

Appendix B - CULTURAL RESOURCES CONSULTATION CORRESPONDENCE



DEPARTMENT OF THE ARMY
ALBUQUERQUE DISTRICT, CORPS OF ENGINEERS
4101 JEFFERSON PLAZA NE
ALBUQUERQUE NM 87109-3435

March 9, 2022

Planning, Project and Program Management Division
Planning Branch
Environmental Resources Section

Honorable Randall Vicente
Governor, Pueblo of Acoma
Post Office Box 309
Acoma, New Mexico 87034

Dear Governor Vicente:

Pursuant to 36 CFR Part 800, the U.S. Army Corps of Engineers (Corps), Albuquerque District, is seeking your concurrence in our determination of **no adverse effect to historic properties** for the proposed deviation from the Water Control Plan (WCP) at Abiquiu Dam and Reservoir, in the context of planned repairs of El Vado Dam by the U.S Bureau of Reclamation (USBR). Abiquiu Dam was constructed in the late 1950s and early 1960s as a flood control project on the Rio Chama about 32 miles upstream from the confluence of the Rio Chama and the Rio Grande and became operational in 1963. The project is located on the Cañones, New Mexico (36106-B4) 7.5' USGS Quad map, on unplatted lands of the Piedra Lumbre land grant (Enclosure 1).

The U.S. Army Corps of Engineers (Corps), Albuquerque District is proposing a temporary deviation from the current WCP at the Abiquiu Dam and Reservoir Project, Rio Arriba County, New Mexico. Corps received a request from the New Mexico Interstate Stream Commission (NMISC) requesting Corps to deviate from its normal operation schedule at Abiquiu Dam to allow retention of native Rio Grande water in Abiquiu Reservoir while El Vado Dam and Spillway are under repair by the USBR. Retained Rio Grande water may be released to meet middle Rio Grande irrigation demand, and/or the Coalition of Six Middle Rio Grande Basin Pueblos' direct flow right.

The El Vado Dam and Lake are located on the Rio Chama 32 miles upstream of Abiquiu Reservoir, and 30 miles downstream from Chama, NM. The dam was completed in 1935 to supplement irrigation water for the Middle Rio Grande Conservancy District (MRGCD) with a capacity of 198,000 acre-ft. for a 3,200-acre lake. USBR will begin conducting repairs and construction on El Vado Dam in spring 2022 for up to three years. During the repairs and construction, El Vado will not be able to retain any Rio Grande water.

The purpose of the proposed deviation action is to implement a temporary deviation from the WCP for Abiquiu Dam, which will allow other responsible agencies to retain and release Rio Grande water at Abiquiu Reservoir that would normally be retained at El Vado Reservoir while the El Vado Dam is undergoing repair. The request is for three (3) years until the completion of the El Vado Dam repairs, which are expected to start by the end of May 2022 and continue until December 2024. The water may be retained as Relinquishment Credit to meet middle Rio Grande water users' demand, and/or as Prior and Paramount (P&P) water for the Coalition.

The retained water will serve two purposes: the first purpose will allow NMISC to retain Rio Grande water in Abiquiu Reservoir up to 45,000 acre-feet per year and release it later in the season to meet middle Rio Grande irrigation demand. The water will be retained in the SJC Project conservation pool below elevation 6,220 ft. The total amount that will be retained during

the deviation period is 90,000 acre-feet, with a maximum annual amount of 45,000 acre-feet. Unused water will be carried over to the following year.

The second purpose will allow USBR to retain Rio Grande water in Abiquiu Reservoir up to 20,000 acre-feet/year to meet the Coalition's direct flow right. The water will be retained in the SJC Project conservation pool below elevation 6,220 ft. Unused water will be released between 01 November and 15 December of each year.

Under the no action alternative, El Vado Dam, upstream of Abiquiu Dam, will be under repair and therefore not available to retain its typical amount of water starting in May 2022. Without a deviation at Abiquiu Dam, all water would pass through El Vado and Abiquiu dams during the El Vado Dam repairs. Therefore, the proposed no action (baseline scenario) is to pass all inflow to the downstream channel capacity, except SJC Project water, which will follow normal operation at Abiquiu Dam.

In summary: The proposed action would involve retaining water as described above, with the following possible scenarios:

- Retain water as relinquishment credit
- Retain water as Prior and Paramount (P&P) water
- Both relinquishment credit and P&P

Area of Potential Effect

The Corps determines that the APE consists of the areas where changing lake elevations may affect archaeological sites through inundation, exposure, or wave action, within an elevation range of approximately 6,150 ft to 6,250 ft. As will be described below, hydrologic modeling suggests that the elevation range most likely to experience inundation are elevations at and below 6,220 ft, with a much smaller likelihood of having maximum elevations up to 6,250 ft (Enclosure 2). In addition, changes in flow regimes could have the potential to affect properties located within the channel downstream of Abiquiu Dam.

Based on an examination of the NMCRIS database, as well as Corps records, a total of 148 archaeological sites have been documented within this APE, and these sites represent human use of the landscape ranging from the Archaic to Historic periods. Of these 148 sites, 45 are located above the 6,220 ft level (Enclosure 3).

In addition, there are numerous historic properties documented near the Rio Chama channel downstream of Abiquiu Dam, including a wide range of prehistoric and historic resources, including active acequia systems.

All of the historic properties within the APE at the lake have been inundated or periodically inundated by normal lake operations since the 1960s.

Hydrologic Modeling

In order to determine whether the proposed deviation from the WCP would introduce new adverse effects to historic properties within the APE, we compare the expected behavior of lake elevations and downstream flows with the deviation to the expected behavior of lake elevations and downstream flows without the deviation. In addition, we examine how these conditions compare to past conditions within the APE.

The Corps performed hydrologic modeling of likely lake elevations for four scenarios:

- No deviation
- Deviation (relinquishment credit)
- Deviation (P&P)
- Deviation (combined relinquishment credit + P&P)

This modeling used existing hydrological data from the years 1975-2014, and predicted the range of what lake elevations at Abiquiu Reservoir would look like for the next three years under those conditions. As such, the resulting graphs (Enclosures 4, 5, 7, 8, and 9) each represent 40

different runs of the model, for each of the historical conditions. They also include the average, maximum, and minimum lake levels.

Expected Conditions Without Proposed Deviation

Reservoir elevation can affect archaeological sites by subjecting them to a number of processes, including inundation and wave action. Wave action in particular has been shown to have a significant impact on archaeological sites.

The model runs presented in Enclosures 4 and 5 present expectations for reservoir elevations for the duration of the period under consideration based on historic conditions during wetter years (Enclosure 4) and drier years (Enclosure 5). The model shows that, while there is a wide range of possible elevations for any given year, the average reservoir elevation over all model runs would be expected to range from approximately 6,170 ft to 6,200 ft. The drier years are much more representative of current New Mexico drought conditions, and are expected to more accurately represent likely outcomes.

Enclosure 6 shows daily reservoir elevations throughout the history of the reservoir. Between the years of 1963 and 1987, reservoir elevations increased from a starting point of around 6,060 ft to an all-time maximum of approximately 6,260 ft in August 1987. Since late 1987, elevations have remained largely between 6,170 ft and 6,220 ft, spiking above 6,220 only five times. The figure shows that the predicted average range of elevations for the no action alternative is very similar to the elevation range characteristic of the years since 1987. The no action alternative would be unlikely to inundate sites that have not been inundated over the last three decades.

On the question of wave action, Enclosure 6 shows that the range of elevation in any given year over the last decades has been relatively small (within 20 ft), and the modeling shows average potential swings of a similar range. Given that the expected range of fluctuation is expected to remain at a similar scale, and the fact that the average predicted range of water levels for the no action alternative has been subjected to substantial wave zone action over the last several decades, the no action alternative would not be expected to see new impacts to resources in the APE below 6,220 feet at Abiquiu Reservoir over baseline.

In general, reservoir elevations above 6,220 feet have been rare over the last three decades, so large or sustained spikes above this level would have the potential to introduce effects from wave actions that sites at those elevations have not often experienced. The model shows that there is the possibility of such spikes occurring under the no action alternative. However, such spikes would be rare and generally unlikely; Figure 3, which shows the model runs for drier years that better reflect the current drought conditions, shows only two runs which exceeded 6,220 ft., and these spikes were both brief and relatively small, exceeding 6,220 ft by less than 10 feet. As such, we do not expect the no action alternative to introduce substantial or new effects to sites above 6,220 ft.

Regarding the downstream flow regime: because the no action alternative would pass flows from El Vado and Abiquiu Reservoir downstream, this alternative would see the potential for more days of flow at channel capacity (1800 cfs) than the proposed deviation action alternative. However, these flows would still be within the historic range of releases as part of normal water operations, and as such would not be expected to see new effects to resources downstream.

Expected Conditions With Proposed Deviation

The proposed deviation action result in three different scenarios. Three primary sources of potential impacts to these resources have been considered: direct impacts from retention of water; indirect impacts from potential changes in flow regime; and potential impacts from possible increased recreational use of the area. These are each discussed below.

Water Retention

As noted above, reservoir elevation can affect archaeological sites by subjecting them to a number of processes including inundation and wave action. Under the proposed deviation action alternative, water surface elevations at Abiquiu Reservoir are expected to increase in comparison with the no action alternative. Enclosures 7, 8, and 9 show model runs for predicted ranges of reservoir elevations for three deviation scenarios: relinquishment credit, Prior and Paramount, and a combination of the two (relinquishment credit and Prior and Paramount). Each of these does show some increase in overall expected water levels over the no action alternative. In order to assess potential effects of these increases on historic properties, it is necessary to compare these predicted elevations to those expected for the no action alternative.

