# Rebuttal Testimony of Nancy Parker

## 1. Rebuttal to SVWU Protestants and MBK Supporting Modeling

### Introduction

The Sacramento Valley Water Users, supported by modeling results and analysis provided by MBK, are protesting the Petitioners' proposed WaterFix, claiming that "Inappropriate assumptions contained in the modeling performed by DWR and USBR for the CWF Draft BA … result in impractical and unrealistic modeled CVP and SWP operations." (SVWU-100, p.5.) MBK has provided alternative modeling which demonstrates SVWU's perspective on the possibility that WaterFix operations would adversely affect:

- North of Delta (NOD) storage conditions
  - Petitioners' modeling contains instances of dead pool
  - MBK modeling shows WaterFix operations resulting in lower carryover storage conditions relative to the No Action Alternative (NAA)
- North of Delta Delivery – MBK modeling shows lower CVP NOD Ag Service deliveries as a consequence of WaterFix

I have reviewed MBK's modeling, and my testimony will highlight aspects of their analysis which lead Reclamation to reject their conclusions. A summary of my opinions are below:

- Dead pool conditions criticized by MBK are a function of the input hydrology used in petitioner's modeling as opposed to being the result of a specific operating strategy. Rerunning BA modeling using the same hydrology as MBK models eliminates this adverse comparison to MBK results.
- MBK's claim of WaterFix operations resulting in lower storage conditions and impacts to NOD delivery are the result of manual manipulation of CVP allocations both north and south of the delta, forcing differences between the NAA and WaterFix scenarios.
- MBK's WaterFix operation used CVP storage releases for JPOD export in late summer to satisfy forced CVP SOD Ag allocations, resulting in the lower carryover storage that they claim is necessarily an outcome of the WaterFix.
- The degree to which MBK fixed their models' behavior is extreme, to the point that their analysis is hard to characterize as comparative planning modeling.

### Claim of Impact on Storage Conditions

MBK analysis claimed that storage conditions depicted in Petitioners' modeling were not reflective of actual operations, and indicated that the operation of the California WaterFix would cause lower storage conditions, resulting in injury to north of delta water users. Specific citations of this testimony are listed below:

- Mr. Bourez states "And that is our primary concern, that that movement of that stored water in the wetter years … it makes sense to move that water in wetter years. But then when you get to those drier years – going into those drier years with less water, there's a potential effect to project operations and to water users." (Vol. 20, 75:8-16.)

- Mr. Bourez states "I believe our modeling assumptions result in a model mimicking ~~his~~ actual operations better than petitioners' model." (Vol. 21, 27:6-8.)

- Mr. Bourez states "…in our modeling, we're carrying over far more water in both the no-action and the WaterFix alternative than the petitioners' model. They bring their storage down to dead pool, and they have much lower storages. So ours -- both of our model runs are much more conservative in protecting against a dry year than the petitioners' modeling in both alternatives." (Vol. 21, 28:20-29:2.)

These claims are based on inappropriate comparison between MBK modeling and Petitioners' modeling since they were done with different inflow data sets. If climate change inputs are removed from BA modeling and replaced with the same historical hydrology inputs used by MBK, the resulting storage conditions do not show lower conditions than MBK's models.

**Storage Condition Argument** – MBK analysis was performed with historical hydrology inputs, while Petitioners' modeling used hydrology developed from a central tendency (Q5) ensemble of 2025 climate projections. In order to respond fully to protestant claims, the BA modeling was re-run using inputs which match those used by MBK. These runs will be denoted as No Climate Change, or "NoCC" in further discussion. Taking climate change assumptions out of Petitioners' modeling allows a true comparison of results to MBK studies because it allows for a similar basis of comparison.

The four plots in Figures 1a, 1b, 1c, and 1d show exceedance of reservoir storage results for Trinity, Shasta, Folsom, and Oroville respectively. In each plot, solid lines are the No Action Alternative while dashed lines depict conditions with the WaterFix. The blue lines show BA modeling results, red shows MBK results, and green lines show results of the BA models re-run with the NoCC hydrology. The blue lines are generally lower than the others – as Mr. Bourez has observed. But the BA (blue) results also show that, for each facility, WaterFix results are generally not lower than the no action conditions, which demonstrates Petitioners' claim that the WaterFix can be operated without causing reduced carryover storage.

Figure 2 shows only the NoCC results compared to MBK's analysis. This figure demonstrates two points.

- CVP NOD storage conditions are not impacted by the WaterFix scenario (the dashed green line is mostly at or even above the solid green line), while MBK's analysis shows, as they claim, significantly lower storage due to the WaterFix under all but the driest conditions. (There are other modeling assumptions which contribute to MBK's storage impacts, to be discussed below.)
- The inset plot for the lowest 15% of storage conditions shows that Petitioners' modeling with NoCC hydrology does not result in more instances of dead pool or other low storage conditions than in MBK's studies.

Mr. Bourez asserts that petitioner BA modeling shows WaterFix scenario storage higher than the no action condition, but for total CVP storage this is only 23 TAF on average. For the NoCC studies the effect is reversed with a WaterFix CVP NOD storage condition lower by 15 TAF. Either of these effects is nominal considering the nearly 7.2 MAF of CVP active storage capacity.

**Storage Condition Conclusion** – SVWU criticism of storage conditions in Petitioners' modeling is misplaced. It is based on comparison of two incongruent model runs: 1) BA modeling using climate change inputs; and 2) MBK modeling using historical inputs. Petitioners maintain that BA modeling re-run with historical (NoCC) hydrology results in storage conditions comparable to the MBK No Action and better than MBK for the WaterFix scenario. Reasons for MBK's low WaterFix storage conditions are discussed in subsequent rebuttal topics. The dead pool conditions in BA studies to which protestants object are shown to be primarily the result of the climate-change hydrology.

**Figure 1a**

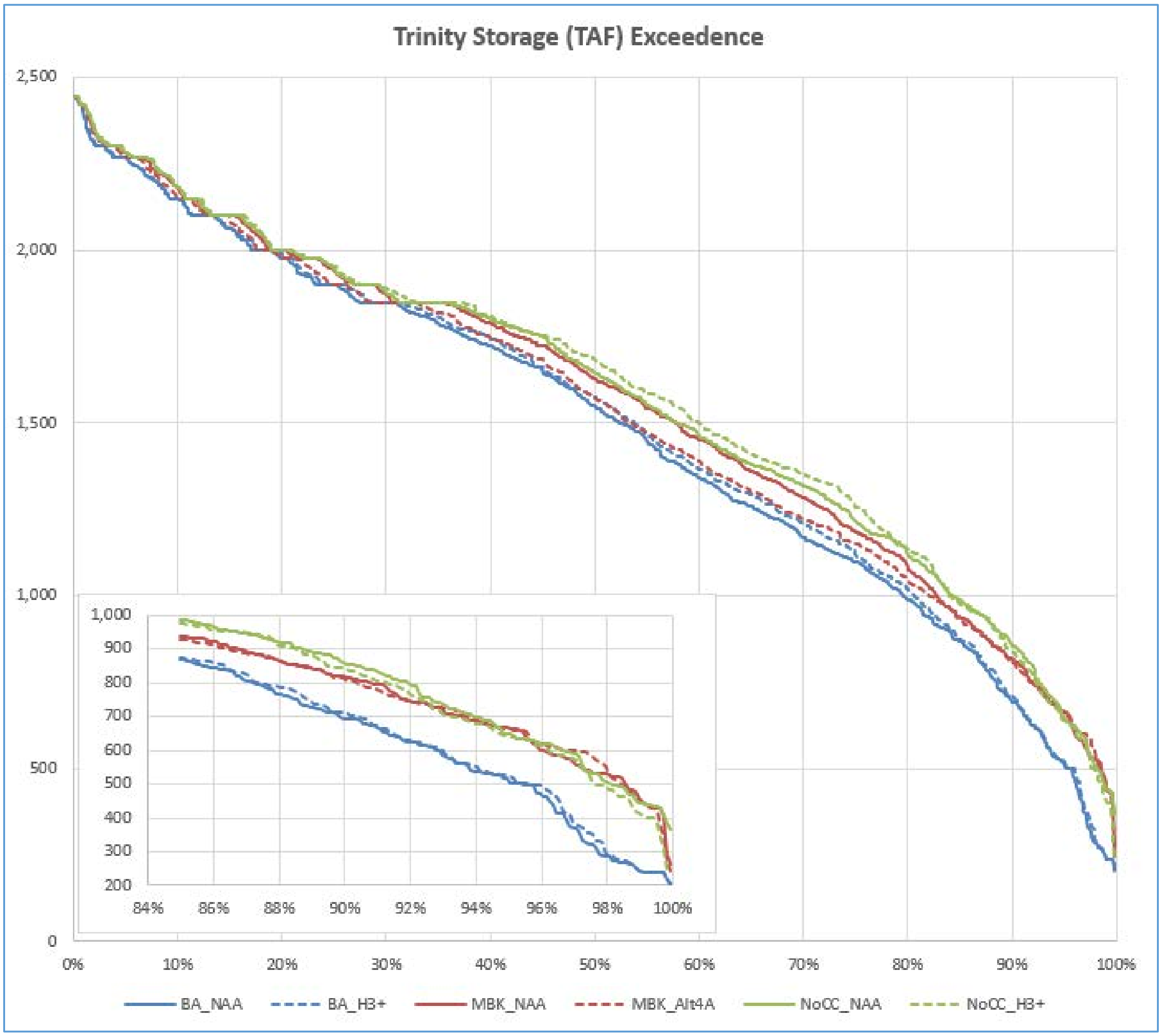

Trinity Storage (TAF) Exceedence
2,500
2,000
1,500
1,000
500
0
0%
10%
20%
30%
40%
50%
60%
70%
80%
90%
100%
1,000
900
800
700
600
500
400
300
200
84%
86%
88%
90%
92%
94%
96%
98%
100%
BA_NAA
BA_H3+
MBK_NAA
MBK_Alt4A
NoCC_NAA
NoCC_H3+

