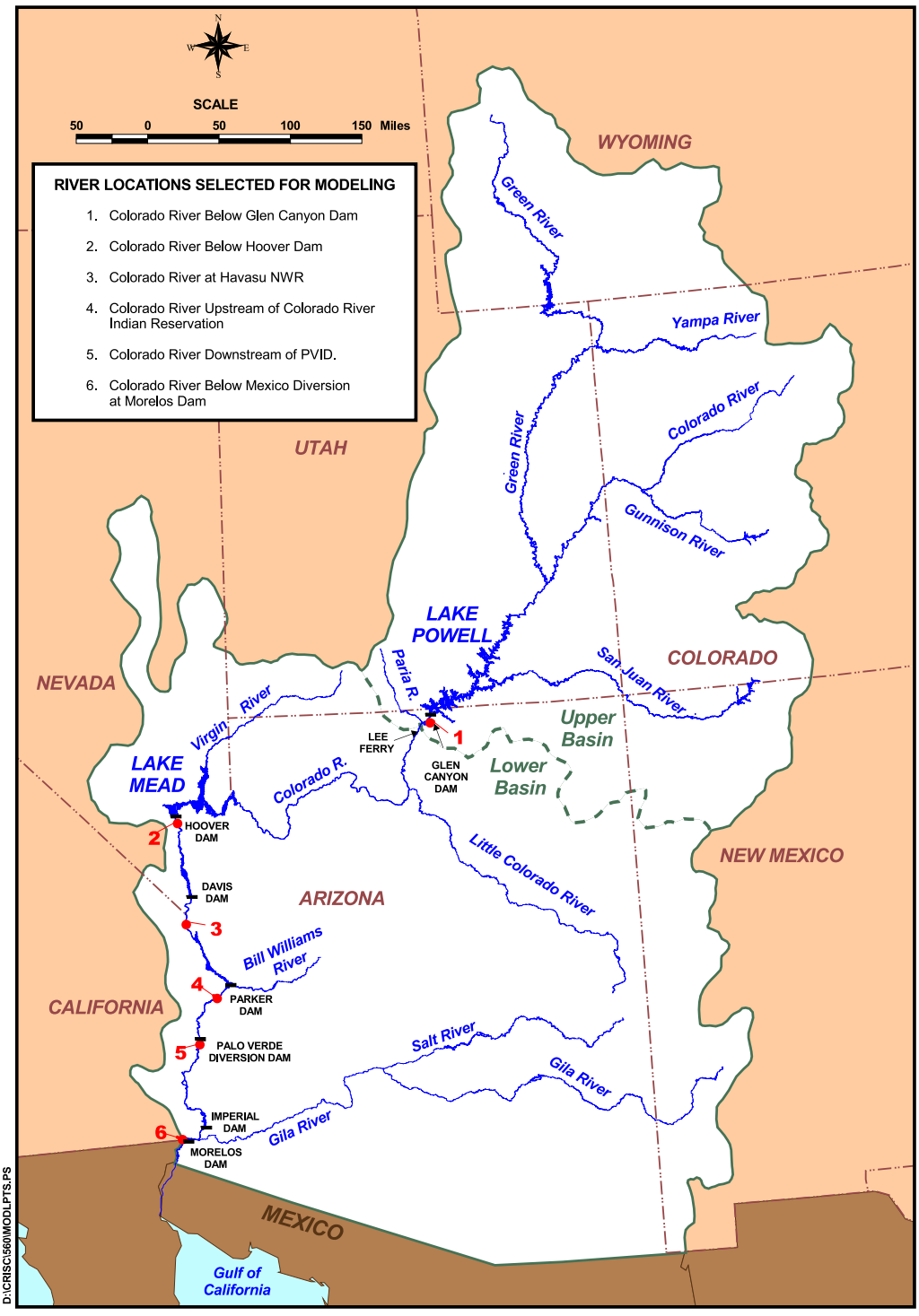
conditions and all surplus alternatives are included in this section for each of the four river points. Cumulative distributions of the annual flow volumes are also presented for specific years to aid in the understanding of the effects. These cumulative distributions consider the year 2006, the year when the largest effects at the 90th percentile are seen.

The second analysis investigated the potential effects on seasonal flows. Cumulative distributions of mean monthly flows (in cfs) were produced for specific years and selected months representative of each season. The mean monthly flows for January were used to represent the winter season flows and likewise for April, July, and October to represent spring, summer, and fall, respectively. The specific years analyzed included 2006, 2016, 2025, and 2050. Only the graphs for 2016 are presented in this section. The graphs for the other years are presented in Attachment N.

It should be noted that the monthly demand schedules used in the model are based on a distribution of the total annual demand (a percentage for each month). Although each diversion point may use a different distribution, those percentages do not change from year to year, and can not reflect potential future changes in the system that might affect the monthly distributions. Therefore, the seasonal differences are primarily governed by the overall changes in annual flow volumes, coupled with the effect of each diversion's distribution upstream of the point of interest.

Daily and hourly releases from Hoover Dam reflect the short-term demands of Colorado River water users with diversions located downstream, storage management in Lakes Mohave and Havasu, and power production at Hoover, Davis and Parker Dams. The close proximity of Lake Mohave to Hoover Dam effectively dampens the short-term fluctuations below Hoover Dam. The scheduling and subsequent release of water through Davis and Parker Dams create short-term fluctuations in river flows, depths, and water surface elevations downstream of these structures. These fluctuations of water surface elevations in the river are most noticeable in the river reaches located immediately downstream of the dams and lessen as the downstream distance increases. Interim surplus criteria, however, will have no effect on the short-term operations of Hoover, Davis and Parker Dam, and therefore, short-term fluctuations in river reaches downstream of Hoover Dam were not evaluated.

Map 3.3-1
Colorado River Locations Selected for Modeling



3.3.4.5.1 River Flows Between Hoover Dam and Parker Dam

The river flows between Hoover Dam and Parker Dam are comprised mainly of flow releases from Hoover Dam and Davis Dam. Inflows from the Bill Williams River and other intermittent tributaries are infrequent and are usually concentrated into short time periods due to their dependence on localized precipitation. Tributary inflows comprise less than one percent of the total annual flow in this reach of the river.

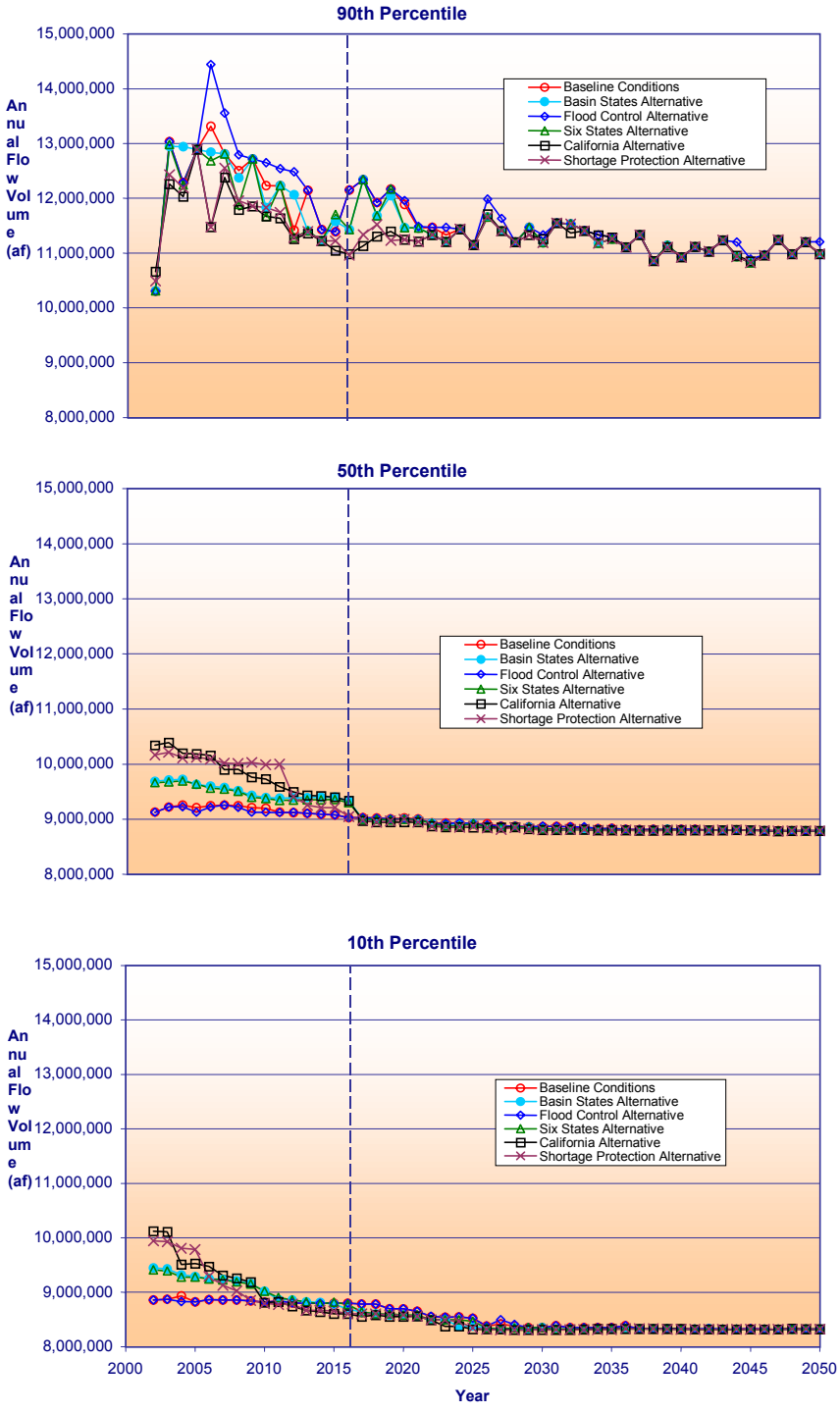
Due to the backwater effect of Lake Mohave, a point on the Colorado River downstream of Davis Dam was used to evaluate the river flows for this reach, located immediately downstream of the Havasu National Wildlife Refuge (NWR).

The 90th, 50th, and 10th percentile annual flow volumes for this reach are shown in Figure 3.3-18. As shown by the 50th percentile values, annual flow volumes in this reach can be expected to be greater for the surplus alternatives (except for the Flood Control Alternative) than for the baseline conditions during the 15-year interim surplus criteria period. This is a direct result of more frequent surplus deliveries. The largest increases from baseline conditions occur under the California Alternative and range from approximately 13 percent in the first two years down to three percent by 2016. Results for the Six States and Basin States alternatives are similar to each other, ranging from approximately a six percent increase over baseline conditions down to three percent by 2016. Beyond the 15-year interim period, the annual flow volumes under the surplus alternatives are essentially the same (within one percent) as those under the baseline conditions.

At the 10th percentile level, although the magnitudes of the annual flow volumes are different, the relative changes in surplus conditions compared to the baseline conditions are similar to those at the 50th percentile.

At the 90th percentile level, all surplus alternatives (except for the Flood Control Alternative) show annual flow volumes less than or equal to the flows under the baseline conditions. This is the result of more frequent surplus deliveries, which tend to lower Lake Mead reservoir levels. With lower reservoir levels, the frequency of flood control events (which contribute most of the flows at the 90th percentile level) is decreased, which in turn decreases the annual flow volume for a given percentile. The California and Shortage Protection alternatives exhibit the largest decreases, ranging from approximately 13 percent less than baseline conditions in 2006 to one percent less by 2023. Results for the Six States and Basin States alternatives are similar to each other, ranging from approximately six percent less than baseline conditions in 2013 to one percent less by 2023.

Figure 3.3-18
Colorado River Downstream of Havasu NWR Annual Flow Volume (af)
Comparison of Surplus Alternatives to Baseline Conditions
90th, 50th and 10th Percentile Values



In Figure 3.3-19, the cumulative distribution of annual flow volumes is shown for year 2006. This is the year of the largest differences at the 90th percentile level as shown in Figure 3.3-18. Although the annual flow volumes decrease for all surplus alternatives (except Flood Control Alternative) at a fixed percentile (i.e. at the 90th percentile) as compared to baseline, the range of annual flow volumes are the same for baseline conditions and the surplus alternatives. The frequency that a flow of a specific magnitude will occur, however, is lower under the surplus alternatives (except for the Flood Control Alternative) as shown in Figure 3.3-19.

Figures 3.3-20(a-d) present comparisons of the representative seasonal flows under baseline conditions and the surplus alternatives for 2016. For all seasons, the Flood Control Alternative is very similar to the baseline conditions. The Six States and Basin States alternatives tend to fall between the baseline conditions (and Flood Control Alternative) and the California (and Shortage Protection) alternatives.

As expected, the largest flows occur in the spring and summer seasons for baseline conditions and all alternatives due to downstream irrigation demands. For flows that are due primarily to flood control releases from Lake Mead (flows in the 90th – 100th percentile range), the range of mean monthly flows is not changed by the different surplus alternatives, since these magnitudes are dictated by the flood control regulations. These flows occur, however, less often for the surplus alternatives (except the Flood Control Alternative). This effect is less pronounced in July, when most flood control releases have ceased.

The differences in flows that are not due to flood control releases are greatest near the 70th percentile level. A numerical comparison of the 70th percentile values is shown in Table 3.3-13. The differences in mean monthly flows for the California Alternative compared to baseline conditions are approximately 16 percent in the winter, nine percent in the spring, six percent in the summer, and eight percent in the fall. For the Basin States alternative, the differences (compared to baseline conditions) in mean monthly flows are approximately three percent in the winter, one percent in the spring, and less than one percent in the summer and fall seasons.

Despite these differences, the flows for all alternatives fall well within the minimum and maximum flows for the baseline conditions, as well as within the current operational range for this reach.