As with the no action alternative, the average predicted reservoir elevations for each of the deviation scenarios are within the range of reservoir elevations characteristic of the years since 1987, but there are differences. For the relinquishment credit scenario, the average predicted water level ranges from approximately 6,185 ft to 6,210 ft (Enclosure 10). For the Prior and Paramount scenario, the average level ranges between approximately 6,185 ft and 6,205 ft (Enclosure 11). For the combined relinquishment credit and Prior and Paramount alternative, average water levels range slightly higher, from approximately 6,190 ft to 6,215 ft (Enclosure 12).

While slightly higher than the figures for the no action alternative (Enclosure 5), these predicted average ranges are still similar to the elevation range characteristic of the years since 1987, and in particular still fall below the 6,220 ft level. As such, averages for these alternatives make it unlikely that sites would be inundated that have not been inundated for substantial periods during the last three decades. No new effects would be expected for sites below 6,220 ft.

Because reservoir elevations above 6,220 feet have been rare over the last three decades, large or sustained spikes above this level would have the potential to introduce effects from wave actions that sites at those elevations have not often experienced. Under these alternatives, the likelihood of exceeding this elevation is slightly higher than for the no action alternative, but would still be rare. As with the no action alternative, Enclosures 7 and 8 show only two runs exceeding 6,220 ft during the drier years (which better approximate current drought conditions), and Enclosure 9 shows only three runs with brief periods exceeding this elevation. While brief, these simulated peaks do reach slightly higher elevations than the no action alternative. Enclosure 13 shows average exceedance curves for the simulations for each of the alternatives (no action, and each of the three deviation scenarios), showing the percentage likelihood that each of the scenarios will exceed water level ranges. For the no action alternative, the relinquishment credit alternative, and the Prior and Paramount alternative, likelihood of exceeding 6,220 ft in elevation is less than two percent. For the combined relinquishment credit and Prior and Paramount alternative, likelihood of exceeding 6,220 ft increases to approximately nine percent; however, likelihood of exceeding 6,225 ft drops to less than two percent. In other words, while the combined alternative does raise the likelihood of exceeding 6,220 ft, such exceedance would still be rare, and the magnitude of increases more than five feet above this level are even less likely. As such, any of the three deviation scenarios are unlikely to introduce substantial or new effects from inundation or wave action to sites above 6,220 ft.

Downstream Flow Regime

As noted above, the fact that the no action alternative passes all Rio Grande inflows downstream of the dam, that alternative would have the potential for a greater number of days of flow at channel capacity (1800 cfs) over baseline. Because the proposed action under consideration would allow retention of Rio Grande water in Abiquiu Reservoir, these scenarios would reduce the number of days of flow at channel capacity downstream of Abiquiu by

approximately 25 percent. As with the no action alternative, these flows would be within the historic range of releases as part of normal water operations, and as such would not be expected to introduce new effects to resources downstream.

Recreation

While slightly higher water levels may result in some increases in recreation, the ranges of water levels (and therefore the expected variation in coincident recreation activities) are within historical ranges. As such, we expect potential temporary increases in recreation to be negligible relative to the no action alternative.

Summary and Determination of Effect

In sum, the proposed deviation is expected to slightly change the elevation of the lake, as well as some aspects of downstream flow. Lake levels are expected to be slightly higher with the deviation than without the deviation, but expected lake levels would be within the historic range of lake elevations from normal lake operations. In addition, without the deviation, downstream flow is likely to be at channel capacity longer than with the deviation (in other words, the deviation would somewhat reduce the number of days that downstream flow would be at channel capacity). Regardless, downstream flow will be within the historic range for normal dam operations.

The Corps concludes that the proposed deviation would not substantially alter the current and historical conditions for historic properties at Abiquiu Reservoir or downstream, and as such determines that the proposed work would have **no adverse effect** to historic properties. We invite your comment on this determination, and any additional information you wish to provide regarding the potential for this action to affect historic properties.

If you have any questions or require additional information concerning the Abiquiu Temporary Deviation, please contact Jonathan Van Hoose at (505) 342-3687 or by email at jonathan.e.vanhoose@usace.army.mil; or me at (505) 342-3661 or by email at danielle.a.galloway@usace.army.mil. You may also provide comments to the above address.