**Figure 1b**

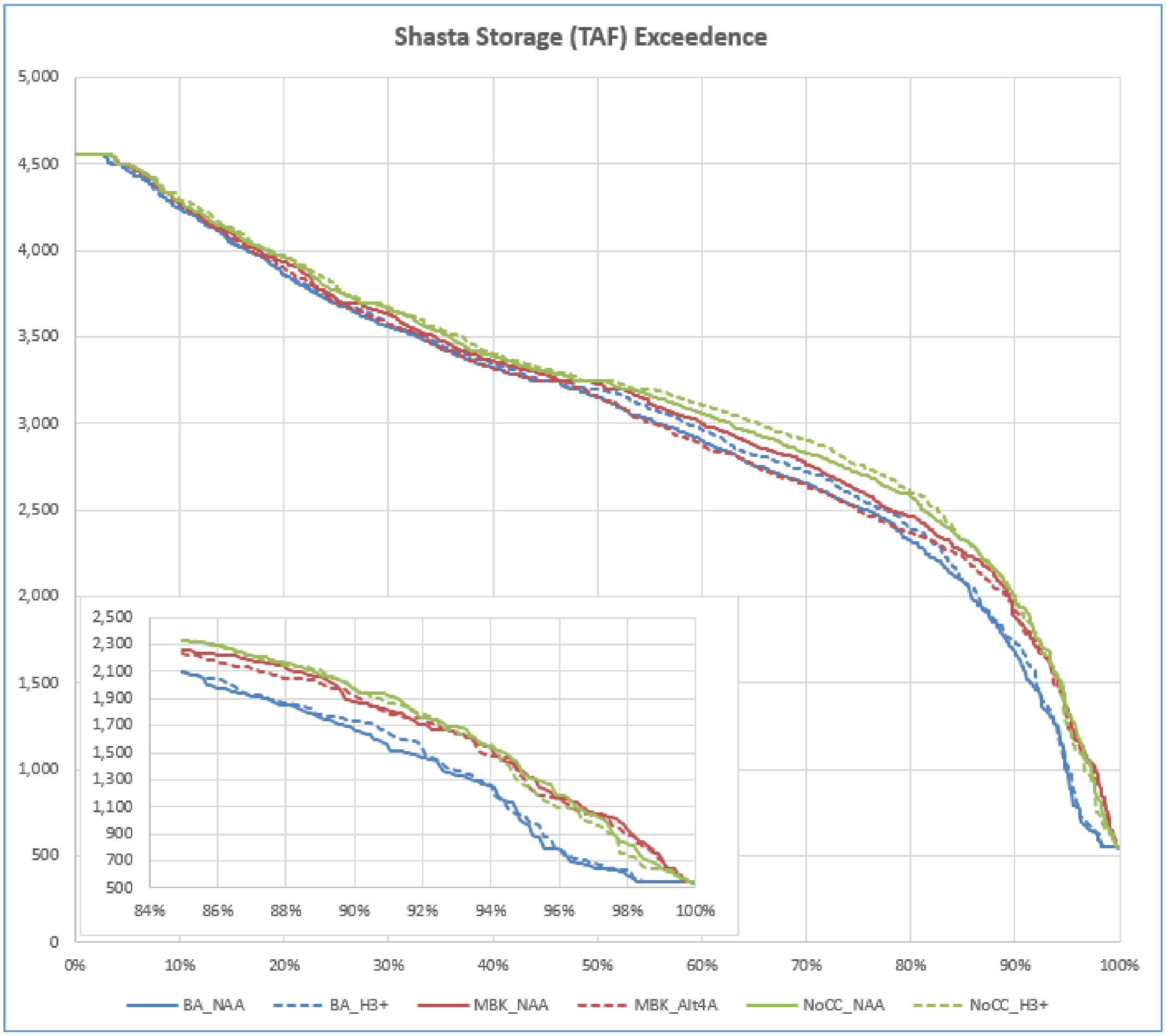

Shasta Storage (TAF) Exceedence
5,000
4,500
4,000
3,500
3,000
2,500
2,000
1,500
1,000
500
0
0%
10%
20%
30%
40%
50%
60%
70%
80%
90%
100%
2,500
2,300
2,100
1,900
1,700
1,500
1,300
1,100
900
700
500
84%
86%
88%
90%
92%
94%
96%
98%
100%
BA_NAA
BA_H3+
MBK_NAA
MBK_Alt4A
NoCC_NAA
NoCC_H3+

**Figure 1c**

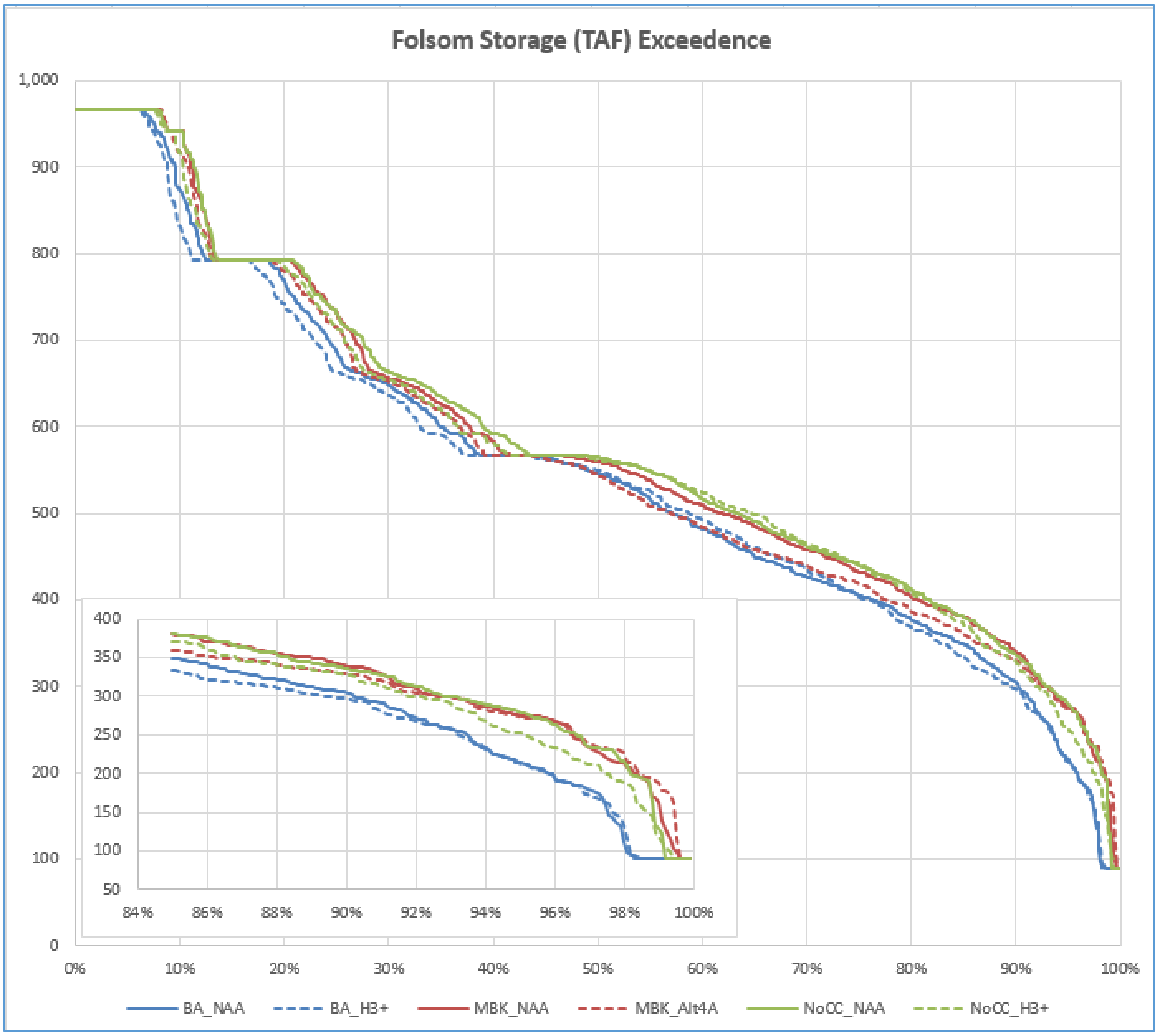

Folsom Storage (TAF) Exceedence
1,000
900
800
700
600
500
400
300
200
100
0
0%
10%
20%
30%
40%
50%
60%
70%
80%
90%
100%
400
350
300
250
200
150
100
50
84%
86%
88%
90%
92%
94%
96%
98%
100%
BA_NAA
BA_H3+
MBK_NAA
MBK_Alt4A
NoCC_NAA
NoCC_H3+

**Figure 1d**

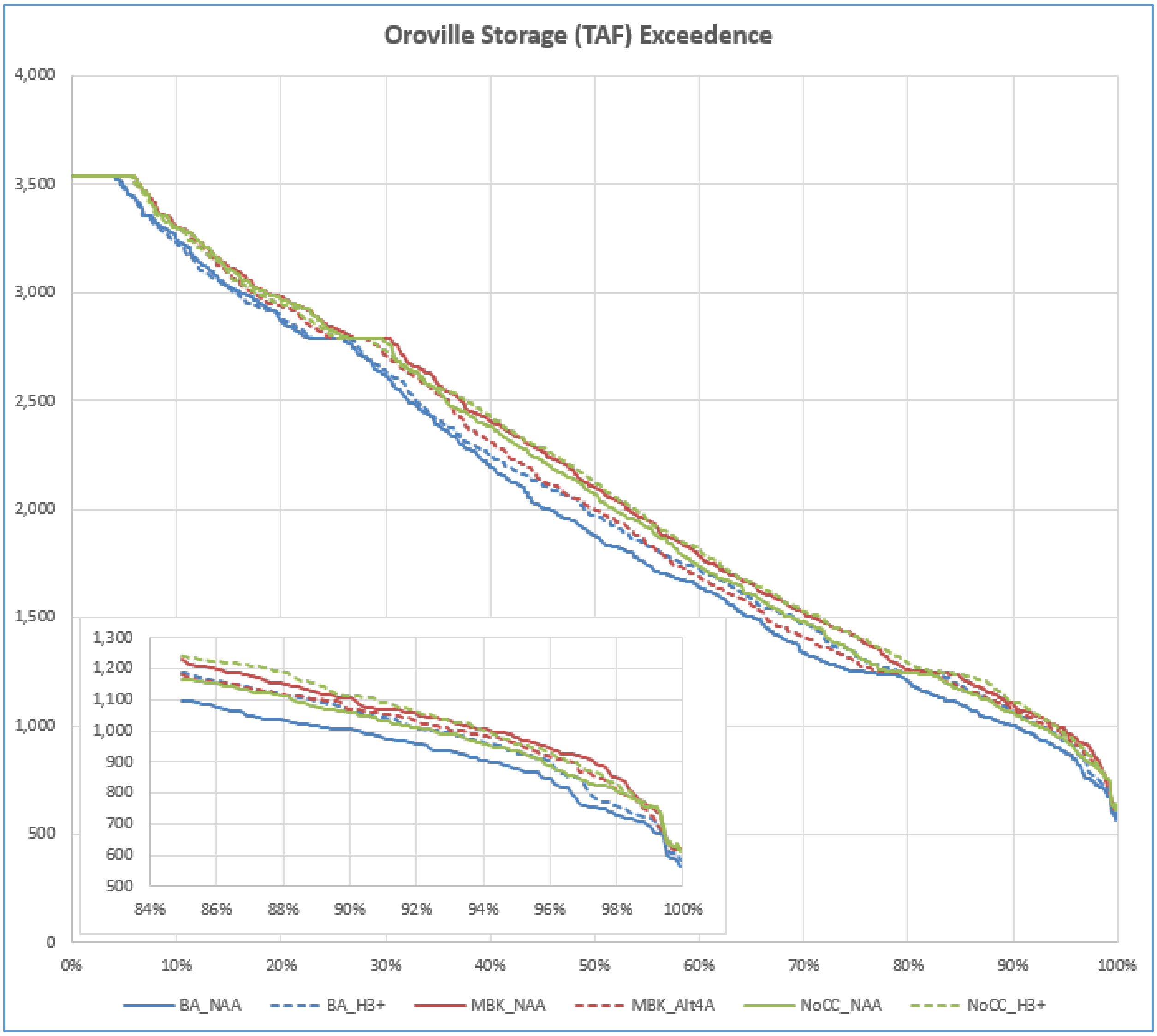
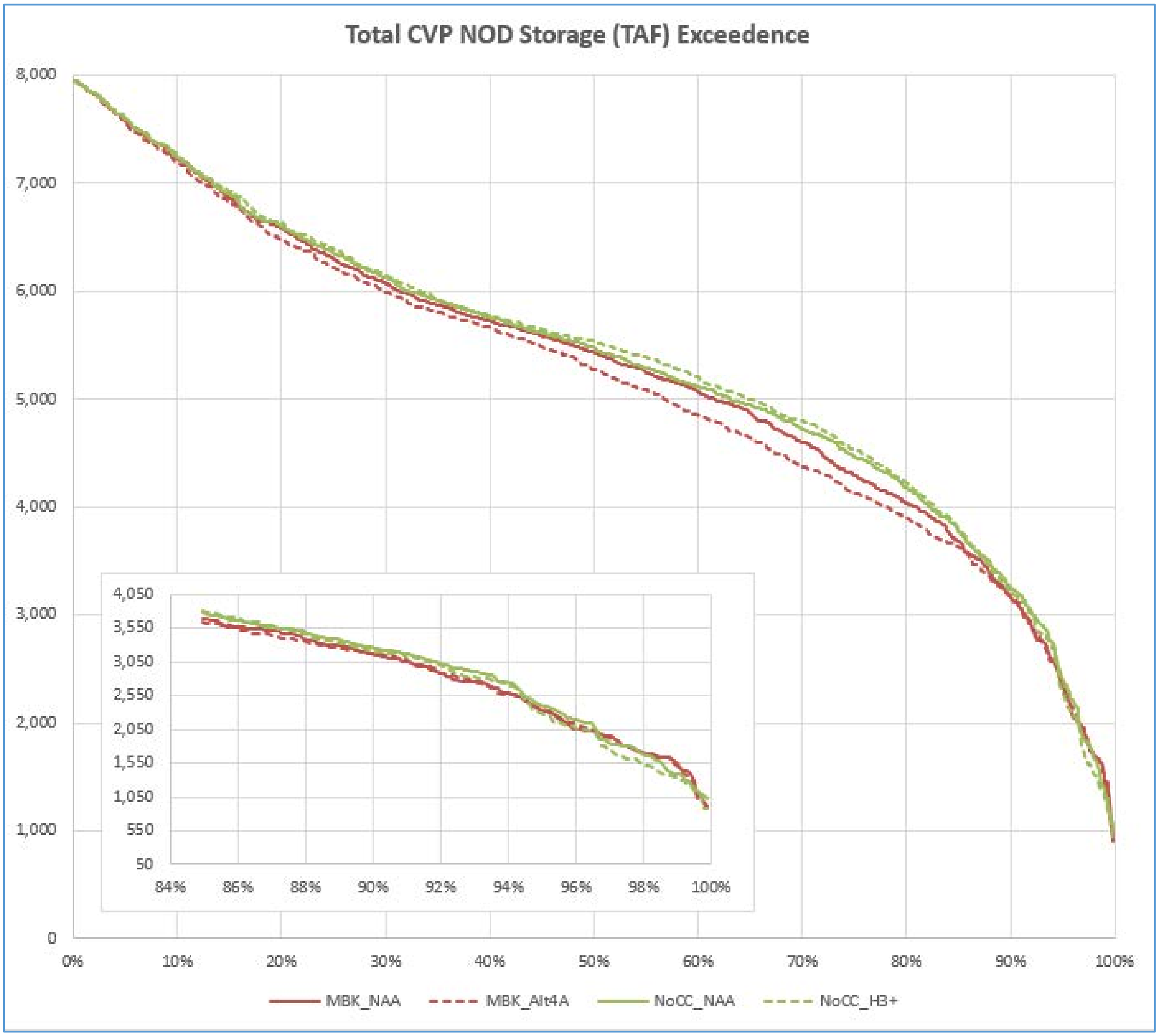

