
2002	1350
2003	1350
2004	1350
2005	1350
2006	1400
2007	1450
2008	1500
2009	1550
2010	1600
2011	1600
2012	1650
2013	1650
2014	1650
2015	1700
2016	1700

2.3.4 SIX STATES ALTERNATIVE

2.3.4.1 APPROACH TO SURPLUS WATER DETERMINATION

The Six States Alternative specifies ranges of Lake Mead water surface elevations to be used through 2015 for determining the availability of surplus water through 2016. The elevation ranges are coupled with specific uses of surplus water in such a way that, if Lake Mead's surface elevation were to decline, the amount of surplus water would be reduced. The interim criteria would be reviewed at five-year intervals with the LROC and as needed based upon actual operational experience.

Figure 2-3
Flood Control Alternative Surplus Trigger Elevations

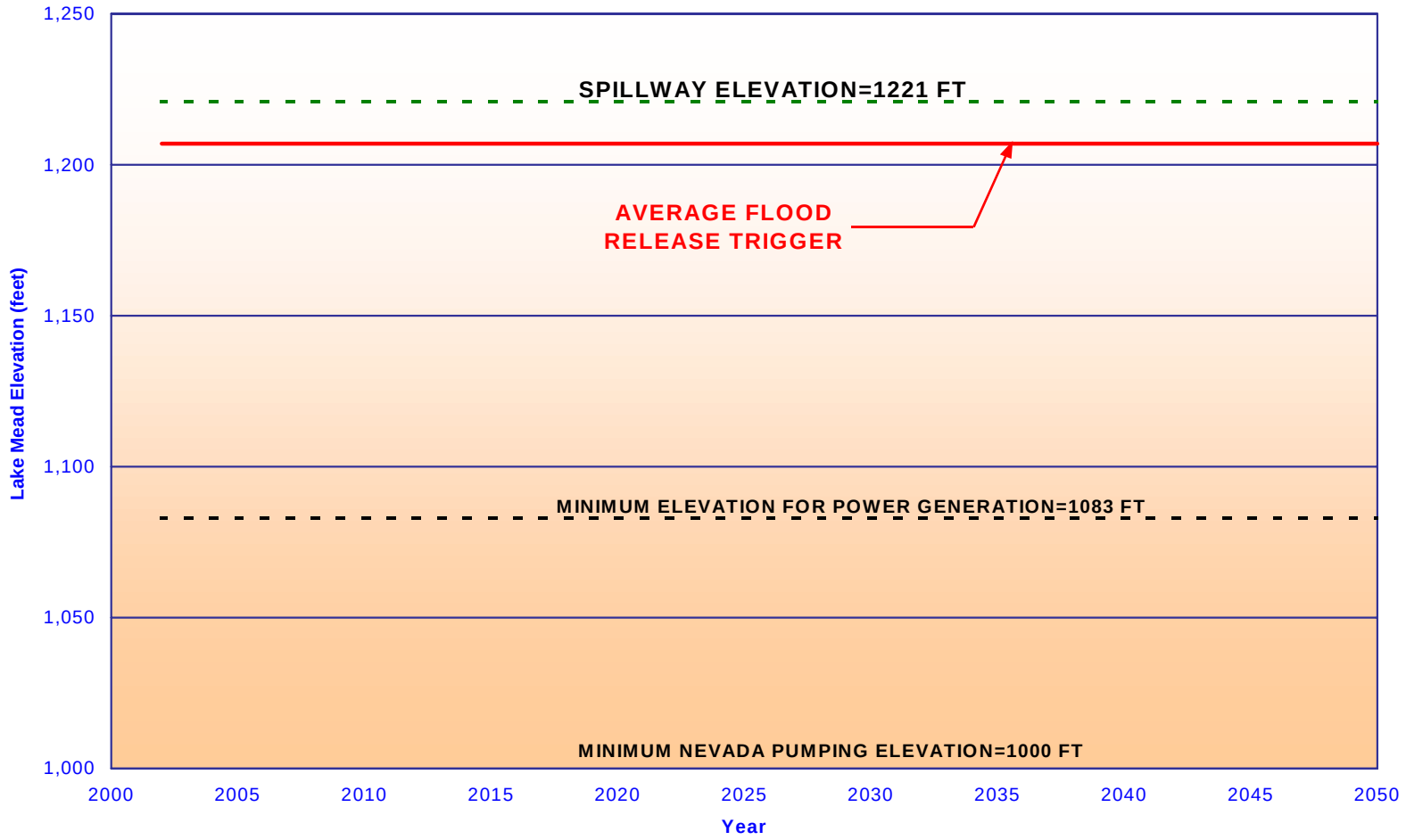
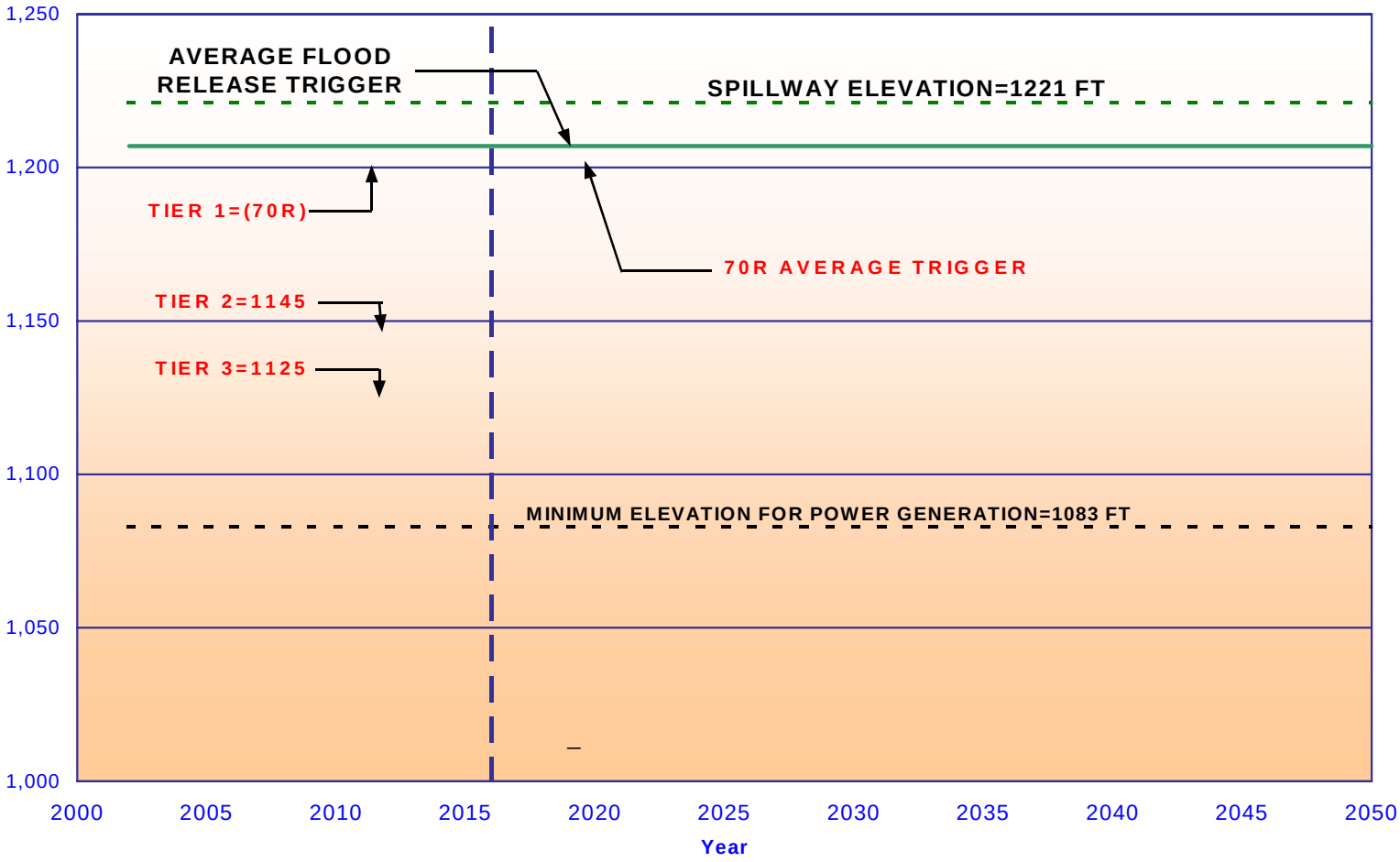