Table 3.3-13
Comparison of Mean Monthly Flow (cfs) – Baseline Conditions and Surplus Alternatives
Colorado River Downstream of Havasu NWR (River Mile = 242.3)
70th Percentile Values for Year 2016

Season	Mean Monthly Flows (cfs) for Year 2016 at the 70th Percentile					
	Baseline	Basin States	Flood Control	Six States	California	Shortage Protection
Winter	8069	8347	7965	8317	9327	9223
Spring	15939	16166	15899	16072	17294	17144
Summer	15880	15957	15862	15953	16853	16644
Fall	11776	11805	11776	11686	12688	12531

Figure 3.3-19
Colorado River Annual Flow Volume Downstream of Havasu NWR
Comparison of Surplus Alternatives to Baseline Conditions for Modeled Year 2016

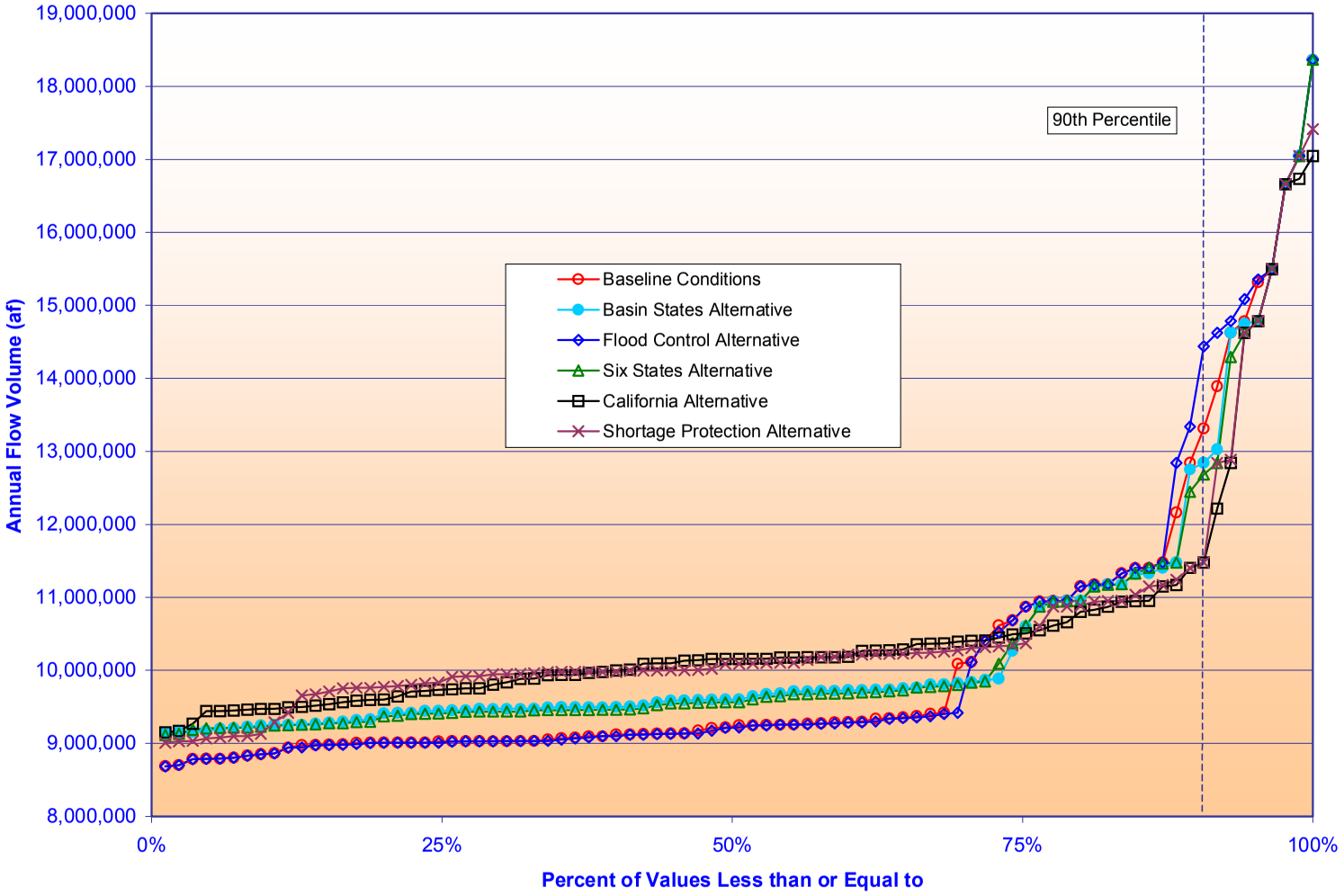


Figure 3.3-20a
Colorado River Seasonal Flows Downstream of Havasu NWR
Comparison of Surplus Alternatives to Baseline Conditions for Modeled Year 2016

Winter Season Flows
as Represented by January Flows

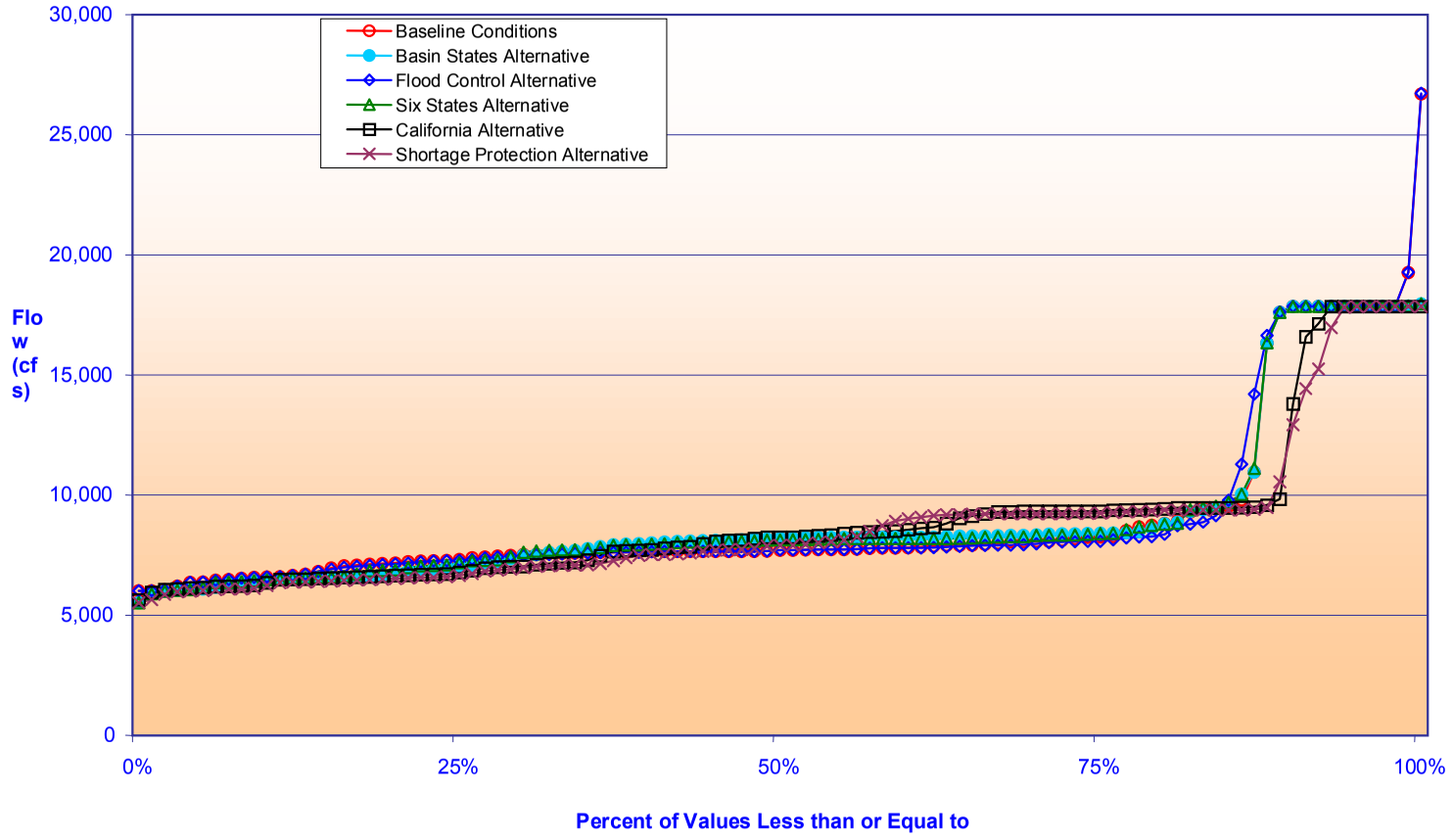


Figure 3.3-20b
Colorado River Seasonal Flows Downstream of Havasu NWR
Comparison of Surplus Alternatives to Baseline Conditions for Modeled Year 2016

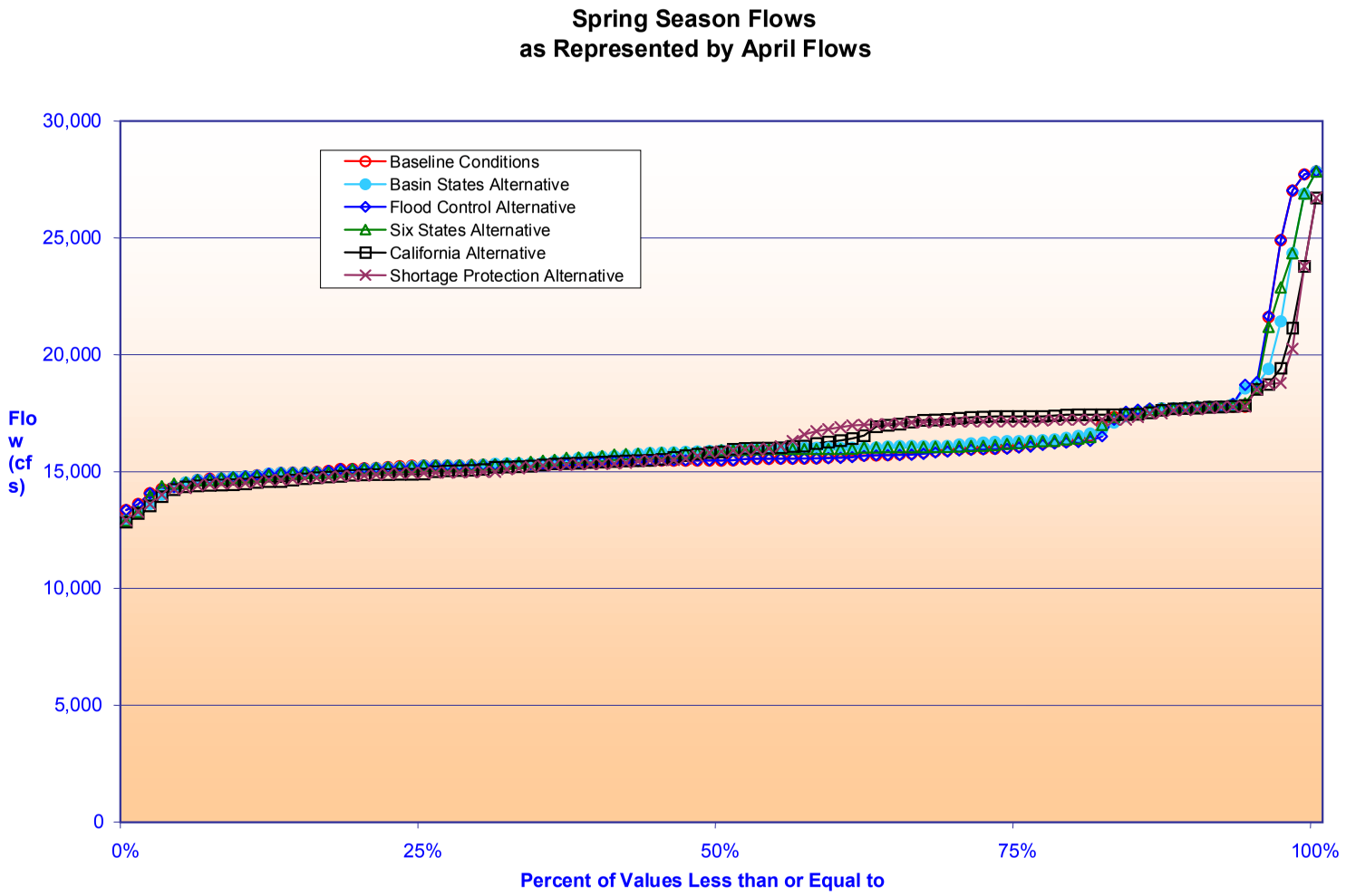


Figure 3.3-20c
Colorado River Seasonal Flows Downstream of Havasu NWR
Comparison of Surplus Alternatives to Baseline Conditions for Modeled Year 2016