Oroville Storage (TAF) Exceedence
4,000
3,500
3,000
2,500
2,000
1,500
1,000
500
0
0%
10%
20%
30%
40%
50%
60%
70%
80%
90%
100%
1,300
1,200
1,100
1,000
900
800
700
600
500
84%
86%
88%
90%
92%
94%
96%
98%
100%
BA_NAA
BA_H3+
MBK_NAA
MBK_Alt4A
NoCC_NAA
NoCC_H3+

**Figure 2**


Total CVP NOD Storage (TAF) Exceedence
8,000
7,000
6,000
5,000
4,000
3,000
2,000
1,000
0
0%
10%
20%
30%
40%
50%
60%
70%
80%
90%
100%
4,050
3,550
3,050
2,550
2,050
1,550
1,050
550
50
84%
86%
88%
90%
92%
94%
96%
98%
100%
MBK_NAA
MBK_Alt4A
NoCC_NAA
NoCC_H3+

**MBK Model Manipulation to Depict WaterFix Effects**

MBK manipulated CalSim to support Sacramento Valley Water Users' claims that the WaterFix would affect delivery and storage conditions north of the delta. I will present information about how two key areas of model logic and operations assumptions were used to produce their results:

- predetermined control of allocations that affect 65 out of 82 years in the modeled period of record, or 80% of the WaterFix comparison to the No Action
- reliance on late summer JPOD export of CVP storage release to achieve delivery of high SOD allocations with WaterFix

MBK modeling explicitly forced higher CVP NOD allocations and lower CVP SOD allocations in their no action alternative, and conversely forced higher CVP SOD allocations in their WaterFix operation, driving their modeling to achieve adverse impacts to NOD delivery. In order to achieve additional exports needed to meet the much higher CVP SOD allocations, MBK relied heavily on JPOD capacity at Banks to move late summer releases from CVP NOD storage. Central Valley Operations director Ron Milligan will testify that these operations assumptions are not appropriate for long term water supply planning.

Petitioners disagree with the modeling mechanisms used by MBK and with the resulting depiction of overall CVP allocation and operations perspective.

### Manual Allocation Adjustments

*CalSim Allocation Logic* - To put MBK's efforts in context, we first provide a very short primer on CalSim allocation logic. The CVP allocation has its foundation in the Water Supply Index – Delivery Index (WSI-DI), where the WSI is defined as the sum of CVP storage resources plus forecasted Sacramento and American River inflows and an assessment of useable James Bypass inflow to Mendota Pool.

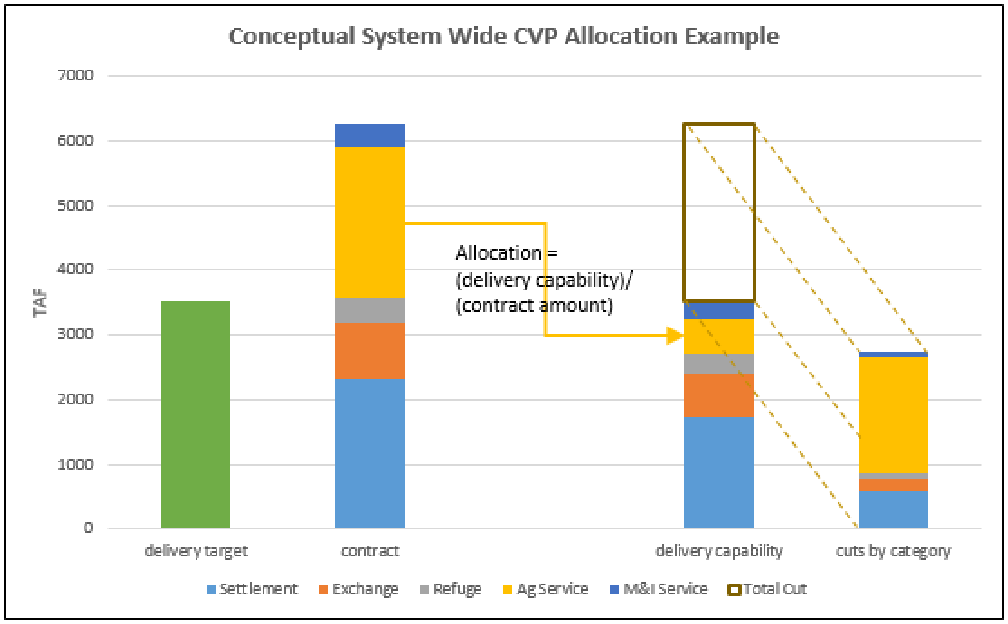
- The WSI is calculated in March, April, and May, updating each time with the previous month's storage condition and a more confident inflow forecast.
- The WSI is used in a simple lookup function to derive a CVP system-wide delivery target, shown as the green bar in Figure ~~4~~3.
- If the delivery target is lower than the sum of all CVP contract obligations, as it is in the figure, cuts are applied to each category of contracts until the delivery obligation is reduced to the size of the delivery target.
- Allocations for each contractor type are calculated from the amounts that are left relative to the total contract volumes. For example, if CVP Ag Service contracts need to be cut by 76%, the allocation is 24%.

The plot in Figure ~~4~~ 3 shows an example of system-wide allocation for a year in which all contract categories are cut.

A second step in the allocation process can determine a modified allocation for south of delta CVP demands by considering CVP storage reserves in San Luis along with estimated export capacity limitations. South of Delta Ag allocations can be lower than system-wide water supply would allow due to these operational constraints.

This generalized allocation process does not capture nuances in operations capabilities, but it has long served as a reasonable foundation for depicting water supply reliability differences between two model runs.

**Figure 43**




*MBK's Allocation Approach* - MBK's modeling represents a wholesale departure from the modeling approach described above. Although hard-wiring model behavior can be expedient in overcoming occasional extreme conditions, the extent of MBK's manual adjustments went far beyond this. MBK used four modeling mechanisms to affect CVP Ag allocations:

- user-defined final allocations
- user-defined "corrections" to system-wide and SOD delivery targets
- user-adjusted export estimates used in calculation of SOD allocation
- hard-coded exceptions in specific years using CalSim's **w**ater **re**sources **s**imulation **l**anguage (wresl)

```
define perdel_cvpag_sys {
    case User_Defined {
        condition   user_defined_cvp_sys_alloc_switch > 0.5
        value       user_defined_alloc_ag_sys/100.
    }
    case Alloc1929 {
        condition   (month > feb .and. wateryear == 1929) .or. (month < mar .and. wateryear == 1930)
        value       perdel_cvpag_s
    }
    case Alloc1932to1934 {
        condition   (month > feb .and. wateryear == 1932) .or. (wateryear > 1932 .and. wateryear < 1935) .or. (month < mar .and. wateryear == 1935)
        value       perdel_cvpag_s
    }
    case Alloc1935to1937 {
        condition   (month > feb .and. wateryear == 1935) .or. (wateryear > 1935 .and. wateryear < 1938) .or. (month < mar .and. wateryear == 1938)
        value       max(perdel_cvpag_s,perdel_cvpag_sys1)
    }
    case otherwise {
        condition   always
        value       perdel_cvpag_sys1
    }
}
```

Table 1 shows the details of which mechanisms controlled MBK's NOD and SOD allocations in their NAA and Alt4A studies for each year of the simulation. The summary column can have up to 4 "X"s – one each for NAA NOD, NAA SOD, Alt4A NOD, and Alt4A SOD. Since it is the comparison of the NAA and Alt4A studies which characterizes the effect of the WaterFix, hardwiring any of the four allocations has an effect on the study conclusions. The total number of years when either or both of the NAA and Alt4A studies had hard-wired either or both NOD or SOD Ag allocations is 65, or 80% of the 82-year period of record. 17 years have no manual adjustments, but are still influenced by a trained timeseries of export estimates (discussed at length in other rebuttal testimony by DWR), and are also affected by system conditions predicated on previous years' fixed operations.

- XXXX 4 Fixes 23 years
- XXX 3 Fixes 18 years
- XX 2 Fixes 15 years
- X 1 Fix 9 years

MBK described their work implementing these mechanisms as iterative and trial-and-error. They iteratively trained their export estimate time series. Then for each successive year of a model run, they examined conditions throughout the forecasting season and made their own decisions about allocations, in most instances dismissing normal allocation processes and even the trained export estimate in favor of unspecified operations projection analyses or modeler choice.

- "So the procedure that we put into our modeling mimics the procedures in a way that the operators walk through their decision process. And it's a lot more work to run the model – it takes us a couple of weeks to do one model run – rather than plug the model in and run with the standard operating procedure." (Vol. 20, 215:12-18.)

- "we may have run it 150 times, maybe even a couple of hundred times, to get the modeling correct…. wherever we had a question of whether it was a *reasonable* allocation or not, we could run the model to that year. The tool allows you to stop the model at that year, and then you could try different allocations to see how that played out until you got to a *reasonable* carryover and a *reasonable* export. And that's what -- that's how we were running the model." (Vol. 20, 219:12-221:3.)

This characterization of storage and allocation results as *reasonable* (my italics) is at the heart of Reclamation's rebuttal. MBK's manual tinkering with the model's decisions was so extensive as to make it more a hand-crafted narrative to support the conclusion that the WaterFix would have undesirable impacts on NOD delivery and storage. In each of the iterations they refer to, something about the model inputs for that year was directly adjusted by MBK. Sometimes the export estimate was disabled by changing it to 9999, which would result in a different mechanism controlling the allocation. Sometimes one or both allocations were explicitly fixed, a delivery target was adjusted, or a wresl case statement directed NOD and SOD to use the same allocation in specific years. In some cases multiple mechanisms were used in a single year. It's easy to see how a single model run could take weeks to prepare, considering that they had to assess how a manual change in any year of a particular run affected not only that run in that year but also the differences between the NAA and Alt4 studies over the whole period of record. Fundamentally, hardwiring 80% of the delivery impacts does not appropriately comprise a comparative study. And finally, although MBK claimed no use of perfect foresight in deriving their manual adjustments, it absolutely strains credulity that expert CalSim modelers did not, on some level, allow their understanding of subsequent conditions to affect decision points in any given May.