Figure 2-4
Six States Alternative Surplus Trigger Elevations



2.3.4.2 SIX STATES ALTERNATIVE SURPLUS TRIGGERS

The surplus determination elevations under the Six States Alternative consist of the tiered Lake Mead water surface elevations listed below, each of which is associated with certain stipulations on the purposes for which surplus water could be used. The tiered elevations are shown on Figure 2-4. They are as follows, proceeding from higher to lower water levels:

Tier 1 - 70R Line (approximately 1199 to 1201 feet msl)
Tier 2 - 1145 feet msl
Tier 3 - 1125 feet msl

The following sections describe the various tiers and the estimated amounts of surplus water available at those tiers under the Six States Alternative. When flood control releases are made, any and all beneficial uses would be met, including unlimited off-stream storage.

2.3.4.2.1 Six States Alternative Tier 1 (70R)

Six States Alternative Tier 1 Lake Mead surplus trigger elevations are based on the 70R strategy and range from approximately 1199 feet msl to 1201 feet msl during the interim period. When Lake Mead surface elevations are at or above the 70R line (and below the average flood release trigger line shown in Figure 2.4), surplus water would be available. Table 2-4 lists the estimated annual amounts of surplus water that would be available to the Lower Division states under the Basin States Alternative, when Lake Mead is at or above the Tier 1 trigger. The table also lists the estimated amounts of surplus water that would be available to the Lower Division states when flood control releases are required.