Sincerely,

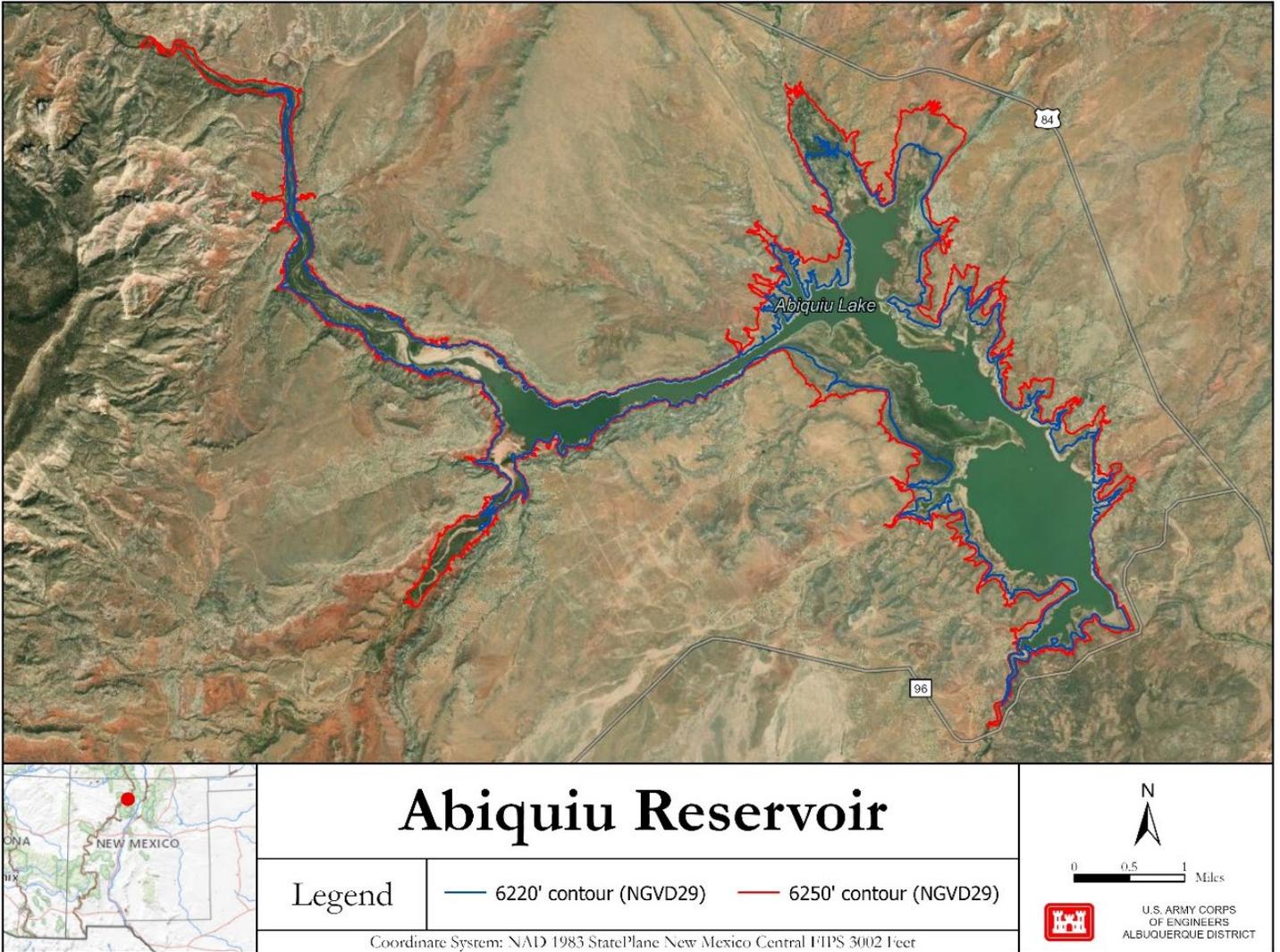


Danielle A. Galloway
Acting Chief, Environmental Resources Section

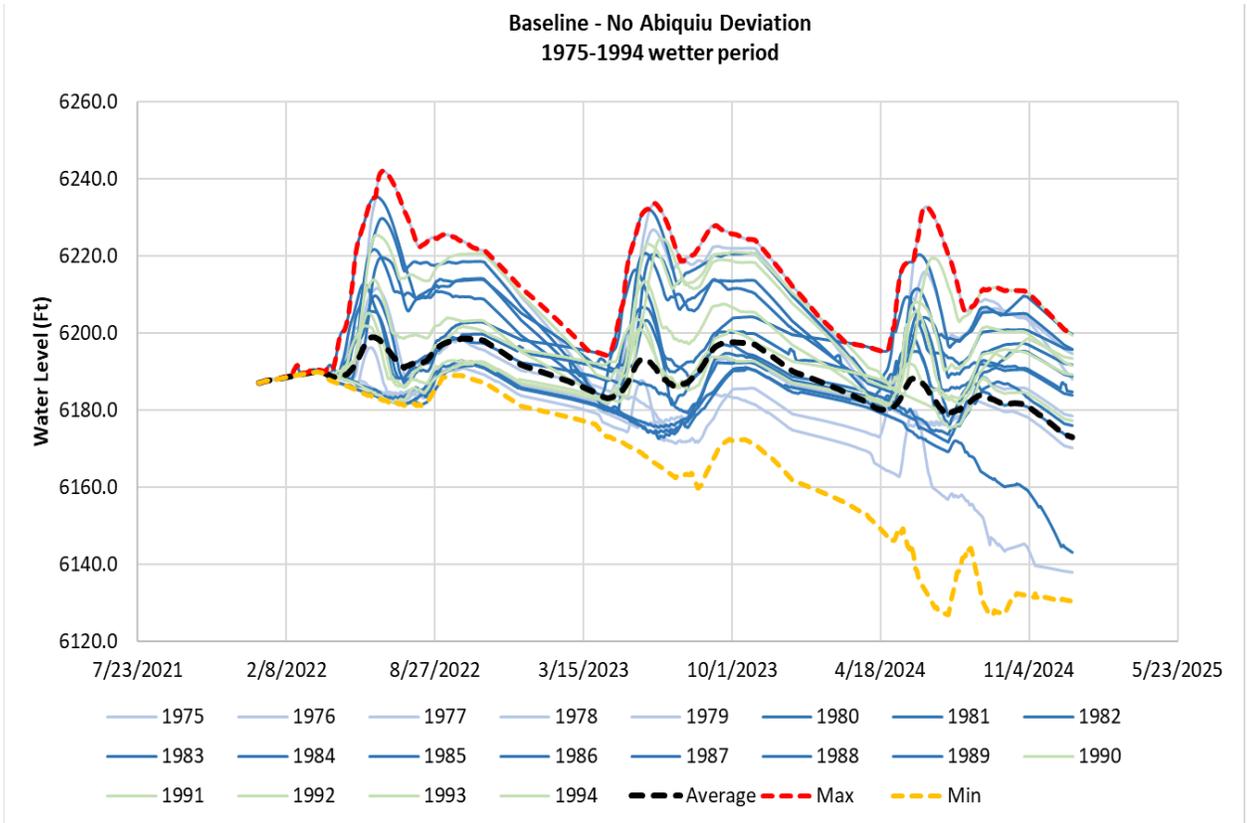
Enclosures



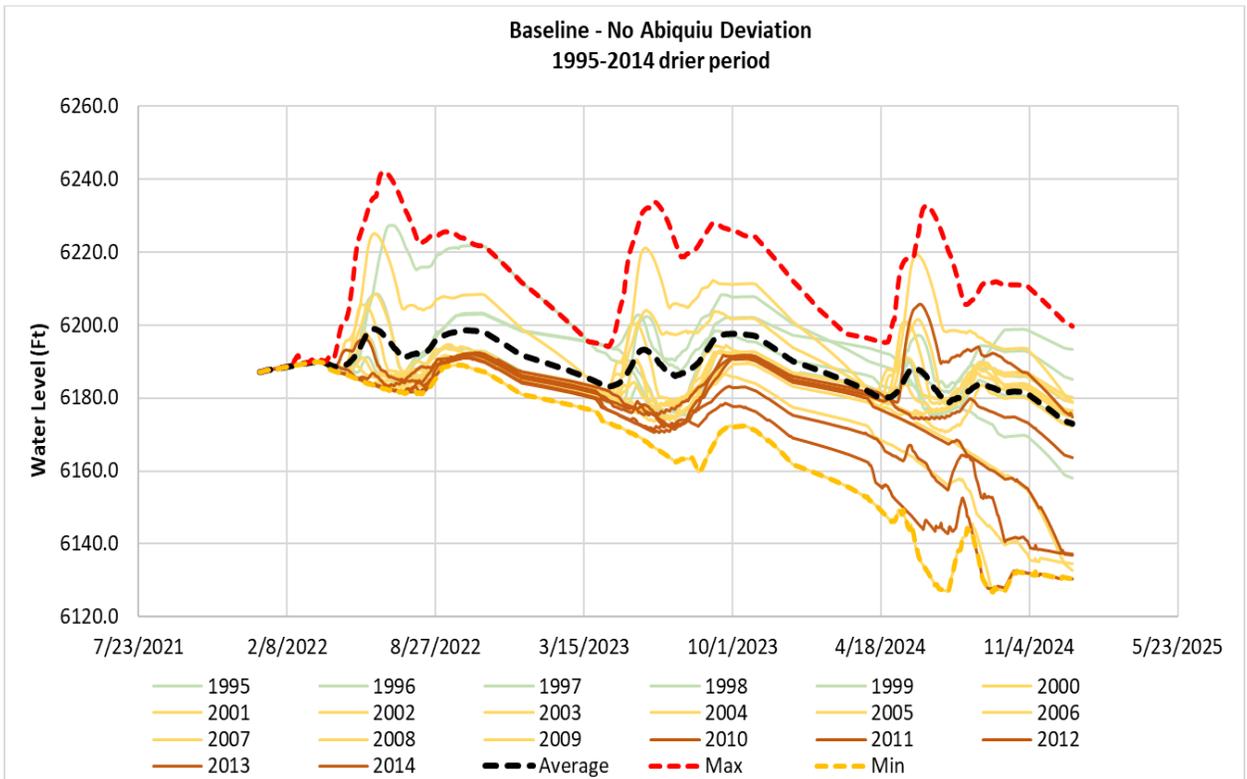
Enclosure 1. Location of Abiquiu Dam.



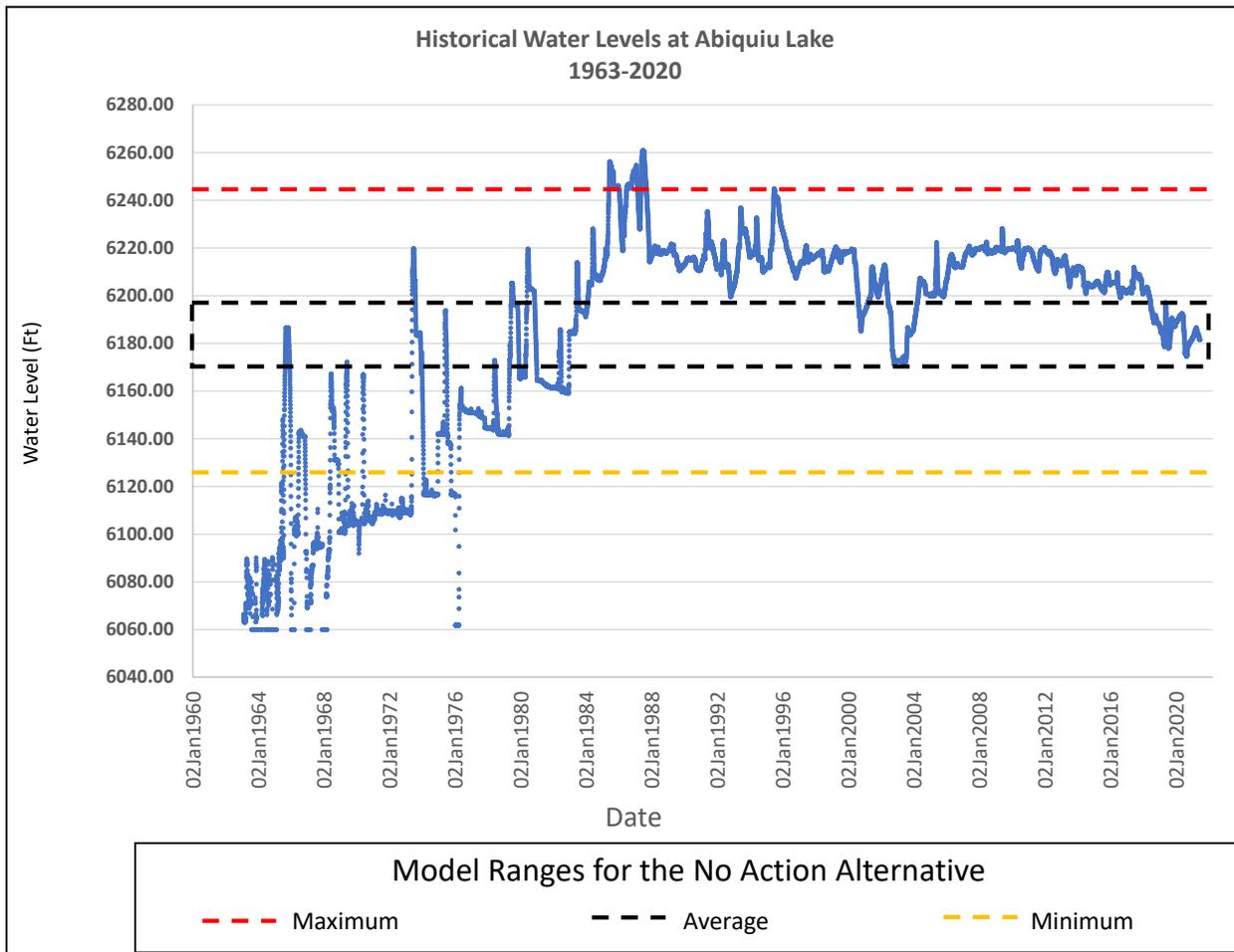
Enclosure 2. Area of Potential Effect (APE) at Abiquiu Reservoir.