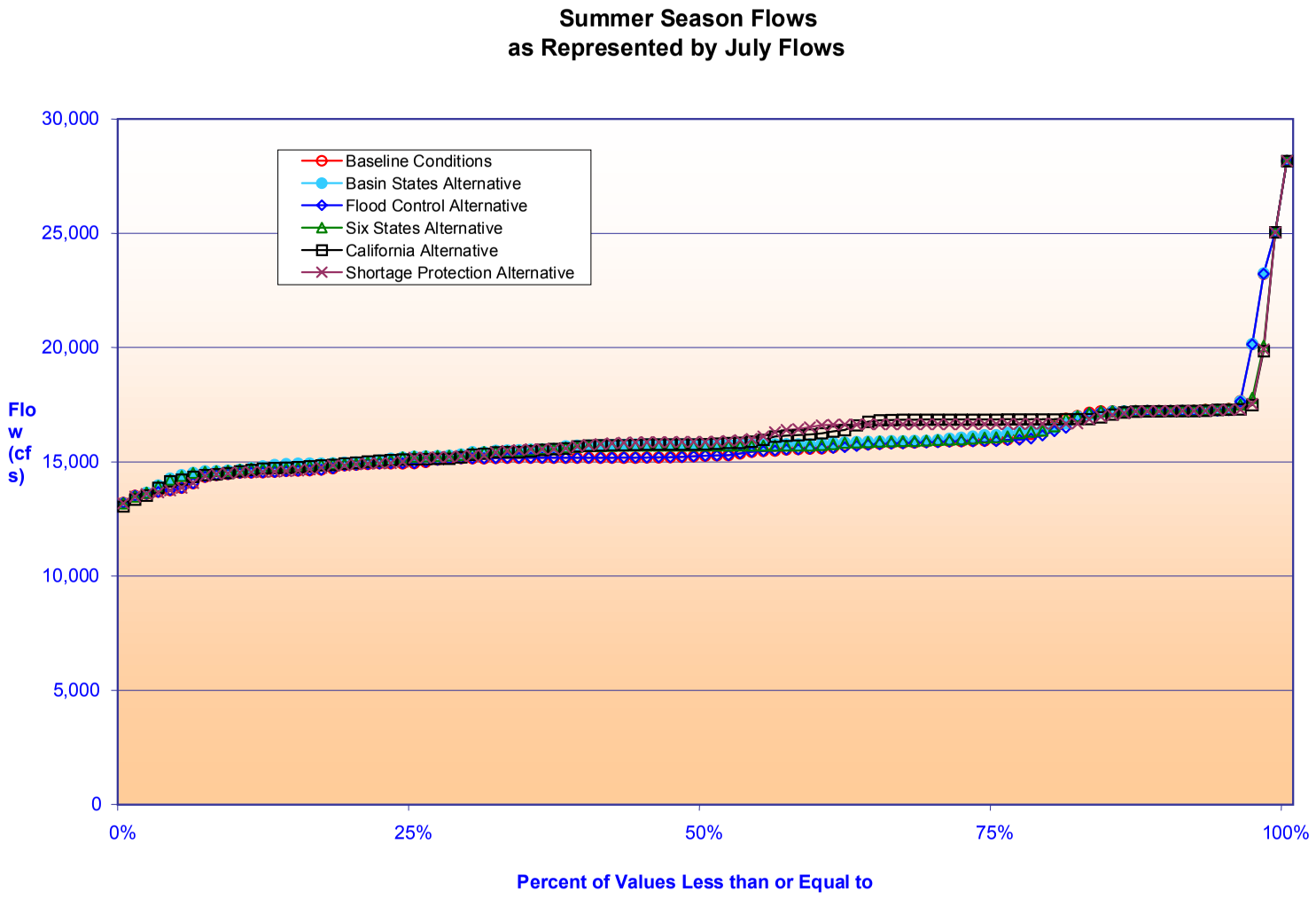
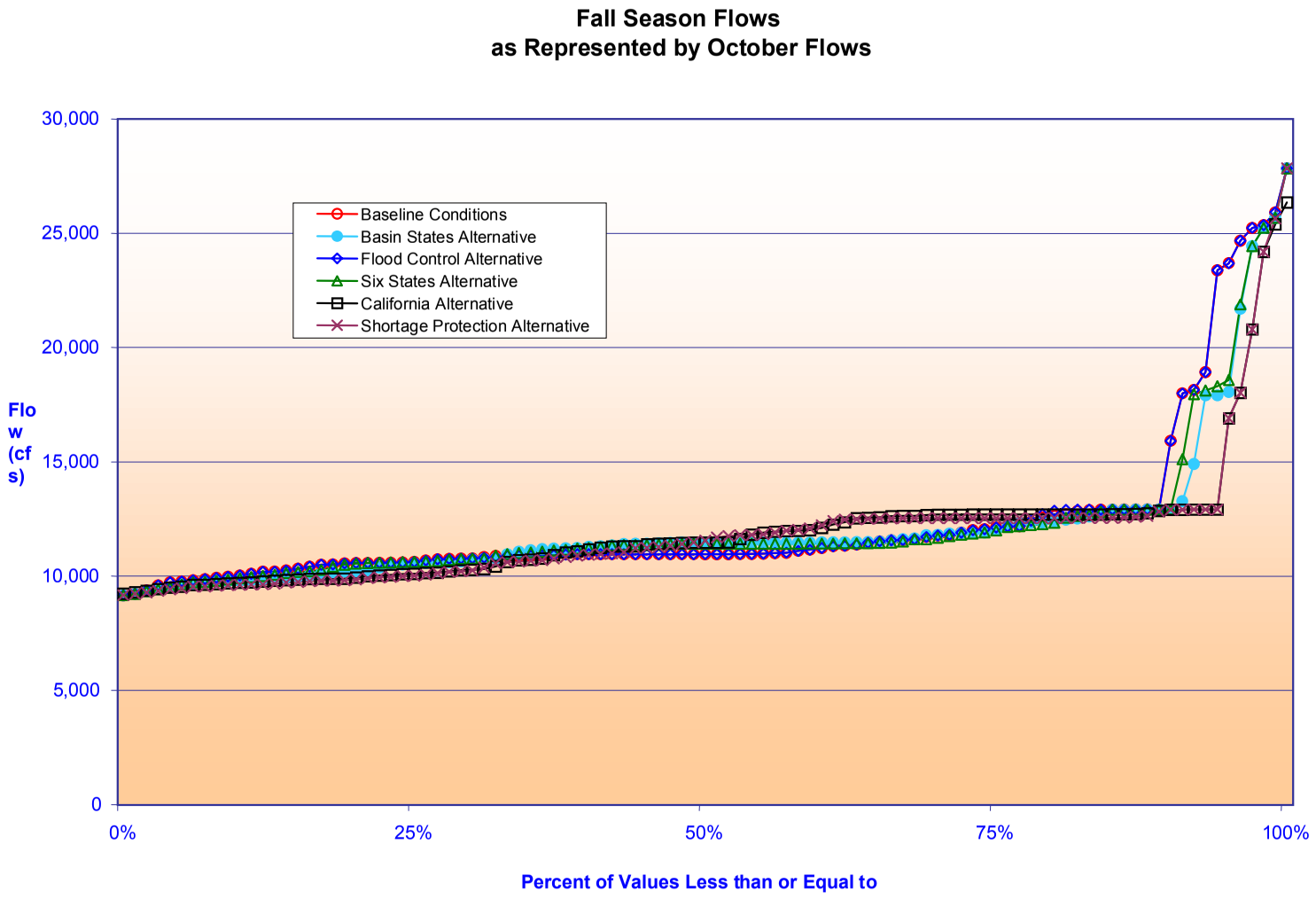


Figure 3.3-20d
Colorado River Seasonal Flows Downstream of Havasu NWR
Comparison of Surplus Alternatives to Baseline Conditions for Modeled Year 2016



3.3.4.5.2 River Flows Between Parker Dam and Palo Verde Diversion

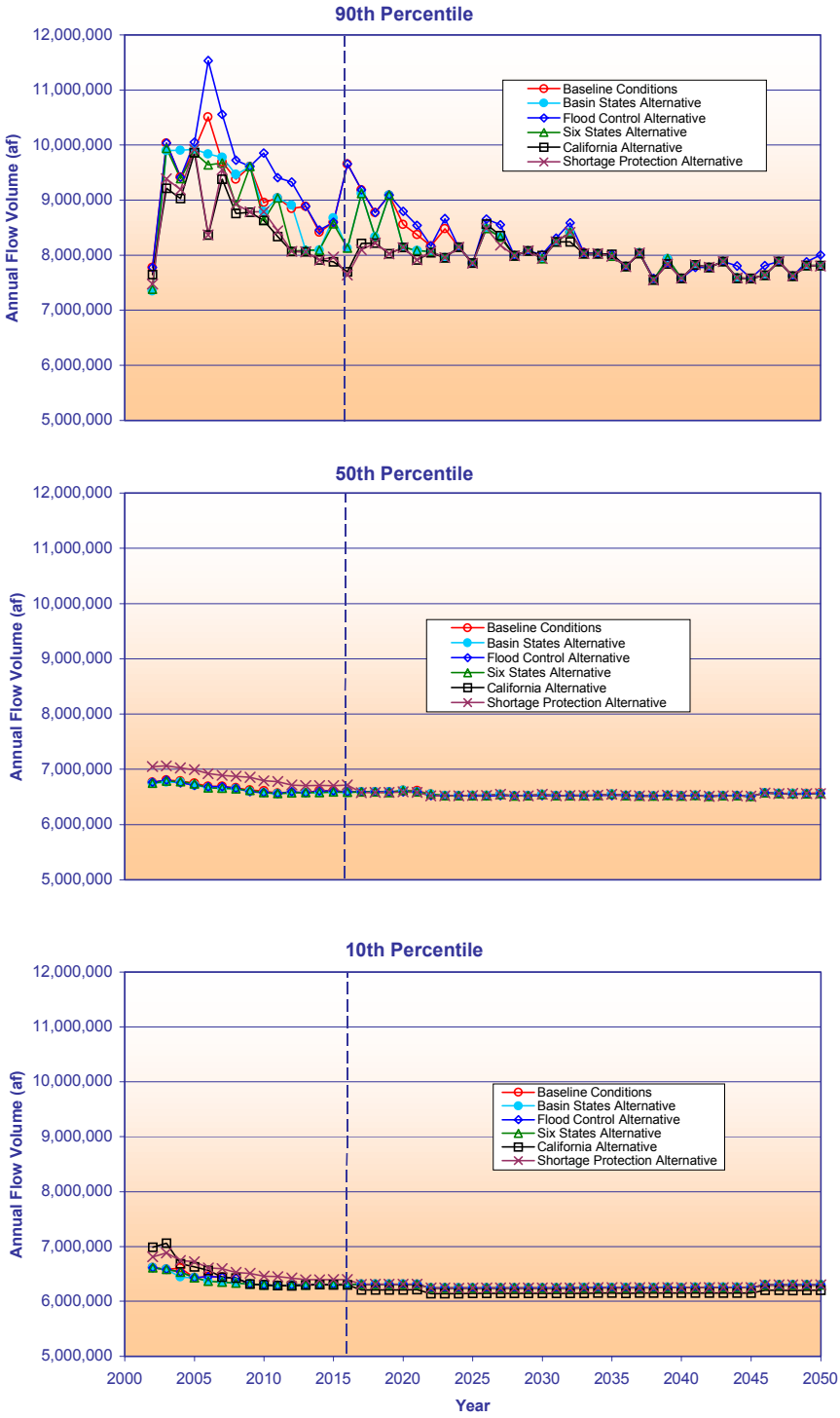
The point on the Colorado used to evaluate the river flows in the reach of the river located between Parker Dam and the Palo Verde Diversion Dam is located immediately upstream of the Colorado River Indian Reservation (CRIR) diversion. The CRIR diversion is located at Headgate Rock Dam, approximately 14 miles below Parker Dam. Flows in this reach of the river result from primarily from releases from Parker Dam (Lake Havasu).

Future flows in this reach would be affected by the proposed water transfers and exchanges between the California agricultural water agencies and MWD, which change the point of diversion. For example, under a potential transfer between IID and MWD (or SDCWA), the water that would normally be diverted at Imperial Dam would now be diverted above Parker Dam. As discussed in Section 3.3.3.2, the proposed California intrastate transfers are included in the simulation of the baseline conditions and surplus alternatives. Although the transfers themselves are not a direct result of the proposed interim surplus criteria, the transfers were modeled because they are expected to be a component of the future Lower Basin water supply management programs and to maintain consistency for comparison of the alternatives to baseline conditions. The intrastate transfers proposed by California and any potential environmental effects that would occur as a result of those actions are addressed by separate NEPA and other environmental compliance.

The 90th, 50th, and 10th percentile annual flow volumes for this reach are shown in Figure 3.3-21. As shown by the 50th percentile values, annual flow volumes in this reach can be expected to be greater for the California and Shortage Protection alternatives than for the baseline conditions and other alternatives during the 15-year interim surplus criteria period. This is the result of more frequent surplus deliveries under those two alternatives. Increases from baseline conditions under the California Alternative range from approximately seven percent in the first year down to one percent by 2013. A 1.5 percent decrease from baseline conditions is seen for the period 2017 through 2050 as a result of the modeled transfer of 100 kaf from PVID to MWD as part of the California Alternative. Increases from baseline conditions under the Shortage Protection Alternative range from approximately four percent in the first year down to two percent by 2016. The annual flow volumes for the Flood Control, Six States, and Basin States alternatives are essentially the same (less than one percent) as those under the baseline conditions for the entire period of analysis (2002 through 2050).

Similar results are seen at the 10th percentile level. Increases from baseline conditions under the California Alternative range from approximately six percent in the first year down to two percent by 2006. A 1.6 percent decrease from baseline conditions is seen for the period 2017 through 2050 as a result of the modeled transfer of 100 kaf from PVID to MWD as part of the California Alternative. Increases from baseline conditions under the Shortage Protection Alternative range from approximately three percent in the

Figure 3.3-21
Colorado River Upstream of CRIR Diversion Annual Flow Volume (af)
Comparison of Surplus Alternatives to Baseline Conditions
90th, 50th and 10th Percentile Values

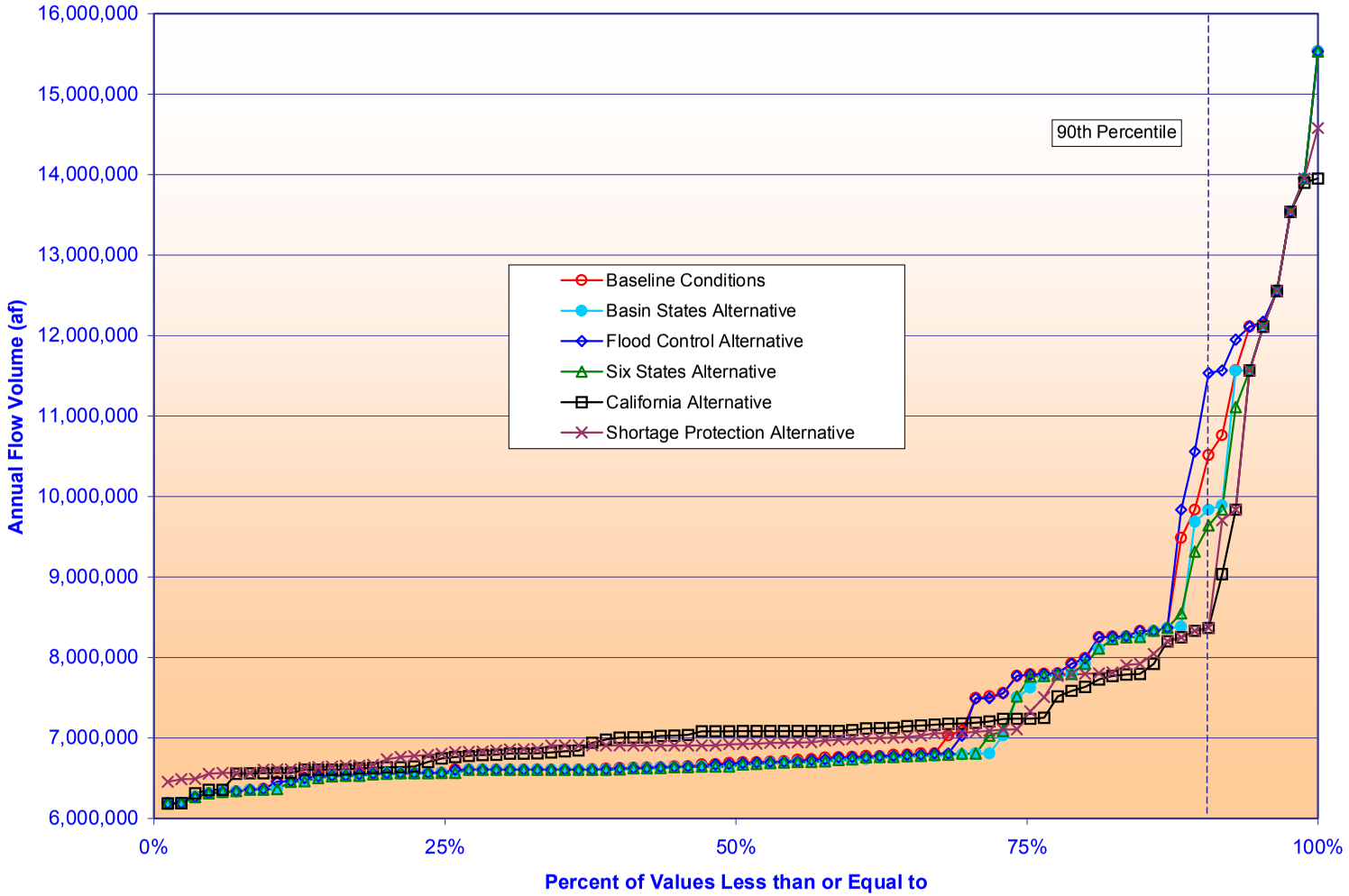


first year down to one percent by 2016. The annual flow volumes for the Flood Control, Six States, and Basin States alternatives are essentially the same (less than one percent) as those under the baseline conditions for the entire period of analysis (2002 through 2050).