**Table 1** – Details of manual adjustments to CVP Ag Allocations in MBK modeling.

| | MBK No Action | | | | MBK Alternative4A | | | | | | | Summary | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | nod fixed | nod coded | sod fixed | all dynamic | nod fixed | nod corrected | nod coded | sod fixed | sod corrected | sod limited to nod corrected | all dynamic | Total Manual Adjustments Count | NAA SOD Exp Est Training Only |
| 1922 | | | | | | | | | X | | | X | |
| 1923 | X | | | | X | | | X | | | | XXX | |
| 1924 | X | | | | X | | | X | | | | XXX | |
| 1925 | X | | | | | X | | | | X | | XXX | |
| 1926 | X | | X | | X | | | X | | | | XXXX | |
| 1927 | | | | | | | | | X | | | X | |
| 1928 | | | | | | | | | | | X | | X |
| 1929 | X | | X | | X | | | X | | | | XXXX | |
| 1930 | X | | X | | X | | | X | | | | XXXX | |
| 1931 | X | | X | | X | | | X | | | | XXXX | |
| 1932 | | X | | | | | X | | | | | XX | |
| 1933 | | X | | | | | X | | | | | XX | |
| 1934 | | X | | | X | | | X | | | | XXX | |
| 1935 | | X | | | X | | | X | | | | XXX | |
| 1936 | X | | | | | X | X | | X | | | XXXX | |
| 1937 | | X | | | | | X | | | | | XX | |
| 1938 | | | | | | | | | | | X | | X |
| 1939 | X | | X | | | | | | | | X | XX | |
| 1940 | | | | | | | | | | | X | | X |
| 1941 | | | X | | | | | | | | X | X | |
| 1942 | | | | | | | | | | | X | | X |
| 1943 | | | | X | | X | | | | X | | XX | |
| 1944 | X | | X | | X | | | X | | | | XXXX | |
| 1945 | X | | | | | X | | | | X | | XXX | |
| 1946 | X | | | | | X | | | | X | | XXX | |
| 1947 | X | | X | | X | | | X | | | | XXXX | |
| 1948 | X | | | | | X | | | X | | | XXX | |
| 1949 | X | | X | | X | | | X | | | | XXXX | |
| 1950 | X | | X | | X | | | X | | | | XXXX | |
| 1951 | X | | X | | X | | | X | | | | XXXX | |
| 1952 | | | | | | | | | | | X | | X |
| 1953 | | | | | | | | | X | | | X | |
| 1954 | X | | | | X | | | X | | | | XXX | |
| 1955 | X | | X | | | X | | | | X | | XXXX | |
| 1956 | | | | | | | | | | | X | | X |
| 1957 | X | | | | X | | | X | | | | XXX | |
| 1958 | | | | | | | | | | | X | | X |
| 1959 | X | | X | | X | | | X | | | | XXXX | |
| 1960 | X | | X | | | X | | | | X | | XXXX | |
| 1961 | X | | | | X | | | X | | | | XXX | |
| 1962 | X | | X | | X | | | | | | | XXX | |
| 1963 | | | X | | | | | | X | | | XX | |
| 1964 | | | | X | | | | | | | X | | X |
| 1965 | X | | | | | X | | | | X | | XXX | |
| 1966 | | | X | | | | | | X | | | XX | |
| 1967 | | | | | | | | | | | X | | X |
| 1968 | X | | X | | | | | | | | X | XX | |
| 1969 | | | | | | | | | | | X | | X |
| 1970 | X | | X | | X | | | X | | | | XXXX | |
| 1971 | X | | | | | X | | | X | | | XXX | |
| 1972 | X | | | | X | | | | | | | XX | |
| 1973 | X | | X | | | X | | | | X | | XXXX | |
| 1974 | | | | | | | | | | | X | | X |
| 1975 | | | | | | | | X | | | | X | |
| 1976 | X | | X | | | X | | | | X | | XXXX | |
| 1977 | X | | X | | X | | | X | | | | XXXX | |
| 1978 | | | | | | | | | | | X | | X |
| 1979 | X | | X | | X | | | | | | | XXX | |
| 1980 | X | | X | | | X | | | | X | | XXXX | |
| 1981 | X | | X | | | | | | | | X | XX | |
| 1982 | | | | | | | | | | | X | | X |
| 1983 | | | | | | | | | | | X | | X |
| 1984 | X | | | | X | | | X | | | | XXX | |
| 1985 | X | | X | | X | | | X | | | | XXXX | |
| 1986 | X | | X | | X | | | X | | | | XXXX | |
| 1987 | X | | X | | X | | | X | | | | XXXX | |
| 1988 | | | | | | | | | | | X | | X |
| 1989 | X | | X | | X | | | X | | | | XXXX | |
| 1990 | X | | X | | X | | | X | | | | XXXX | |
| 1991 | X | | | | X | | | X | | | | XXX | |
| 1992 | X | | | | | | | | | | X | X | |
| 1993 | | | X | | | | | X | | | | XX | |
| 1994 | X | | X | | | | | | | | X | XX | |
| 1995 | | | | | | | | | | | X | | X |
| 1996 | | | | | | | | | X | | | X | |
| 1997 | X | | X | | | | | | | | X | XX | |
| 1998 | | | | | | | | | | | X | | X |
| 1999 | | | | | | | | | X | | | X | |
| 2000 | | | X | | | | | | X | | | XX | |
| 2001 | | | | X | X | | | X | | | | XX | |
| 2002 | X | | | | | X | | | | X | | XXX | |
| 2003 | | | X | | | | | | | | | X | |

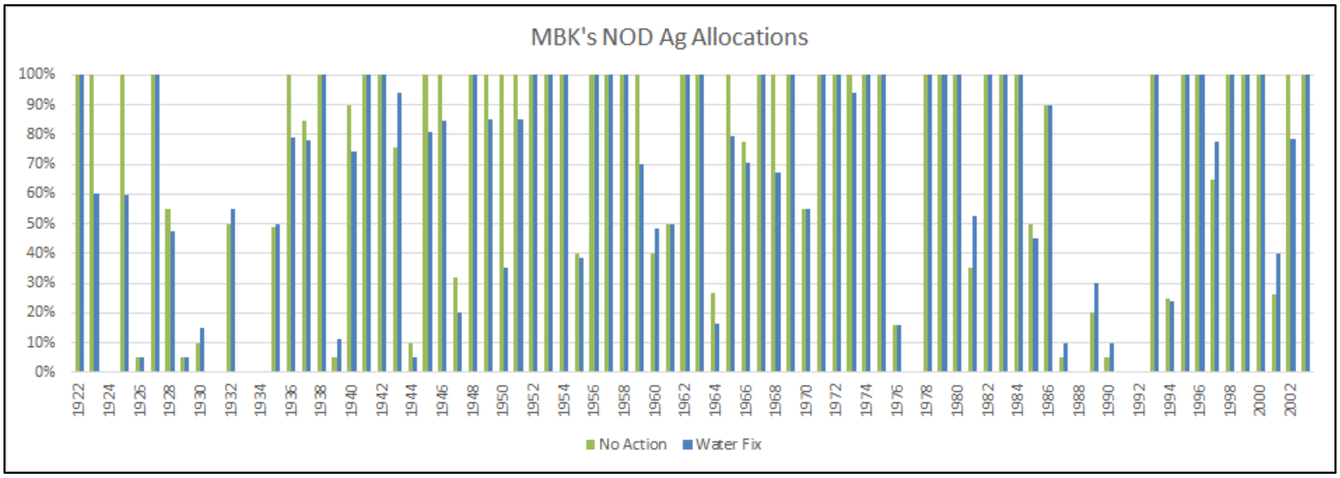
A few figures can help to put the extent of MBK's adjustments into context. Considering the number of "X"s in Table 1 together with the scale of the adjustments in the following plots- demonstrates the lengths to which MBK went to force their desired model results. It appears that the collective allocations were specifically developed to result in a demonstration of impact to storage conditions and north of delta delivery.

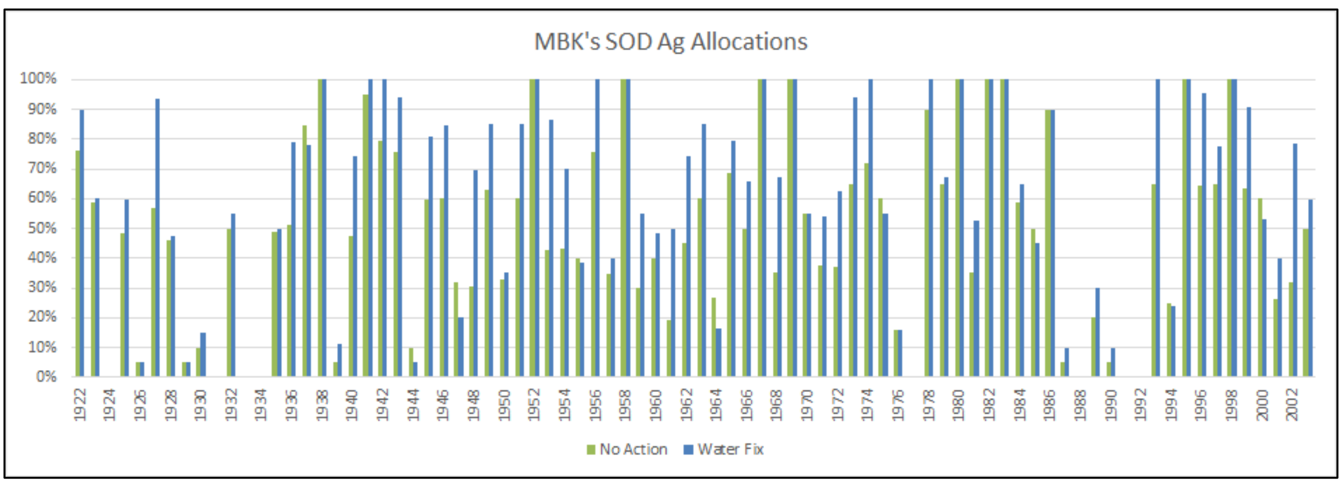
The two plots in Figure ~~6~~ 4 show MBK's CVP Ag allocations for NOD and SOD CVP Ag respectively. Each plot compares the No Action allocation to the Water Fix allocation.

- In the NOD plot, the green (NAA) bars are frequently and significantly higher than the blue bars (Alt4A).
- In the SOD plot, the blue bars (Alt4A) are consistently and significantly higher than the green bars (NAA).

By encouraging lower NOD allocations and higher SOD allocations with WaterFix, MBK explicitly set up the results they were looking for. MBK did not rely on model logic to achieve these results, but instead used the mechanisms detailed in Table 1 to force CalSim to operate this way.