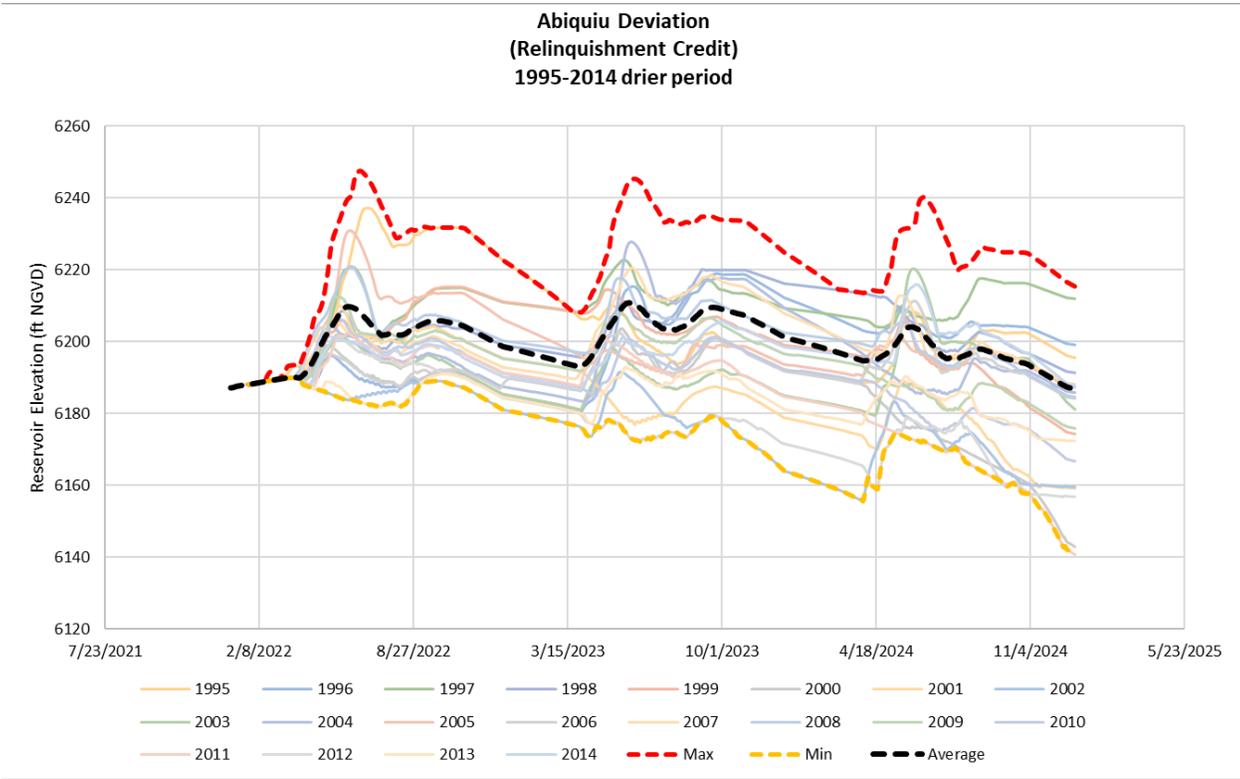
Enclosure 4. Upper Rio Grande Water Operations Model (URGWOM) runs without a deviation for the wetter 1975-1994 period of record. The average, maximum, and minimum hydrographs are from the entire period of record. These years are generally associated with higher lake elevations, and are *not* characteristic of current drought conditions.



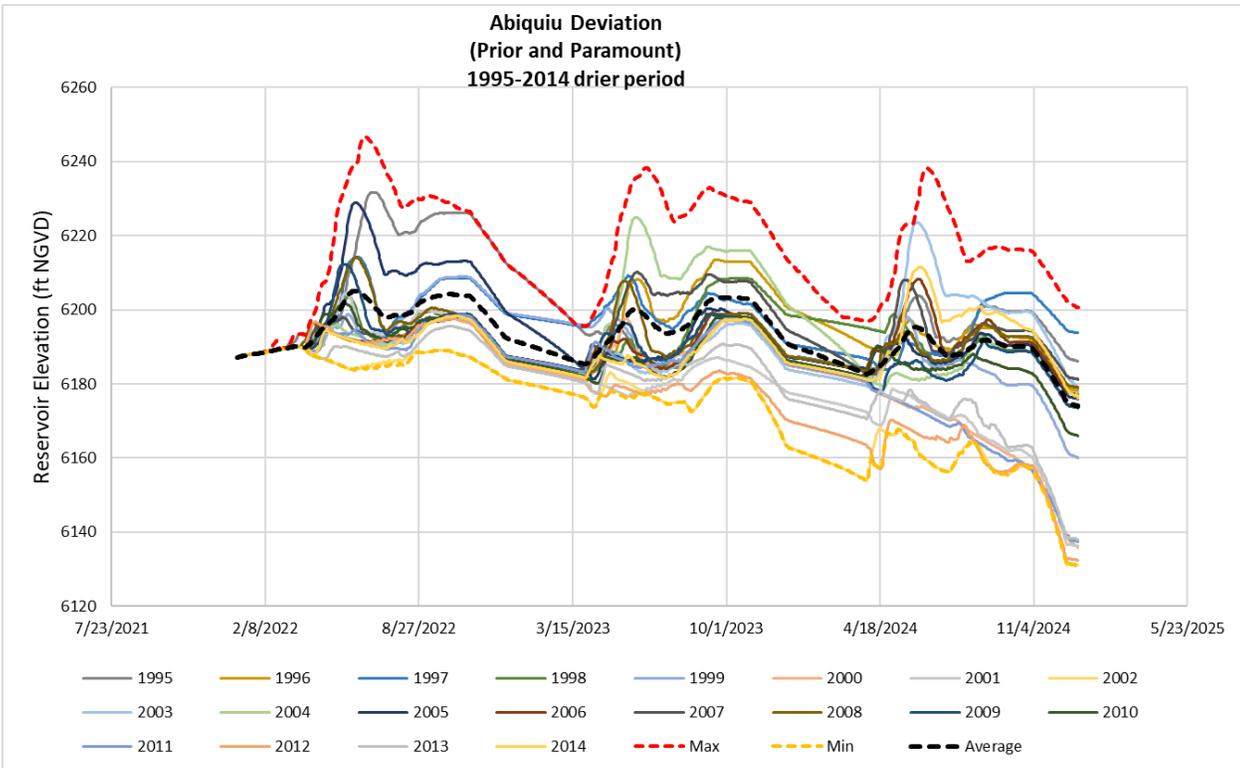
Enclosure 5. Upper Rio Grande Water Operations Model (URGWOM) runs without a deviation for the drier 1995-2014 period of record. The average, maximum, and minimum hydrographs are from the entire period of record. These years generally have lower lake levels, and are more representative of current drought conditions.



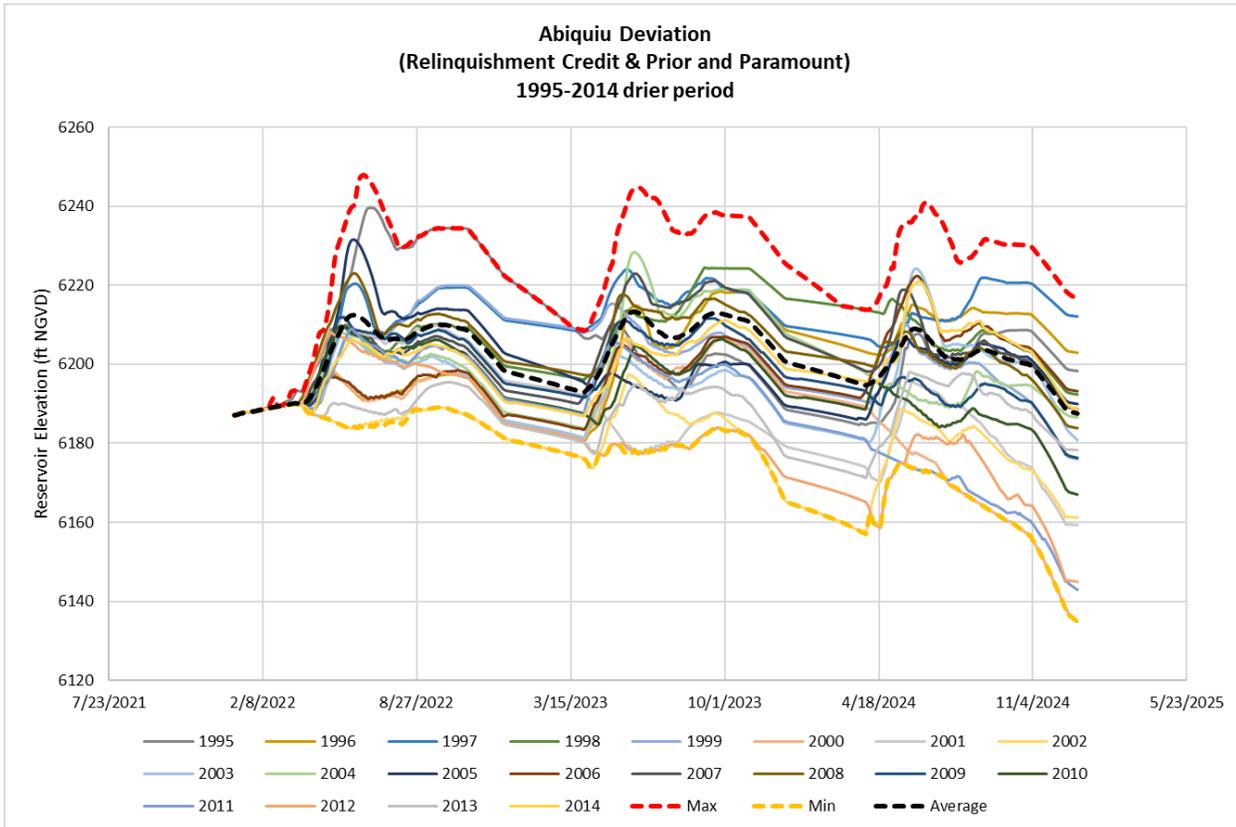
Enclosure 6. Historic water levels at Abiquiu Reservoir, with predicted average, maximum, and minimum ranges based on URGWOM model runs.