At the 90th percentile level, all surplus alternatives (except for the Flood Control Alternative) show annual flow volumes less than or equal to the flows under the baseline conditions. This is the result of more frequent surplus deliveries, which tend to lower Lake Mead reservoir levels. With lower reservoir levels, the frequency of flood control events (which contribute most of the flows at the 90th percentile level) is decreased, which in turn decreases the annual flow volume for a given percentile. The California and Shortage Protection alternatives exhibit the largest decreases, ranging from two to 20 percent less than baseline conditions from 2002 through 2023, with the largest differences in 2006 and 2016. The Six States and Basin States alternatives exhibit similar behavior, ranging from two to 16 percent less than baseline conditions from 2002 through 2023, with the largest differences in 2016.

In Figure 3.3-22, the cumulative distribution of annual flow volumes is shown for year 2006. This is the year of the largest differences at the 90th percentile level as shown in Figure 3.3-21. Although the annual flow volumes decrease for all surplus alternatives (except Flood Control Alternative) at a fixed percentile (i.e. at the 90th percentile) as compared to baseline, the range of annual flow volumes are the same for baseline conditions and the surplus alternatives. The frequency that a flow of a specific magnitude will occur, however, is lower under the surplus alternatives (except for the Flood Control Alternative) as shown in Figure 3.3-22.

Figure 3.3-22
Colorado River Annual Flow Volumes Upstream of Colorado River Indian Reservation
Comparison of Surplus Alternatives to Baseline Conditions for Modeled Year 2006



Figures 3.3-23 (a-d) present comparisons of the representative seasonal flows under baseline conditions and the surplus alternatives for 2016. As expected, the largest flows occur in the spring and summer seasons for baseline conditions and all alternatives due to downstream irrigation demands. For flows that are due primarily to flood control releases from Lake Mead (flows in the 90^{th} – 100^{th} percentile range), the range of mean monthly flows is not changed by the different surplus alternatives, since these magnitudes are dictated by the flood control regulations. These flows occur, however, less often for the surplus alternatives (except the Flood Control Alternative). This effect is less pronounced in July, when most flood control releases have ceased.

The differences in flows that are not due to flood control releases are similar for all alternatives and baseline conditions. A numerical comparison of the 70^{th} percentile values is shown in Table 3.3-14. The differences in mean monthly flows for the California Alternative compared to baseline conditions are approximately six percent in the winter, three percent in the spring, one percent in the summer, and less than one percent in the fall. For the Basin States alternative, the differences (compared to baseline conditions) in mean monthly flows are less than one percent for all seasons.

Table 3.3-14
Comparison of Mean Monthly Flow (cfs) – Baseline Conditions and Surplus Alternatives
Colorado River Upstream of CRIR Diversion (River Mile = 180.8)
70^{th} Percentile Values for Year 2016

Season	Mean Monthly Flows (cfs) for Year 2016 at the 70^{th} Percentile					
	Baseline	Basin States	Flood Control	Six States	California	Shortage Protection
Winter	3897	3895	3880	3897	4117	4012
Spring	11690	11690	11690	11690	12009	11793
Summer	13025	12990	12989	13025	13194	12984
Fall	8005	7934	8064	8005	7987	7895

Figure 3.3-23a
Colorado River Seasonal Flows Upstream of Colorado River Indian Reservation
Comparison of Surplus Alternatives to Baseline Conditions for Modeled Year 2016

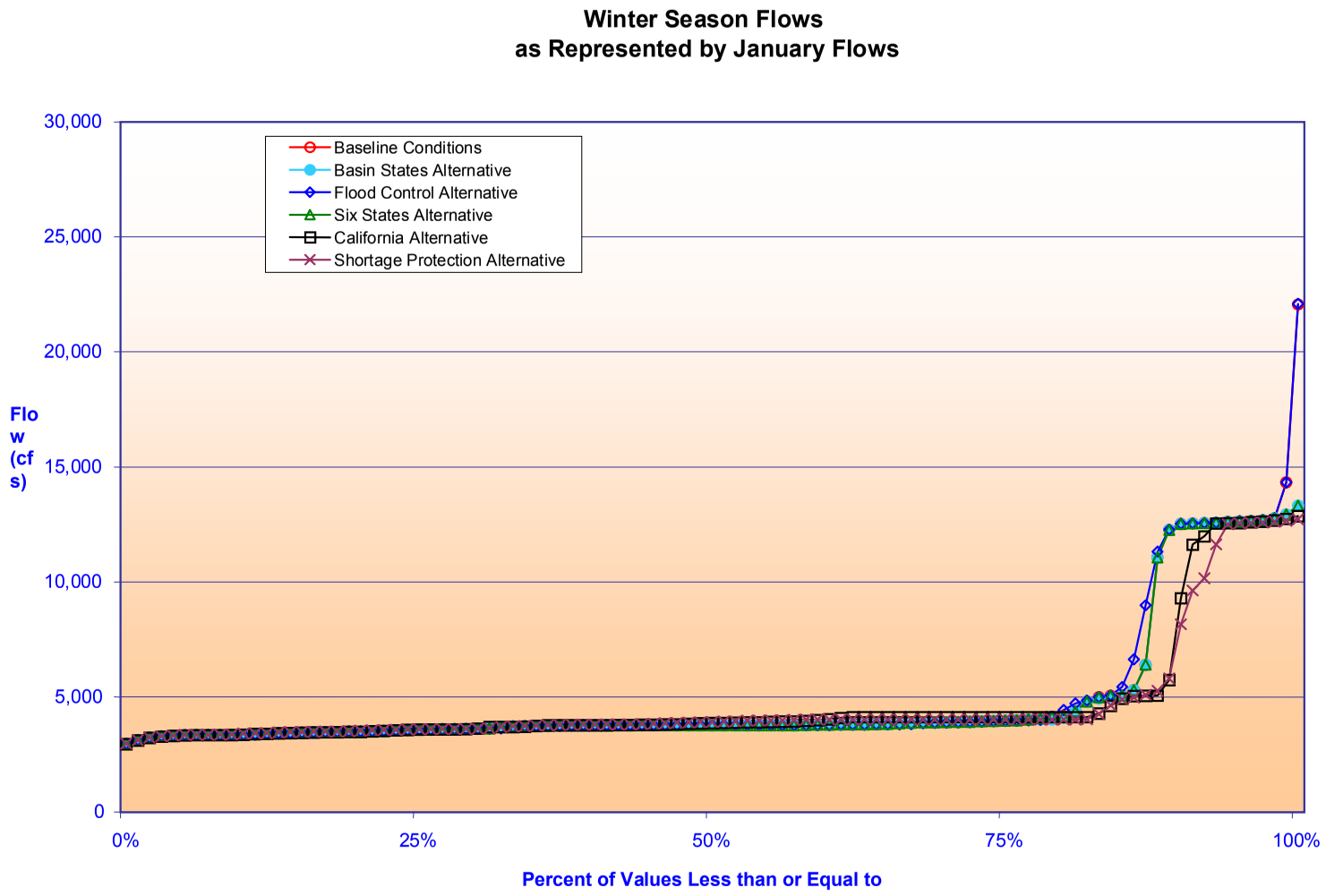


Figure 3.3-23b
Colorado River Seasonal Flows Upstream of Colorado River Indian Reservation
Comparison of Surplus Alternatives to Baseline Conditions for Modeled Year 2016

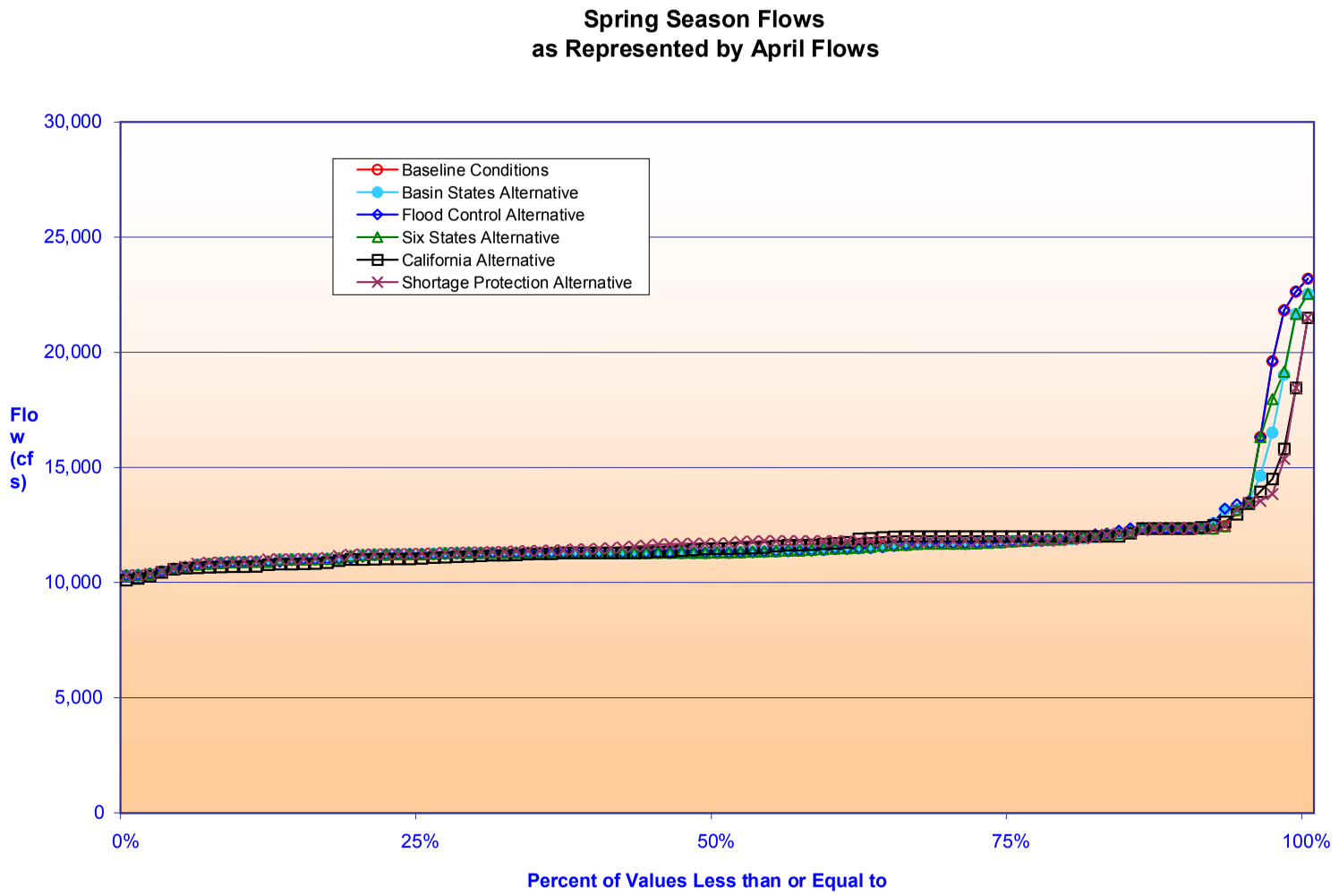


Figure 3.3-23c
Colorado River Seasonal Flows Upstream of Colorado River Indian Reservation
Comparison of Surplus Alternatives to Baseline Conditions for Modeled Year 2016