**Figure ~~6~~4**



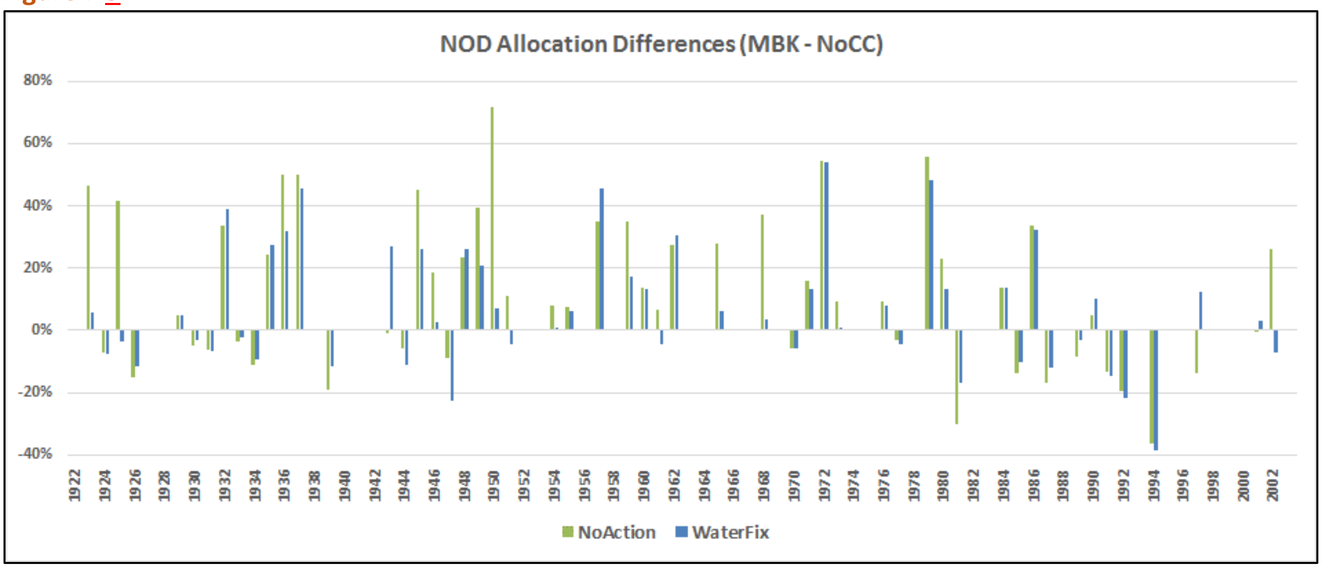



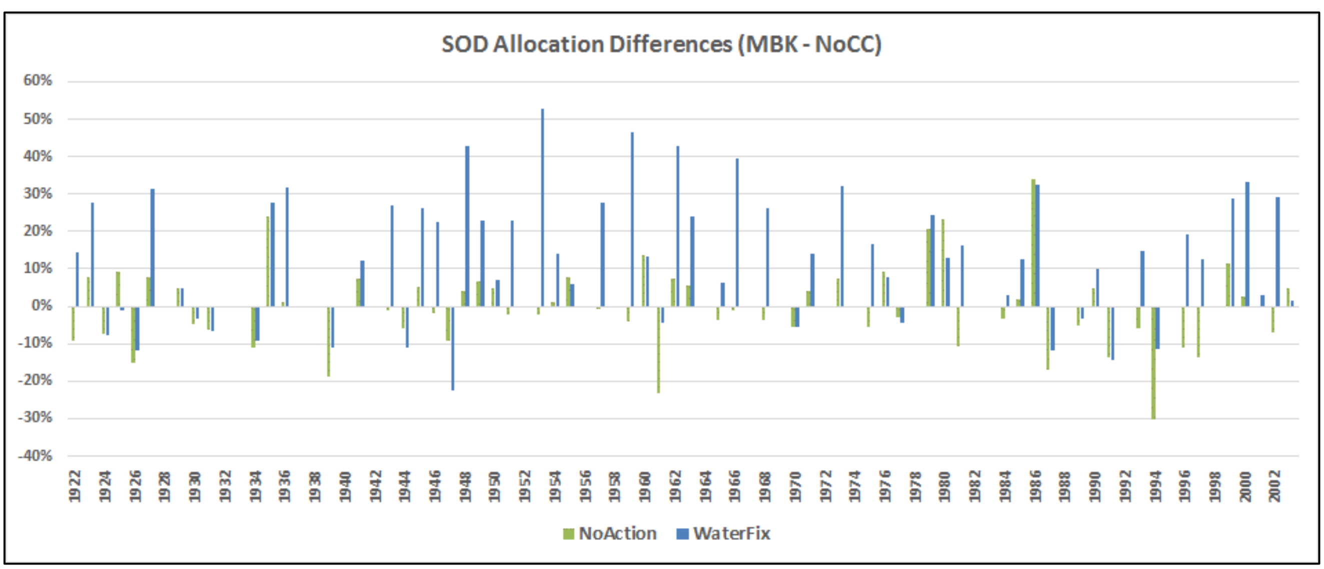

Another perspective can be gained by examining the differences between the allocations achieved by MBK through their manual adjustments and the allocations calculated dynamically in Petitioners' NoCC re-run of the BA studies.

Figure ~~7~~ 5 shows these differences only for years which were manually adjusted by MBK. Positive bars indicate that MBK's manual allocations were higher than dynamically determined allocations in Petitioner's modeling. There are separate plots for NOD and SOD. Green bars show the MBK-NoCC difference for the NAA allocation, and blue bars show the MBK-NoCC difference for the WaterFix Allocation. Based on Figure ~~7~~5, I draw the following conclusions:

- The NOD plot shows that MBK's allocations were higher in both the NoAction and WaterFix runs – this demonstrates a more aggressive view of water supply reliability than in Petitioners' modeling, resulting in more years of higher allocation but also more years of extremely low or zero allocation.
- The NOD plot also shows NoAction differences larger than the WaterFix differences – green bars are larger than blue bars. MBK's NOD allocations were fixed to be more aggressive in their NoAction than in their WaterFix, setting up the depiction of lower NOD allocations due to WaterFix.
- The SOD plot features a profusion of positive blue bars, demonstrating the extent to which MBK's WaterFix SOD Ag allocation was embellished by their manual adjustments.

**Figure ~~7~~ 5**



### Use of JPOD to Achieve CVP SOD WaterFix Benefits

Much of the export needed to satisfy the higher allocation levels for CVP SOD Ag contractors in MBK's Alternative4A study is enabled by their use of JPOD export.

- Figure ~~9a~~ 6a shows average annual total SOD CVP Ag delivery, and each bar shows the average annual JPOD expressed as a portion of that delivery. The bar for MBK's WaterFix scenario shows how much of the increased delivery benefit, largely driven by the manual allocation adjustments discussed above, is satisfied by the large increase in assumed JPOD export capabilities.
- The major blue portion of the right hand bar in Figure ~~9b~~ 6b shows how much of MBK's assumed JPOD export is contributed by storage release versus export of delta surplus. This large percentage of the Alt4A JPOD benefit is derived from withdrawals taken from CVP NOD storage, creating the reductions in storage conditions that are depicted as an outcome of the WaterFix operation. Like the forced CVP Ag allocations, this is a modeling mechanism that contributes directly to SVWU's claim of injury.
- Figure ~~9c~~ 6c shows that the majority of the JPOD difference is concentrated in July through September. Monthly average JPOD by water year type shows the significant change in export in July, August, and September assumed in MBK's Alt4A. Analysis shows that most of the JPOD in July and August is directly delivered, while September JPOD is stored in San Luis. CVO has provided comments indicating that they do not make assumptions about presumed JPOD capacity availability when making allocation decisions in the spring.
- Figure ~~9d~~ 6d provides one more perspective on storage release for JPOD. As we know from Figure ~~9c~~ 6c that the bulk of MBK's JPOD export is in the late summer, this plot shows that many of the storage releases to facilitate these exports are made at fairly low Shasta storage conditions.

Central Valley Operations Director Ron Milligan's rebuttal testimony will address the advisability of MBK's JPOD assumptions for long term planning purposes. Dependability of forecasting JPOD capacity, sourcing from CVP NOD storage withdrawal, and late summer timing are all problematic.

MBK's testimony charged that Petitioners' modeling included artificial limits on the use of JPOD diversion capacity. To test this theory, Petitioner's modeling was re-run using artificially high capacities at Banks to convey JPOD, and results for JPOD exports did not change appreciably. Petitioners' modeling did not include mechanisms to inflate SOD delivery goals to the point where NOD storage conditions could be compromised.

**Figure ~~9a~~6a**

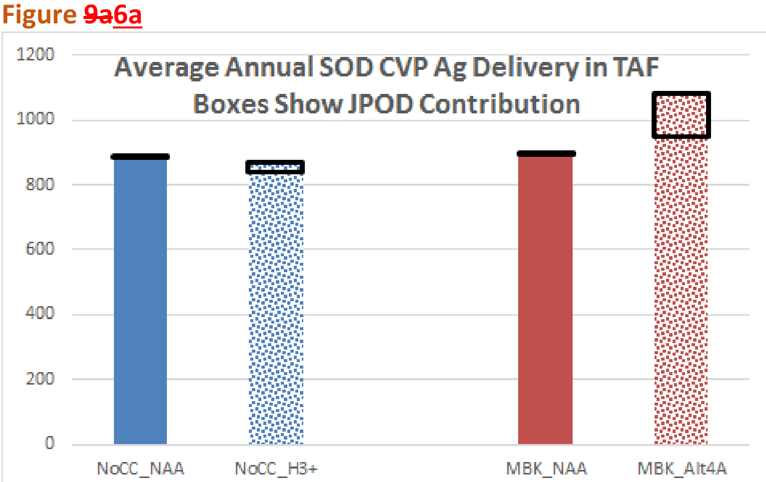


**Figure ~~9b~~6b**

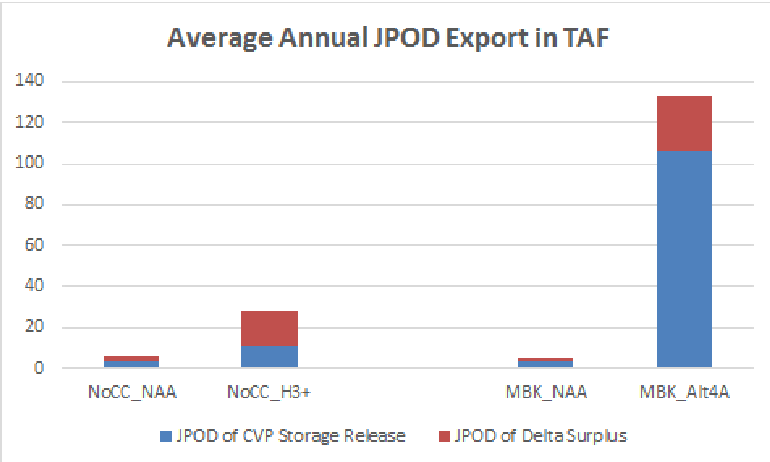



**Figure ~~9c~~ 6c** – Use of JPOD by MBK for WaterFix SOD Delivery Benefit.

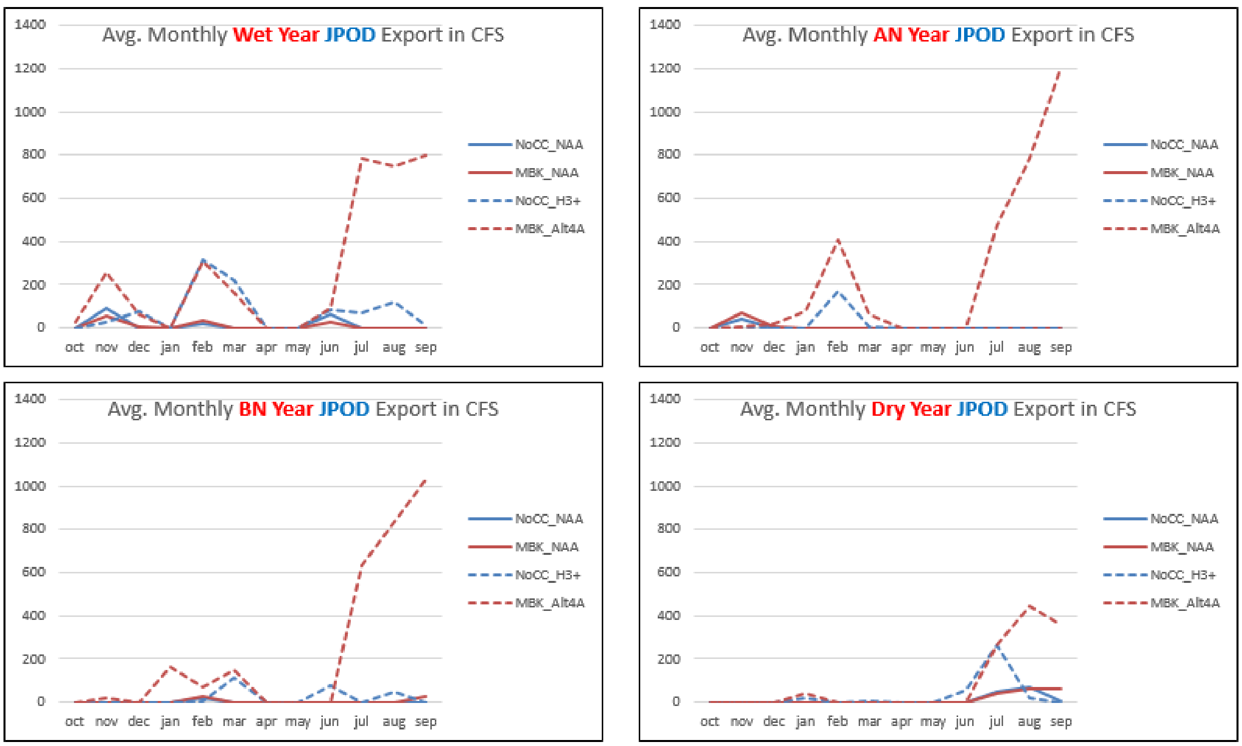
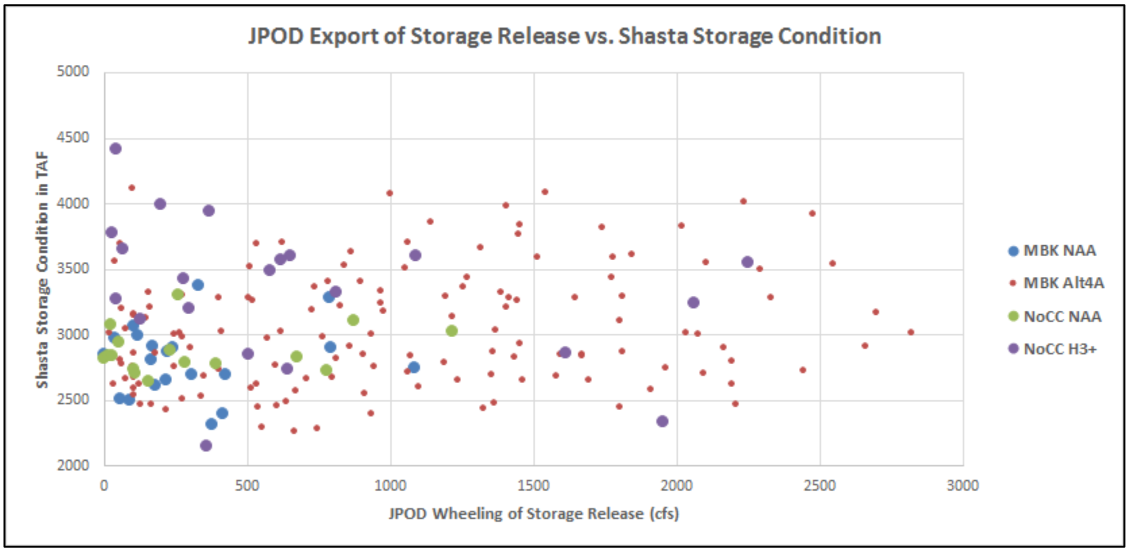