Table 2-4
Six States Alternative Potential Surplus Water Supply
Unit: thousand acre-feet (kaf)

Year	Flood Control	Tier 1	Tier 2	Tier 3
2002	1350	1350	600	350
2003	1350	1350	550	300
2004	1350	1350	500	250
2005	1350	1350	500	250
2006	1400	1400	450	200
2007	1450	1450	450	200
2008	1500	1500	450	150
2009	1550	1550	400	150
2010	1600	1600	400	150
2011	1600	1600	400	150
2012	1650	1650	400	150
2013	1650	1650	400	150
2014	1650	1650	400	150
2015	1700	1700	400	150
2016	1700	1700	400	150

2.3.4.2.2 Six States Alternative Tier 2 (1145 feet msl)

The Six States Alternative Tier 2 Lake Mead surplus trigger elevation is 1145 feet msl. At or above this Tier 2 elevation (and below the Tier 1 elevation), surplus water would be available for use by the Lower Division states in the estimated amounts on Table 2-4.

2.3.4.2.3 Six States Alternative Tier 3

The Six States Alternative Tier 3 Lake Mead surplus trigger elevation is 1125 feet msl. At or above this Tier 3 elevation (and below the Tier 2 elevation). Surplus water would be available for use by the Lower Division states in the estimated amounts on Table 2-4.

When Lake Mead water levels are below the Tier 3 trigger elevation, surplus water would not be available.

2.3.5 CALIFORNIA ALTERNATIVE

2.3.5.1 APPROACH TO SURPLUS WATER DETERMINATION

The California Alternative specifies Lake Mead water surface elevations to be used for the interim period through 2015 for determining the availability of surplus water through 2016. The elevation ranges are coupled with specific uses of surplus water in such a way that, if Lake Mead's surface elevation declines, the amount of surplus water would be reduced.

2.3.5.2 CALIFORNIA ALTERNATIVE SURPLUS TRIGGERS

The Lake Mead elevations at which surplus conditions would be determined under the California Alternative are indicated by a series of tiered, sloping lines from the present to 2016. Each tiered line would be coupled with limitations on the amount of surplus water available at that tier. Figure 2-5 shows the structure of these tiered lines. Each tier is defined as a trigger line that rises gradually year by year to 2016, in recognition of the gradually increasing water demand of the Upper Division states. The elevations associated with the three tiers are as follows:

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

Each tier under the California Alternative 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. The following sections describe the California Alternative tiers. When flood control releases are made, any and all beneficial uses would be met, including unlimited off-stream storage.

2.3.5.2.1 California Alternative Tier 1

California Alternative Tier 1 Lake Mead surplus trigger elevation increases from an initial elevation of 1160 feet msl to 1166 feet msl at the end of the interim period (based on Upper Basin demand projections). Lake Mead water surface elevations at or above the Tier 1 trigger line would permit surplus water deliveries to the Lower Division states in the estimated amounts on Table 2-5. The table also lists the estimated amounts of surplus water that would be available to the Lower Division states when flood control releases are required.

Table 2-5
California Alternative Potential Surplus Water Supply
Unit: thousand acre-feet (kaf)

Year	Flood Control	Tier 1	Tier 2	Tier 3
2002	1350	1350	650	550
2003	1350	1350	600	500
2004	1350	1350	550	400
2005	1350	1350	550	400
2006	1400	1400	500	400
2007	1450	1450	450	350
2008	1500	1500	450	350
2009	1550	1550	450	350
2010	1600	1600	400	300
2011	1600	1600	400	300
2012	1650	1650	400	300
2013	1650	1650	400	300
2014	1650	1650	400	300
2015	1700	1700	400	300
2016	1700	1700	400	300