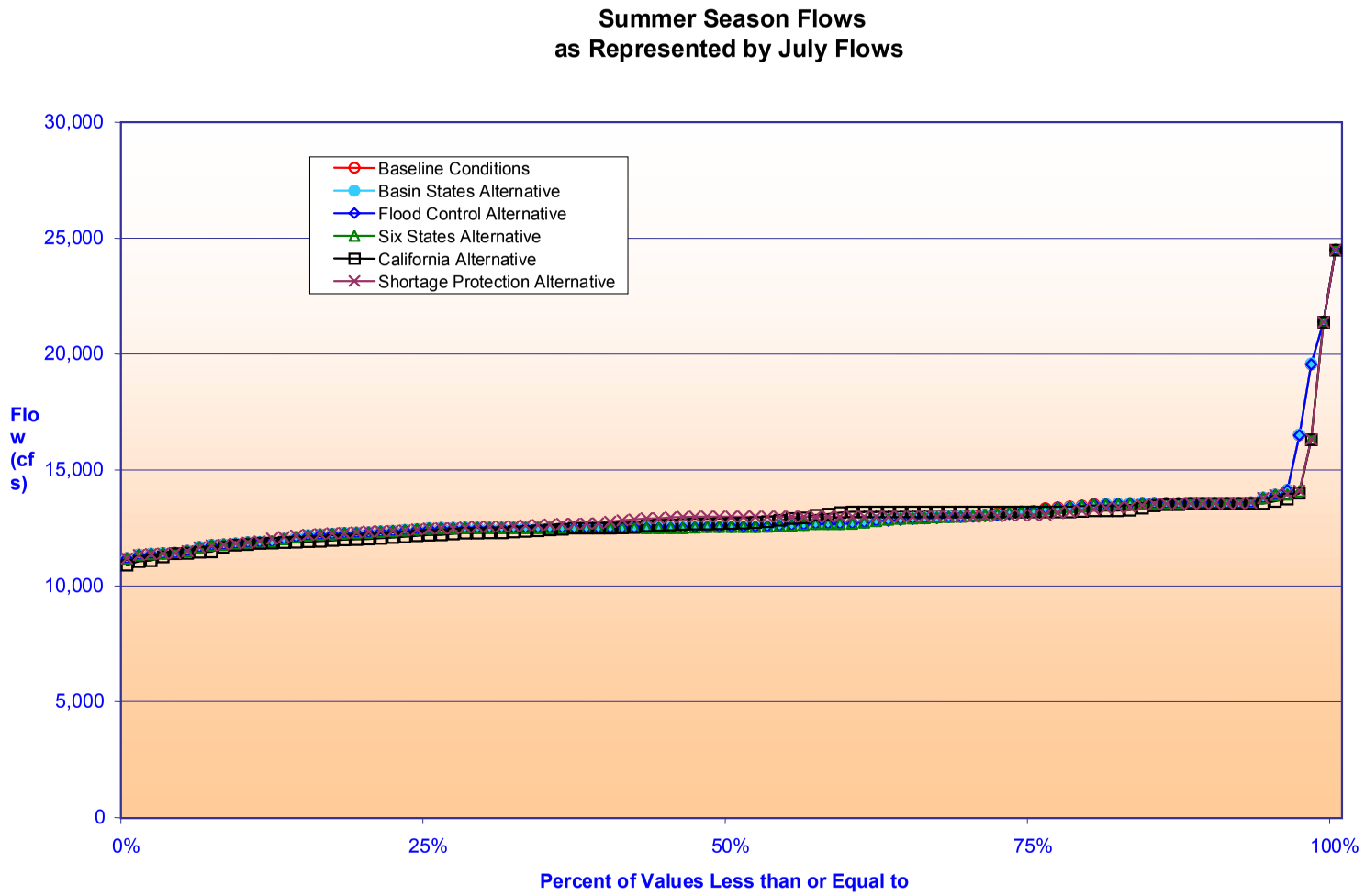
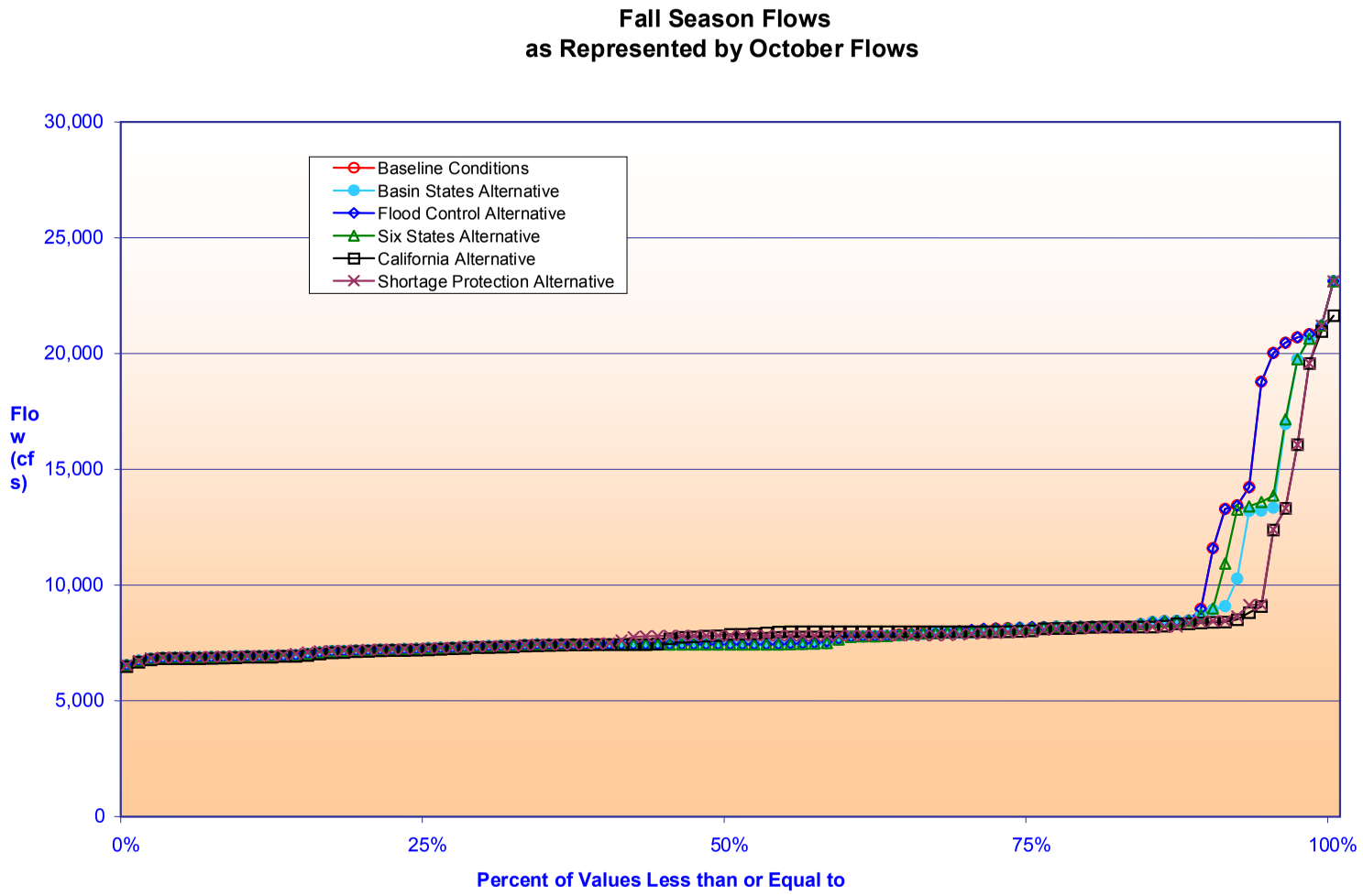


Figure 3.3-23d
Colorado River Seasonal Flows Upstream of Colorado River Indian Reservation
Comparison of Surplus Alternatives to Baseline Conditions for Modeled Year 2016



3.3.4.5.3 River Flows Between Palo Verde Diversion Dam and Imperial Dam

The flow of the Colorado River between Palo Verde Diversion Dam and Imperial Dam is normally set at the amount needed to meet the United States diversion requirements downstream of the Palo Verde Diversion plus deliveries to Mexico. The river location that was modeled for this reach of the river is located immediately downstream of the Palo Verde Diversion Dam.

As discussed in Section 3.3.4.5.2, the proposed California water interstate transfers are included in the simulation of the baseline conditions and surplus alternatives.

The 90th, 50th, and 10th percentile annual flow volumes for this reach are shown in Figure 3.3-24. As shown by the 50th percentile values, annual flow volumes in this reach can be expected to be greater for the California and Shortage Protection alternatives than for the baseline conditions for the first few years of the 15-year interim surplus criteria period. This is a result of more frequent surplus deliveries. The largest increases from baseline conditions occur under the California Alternative and are approximately eight percent during the years 2002 through 2007. After 2007, the annual flow volumes are identical to the baseline conditions. Annual flow volumes under the Shortage Protection Alternative are approximately five percent during the years 2002 through 2011. After 2011, the annual flow volumes are identical to the baseline conditions. Results for the Flood Control, Six States, and Basin States alternatives are identical to those under the baseline conditions for the entire period (2002 through 2050).

At the 10th percentile level, the California Alternative has the same relative difference (eight percent) for the years 2002 and 2003, while the Shortage Protection Alternative exhibits the same relative difference (five percent) for the years 2002 through 2005. All other results are identical to those observed for the 50th percentile values.

At the 90th percentile level, all surplus alternatives (except for the Flood Control Alternative) show annual flow volumes less than or equal to the flows under the baseline conditions. This is the result of more frequent surplus deliveries, which tend to lower Lake Mead reservoir levels. With lower reservoir levels, the frequency of flood control events (which contribute most of the flows at the 90th percentile level) is decreased, which in turn decreases the annual flow volume for a given percentile. The California and Shortage Protection alternatives exhibit the largest decreases, ranging from approximately 17 percent less than baseline conditions in 2006 to four percent less by 2023. Results for the Six States and Basin States alternatives are similar to each other, ranging from approximately 11 percent less than baseline conditions in 2016 to four percent less by 2023.

In Figure 3.3-25, the cumulative distribution of annual flow volumes is shown for year 2006. This is the year of the largest differences at the 90th percentile level as shown in Figure 3.3-24. Although the annual flow volumes decrease for all surplus alternatives (except Flood Control Alternative) at a fixed percentile (i.e. at the 90th percentile) as compared to baseline, the range of annual flow volumes are the same for baseline conditions and the surplus alternatives. The frequency that a flow of a specific magnitude will occur, however, is lower under the surplus alternatives (except for the Flood Control Alternative) as shown in Figure 3.3-25.

Figures 3.3-26 (a-d) present comparisons of the representative seasonal flows under baseline conditions and the surplus alternatives for 2016. As expected, the largest flows occur in the spring and summer seasons for baseline conditions and all alternatives due to downstream irrigation demands. For flows that are due primarily to flood control releases from Lake Mead (flows in the 90th – 100th percentile range), the range of mean monthly flows is not changed by the different surplus alternatives, since these magnitudes are dictated by the flood control regulations. These flows occur, however, less often for the surplus alternatives (except the Flood Control Alternative). This effect is less pronounced in July, when most flood control releases have ceased.

The differences in flows not due to flood control releases are similar for all alternatives and baseline conditions. A numerical comparison are the 70th percentile values is shown in Table 3.3-15. The differences in mean monthly flows for the California Alternative compared to baseline conditions are approximately 10 percent in the winter, seven percent in the spring, six percent in the summer, and eight percent in the fall. For the Basin States Alternative, the mean monthly flows are identical to those under baseline conditions for all seasons.

Table 3.3-15
Comparison of Mean Monthly Flow (cfs) – Baseline Conditions and Surplus Alternatives
Colorado River Downstream of Palo Verde Diversion Dam (River Mile = 133.8)
70th Percentile Values for Year 2016

Season	Mean Monthly Flows (cfs) for Year 2016 at the 70th Percentile					
	Baseline	Basin States	Flood Control	Six States	California	Shortage Protection
Winter	3516	3516	3516	3516	3865	3760
Spring	9888	9888	9888	9888	10608	10392
Summer	10729	10729	10729	10729	11426	11217
Fall	7191	7191	7191	7191	7749	7582

Figure 3.3-24
Colorado River Downstream Palo Verde Diversion Dam Annual Flow Volume (af)
Comparison of Surplus Alternatives to Baseline Conditions
90th, 50th and 10th Percentile Values

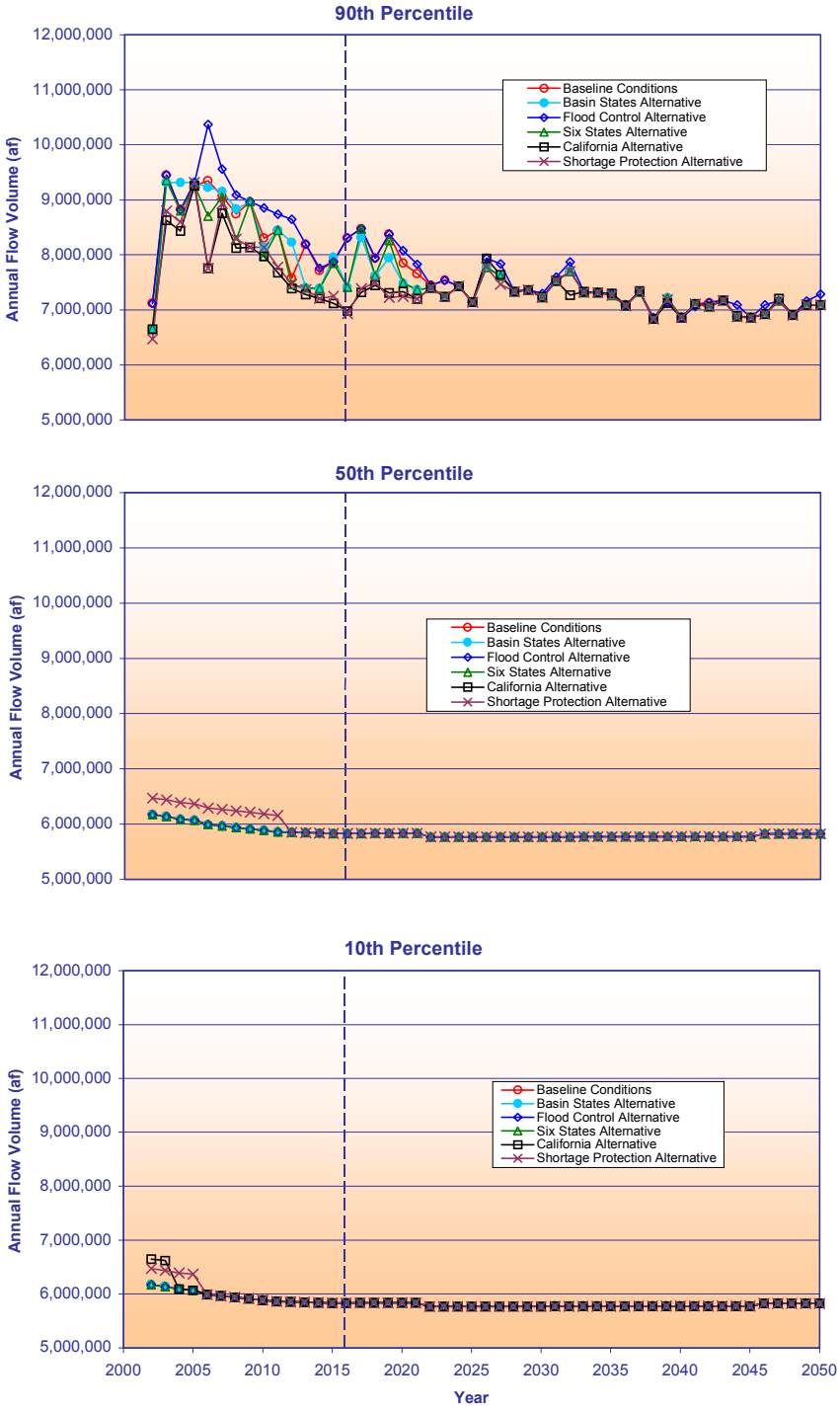


Figure 3.3-25
Colorado River Annual Flow Volumes Downstream of Palo Verde Irrigation Diversion
Comparison of Surplus Alternatives to Baseline Conditions for Modeled Year 2006