**Figure ~~9d~~6d**




## Conclusion

SVWU has protested the WaterFix based on MBK modeling results showing that the WaterFix could be operated in a manner which causes reductions in CVP NOD storage conditions and CVP Ag Service deliveries relative to a No Action condition. To produce this outcome, MBK modeling hard-wired CVP allocations in 80% of the period of record, relying on a suite of mechanisms for manually adjusting or entirely bypassing model logic. As mentioned earlier, occasional manual tweaking of a model to overcome an anomaly in an otherwise standard set of logic is understandable. The degree to which MBK pre-determined their results renders them essentially a storyline carefully designed to support SVWU's claim of injury, not a comparative modeling analysis of potential project impacts. By contrast, Petitioners' modeling was done using standard modeling practices to show that the project could be operated without causing harm to legal users of water, and Reclamation maintains that this is the desired intent of the project.

Reclamation disagrees with the practice of forcing model operations differently in the No Action and WaterFix scenarios, disagrees with the allocation values that MBK derived, and disagrees with the use of JPOD in late summer to achieve their WaterFix benefit. MBK's studies do not represent Reclamation's potential operation of the WaterFix.

## 2. Rebuttal to ARWA Protestants and Supporting Analysis by Jeff Weaver

**Introduction**

Reclamation disagrees with two areas where Protestants with the American River Water Agencies (ARWA) have misinterpreted model results and wrongly characterize the intent of WaterFix operations. I will present information to clarify Petitioners' analysis on both points.

First, MBK modeling was interpreted as showing that Folsom Reservoir storage could be lower in the future as a result of CWF operations, and ARWA claimed that Petitioners' modeling shows Folsom Reservoir at dead pool one in every ten years. Specific citations of this testimony are listed below:

- 10/26 page 56 – Mr. Fecko states "Mr. Maisch and I have reviewed the testimony of Walter Bourez of MBK Engineers, and we're relying on that testimony and the bounds of the analysis that he did in that testimony to have an opinion about what California WaterFix might be – how it might impact Folsom Reservoir. And in our view, it appears that Folsom Reservoir could be lower in the future as a result of California WaterFix -- of the California WaterFix project if there were no permit terms and conditions placed on that project which would protect upstream storage."
- 10/26 page 62 – Mr. Maisch states "Every modeling scenario presented shows Folsom Reservoir at dead pool one in every ten years."

These claims are based on inappropriate comparison between MBK modeling and Petitioners' modeling since they were done with different inflow data sets. If the climate change inputs used in Petitioners' modeling are replaced with the historical inflows used by MBK, storage results do not show the impact claimed by the protestants.

Second, Jeff Weaver, testifying on behalf of ARWA, presented his opinion that the WaterFix would cause unreasonable Folsom storage and release operations. However, his analysis was based upon a focus on a single two-year sequence in the middle of an extreme dry period. Further examination of the modeling record will show that this is not a sufficient basis to demonstrate true effects of the WaterFix, and that his interpretation of the model results was not correct.

**Rebuttal to Claim of Impact on Folsom Storage Conditions**

**Main Storage Argument** – Petitioners' BA model results show Folsom at or near dead pool in 5 of the 82 years of simulation. This is three years short of the one in ten claimed by Mr. Maisch. No additional years of dead pool result from implementation of the CWF relative to the No Action. ARWA witnesses based their conclusions on comparison of BA modeling to that performed by MBK. But MBK analysis was performed with historical hydrology inputs, while Petitioners' modeling used hydrology developed from a central tendency (Q5) ensemble of 2025 climate projections. In order to respond fully to protestant claims, the BA modeling was re-run using the same historical hydrology inputs used by MBK. These results are labeled "NoCC" (No Climate Change) in the discussion and figures which follow. NoCC results are more comparable to MBK modeling because there is a consistent hydrologic basis. The NoCC study results mirror MBK study frequency of dead pool at Folsom, with only one year of dead pool in the H3plus scenario and two in the No Action.

Figure ~~1~~7/ and Table ~~1~~ 2 shows the minimum annual storage for 6 model runs – the BA NAA and H3+, the NoCC NAA and H3+, and MBK's NAA and Alt4 studies. Figure ~~2~~ 8 shows exceedance of Folsom storage results for all 6 runs. The blue lines show BA modeling results, red shows MBK results, and green lines show results of the BA models re-run with the historical (NoCC), hydrology. Solid lines are the No Action Alternative while dashed lines depict conditions with the WaterFix. The blue lines are generally lower than the others, demonstrating lower storage conditions with the Q5 hydrology. BA (blue) results indicate that WaterFix results are generally not lower than the no action conditions, supporting Petitioners' claim that the WaterFix can be operated without causing impacts to CVP contractors. Inspection of the NoCC and MBK results leads to finding that Petitioners' WaterFix operation does not significantly change Folsom conditions whereas MBK's operation does.

**Conclusion** – ARWA criticism of storage conditions in Petitioners' modeling is misplaced. It is based on comparison of two incongruent model runs: 1) BA modeling using climate change inputs; and 2) MBK modeling using historical inputs. Petitioners maintain that BA modeling re-run with historical (NoCC) hydrology results in storage conditions comparable to the MBK No Action and better than MBK for the WaterFix scenario. The dead pool conditions in BA studies to which protestants object are shown to be primarily the result of the climate-change hydrology.