2.3.5.2.2 California Alternative Tier 2

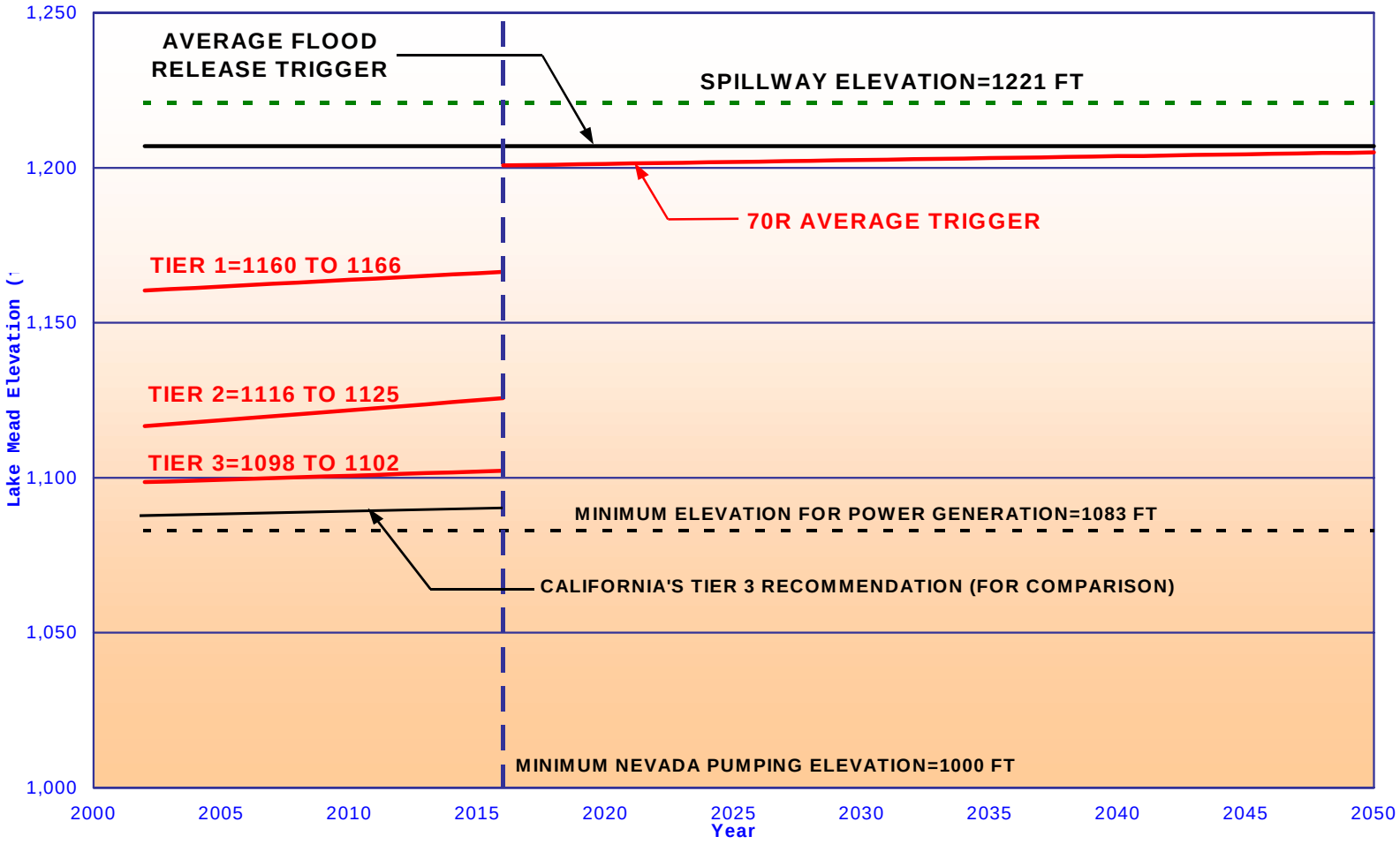
California Alternative Tier 2 Lake Mead surplus trigger elevation increases from 1116 feet msl to 1125 feet msl (based on Upper Basin demand projections). Lake Mead water surface elevations at or above the Tier 2 line (and below the Tier 1 line) would permit surplus water diversions for use by the Lower Division states in the estimated amounts on Table 2-5.

2.3.5.2.3 California Alternative Tier 3

California Alternative Tier 3 trigger elevation increases from 1098 feet msl to 1102 feet msl (based on Upper Basin demand projections). Lake Mead water surface elevations at or above the Tier 3 line (and below the Tier 2 line) would permit surplus water diversions for use by the Lower Division states in the estimated amounts on Table 2-5.

When Lake Mead water levels are below the Tier 3 trigger elevation, surplus water would not be made available.

Figure 2-5
California Alternative Surplus Trigger Elevations



2.3.6 SHORTAGE PROTECTION ALTERNATIVE

2.3.6.1 APPROACH TO SURPLUS WATER DETERMINATION

The Shortage Protection Alternative is based on maintaining an amount of water in Lake Mead necessary to provide a normal annual supply of 7.5 maf for the Lower Division, 1.5 maf for Mexico and storage necessary to provide an 80 percent probability of avoiding future shortages. The modeling assumptions for shortage protection are discussed in Section 3.3.3.4, Lake Mead Water Level Protection Assumptions.

2.3.6.2 SURPLUS TRIGGERS

The surplus triggers under this alternative range from an approximate Lake Mead initial elevation of 1126 feet msl to an elevation of 1155 feet msl at the end of the interim period, as shown on Figure 2-6. At Lake Mead elevations above the surplus trigger, surplus conditions would be determined to be in effect and surplus water would be available for use in the Lower Division states in the estimated amounts on Table 2-6. Below the trigger elevation, surplus water would not be made available.

Table 2-6
Shortage Protection Alternative
Potential Surplus Water Supply
Unit: thousand acre-feet (kaf)

Year	Flood Control	Surplus Amount
2002	1350	1350
2003	1350	1350
2004	1350	1350
2005	1350	1350
2006	1400	1400
2007	1450	1450
2008	1500	1500
2009	1550	1550
2010	1600	1600
2011	1600	1600
2012	1650	1650
2013	1650	1650
2014	1650	1650
2015	1700	1700
2016	1700	1700

2.4 SUMMARY TABLE OF IMPACTS

Table 2-7 presents a summary of the potential effects of the baseline operation and the interim surplus alternatives. Chapter 3 contains detailed descriptions of these effects.