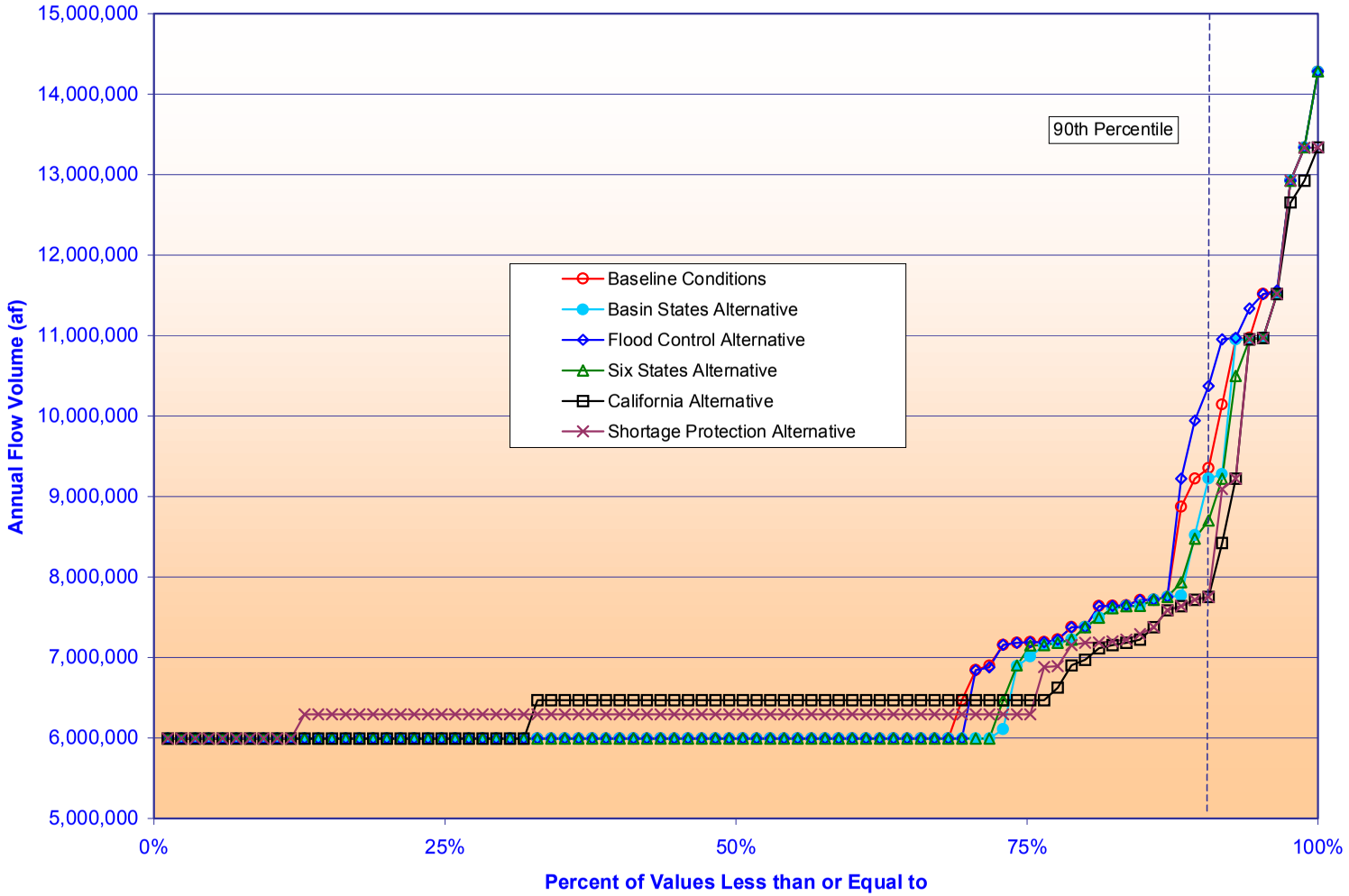


Figure 3.3-26a
Colorado River Seasonal Flows Downstream of Palo Verde Diversion Division
Comparison of Surplus Alternatives to Baseline Conditions for Modeled Year 2016

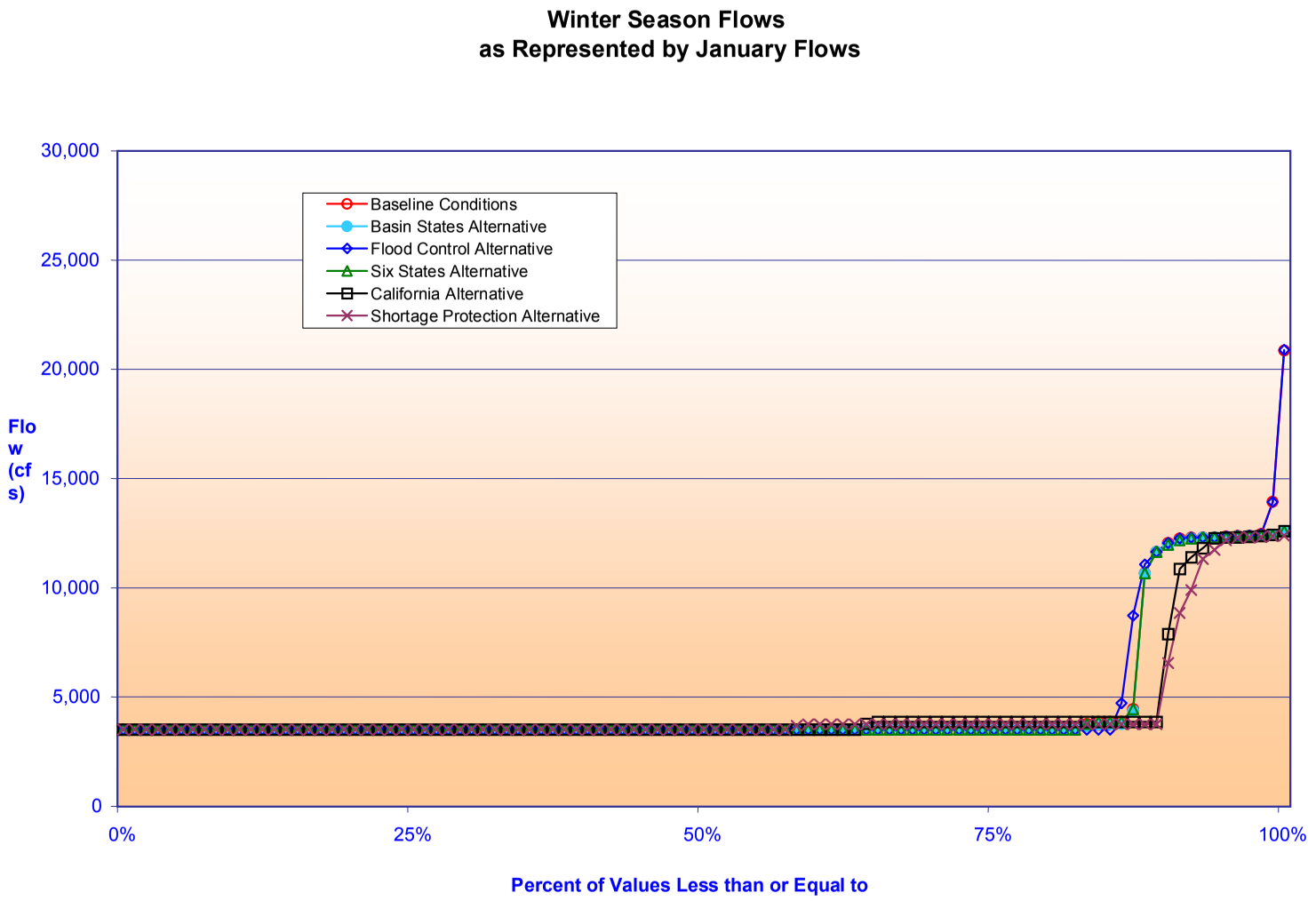


Figure 3.3-26b
Colorado River Seasonal Flows Downstream of Palo Verde Diversion Division
Comparison of Surplus Alternatives to Baseline Conditions for Modeled Year 2016

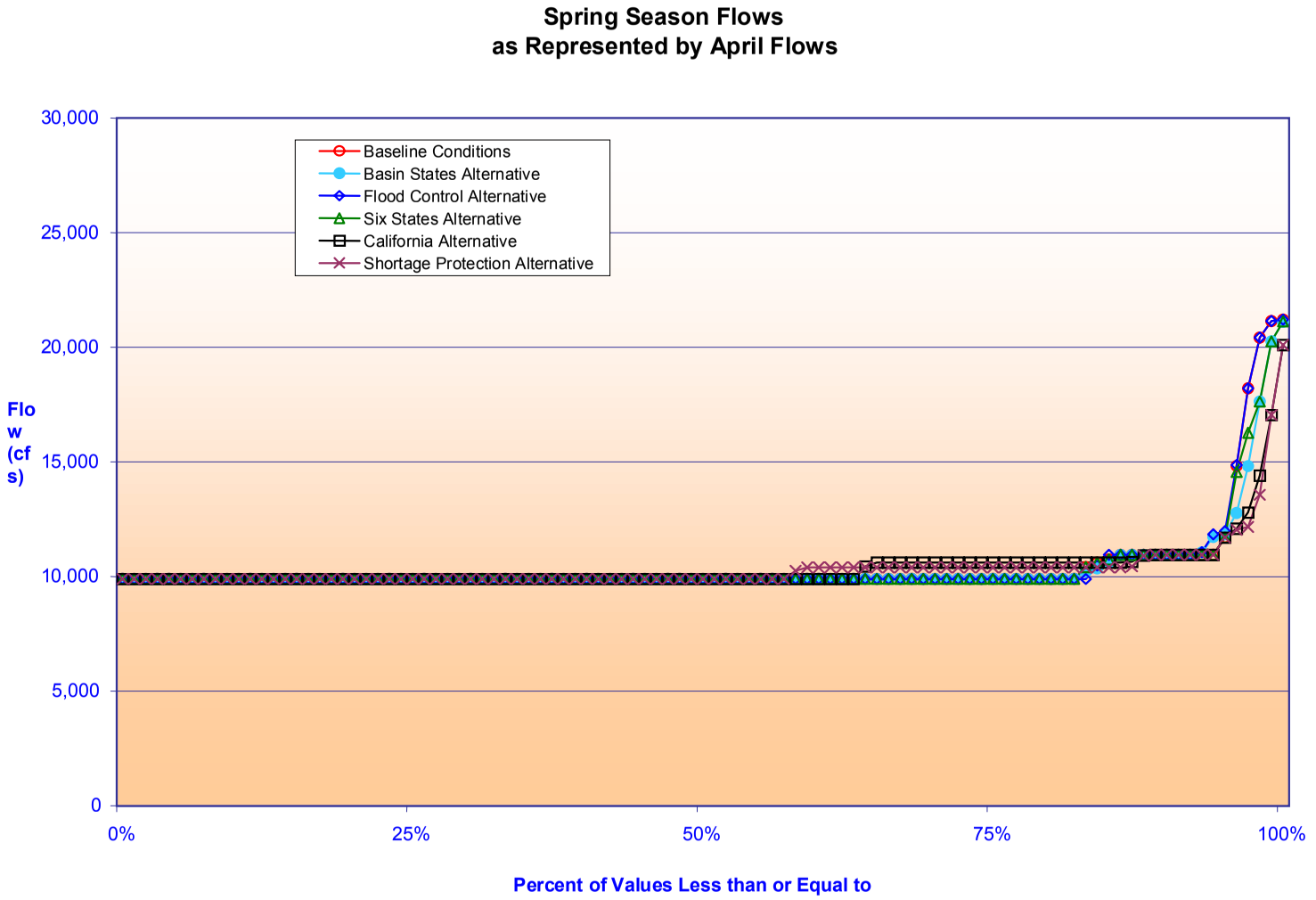


Figure 3.3-26c
Colorado River Seasonal Flows Downstream of Palo Verde Diversion Division
Comparison of Surplus Alternatives to Baseline Conditions for Modeled Year 2016

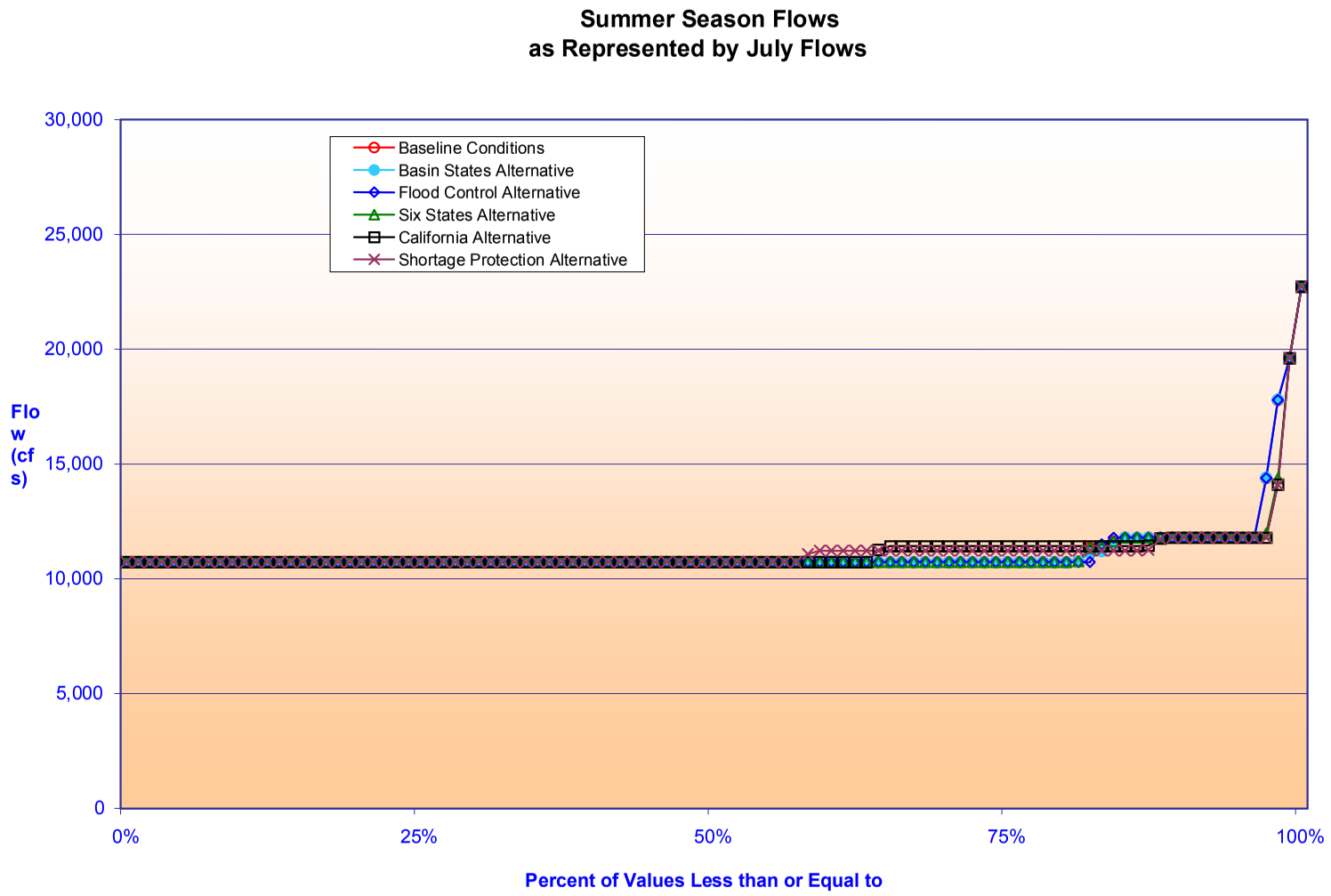
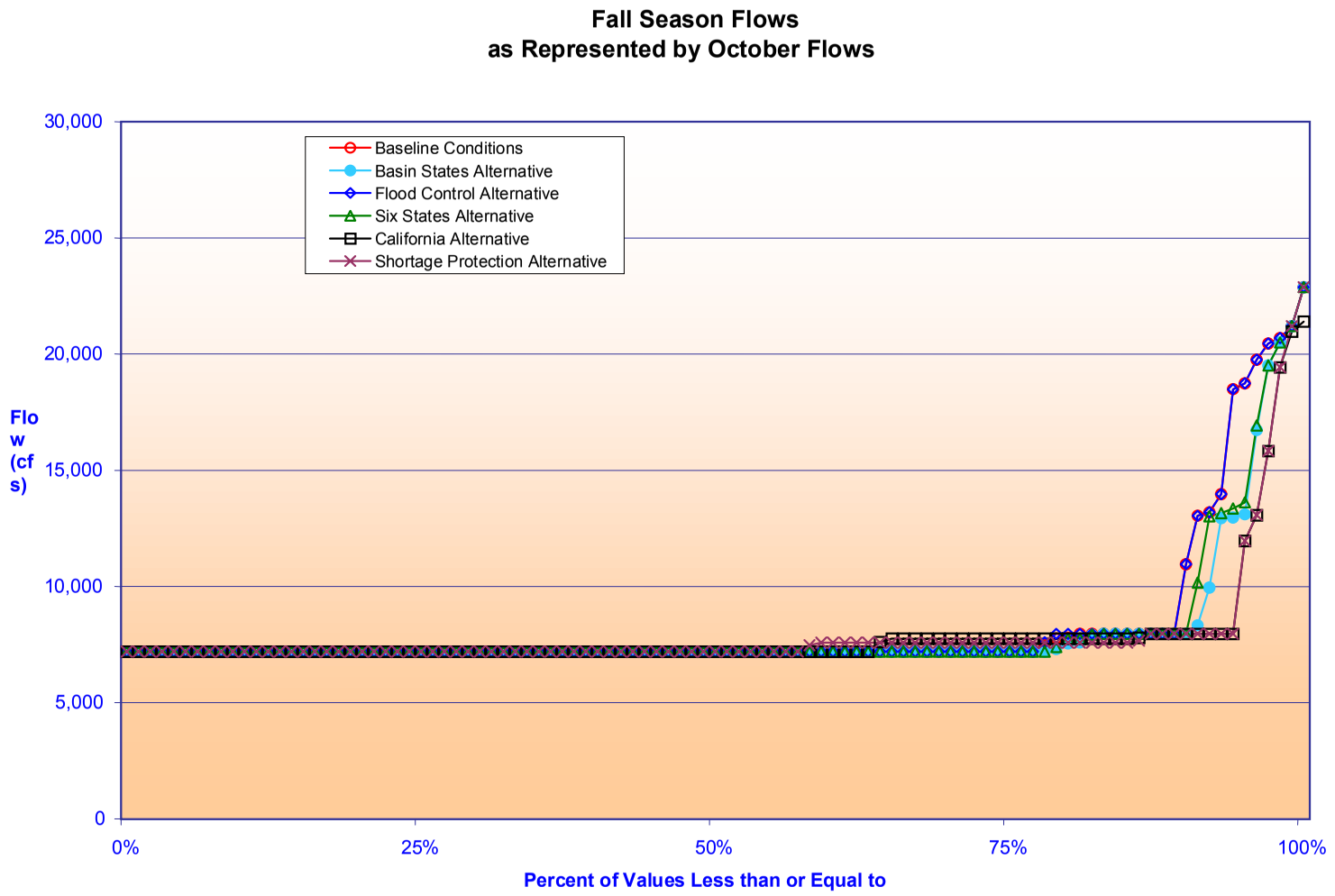