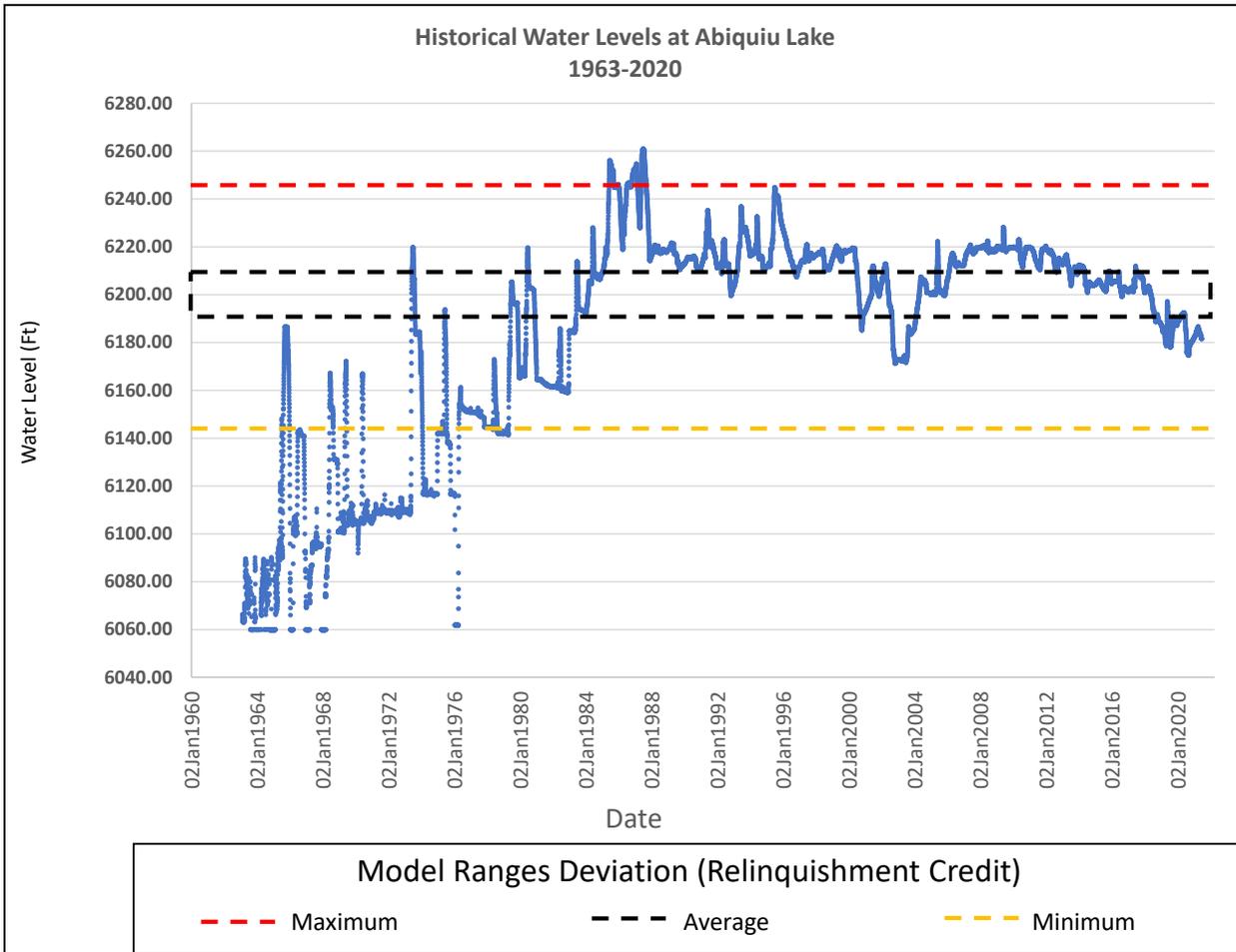
Enclosure 7. Upper Rio Grande Water Operations Model (URGWOM) runs with a deviation (relinquishment credit) for the drier 1995-2014 period of record. The average, maximum, and minimum hydrographs are from the entire period of record.



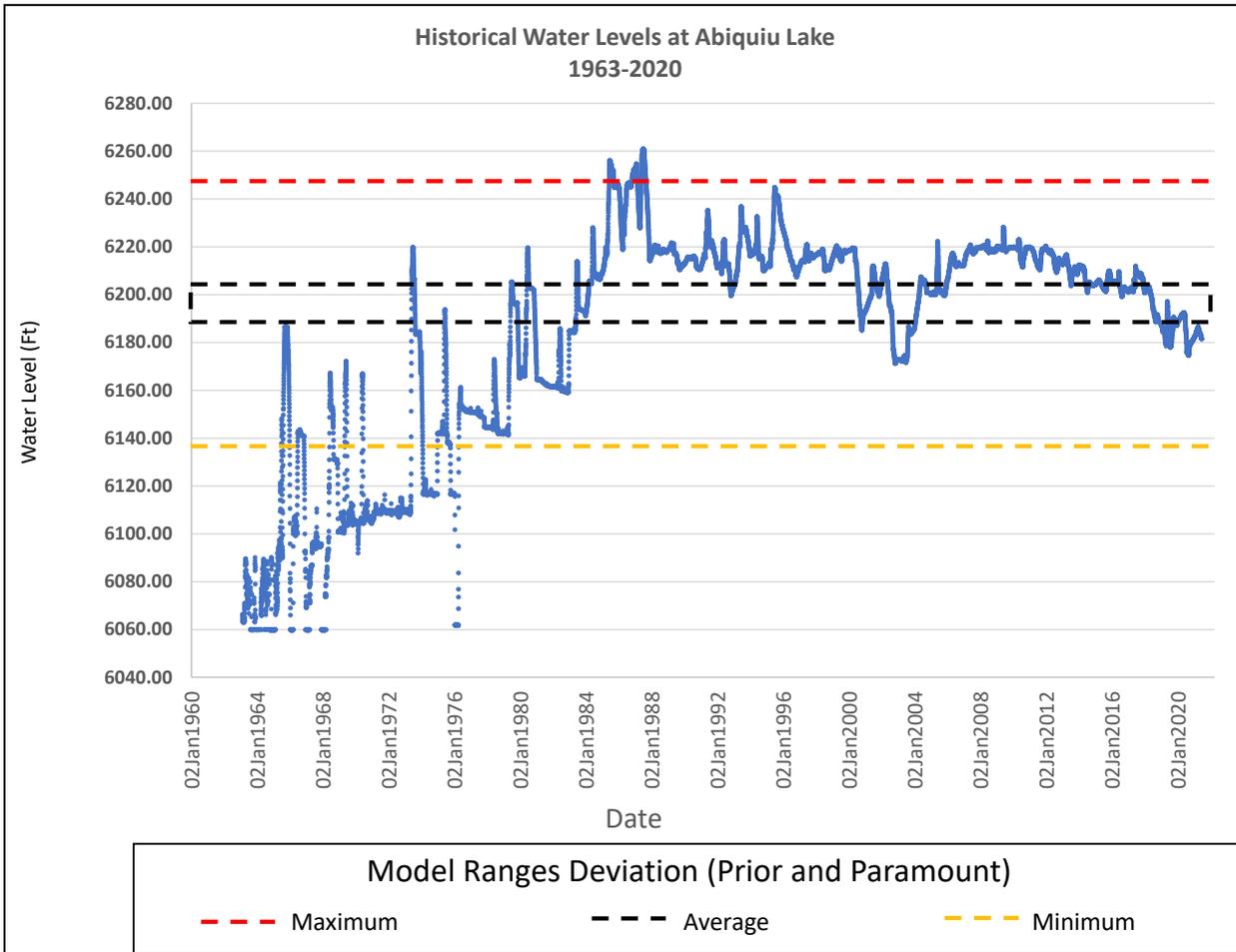
Enclosure 8. Upper Rio Grande Water Operations Model (URGWOM) runs with a deviation (Prior and Paramount) for the drier 1995-2014 period of record. The average, maximum, and minimum hydrographs are from the entire period of record.