Figure 2-6
Shortage Protection Alternative Trigger Elevations

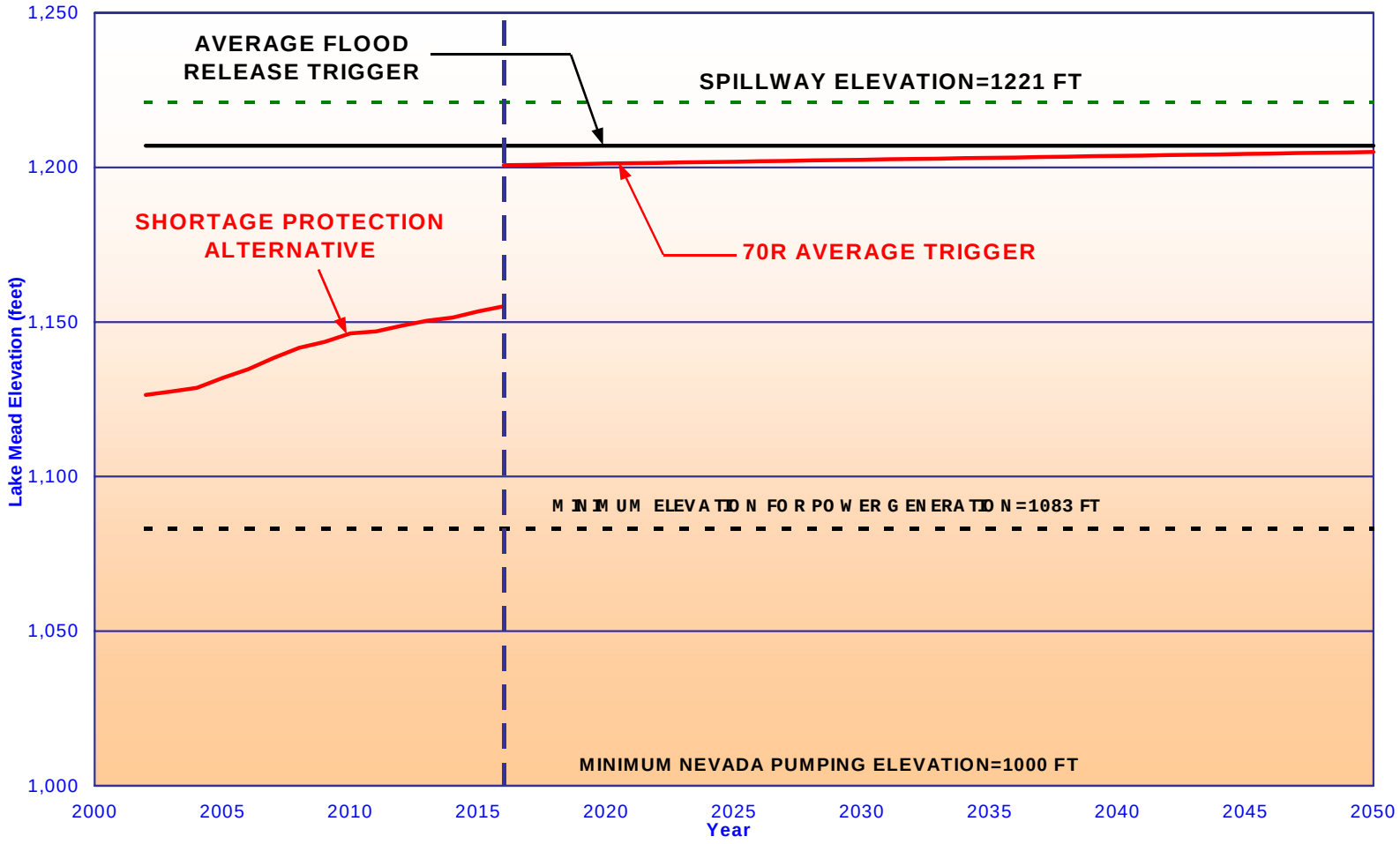


Table 2-7
Summary of Potential Effects of Implementing Interim Surplus Criteria[1]

Resource/Issue	Baseline Conditions/No Action	Effects of Alternatives[2]
Reservoirs Elevations and River Flows		
Lake Powell Water Surface Elevations Potential changes in Lake Powell water surface elevations.	Reservoir water levels exhibit a gradual declining trend during the interim surplus criteria period as a result of increasing Upper Division states consumptive use. The median water surface elevation in 2016 is 3665 feet msl. The probability of Lake Powell being full[3] in 2016 is 27%. After 2016, median levels stabilize, then rise and fall slightly, due to 602(a) storage requirements and less frequent equalization releases.	Median Elevations in 2016 for each of the alternatives are as follows: Basin States 3664 feet msl Flood Control 3665 feet msl Six States 3664 feet msl California 3660 feet msl Shortage Protection 3659 feet msl After 2016, Lake Powell water levels under all five alternatives tend to stabilize similar to baseline conditions. Water levels under the Basin States, Flood Control, Six States, California and Shortage Protection alternatives tend to converge with the baseline conditions by about year 2030.
Lake Mead Water Surface Elevations Potential changes in Lake Mead water surface elevations.	Reservoir water levels exhibit a gradual declining trend during the interim surplus criteria period as a result of Lower Basin consumptive use exceeding long-term inflow. The median water surface elevation in 2016 is 1162 feet msl. After 2016, median water surface elevations continue to decline, although at a lower rate, due to less frequent Lower Basin surplus deliveries.	Median Elevations in 2016 for each of the alternatives are as follows: Basin States 1143 feet msl Flood Control 1162 feet msl Six States 1146 feet msl California 1131 feet msl Shortage Protection 1130 feet msl After 2016, median surface elevations continue to decline. By about 2035, all alternatives converge to elevations similar to baseline conditions.
River Flows Glen Canyon and Hoover Dam releases and flows downstream of Lake Mead.	Flows downstream of Glen Canyon Dam would be managed in accordance with the 1995 Glen Canyon Dam EIS and the 1996 ROD. Flows downstream of Hoover Dam are governed by downstream demand or Hoover Dam flood control releases.	Flood Control Alternative: Similar to baseline conditions. Other alternatives: Flows below Glen Canyon Dam would be similar to baseline conditions. Flows from Hoover Dam to Parker Dam would be moderately higher until 2016 because of surplus deliveries. After 2016, flows would be similar to baseline conditions.