**Figure 7**

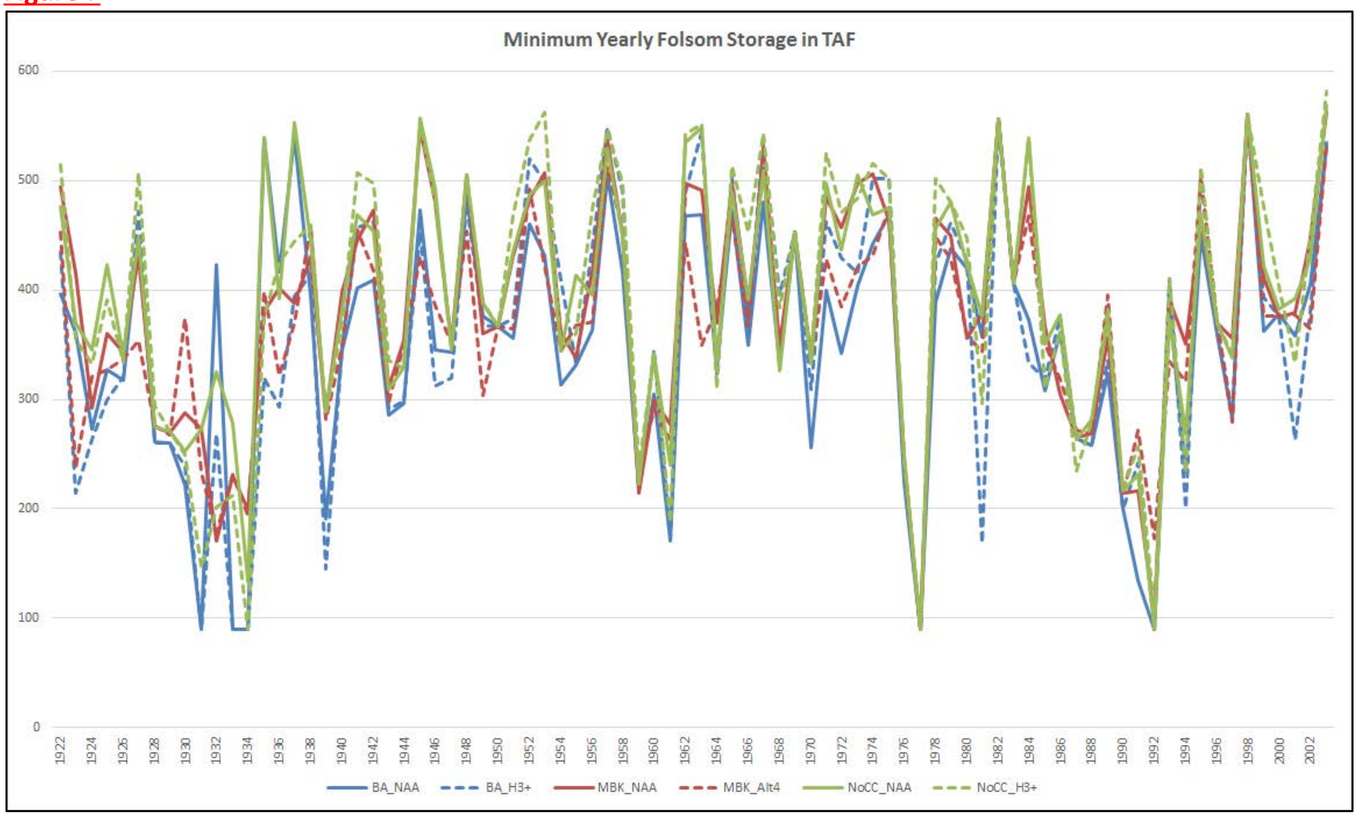


**Table ~~1~~ 2 ~~/ Figure 1~~**

| | BA_NAA | BA_H3+ | MBK_NAA | MBK_Alt4 | NoCC_NAA | NoCC_H3+ |
|---|---|---|---|---|---|---|
| 1922 | 396 | 435 | 494 | 453 | 476 | 515 |
| 1923 | 361 | 214 | 416 | 238 | 370 | 354 |
| 1924 | 273 | 264 | 292 | 320 | 346 | 333 |
| 1925 | 327 | 300 | 360 | 327 | 423 | 392 |
| 1926 | 318 | 321 | 343 | 337 | 340 | 333 |
| 1927 | 449 | 473 | 432 | 354 | 449 | 508 |
| 1928 | 261 | 260 | 275 | 276 | 275 | 294 |
| 1929 | 260 | 260 | 270 | 268 | 271 | 271 |
| 1930 | 222 | 239 | 288 | 374 | 253 | 249 |
| 1931 | **90** | **90** | 273 | 233 | 273 | 146 |
| 1932 | 423 | 269 | 171 | 178 | 325 | 201 |
| 1933 | **90** | **90** | 230 | 231 | 278 | 212 |
| 1934 | **90** | **90** | 199 | 194 | 133 | 90 |
| 1935 | 540 | 320 | 380 | 399 | 539 | 375 |
| 1936 | 417 | 294 | 402 | 322 | 392 | 425 |
| 1937 | 541 | 394 | 388 | 370 | 553 | 445 |
| 1938 | 395 | 415 | 431 | 458 | 444 | 459 |
| 1939 | 191 | 145 | 286 | 282 | 289 | 286 |
| 1940 | 346 | 350 | 399 | 349 | 382 | 371 |
| 1941 | 402 | 457 | 446 | 455 | 469 | 508 |
| 1942 | 409 | 463 | 473 | 418 | 453 | 497 |
| 1943 | 285 | 291 | 311 | 298 | 310 | 335 |
| 1944 | 296 | 298 | 354 | 351 | 329 | 328 |
| 1945 | 473 | 453 | 548 | 431 | 557 | 554 |
| 1946 | 345 | 312 | 480 | 385 | 492 | 479 |
| 1947 | 343 | 319 | 351 | 351 | 345 | 346 |
| 1948 | 486 | 480 | 505 | 454 | 505 | 505 |
| 1949 | 376 | 367 | 360 | 303 | 388 | 389 |
| 1950 | 367 | 367 | 367 | 367 | 367 | 367 |
| 1951 | 356 | 374 | 431 | 365 | 436 | 469 |
| 1952 | 460 | 520 | 482 | 493 | 487 | 537 |
| 1953 | 432 | 499 | 508 | 422 | 500 | 562 |
| 1954 | 313 | 409 | 361 | 345 | 345 | 345 |
| 1955 | 332 | 333 | 338 | 368 | 413 | 360 |
| 1956 | 364 | 440 | 417 | 370 | 395 | 474 |
| 1957 | 505 | 549 | 537 | 513 | 529 | 546 |
| 1958 | 416 | 491 | 451 | 454 | 449 | 497 |
| 1959 | 219 | 218 | 214 | 235 | 223 | 236 |
| 1960 | 304 | 345 | 300 | 291 | 342 | 342 |
| 1961 | 170 | 173 | 277 | 264 | 240 | 188 |
| 1962 | 468 | 489 | 498 | 443 | 535 | 543 |
| 1963 | 469 | 544 | 491 | 350 | 548 | 552 |
| 1964 | 330 | 322 | 370 | 384 | 335 | 310 |
| 1965 | 474 | 503 | 498 | 467 | 491 | 513 |
| 1966 | 350 | 372 | 388 | 367 | 391 | 453 |
| 1967 | 481 | 537 | 512 | 532 | 509 | 544 |
| 1968 | 331 | 396 | 349 | 342 | 327 | 384 |
| 1969 | 453 | 453 | 453 | 453 | 453 | 453 |
| 1970 | 256 | 309 | 338 | 334 | 333 | 339 |
| 1971 | 400 | 462 | 485 | 428 | 497 | 525 |
| 1972 | 342 | 429 | 457 | 385 | 437 | 472 |
| 1973 | 404 | 416 | 497 | 421 | 505 | 484 |
| 1974 | 442 | 502 | 506 | 432 | 469 | 516 |
| 1975 | 469 | 502 | 463 | 475 | 476 | 502 |
| 1976 | 224 | 229 | 245 | 245 | 248 | 242 |
| 1977 | **90** | **90** | **90** | **90** | **90** | **90** |
| 1978 | 388 | 424 | 466 | 449 | 456 | 502 |
| 1979 | 438 | 461 | 450 | 428 | 481 | 481 |
| 1980 | 420 | 426 | 356 | 360 | 424 | 448 |
| 1981 | 358 | 168 | 379 | 343 | 376 | 296 |
| 1982 | 556 | 556 | 556 | 556 | 556 | 556 |
| 1983 | 406 | 406 | 406 | 406 | 406 | 406 |
| 1984 | 373 | 334 | 494 | 468 | 539 | 539 |
| 1985 | 308 | 319 | 366 | 350 | 351 | 311 |
| 1986 | 361 | 375 | 304 | 318 | 377 | 362 |
| 1987 | 264 | 264 | 265 | 272 | 263 | 235 |
| 1988 | 258 | 258 | 269 | 269 | 281 | 280 |
| 1989 | 324 | 336 | 357 | 396 | 374 | 384 |
| 1990 | 200 | 199 | 214 | 212 | 217 | 218 |
| 1991 | 134 | 242 | 216 | 272 | 231 | 257 |
| 1992 | **90** | **90** | 100 | 173 | **90** | 106 |
| 1993 | 384 | 411 | 392 | 335 | 373 | 410 |
| 1994 | 233 | 200 | 351 | 316 | 269 | 233 |
| 1995 | 450 | 504 | 465 | 505 | 470 | 513 |
| 1996 | 360 | 370 | 370 | 370 | 370 | 370 |
| 1997 | 283 | 286 | 356 | 279 | 338 | 342 |
| 1998 | 560 | 559 | 560 | 560 | 560 | 560 |
| 1999 | 363 | 393 | 411 | 376 | 422 | 476 |
| 2000 | 379 | 376 | 375 | 377 | 383 | 404 |
| 2001 | 358 | 263 | 379 | 377 | 392 | 334 |
| 2002 | 405 | 381 | 447 | 364 | 429 | 449 |
| 2003 | 533 | 535 | 563 | 533 | 569 | 582 |

California WaterFix Hearing
Exhibit No. DOI - 33 Errata (with tracked changes)

| | BA_NAA | BA_H3+ | MBK_NAA | MBK_Alt4 | NoCC_NAA | NoCC_H3+ |
|---|---|---|---|---|---|---|
| 1922 | 396 | 435 | 494 | 453 | 476 | 515 |
| 1923 | 361 | 214 | 416 | 238 | 370 | 354 |
| 1924 | 273 | 264 | 292 | 320 | 346 | 333 |
| 1925 | 327 | 300 | 360 | 327 | 423 | 392 |
| 1926 | 318 | 321 | 343 | 337 | 340 | 333 |
| 1927 | 449 | 473 | 432 | 354 | 449 | 508 |
| 1928 | 261 | 260 | 275 | 276 | 275 | 294 |
| 1929 | 260 | 260 | 270 | 268 | 271 | 271 |
| 1930 | 222 | 239 | 288 | 374 | 253 | 249 |
| 1931 | **90** | **90** | 273 | 233 | 273 | 146 |
| 1932 | 423 | 269 | 171 | 178 | 325 | 201 |
| 1933 | **90** | **90** | 230 | 231 | 278 | 212 |
| 1934 | **90** | **90** | 199 | 194 | 133 | 90 |
| 1935 | 540 | 320 | 380 | 399 | 539 | 375 |
| 1936 | 417 | 294 | 402 | 322 | 392 | 425 |
| 1937 | 541 | 394 | 388 | 370 | 553 | 445 |
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| 1971 | | | | | | |
| 1972 | | | | | | |
| 1973 | 404 | 416 | 497 | 421 | 505 | 484 |
| 1974 | 442 | 502 | 506 | 432 | 469 | 516 |
| 1975 | 469 | 502 | 463 | 475 | 476 | 502 |
| 1976 | 224 | 229 | 245 | 245 | 248 | 242 |
| 1977 | **90** | **90** | **90** | **90** | **90** | **90** |
| 1978 | 388 | 424 | 466 | 449 | 456 | 502 |
| 1979 | 438 | 461 | 450 | 428 | 481 | 481 |
| 1980 | 420 | 426 | 356 | 360 | 424 | 448 |
| 1981 | 358 | 168 | 379 | 343 | 376 | 296 |
| 1982 | 556 | 556 | 556 | 556 | 556 | 556 |
| 1983 | 406 | 406 | 406 | 406 | 406 | 406 |
| 1984 | 373 | 334 | 494 | 468 | 539 | 539 |
| 1985 | 308 | 319 | 366 | 350 | 351 | 311 |
| 1986 | 361 | 375 | 304 | 318 | 377 | 362 |
| 1987 | 264 | 264 | 265 | 272 | 263 | 235 |
| 1988 | 258 | 258 | 269 | 269 | 281 | 280 |
| 1989 | 324 | 336 | 357 | 396 | 374 | 384 |
| 1990 | 200 | 199 | 214 | 212 | 217 | 218 |
| 1991 | 134 | 242 | 216 | 272 | 231 | 257 |
| 1992 | **90** | **90** | 100 | 173 | **90** | 106 |
| 1993 | 384 | 411 | 392 | 335 | 373 | 410 |
| 1994 | 233 | 200 | 351 | 316 | 269 | 233 |
| 1995 | 450 | 504 | 465 | 505 | 470 | 513 |
| 1996 | 360 | 370 | 370 | 370 | 370 | 370 |
| 1997 | 283 | 286 | 356 | 279 | 338 | 342 |
| 1998 | 560 | 559 | 560 | 560 | 560 | 560 |
| 1999 | 363 | 393 | 411 | 376 | 422 | 476 |
| 2000 | 379 | 376 | 375 | 377 | 383 | 404 |
| 2001 | 358 | 263 | 379 | 377 | 392 | 334 |
| 2002 | 405 | 381 | 447 | 364 | 429 | 449 |
| 2003 | 533 | 535 | 563 | 533 | 569 | 582 |

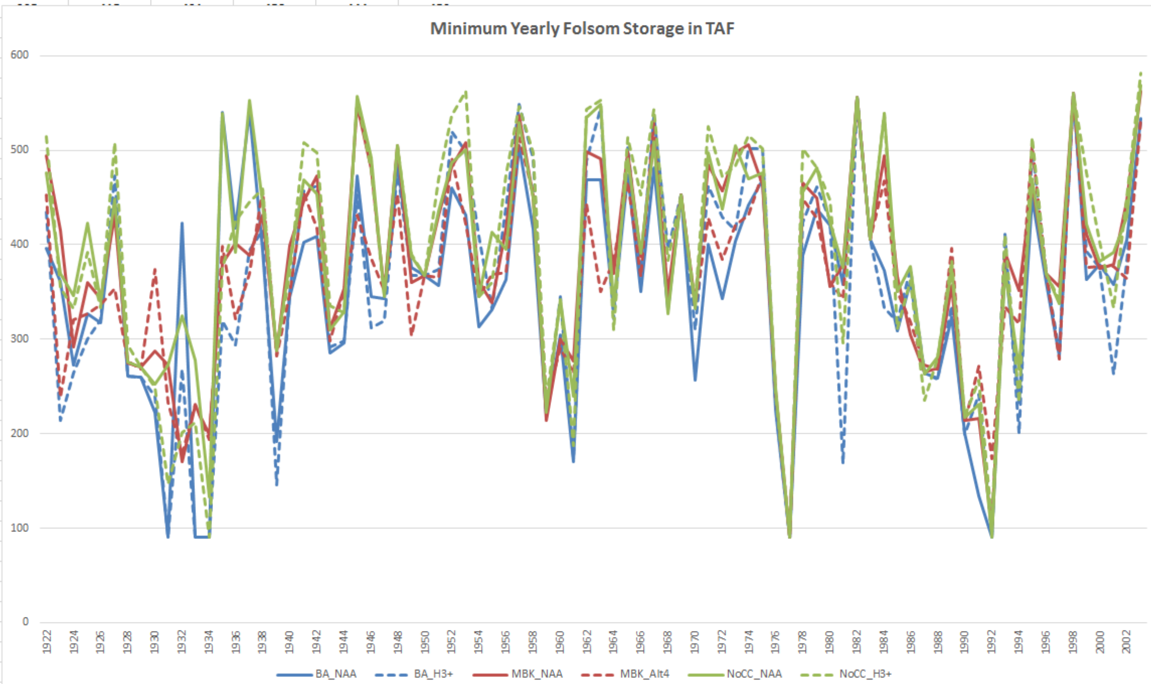
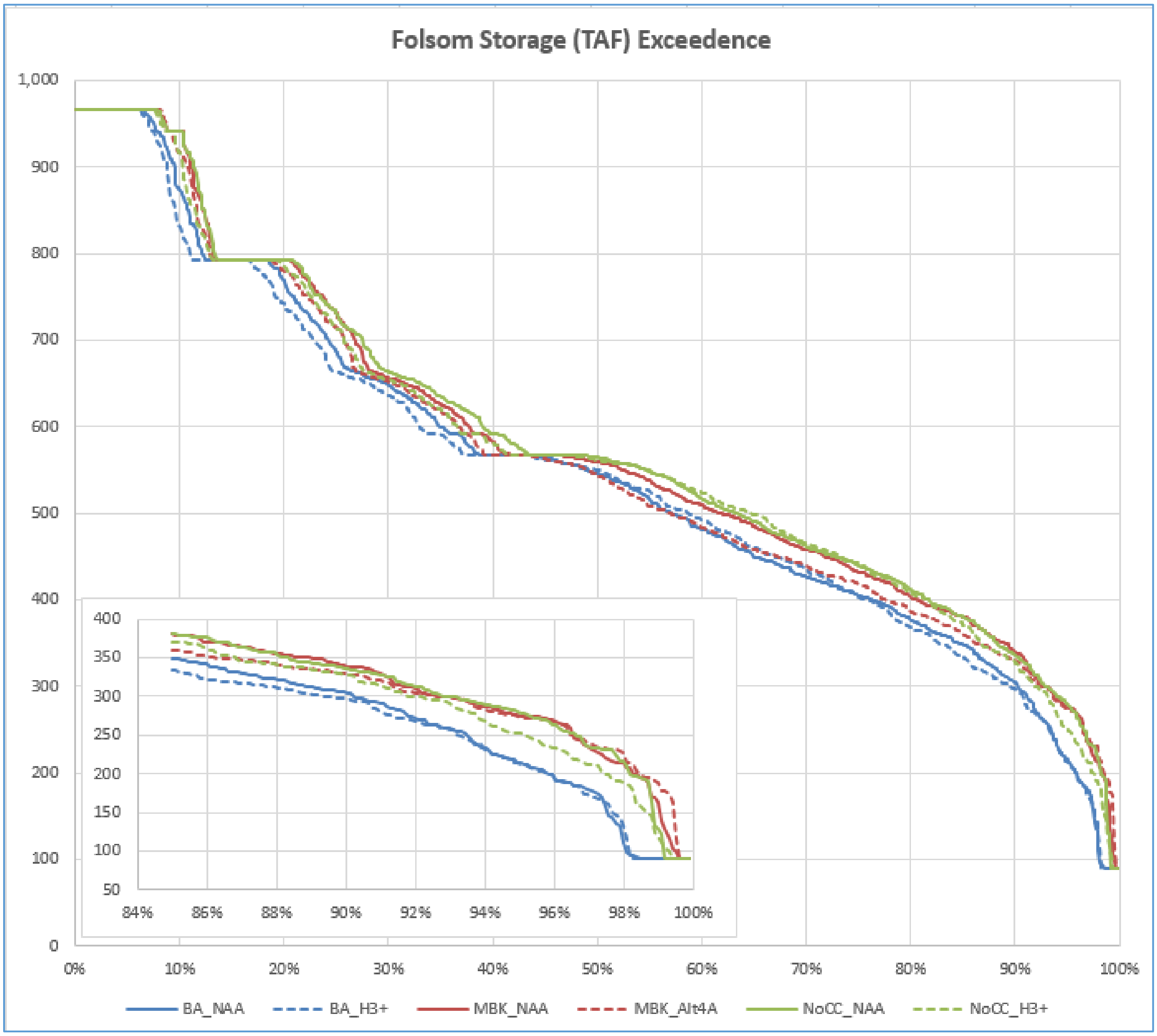