Figure 3.3-26d
Colorado River Seasonal Flows Downstream of Palo Verde Diversion Division
Comparison of Surplus Alternatives to Baseline Conditions for Modeled Year 2016



3.3.4.5.4 River Flows Between Imperial Dam and Morelos Dam

The flows in the Colorado River below Imperial Dam are primarily comprised of the water delivered to Mexico in accordance with the Treaty. Mexico's principal diversion is at Morelos Dam, which is located, approximately nine miles southwest of Yuma, Arizona. Mexico owns, operates, and maintains Morelos Dam.

The reach of river between Morelos Dam and the SIB is commonly referred to by Reclamation as the Limitrophe Division. Reclamation's authority in this division is limited to maintaining the bankline road, the levee, various drains to the river, and the U.S. Bypass drain that carries agricultural drainage water to the Cienega de Santa Clara in Mexico. Under International Treaty the United States Section of the IBWC is obligated to maintain the river channel within this division. Reclamation provides assistance to the IBWC, when requested, for maintenance needs in this reach of the river.

Minute 242 (Minutes are defined as decisions of IBWC and signed by the Mexican and United States commissioners) of IBWC and the Mexican Water Treaty of 1944 provide requirements for deliveries at the NIB and SIB near Yuma and San Luis, Arizona, respectively. Up to 140,000 af annually of agricultural drainage water can be delivered to Mexico at the SIB. The remaining 1,360,000 af of water is to be delivered to Mexico at the NIB annually and diverted at Morelos Dam to the Mexicali Valley. For several years after the United States Bypass Drain was completed in 1978, the Colorado River Channel downstream of Morelos Dam was normally dry. Flows below Morelos Dam now occur only when water in excess of Mexico's requirement arrive at the NIB.

Much of the NIB water is diverted at Imperial Dam into the All-American Canal (AAC) where it is returned to the bed of the Colorado River through Siphon Drop and Pilot Knob Powerplants. A portion of the NIB deliveries remains in the river, passing through Imperial and Laguna Dams to Morelos Dam.

Water in excess of Mexico's water order at the NIB is normally passed through Morelos Dam, through the Limitrophe Division, and into the original Colorado River channel downstream. Water in excess of Mexico's water order occurs primarily when flood releases are made from Lake Mead. Excess water arriving at the NIB may also result from flooding on the Gila River, and from operational activities upstream (i.e., cancelled water orders in the United States, maintenance activities, etc.).

In December of each year, Mexico provides to the United States an advance monthly water order for the following calendar year. Normally, this water order can only be changed by providing the United States with written notice, 30 days in advance and each monthly water order can be increased or decreased by no more than 20 percent of the original monthly water order. The Treaty further stipulates that Mexico's total water order must be no less than 900 cfs and no more than 5500 cfs during the months of January, February, October, November and December. During the remainder of the

year, Mexico's water order must be no less than 1500 cfs and no more than 5500 cfs. Daily water orders are usually not allowed to increase or decrease by more than 500 cfs.

As discussed in Section 3.3.3.3, the model accounts for the all deliveries to Mexico diversions at the NIB (Morelos Dam). Flows that are modeled downstream of Morelos Dam represent mean monthly flows that are excess flows in the Colorado River due to Lake Mead flood control releases. These excess flows may reach the Colorado River Delta, although Mexico has the authority to divert them for other uses. Such decisions by Mexico are not modeled. The excess flows are over and above Mexico's normal 1.5 mafy water entitlement, plus the 200,000 afy for surplus deliveries.

The 90th, 50th, and 10th percentile annual flow volumes for this reach are shown in Figure 3.3-27. Since these flows are dependent solely upon infrequent flood control releases, no flows are observed at either the 10th or 50th percentiles. At the 90th percentile level, all surplus alternatives (except for the Flood Control Alternative) show annual flow volumes less than or equal to the flows under the baseline conditions. This is the result of more frequent surplus deliveries, which tend to lower Lake Mead reservoir levels. With lower reservoir levels, the frequency of flood control events is decreased, which in turn decreases the annual flow volume for a given percentile. The California and Shortage Protection alternatives exhibit the largest decreases, ranging from approximately 70 percent less than baseline conditions in 2016 to 12 percent less by 2023. Results for the Six States and Basin States alternatives are similar to each other, ranging from approximately 47 percent less than baseline conditions in 2013 to 12 percent less by 2023.

In Figure 3.3-28, the cumulative distribution of annual flow volumes is shown for year 2006. This is the year of the largest differences at the 90th percentile level as shown in Figure 3.3-27. Although the annual flow volumes decrease for all surplus alternatives (except Flood Control Alternative) at a fixed percentile (i.e. at the 90th percentile) as compared to baseline, the range of annual flow volumes are the same for baseline conditions and the surplus alternatives. The frequency that a flow of a specific magnitude will occur, however, is lower under the surplus alternatives (except for the Flood Control Alternative) as shown in Figure 3.3-28.

Additional analysis of annual flow volumes in this reach is presented in Section 3-16.

Figure 3.3-27
Colorado River Below Mexico Diversion at Morelos Dam Annual Flow Volume (af)
Comparison of Surplus Alternatives to Baseline Conditions
90th, 50th and 10th Percentile Values

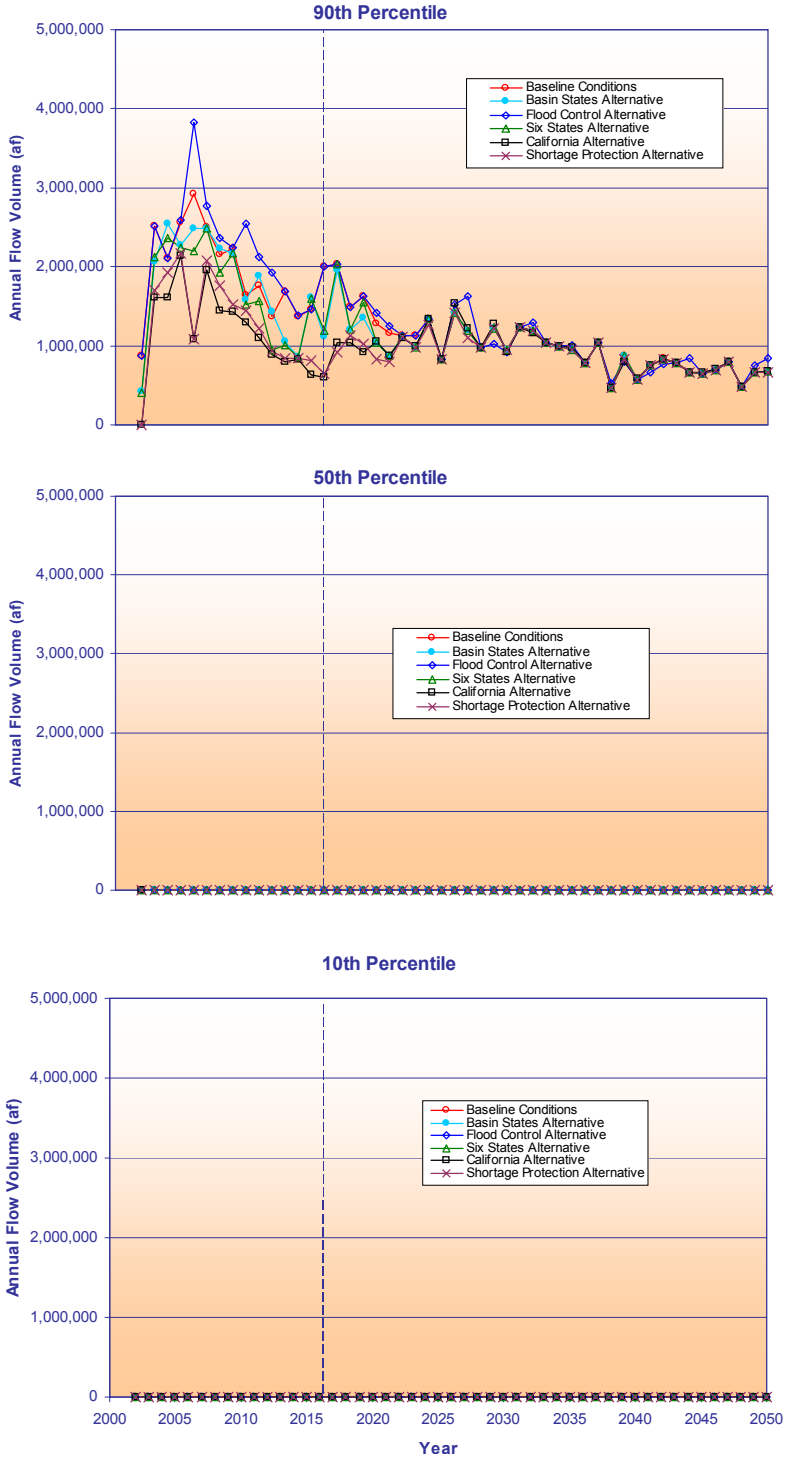
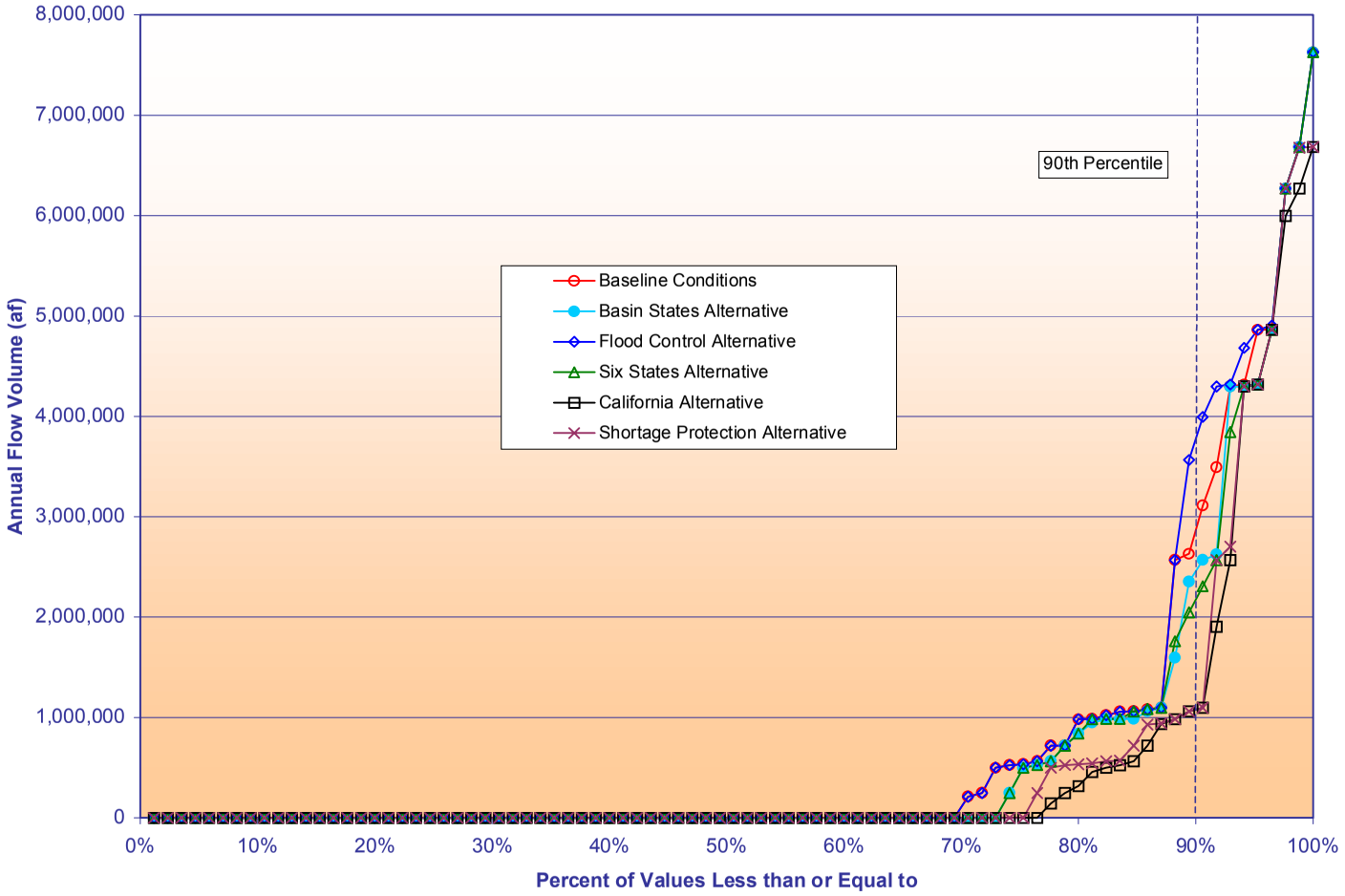


Figure 3.3-28
Colorado River Annual Flow Volumes Below Mexico Diversion at Morelos Dam
Comparison of Surplus Alternatives to Baseline Conditions for Modeled Year 2006



Figures 3.3-29 (a-d) present comparisons of the representative seasonal flows under baseline conditions and the surplus alternatives for 2016. As expected, the only differences are seen for flows that are due to flood control releases from Lake Mead (flows in the 90th – 100th percentile range). As seen in the figures, the range of mean monthly flows is not changed by the different surplus alternatives, since these magnitudes are dictated by the flood control regulations. These flows occur, however, less often for the surplus alternatives (except the Flood Control Alternative). This effect is less pronounced in July, when most flood control releases have ceased.