Table 2-7
Summary of Potential Effects of Implementing Interim Surplus Criteria[1]

Resource/Issue	Baseline Conditions/No Action			Effects of Alternatives[2]
Water Supply				
California Water Supply Probabilities of normal, surplus and shortage[4] conditions.	Normal:	2002 through 2016 2017 through 2050	100% 100%	Flood Control Alternative: Similar to baseline conditions. Other Alternatives: Greater probability of surplus through 2016. The probability is similar to baseline conditions from 2017 through 2050. Deliveries less than the normal apportionment (4.4 mafy) do not occur under the alternatives at any time through 2050.
	Surplus:	2002 through 2016 2017 through 2050	47% 21%	
	Shortage:	2002 through 2016 2017 through 2050	0% 0%	
Arizona Water Supply Probabilities of normal, surplus and shortage[4] conditions.	Normal:	2002 through 2016 2017 through 2050	>96% 50%	Flood Control Alternative: Similar to baseline conditions. Other Alternatives: Greater probability of surplus through 2016 under the California and Shortage Protection alternatives and slightly lower (26%) under the Basin States and Six States alternatives. The probability of surplus under the alternatives is about the same as baseline from 2017 to 2050. The probability of shortage condition deliveries under the alternatives is slightly higher (7% to 14%) through 2016. From 2017 to 2050, the probability of shortages under the alternatives is similar to baseline conditions.
	Surplus:	2002 through 2016 2017 through 2050	29% 21%	
	Shortage:	2002 through 2016 2017 through 2050	< 4% 50%	
Nevada Water Supply Probabilities of normal, surplus and shortage[4] conditions.	Normal:	2002 through 2016 2017 through 2050	96% 50%	Flood Control Alternative: Similar to baseline conditions. Other Alternatives: Greater probability of surplus through 2015; same as baseline from 2017 to 2050. The probability of shortage condition deliveries is slightly higher (7% to 14%) for the alternatives through 2016. From 2017 to 2050, the probability of shortage condition deliveries is higher (3% to 5%) under the alternatives.
	Surplus:	2002 through 2016 2017 through 2050	47% 21%	
	Shortage:	2002 through 2016 2017 through 2050	< 4% 50%	
Mexico Treaty Delivery Probabilities of meeting Treaty delivery obligations.	Normal:	2002 through 2016 2017 through 2050	100% 100%	The Flood Control Alternative would provide slightly higher (1%) probabilities of surplus than under baseline conditions through 2016. The rest of the alternatives provide slightly lower (3% to 7%) probabilities of surplus through 2016 and about the same level as baseline through 2050. Deliveries less than the treaty apportionment (1.5 mafy) do not occur under the alternatives at any time through 2050.
	Surplus:	2002 through 2016 2016 through 2050	26% 19%	
	Shortage:	2002 through 2016 2017 through 2050	0% 0%	

Table 2-7
Summary of Potential Effects of Implementing Interim Surplus Criteria[1]