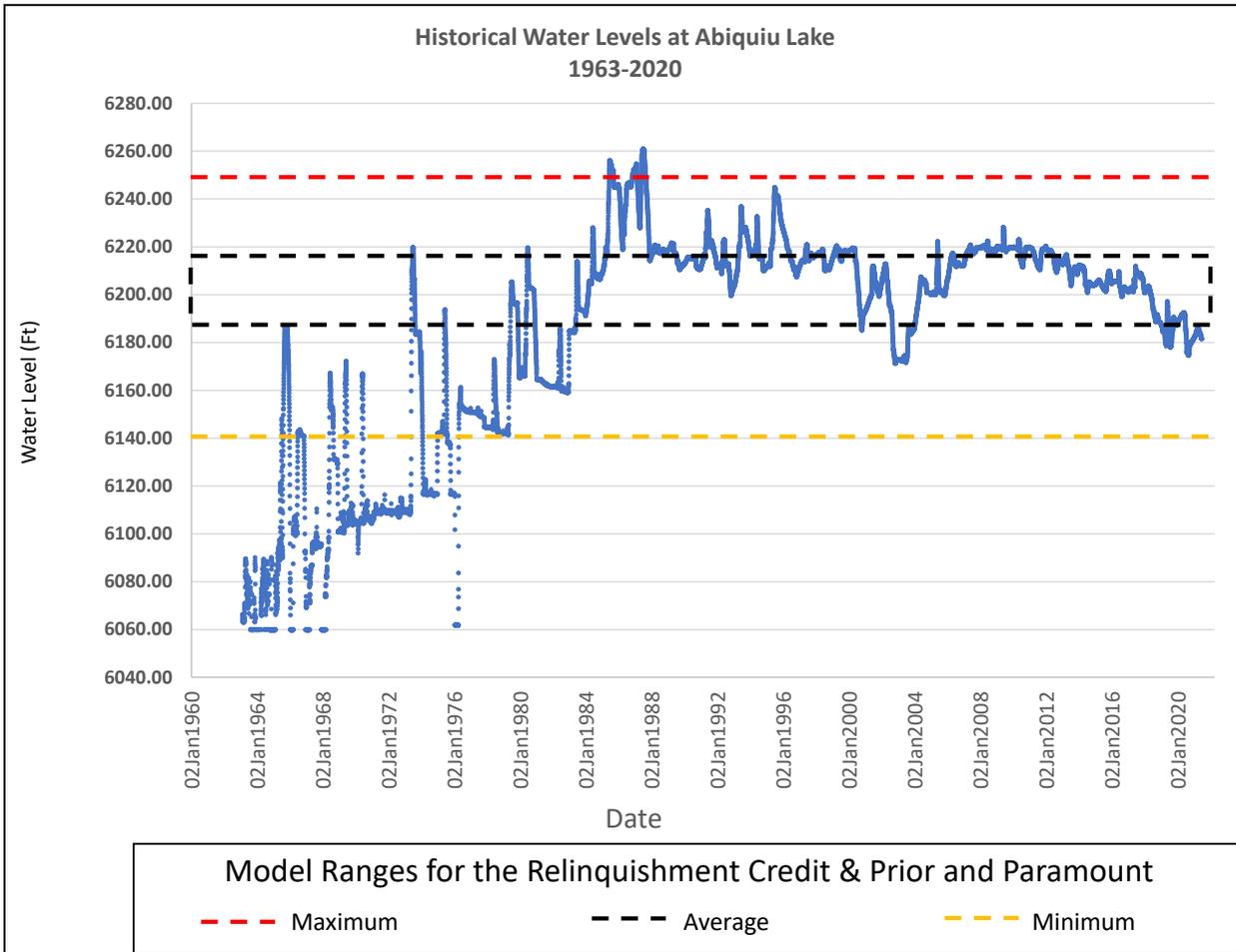
Enclosure 9. Upper Rio Grande Water Operations Model (URGWOM) runs with a combined deviation (relinquishment credit and Prior and Paramount) for the drier 1995-2014 period of record. The average, maximum, and minimum hydrographs are from the entire period of record.



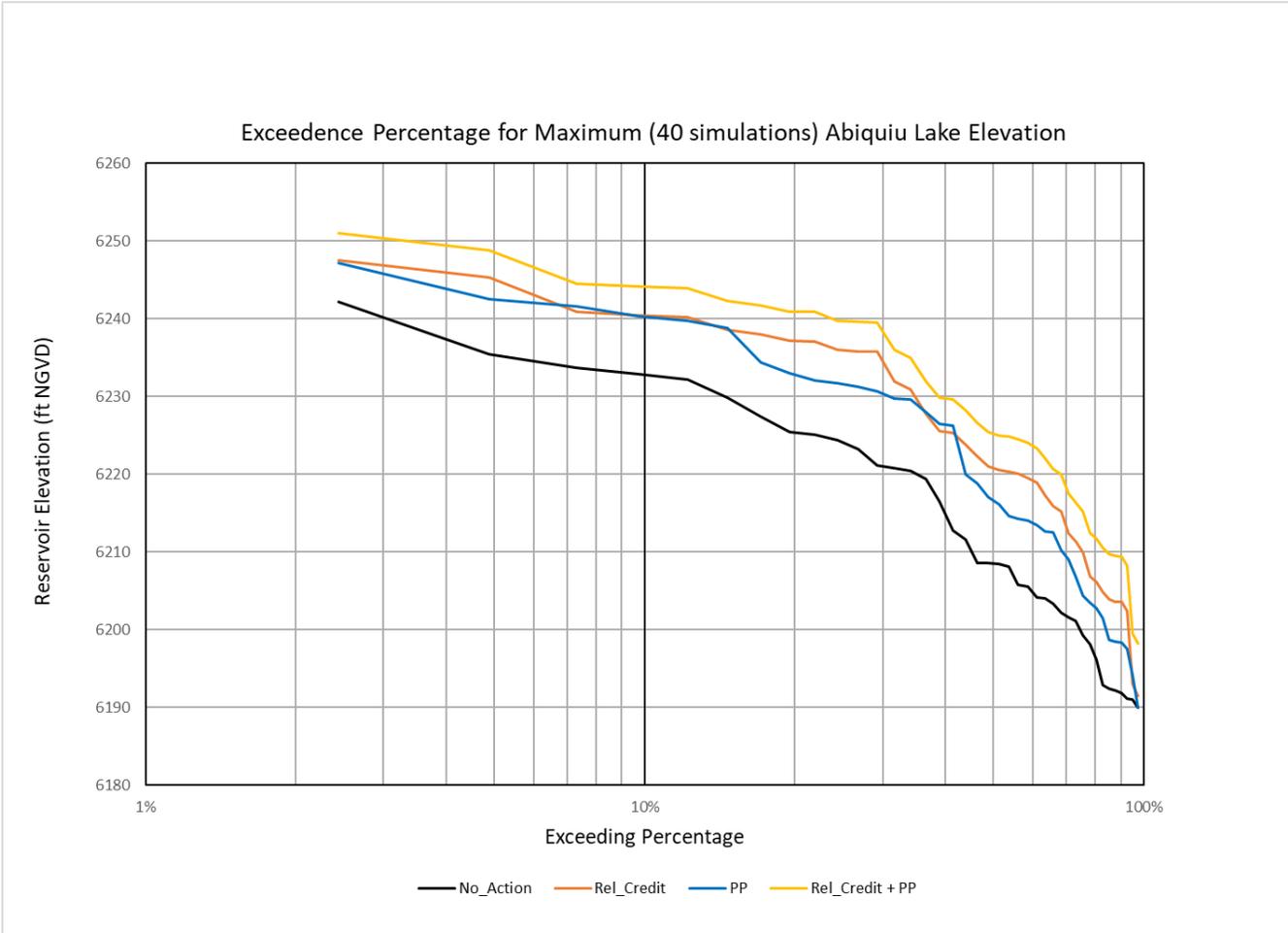
Enclosure 10. Historic water levels at Abiquiu Reservoir, with predicted average, maximum, and minimum ranges based on URGWOM model runs for a deviation (relinquishment credit).



Enclosure 11. Historic water levels at Abiquiu Reservoir, with predicted average, maximum, and minimum ranges based on URGWOM model runs for a deviation (Prior and Paramount).



Enclosure 12. Historic water levels at Abiquiu Reservoir, with predicted average, maximum, and minimum ranges based on URGWOM model runs for a deviation (combined relinquishment credit and Prior and Paramount).



Enclosure 13. Graph showing percentage of URGWOM runs for each alternative exceeding reservoir elevation levels, representing the likelihoods of exceeding elevations for each scenario.



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Via Email

Mr. Darel Madrid
darel@rcaainc.org
Rio Chama Acequia Association

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Project conservation pool below elevation 6,220 ft. The total amount that will be retained during the deviation period is 90,000 acre-feet, with a maximum annual amount of 45,000 acre-feet. Unused water will be carried over to the following year.

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- Deviation (P&P)
- Deviation (combined relinquishment credit + P&P)

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On the question of wave action, Enclosure 6 shows that the range of elevation in any given year over the last decades has been relatively small (within 20 ft), and the modeling shows average potential swings of a similar range. Given that the expected range of fluctuation is expected to remain at a similar scale, and the fact that the average predicted range of water levels for the no action alternative has been subjected to substantial wave zone action over the last several decades, the no action alternative would not be expected to see new impacts to resources in the APE below 6,220 feet at Abiquiu Reservoir over baseline.

In general, reservoir elevations above 6,220 feet have been rare over the last three decades, so large or sustained spikes above this level would have the potential to introduce effects from wave actions that sites at those elevations have not often experienced. The model shows that there is the possibility of such spikes occurring under the no action alternative. However, such spikes would be rare and generally unlikely; Figure 3, which shows the model runs for drier years that better reflect the current drought conditions, shows only two runs which exceeded 6,220 ft., and these spikes were both brief and relatively small, exceeding 6,220 ft by less than 10 feet. As such, we do not expect the no action alternative to introduce substantial or new effects to sites above 6,220 ft.

Regarding the downstream flow regime: because the no action alternative would pass flows from El Vado and Abiquiu Reservoir downstream, this alternative would see the potential for more days of flow at channel capacity (1800 cfs) than the proposed deviation action alternative. However, these flows would still be within the historic range of releases as part of normal water operations, and as such would not be expected to see new effects to resources downstream.

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The proposed deviation action result in three different scenarios. Three primary sources of potential impacts to these resources have been considered: direct impacts from retention of water; indirect impacts from potential changes in flow regime; and potential impacts from possible increased recreational use of the area. These are each discussed below.