A numerical comparison of the 90th percentile values is shown in Table 3.3-16. The differences in mean monthly flows for the California Alternative compared to baseline conditions are approximately 51 percent in the winter, zero percent in the spring, zero percent in the summer, and 100 percent in the fall. For the Basin States alternative, the differences (compared to baseline conditions) in mean monthly flows are approximately one percent in the winter, zero percent in the spring, and zero percent in the summer and 100 percent in the fall seasons. The large fluctuating differences are due to the infrequent nature of these flows and are indicative of the decreased frequency of occurrence due to the interim surplus criteria.

Table 3.3-16
Comparison of Mean Monthly Flow Data – Baseline Conditions and Surplus Alternatives
Colorado River Downstream of Morelos Dam (River Mile = 23.1)
90th Percentile Values (cfs) for Year 2016

Season	Mean Monthly Flows (cfs) for Year 2016 at the 70th Percentile					
	Baseline	Basin States	Flood Control	Six States	California	Shortage Protection
Winter	8125	8052	8125	8052	3983	2706
Spring	0	0	0	0	0	0
Summer	0	0	0	0	0	0
Fall	3007	0	3007	0	0	0

Figure 3.3-29a
Colorado River Seasonal Flows Below Mexico Diversion at Morelos Dam
Comparison of Surplus Alternatives to Baseline Conditions for Modeled Year 2016

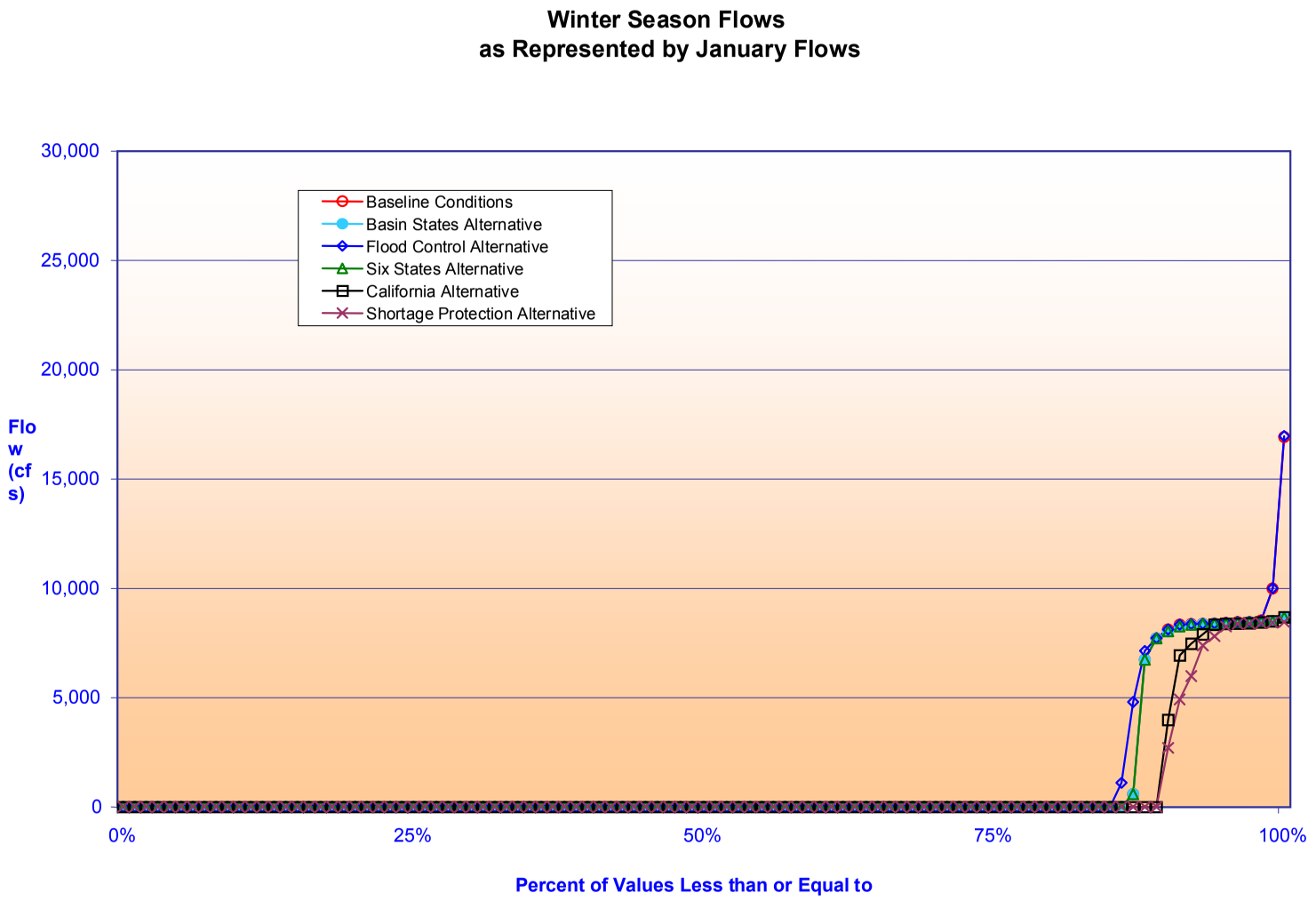


Figure 3.3-29b
Colorado River Seasonal Flows Below Mexico Diversion at Morelos Dam
Comparison of Surplus Alternatives to Baseline Conditions for Modeled Year 2016

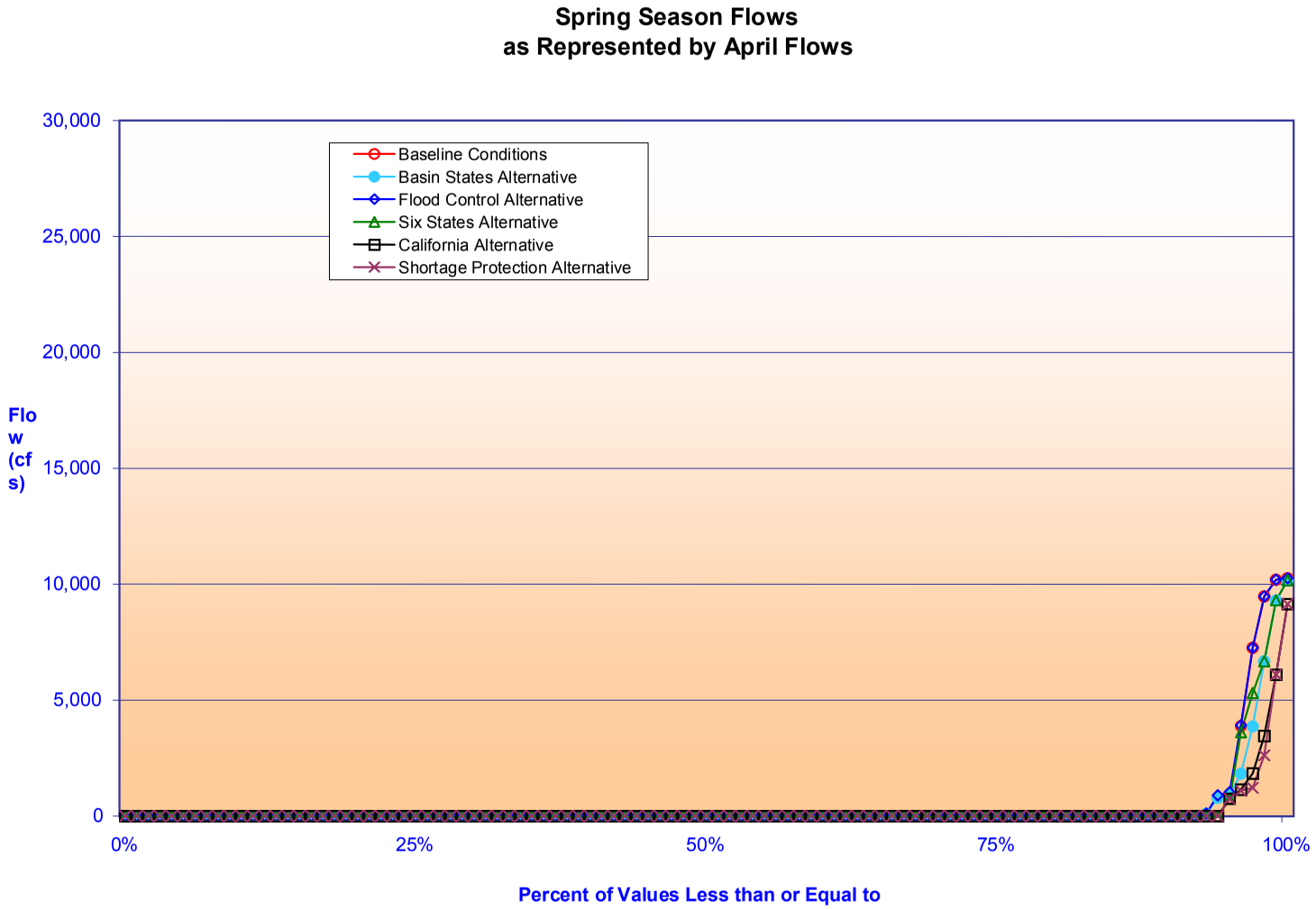


Figure 3.3-29c
Colorado River Seasonal Flows Below Mexico Diversion at Morelos Dam
Comparison of Surplus Alternatives to Baseline Conditions for Modeled Year 2016

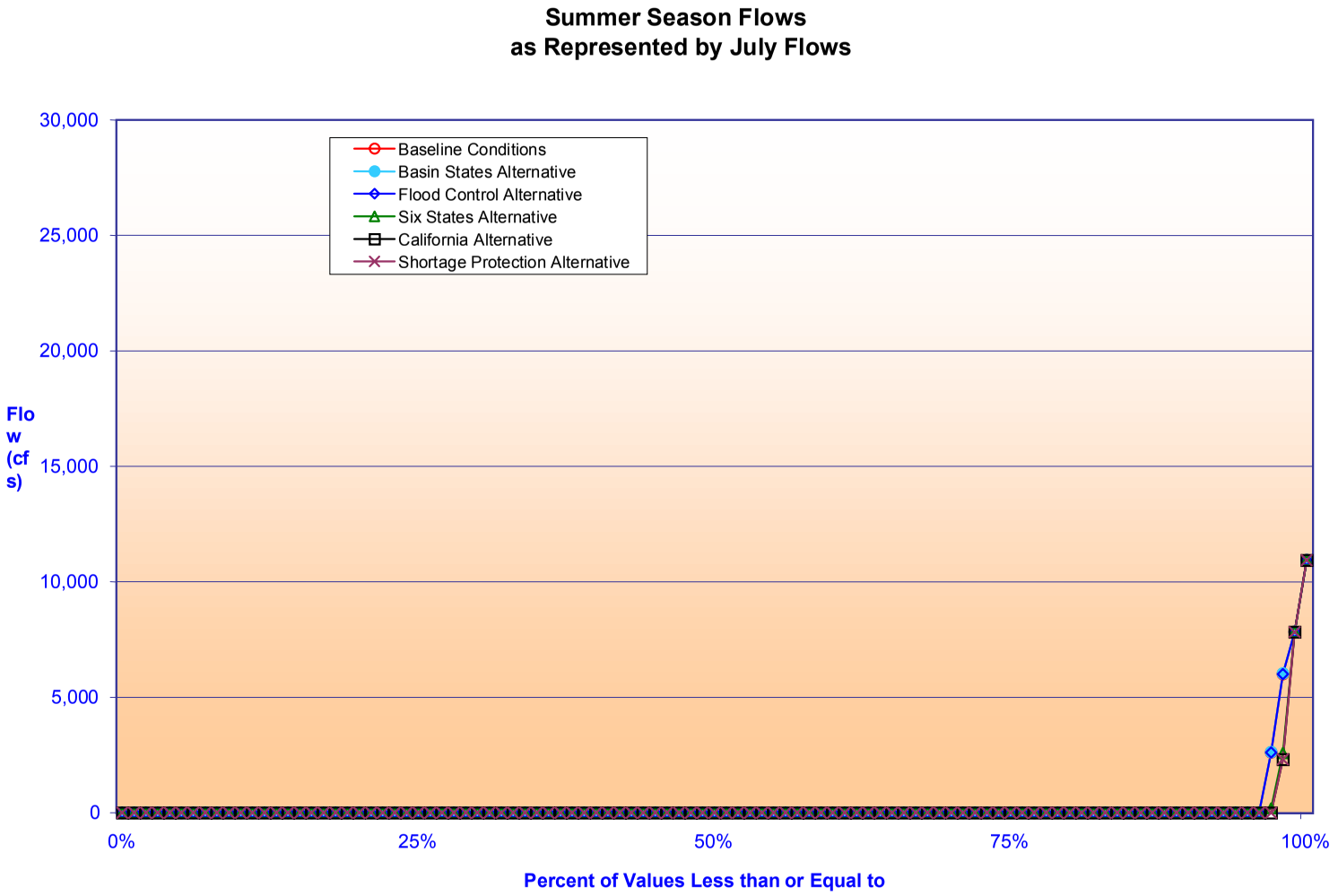


Figure 3.3-29d
Colorado River Seasonal Flows Below Mexico Diversion at Morelos Dam
Comparison of Surplus Alternatives to Baseline Conditions for Modeled Year 2016