Resource/Issue	Baseline Conditions/No Action	Effects of Alternatives[2]
Water Quality		
Colorado River Salinity Potential change in salinity below Hoover Dam.	Baseline projections assume compliance with numeric criteria along the river. The Basin States are committed to meeting the numeric criteria.	Modeling indicates potential for slight reductions in salinity under each alternative as compared to baseline.
Lake Mead Water Quality and Las Vegas Water Supply Contaminant concentrations in Boulder Basin of Lake Mead, in proximity to the SNWS intakes at Saddle Island.	Increased potential for lower Lake Mead levels and increased inflow channel lengths under baseline projections could increase potential of elevated contaminant concentrations.	The alternatives, except the Flood Control Alternative, result in slightly increased potential for increased contaminant concentrations in Boulder Basin, due to greater potential for lower Lake Mead levels than under baseline conditions.
Flow-Related Issues		
Beach/Habitat-Building Flow Releases Probability of BHBF release conditions from Glen Canyon Dam.	The average annual probability of BHBF releases is 16% through 2016 and 14% from 2017 through 2050.	The probability under the alternatives is typically less than under baseline conditions during the interim period, and converges with baseline conditions thereafter.
Low Steady Summer Flows Probability of requisite conditions for low steady summer flow releases from Glen Canyon Dam.	The average annual probability of conditions requisite for low steady summer flows is 38% through 2016 and 62% from 2017 through 2050.	The probability under the alternatives is typically less than under baseline conditions during the first seven years and similar to or slightly greater than under baseline conditions thereafter.
Flooding Downstream of Hoover Dam Probability of damaging flows below Davis and Parker Dams.	Average annual probability from 2002 through 2016: Davis Dam 9% Parker Dam 10% Average annual probability from 2017 through 2050: Davis Dam 5% Parker Dam 6%	The probability under the Flood Control Alternative is slightly greater than under baseline conditions. The probability under other alternatives is slightly less than under baseline conditions.
Aquatic Resources		
Lake Habitat and Sport Fisheries Potential effects on Lake Mead and Lake Powell fisheries and associated aquatic habitat.	Species are adapted to fluctuating reservoir levels. Therefore, increased potential for lower Lake Mead and Lake Powell surface levels is not expected to adversely affect aquatic species.	Compared with baseline conditions, slightly increased potential for higher reservoir levels under the Flood Control Alternative and increased potential for lower reservoir levels under the other alternatives would not be expected to result in substantial changes to lake habitat.

Table 2-7
Summary of Potential Effects of Implementing Interim Surplus Criteria[1]

Resource/Issue	Baseline Conditions/No Action	Effects of Alternatives[2]
Special-Status Species		
Special-Status Plants Potential effects on special-status plants for areas influenced by Lake Powell and Lake Mead water levels.	Under baseline conditions, special-status plant species would continue to be affected by fluctuating water levels, which would periodically expose and inundate areas where the plants occur.	Although reservoir elevations would differ, the effects of all alternatives would be similar to baseline conditions.
Special-Status Wildlife Potential effects on special-status wildlife species associated primarily with potential effects on riparian habitat at the Lake Mead and Virgin River deltas, and the lower Grand Canyon.	Under baseline conditions, increased potential over time for lower reservoir levels could increase potential for development of temporary riparian habitat at the deltas, which would benefit special-status wildlife species that utilize such habitat.	The Flood Control Alternative would have slightly lower potential, while the other alternatives would have increased potential, for lower reservoir elevations and associated potential increases in delta habitat.
Special-Status Fish Potential effects of Lake Mead and Lake Powell reservoir level changes on special-status fish species.	Under baseline conditions, increased potential for lower elevations is not expected to have effects on special-status species fish different than those that occur at present.	Changes in potential for lower reservoir levels under the various alternatives would not change potential for effects.
Recreation		
Reservoir Marinas/Boat Launching Potential effects on shoreline recreation facilities from changes in Lake Mead and Lake Powell surface elevations.	Baseline condition projections indicate increased potential for reservoir levels lower than those considered within the normal operating range that some existing facilities may be able to accommodate. Such occurrence would likely result in modification of facilities to accommodate lower surface elevations.	The Flood Control Alternative has a slightly decreased potential for lower reservoir levels; each of the other alternatives have increased potential for lower levels and necessary relocations.
Reservoir Boating/Navigation Potential effects on reservoir boating that may result from changes in Lake Mead and Lake Powell surface elevations.	Baseline condition projections indicate an increased potential for the occurrence of lower Lake Mead and Lake Powell reservoir levels, which may result in potential increases in navigation hazards and decreased safe boating capacity (due to decreased reservoir surface area).	The Flood Control Alternative has slightly lower potential, and each of the other alternatives have higher potential, for each of navigation hazards and reduced carrying capacity.
River and Whitewater Boating Potential effects on river boating at Lake Powell and Lake Mead inflow areas.	Boaters may have reduced take-out opportunities due to increased potential for lower reservoir surface elevations.	The Flood Control Alternative has lower potential, and each of the other alternatives have increased potential, for reduced take-out opportunities resulting from lower reservoir elevations.

Reservoir Sport Fishing Potential effects on sport fishing in Lake Mead and Lake Powell.	Potential effects on sport fisheries are minimal under baseline conditions.	Changes in reservoir elevations under each of the alternatives would not be expected to adversely affect sport fisheries or fishing in either reservoir.
Recreation Facilities Relocation Costs Increased costs associated with relocating shoreline facilities to remain in operation at lower reservoir elevations.	Baseline condition projections indicate increased relocation costs associated with future increased potential for lower reservoir levels.	The Flood Control Alternative is similar to baseline conditions. Other alternatives have greater potential for increased relocation costs, based on an average cost per foot associated with relocating facilities.
Energy Resources		
Hydroelectric Power Production Potential for changes in energy production at Glen Canyon and Hoover powerplants.	Glen Canyon Powerplant average annual energy production: 4532 GWh through 2016; 4086 GWh from 2017 through 2050. Hoover Powerplant average annual energy production: 4685 GWh through 2016; 3903 GWh from 2017 through 2050.	The Flood Control Alternative is similar to baseline conditions. Average annual power production under the other alternatives is greater than under baseline conditions for the first six to eight years, then is less for the remaining years. Averaged from 2002 to 2050, Glen Canyon annual power production is from 12 to 30 GWh less than baseline conditions, while Hoover power production is from 51 to 127 GWh less.
Pumping Power Needs for SNWS Potential change in the cost of power to pump Lake Mead water through the SNWS.	Future lower average Lake Mead water levels would require more energy and increased pumping costs for the SNWS intake.	The increase over baseline conditions of annual pumping costs for each alternative follows: Basin States $229,395 Flood Control $ 32,685 Six States $214,779 California $544,843 Shortage Protection $532,635