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As noted above, reservoir elevation can affect archaeological sites by subjecting them to a number of processes including inundation and wave action. Under the proposed deviation action alternative, water surface elevations at Abiquiu Reservoir are expected to increase in comparison with the no action alternative. Enclosures 7, 8, and 9 show model runs for predicted ranges of reservoir elevations for three deviation scenarios: relinquishment credit, Prior and Paramount, and a combination of the two (relinquishment credit and Prior and Paramount). Each of these does show some increase in overall expected water levels over the no action alternative. In order to assess potential effects of these increases on historic properties, it is necessary to compare these predicted elevations to those expected for the no action alternative.

As with the no action alternative, the average predicted reservoir elevations for each of the deviation scenarios are within the range of reservoir elevations characteristic of the years since 1987, but there are differences. For the relinquishment credit scenario, the average predicted water level ranges from approximately 6,185 ft to 6,210 ft (Enclosure 10). For the Prior and Paramount scenario, the average level ranges between approximately 6,185 ft and 6,205 ft (Enclosure 11). For the combined relinquishment credit and Prior and Paramount alternative, average water levels range slightly higher, from approximately 6,190 ft to 6,215 ft (Enclosure 12).

While slightly higher than the figures for the no action alternative (Enclosure 5), these predicted average ranges are still similar to the elevation range characteristic of the years since 1987, and in particular still fall below the 6,220 ft level. As such, averages for these alternatives make it unlikely that sites would be inundated that have not been inundated for substantial periods during the last three decades. No new effects would be expected for sites below 6,220 ft.

Because reservoir elevations above 6,220 feet have been rare over the last three decades, large or sustained spikes above this level would have the potential to introduce effects from wave actions that sites at those elevations have not often experienced. Under these alternatives, the likelihood of exceeding this elevation is slightly higher than for the no action alternative, but would still be rare. As with the no action alternative, Enclosures 7 and 8 show only two runs exceeding 6,220 ft during the drier years (which better approximate current drought conditions), and Enclosure 9 shows only three runs with brief periods exceeding this elevation. While brief, these simulated peaks do reach slightly higher elevations than the no action alternative. Enclosure 13 shows average exceedance curves for the simulations for each of the alternatives (no action, and each of the three deviation scenarios), showing the percentage likelihood that each of the scenarios will exceed water level ranges. For the no action alternative, the relinquishment credit alternative, and the Prior and Paramount alternative, likelihood of exceeding 6,220 ft in elevation is less than two percent. For the combined relinquishment credit and Prior and Paramount alternative, likelihood of exceeding 6,220 ft increases to approximately nine percent; however, likelihood of exceeding 6,225 ft drops to less than two percent. In other words, while the combined alternative does raise the likelihood of exceeding 6,220 ft, such exceedance would still be rare, and the magnitude of increases more than five feet above this level are even less likely. As such, any of the three deviation scenarios are unlikely to introduce substantial or new effects from inundation or wave action to sites above 6,220 ft.

Downstream Flow Regime

As noted above, the fact that the no action alternative passes all Rio Grande inflows downstream of the dam, that alternative would have the potential for a greater number of days of flow at channel capacity (1800 cfs) over baseline. Because the proposed action under consideration would allow retention of Rio Grande water in Abiquiu Reservoir, these scenarios

would reduce the number of days of flow at channel capacity downstream of Abiquiu by approximately 25 percent. As with the no action alternative, these flows would be within the historic range of releases as part of normal water operations, and as such would not be expected to introduce new effects to resources downstream.

Recreation

While slightly higher water levels may result in some increases in recreation, the ranges of water levels (and therefore the expected variation in coincident recreation activities) are within historical ranges. As such, we expect potential temporary increases in recreation to be negligible relative to the no action alternative.

Summary and Determination of Effect

In sum, the proposed deviation is expected to slightly change the elevation of the lake, as well as some aspects of downstream flow. Lake levels are expected to be slightly higher with the deviation than without the deviation, but expected lake levels would be within the historic range of lake elevations from normal lake operations. In addition, without the deviation, downstream flow is likely to be at channel capacity longer than with the deviation (in other words, the deviation would somewhat reduce the number of days that downstream flow would be at channel capacity). Regardless, downstream flow will be within the historic range for normal dam operations.

The Corps concludes that the proposed deviation would not substantially alter the current and historical conditions for historic properties at Abiquiu Reservoir or downstream, and as such determines that the proposed work would have **no adverse effect** to historic properties. We invite your comment on this determination, and any additional information you wish to provide regarding the potential for this action to affect historic properties.

If you have any questions or require additional information concerning the Abiquiu Temporary Deviation, please contact Jonathan Van Hoose at (505) 342-3687 or by email at jonathan.e.vanhoose@usace.army.mil; or me at (505) 342-3661 or by email at danielle.a.galloway@usace.army.mil. You may also provide comments to the above address.

Sincerely,



Danielle A. Galloway
Acting Chief, Environmental Resources Section

Enclosures



DEPARTMENT OF THE ARMY
ALBUQUERQUE DISTRICT, CORPS OF ENGINEERS
4101 JEFFERSON PLAZA NE
ALBUQUERQUE NM 87109-3435

March 8, 2022

Planning, Project and Program Management Division
Planning Branch
Environmental Resources Section

Dr. Jeff Pappas
State Historic Preservation Officer
Historic Preservation Division
Bataan Memorial Building
407 Galisteo Street, Suite 236
Santa Fe, New Mexico 87501

Dear Dr. Pappas:

Pursuant to 36 CFR Part 800, the U.S. Army Corps of Engineers (Corps), Albuquerque District, is seeking your concurrence in our determination of **no adverse effect to historic properties** for the proposed deviation from the Water Control Plan (WCP) at Abiquiu Dam and Reservoir, in the context of planned repairs of El Vado Dam by the U.S Bureau of Reclamation (USBR). Abiquiu Dam was constructed in the late 1950s and early 1960s as a flood control project on the Rio Chama about 32 miles upstream from the confluence of the Rio Chama and the Rio Grande and became operational in 1963. The project is located on the Cañones, New Mexico (36106-B4) 7.5' USGS Quad map, on unplatted lands of the Piedra Lumbre land grant (Enclosure 1).

The U.S. Army Corps of Engineers (Corps), Albuquerque District is proposing a temporary deviation from the current WCP at the Abiquiu Dam and Reservoir Project, Rio Arriba County, New Mexico. Corps received a request from the New Mexico Interstate Stream Commission (NMISC) requesting Corps to deviate from its normal operation schedule at Abiquiu Dam to allow retention of native Rio Grande water in Abiquiu Reservoir while El Vado Dam and Spillway are under repair by the USBR. Retained Rio Grande water may be released to meet middle Rio Grande irrigation demand, and/or the Coalition of Six Middle Rio Grande Basin Pueblos' direct flow right.

The El Vado Dam and Lake are located on the Rio Chama 32 miles upstream of Abiquiu Reservoir, and 30 miles downstream from Chama, NM. The dam was completed in 1935 to supplement irrigation water for the Middle Rio Grande Conservancy District (MRGCD) with a capacity of 198,000 acre-ft. for a 3,200-acre lake. USBR will begin conducting repairs and construction on El Vado Dam in spring 2022 for up to three years. During the repairs and construction, El Vado will not be able to retain any Rio Grande water.

The purpose of the proposed deviation action is to implement a temporary deviation from the WCP for Abiquiu Dam, which will allow other responsible agencies to retain and release Rio Grande water at Abiquiu Reservoir that would normally be retained at El Vado Reservoir while the El Vado Dam is undergoing repair. The request is for three (3) years until the completion of the El Vado Dam repairs, which are expected to start by the end of May 2022 and continue until December 2024. The water may be retained as Relinquishment Credit to meet middle Rio Grande water users' demand, and/or as Prior and Paramount (P&P) water for the Coalition.

The retained water will serve two purposes: the first purpose will allow NMISC to retain Rio Grande water in Abiquiu Reservoir up to 45,000 acre-feet per year and release it later in the season to meet middle Rio Grande irrigation demand. The water will be retained in the SJC

Project conservation pool below elevation 6,220 ft. The total amount that will be retained during the deviation period is 90,000 acre-feet, with a maximum annual amount of 45,000 acre-feet. Unused water will be carried over to the following year.

The second purpose will allow USBR to retain Rio Grande water in Abiquiu Reservoir up to 20,000 acre-feet/year to meet the Coalition's direct flow right. The water will be retained in the SJC Project conservation pool below elevation 6,220 ft. Unused water will be released between 01 November and 15 December of each year.

Under the no action alternative, El Vado Dam, upstream of Abiquiu Dam, will be under repair and therefore not available to retain its typical amount of water starting in May 2022. Absent a deviation at Abiquiu Dam, all water will pass through El Vado and Abiquiu dams during the El Vado Dam repairs. Therefore, the proposed no action (baseline scenario) is to pass all inflow to the downstream channel capacity, except SJC Project water, which will follow normal operation at Abiquiu Dam.

In summary: The proposed action will involve retaining water as described above, with the following possible scenarios:

- Retain water as relinquishment credit
- Retain water as Prior and Paramount (P&P) water
- Both relinquishment credit and P&P

Area of Potential Effect

The Corps determines that the APE consists of the areas where changing lake elevations may affect archaeological sites through inundation, exposure, or wave action, within an elevation range of approximately 6,150 ft to 6,250 ft. As will be described below, hydrologic modeling suggests that the elevation range most likely to experience inundation are elevations at and below 6,220 ft, with a much smaller likelihood of having maximum elevations up to 6,250 ft (Enclosure 2). In addition, changes in flow regimes could have the potential to affect properties located within the channel downstream of Abiquiu Dam.

Based on an examination of the NMCRIS database, as well as Corps records, a total of 148 archaeological sites have been documented within this APE, and these sites represent human use of the landscape ranging from the Archaic to Historic periods. Of these 148 sites, 45 are located above the 6,220 ft level (Enclosure 3).

In addition, there are numerous historic properties documented near the Rio Chama channel downstream of Abiquiu Dam, including a wide range of prehistoric and historic resources, including active acequia systems.

All of the historic properties within the APE at the lake have been inundated or periodically inundated by normal lake operations since the 1960s.

Hydrologic Modeling

In order to determine whether the proposed deviation from the WCP would introduce new adverse effects to historic properties within the APE, we compare the expected behavior of lake elevations and downstream flows with the deviation to the expected behavior of lake elevations and downstream flows without the deviation. In addition, we examine how these conditions compare to past conditions within the APE.

The Corps performed hydrologic modeling of likely lake elevations for four scenarios:

- No deviation
- Deviation (relinquishment credit)
- Deviation (P&P)
- Deviation (combined relinquishment credit + P&P)

This modeling used existing hydrological data from the years 1975-2014, and predicted the range of what lake elevations at Abiquiu Reservoir would look like for the next three years under

those conditions. As such, the resulting graphs (Enclosures 4, 5, 7, 8, and 9) each represent 40 different runs of the model, for each of the historical conditions. They also include the average, maximum, and minimum lake levels.

Expected Conditions Without Proposed Deviation

Reservoir elevation can affect archaeological sites by subjecting them to a number of processes, including inundation and wave action. Wave action in particular has been shown to have a significant impact on archaeological sites.

The model runs presented in Enclosures 4 and 5 present expectations for reservoir elevations for the duration of the period under consideration based on historic conditions during wetter years (Enclosure 4) and drier years (Enclosure 5). The model shows that, while there is a wide range of possible elevations for any given year, the average reservoir elevation over all model runs would be expected to range from approximately 6,170 ft to 6,200 ft. The drier years are much more representative of current New Mexico drought conditions, and are expected to more accurately represent likely outcomes.

Enclosure 6 shows daily reservoir elevations throughout the history of the reservoir. Between the years of 1963 and 1987, reservoir elevations increased from a starting point of around 6,060 ft to an all-time maximum of approximately 6,260 ft in August 1987. Since late 1987, elevations have remained largely between 6,170 ft and 6,220 ft, spiking above 6,220 only five times. The figure shows that the predicted average range of elevations for the no action alternative is very similar to the elevation range characteristic of the years since 1987. The no action alternative would be unlikely to inundate sites that have not been inundated over the last three decades.

On the question of wave action, Enclosure 6 shows that the range of elevation in any given year over the last decades has been relatively small (within 20 ft), and the modeling shows average potential swings of a similar range. Given that the expected range of fluctuation is expected to remain at a similar scale, and the fact that the average predicted range of water levels for the no action alternative has been subjected to substantial wave zone action over the last several decades, the no action alternative would not be expected to see new impacts to resources in the APE below 6,220 feet at Abiquiu Reservoir over baseline.

In general, reservoir elevations above 6,220 feet have been rare over the last three decades, so large or sustained spikes above this level would have the potential to introduce effects from wave actions that sites at those elevations have not often experienced. The model shows that there is the possibility of such spikes occurring under the no action alternative. However, such spikes would be rare and generally unlikely; Figure 3, which shows the model runs for drier years that better reflect the current drought conditions, shows only two runs which exceeded 6,220 ft., and these spikes were both brief and relatively small, exceeding 6,220 ft by less than 10 feet. As such, we do not expect the no action alternative to introduce substantial or new effects to sites above 6,220 ft.

Regarding the downstream flow regime: because the no action alternative would pass flows from El Vado and Abiquiu Reservoir downstream, this alternative would see the potential for more days of flow at channel capacity (1800 cfs) than the proposed deviation action alternative. However, these flows would still be within the historic range of releases as part of normal water operations, and as such would not be expected to see new effects to resources downstream.

Expected Conditions With Proposed Deviation

The proposed deviation action result in three different scenarios. Three primary sources of potential impacts to these resources have been considered: direct impacts from retention of water; indirect impacts from potential changes in flow regime; and potential impacts from possible increased recreational use of the area. These are each discussed below.

Water Retention

As noted above, reservoir elevation can affect archaeological sites by subjecting them to a number of processes including inundation and wave action. Under the proposed deviation action alternative, water surface elevations at Abiquiu Reservoir are expected to increase in comparison with the no action alternative. Enclosures 7, 8, and 9 show model runs for predicted ranges of reservoir elevations for three deviation scenarios: relinquishment credit, Prior and Paramount, and a combination of the two (relinquishment credit and Prior and Paramount). Each of these does show some increase in overall expected water levels over the no action alternative. In order to assess potential effects of these increases on historic properties, it is necessary to compare these predicted elevations to those expected for the no action alternative.

As with the no action alternative, the average predicted reservoir elevations for each of the deviation scenarios are within the range of reservoir elevations characteristic of the years since 1987, but there are differences. For the relinquishment credit scenario, the average predicted water level ranges from approximately 6,185 ft to 6,210 ft (Enclosure 10). For the Prior and Paramount scenario, the average level ranges between approximately 6,185 ft and 6,205 ft (Enclosure 11). For the combined relinquishment credit and Prior and Paramount alternative, average water levels range slightly higher, from approximately 6,190 ft to 6,215 ft (Enclosure 12).

While slightly higher than the figures for the no action alternative (Enclosure 5), these predicted average ranges are still similar to the elevation range characteristic of the years since 1987, and in particular still fall below the 6,220 ft level. As such, averages for these alternatives make it unlikely that sites would be inundated that have not been inundated for substantial periods during the last three decades. No new effects would be expected for sites below 6,220 ft.

Because reservoir elevations above 6,220 feet have been rare over the last three decades, large or sustained spikes above this level would have the potential to introduce effects from wave actions that sites at those elevations have not often experienced. Under these alternatives, the likelihood of exceeding this elevation is slightly higher than for the no action alternative, but would still be rare. As with the no action alternative, Enclosures 7 and 8 show only two runs exceeding 6,220 ft during the drier years (which better approximate current drought conditions), and Enclosure 9 shows only three runs with brief periods exceeding this elevation. While brief, these simulated peaks do reach slightly higher elevations than the no action alternative. Enclosure 13 shows average exceedance curves for the simulations for each of the alternatives (no action, and each of the three deviation scenarios), showing the percentage likelihood that each of the scenarios will exceed water level ranges. For the no action alternative, the relinquishment credit alternative, and the Prior and Paramount alternative, likelihood of exceeding 6,220 ft in elevation is less than two percent. For the combined relinquishment credit and Prior and Paramount alternative, likelihood of exceeding 6,220 ft increases to approximately nine percent; however, likelihood of exceeding 6,225 ft drops to less than two percent. In other words, while the combined alternative does raise the likelihood of exceeding 6,220 ft, such exceedance would still be rare, and the magnitude of increases more than five feet above this level are even less likely. As such, any of the three deviation scenarios are unlikely to introduce substantial or new effects from inundation or wave action to sites above 6,220 ft.

Downstream Flow Regime

As noted above, the fact that the no action alternative passes all Rio Grande inflows downstream of the dam, that alternative would have the potential for a greater number of days of flow at channel capacity (1800 cfs) over baseline. Because the proposed action under consideration would allow retention of Rio Grande water in Abiquiu Reservoir, these scenarios would reduce the number of days of flow at channel capacity downstream of Abiquiu by

approximately 25 percent. As with the no action alternative, these flows would be within the historic range of releases as part of normal water operations, and as such would not be expected to introduce new effects to resources downstream.

Recreation

While slightly higher water levels may result in some increases in recreation, the ranges of water levels (and therefore the expected variation in coincident recreation activities) are within historical ranges. As such, we expect potential temporary increases in recreation to be negligible relative to the no action alternative.

Summary and Determination of Effect

In sum, the proposed deviation is expected to slightly change the elevation of the lake, as well as some aspects of downstream flow. Lake levels are expected to be slightly higher with the deviation than without the deviation, but expected lake levels would be within the historic range of lake elevations from normal lake operations. In addition, without the deviation, downstream flow is likely to be at channel capacity longer than with the deviation (in other words, the deviation would somewhat reduce the number of days that downstream flow would be at channel capacity). Regardless, downstream flow will be within the historic range for normal dam operations.

The Corps concludes that the proposed deviation would not substantially alter the current and historical conditions for historic properties at Abiquiu Reservoir or downstream, and as such determines that the proposed work would have **no adverse effect** to historic properties. We seek your concurrence with this determination.

If you have any questions or require additional information concerning the Abiquiu Temporary Deviation, please contact Jonathan Van Hoose at (505) 342-3687 or by email at jonathan.e.vanhoose@usace.army.mil; or me at (505) 342-3661 or by email at danielle.a.galloway@usace.army.mil. You may also provide comments to the above address.

Sincerely,

Danielle Galloway

Danielle A. Galloway
Acting Chief, Environmental Resources Section

Date

I CONCUR

JEFF PAPPAS
NEW MEXICO STATE HISTORIC
PRESERVATION OFFICER

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