Intake Energy Requirements at Lake Powell Potential change in the cost of power to pump Lake Powell water to the Navajo Generating Station and the City of Page.	Future lower average Lake Powell water levels would require more energy and increased pumping costs for the Navajo Generating Station and the City of Page.	The increase over baseline conditions of annual pumping costs for each alternative follows: **Navajo Generating Station** Basin States $2,216 Flood Control $ 0 Six States $2,129 California $4,651 Shortage Protection $4,660 **City of Page** Basin States $ 529 Flood Control $ 0 Six States $ 508 California $1,110 Shortage Protection $1,112
Air Quality		
Fugitive Dust Emissions from Exposed Reservoir Shoreline Potential for fugitive dust emissions from shoreline exposure at Lake Mead and Lake Powell.	Increased potential for lower reservoir levels would increase potential for shoreline exposure under baseline conditions. Increases in fugitive dust emissions would be minimal due to low emission potential of shoreline.	Slightly decreased shoreline exposure under Flood Control Alternative would lower fugitive dust emission potential. Other alternatives would have slightly increased potential for increased fugitive dust emissions. Minimal changes in area-wide fugitive dust emissions would be expected.
Visual Resources		
Visual Attractiveness of Reservoir Scenery, Lake Mead and Lake Powell Potential effects of lower reservoir elevations on scenic quality.	Increased probability of temporary degradation in visual attractiveness of shoreline vistas resulting from increasing potential for lower water levels in Lake Mead and Lake Powell.	Flood Control Alternative: Same as baseline conditions. Other alternatives: Higher probability of degradation of visual attractiveness through 2016 due to accelerated decline of minimum reservoir levels.
Cultural Resources		
Effects on Historic Properties in Operational Zone of Reservoir and River Reaches.	Not significant due to past water level fluctuations. Impacts have already occurred.	Not significant due to past water level fluctuations. Impacts have already occurred.
Indian Trust Assets		
Effects on water supply for Indian Tribes and Communities	The water available to members of Ten Tribes Partnership would not be affected by future changes under baseline conditions. There is a probability of shortages of CAP priority water for tribes in central Arizona.	No effect on water available to members of Ten Tribes Partnership. Greater probability of shortages of CAP priority water for tribes in central Arizona under all alternatives with the exception of the Flood Control Alternative.

Environmental Justice				
Exposure of Minority or Low Income Communities to Health or Environmental Hazards	No effects are anticipated.			No effects anticipated.
Transboundary Effects				
Treaty Water Delivery Obligations Probabilities of meeting Treaty delivery obligations	Normal:	2002 through 2016 2017 through 2050	100% 100%	The Flood Control Alternative would provide slightly higher (1%) probabilities of surplus than under baseline conditions 2016. The rest of the alternatives provide slightly lower (3% to 7%) probabilities of surpluses through 2016 and about the same level as baseline through 2050. Deliveries less than the treaty apportionment (1.5 mafy) do not occur under the alternatives at any time through 2050.
	Surplus:	2002 through 2016 2016 through 2050	26% 19%	
	Shortage:	2002 through 2016 2017 through 2050	0% 0%	
Flow Below Morelos Dam Amount of excess flow that may reach the Colorado River delta.	Probability of excess flows below Morelos Dam would gradually decline under baseline conditions.			Flood Control Alternative: Similar to baseline. Other alternatives: Small reduction in probability of excess flows.
Potential Effects on Species and Habitat in Mexico	Probability of excess flows below Morelos Dam would gradually decline.			Under the Basin States Alternative there would be no effect on desert pupfish, Vaquita, Yuma clapper rail, California black rail, Clarks grebe; and there is not likely to be any adverse affect on totoaba, Southwestern willow flycatcher, Yellow-billed cuckoo, Elf owl or Bell's vireo.

1. Effects identified are based on probabilities developed through modeling of possible future conditions through 2050, discussed in detail in Chapter 3.
2. In general, the differences between the alternatives and baseline conditions would be greatest at or near 2016, the year in which the interim surplus criteria would terminate.
3. Lake Powell is considered to be essentially full when the lake elevation reaches 3695 feet msl (5 feet below the top of the spillway gates).
4. Probabilities of shortage are based on the modeling assumption of protecting a Lake Mead elevation of 1083 feet msl. There are no established shortage criteria for the operation of Lake Mead.