**Figure ~~2~~ 8**


Folsom Storage (TAF) Exceedence
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350
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50
84%
86%
88%
90%
92%
94%
96%
98%
100%
BA_NAA
BA_H3+
MBK_NAA
MBK_Alt4A
NoCC_NAA
NoCC_H3+

**Rebuttal to ARWA/Weaver Critique of 1932-33 Operation**

Jeff Weaver, testifying on behalf of the American River Water Agencies, concluded from his analysis that the CWF would cause unreasonable Folsom storage and release operations.

> Exh. ARWA-100 12:34
> Based on that analysis of the California WaterFix modeling, I reached the following conclusions:
> (a) The California WaterFix project – as represented in the With-Project scenarios – would enable Reclamation to draw down Folsom Reservoir storage substantially going into a critically dry water year like 1933 and during the fall and winter months of such a water year, relative to the NAA;
> (b) The California WaterFix modeling does not appropriately indicate how Reclamation would operate Folsom Reservoir in the spring of a critically dry water year like 1933 because the modeling contains an unrealistic step function concerning the operations of the off-ramp criteria contained in the 2006 FMS and the 2009 NMFS BiOp that allows for inappropriate reductions in lower American River streamflows as a result of projected future low Folsom Reservoir storage; and
> (c) The California WaterFix modeling does not appropriately indicate how Reclamation would operate Folsom Reservoir during the summer of a critically dry year like 1933 because the modeled releases from the reservoir for 1933 swing dramatically from very low to very high releases in a manner that, in my experience, do not reflect a reasonable operation of the reservoir.

Mr. Weaver bases his analysis upon examination of a single 2-year sequence that occurs in the middle of the dry period of record. This is not a sufficient basis to demonstrate actual impacts caused by the CWF, and Mr. Weaver's conclusions drawn from this analysis do not logically follow from the model results.

### 1932-1933 Issue

Mr. Weaver focused on the 1932-1933 sequence of operations at Folsom and claimed that the BA modeling did not depict appropriate operations for a below normal year followed by a critical year. (Note – cross examination pointed out that the historical hydrology water year type sequence is actually dry/critical, and in the Q5 hydrology used by Petitioners' modeling both years are critical.) Beyond the year-type issue, Reclamation disagrees with drawing broad conclusions from an atypical model result which occurs during an extended period of extreme drought. CalSim is a long term water supply reliability planning model. Mr. Weaver himself describes CalSim as "representative of general water supply conditions over the modeled period of record", and acknowledges that "results from a single CalSim II simulation may not necessarily correspond to actual system operations for a specific month or year" (Exh. ARWA-100, 3:10). I concur with Mr. Weaver's assessment, and propose that this is one of those specific months when CalSim results should not be considered representative of a deliberate operation.

At the core of Mr. Weaver's criticisms are the July 1932 Nimbus release, which is larger in the Petitioners' modeling with WaterFix relative to the Petitioners' No Action, and the drawdown of Folsom storage created by the release which persists into 1933. He casts the July 1932 WaterFix release as a deliberate release from Folsom due specifically to the WaterFix. He characterizes it as irresponsible for Reclamation to draw Folsom down going into a critical year. However, let it be noted that MBK's models, relied upon by Mr. Weaver for other purposes, include the same Nimbus release in July 1932 in both their No Action and WaterFix modeling scenarios. Examination of BA results to discern the reason for the difference between the NAA and WaterFix scenario reveals that the opposite of Mr. Weaver's criticism is true. Instead of the WaterFix study releasing water to meet WaterFix objectives, it was the NAA study that was discouraged from making the larger release due to negative carriage water logic for delta water quality. Absent that specific logic (which is not used in

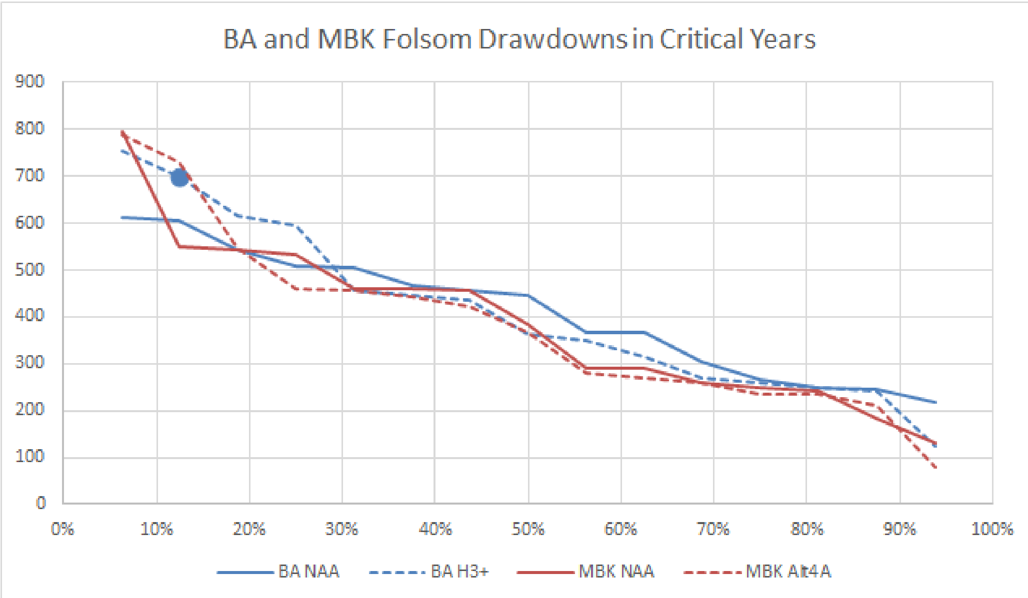
MBK's modeling), the BAA NAA model would have released the water also. Mr. Weaver has erred in his representation of this result as an intentional WaterFix operation.

In cross examination, Mr. Weaver said that he "did not look at every two-year sequence" (Vol. 23, 164:20-21.) I did look at every two-year sequence and maintain that the 1932-1933 operation is not typical of other model results. I examined all sequences of critical years following critical, dry, or below normal years and these are listed in Table ~~2~~3, which shows the Folsom Reservoir drawdown for each year, calculated from the maximum and minimum storage conditions, for both BA and MBK modeling. The BA H3+ drawdown that Mr. Weaver criticizes in 1932 is 698 taf, which is not only the 2nd highest drawdown in the Table ~~2~~ 3 data set but also the 2nd highest drawdown in the entire period of record for the BA WaterFix scenario. Other drawdowns for similar year situations are far smaller. Drawdowns achieved by MBK modeling have similar magnitudes and distributions to those achieved by the BA models, as shown in Figure ~~3~~ 9 – an exceedance plot of the drawdowns in Table ~~2~~3. It is illogical that Mr. Weaver should criticize the Petitioners' modeling result as unrealistic but accept MBK's result.

**Table ~~2~~ 3** – Folsom Storage Conditions – max and min conditions and drawdown for operational year

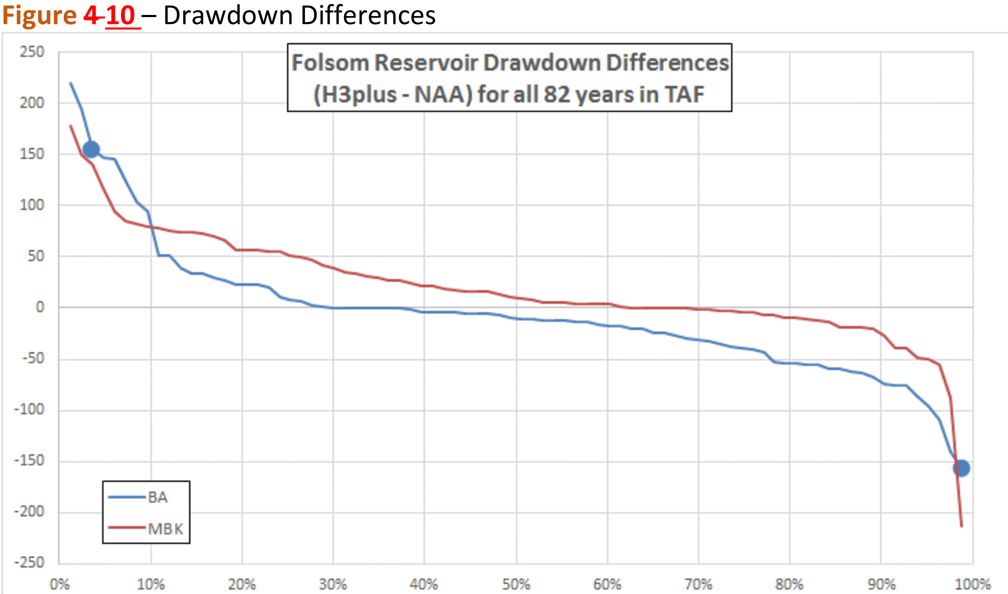
| Q0 | Q5 | | BA_NAA | | | BA H3plus | | | MBK_NAA | | | MBK_Alt4A | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| wyt | wyt | wy | max | min | drw | max | min | drw | max | min | drw | max | min | drw |
| | | | | | | | | | | | | | | |
| 3 | 3 | 1923 | 967 | 361 | 606 | 967 | 214 | 753 | 967 | 416 | 551 | 967 | 238 | 729 |
| 5 | 5 | 1924 | 538 | 273 | 265 | 389 | 264 | 125 | 584 | 292 | 292 | 400 | 320 | 79 |
| | | | | | | | | | | | | | | |
| 4 | 4 | 1930 | 833 | 222 | 611 | 833 | 239 | 594 | 820 | 288 | 532 | 819 | 374 | 445 |
| 5 | 5 | 1931 | 339 | 90 | 249 | 361 | 90 | 271 | 405 | 273 | 132 | 515 | 233 | 282 |
| 4 | 5 | 1932 | 967 | 423 | 544 | 967 | 269 | 698 | 967 | 171 | 796 | 967 | 178 | 789 |
| 5 | 5 | 1933 | 595 | 90 | 505 | 439 | 90 | 349 | 414 | 230 | 184 | 442 | 231 | 211 |
| 5 | 5 | 1934 | 536 | 90 | 446 | 526 | 90 | 436 | 655 | 199 | 456 | 655 | 194 | 461 |
| | | | | | | | | | | | | | | |
| 5 | 4 | 1976 | 592 | 224 | 368 | 592 | 229 | 363 | 630 | 245 | 384 | 610 | 245 | 365 |
| 5 | 5 | 1977 | 308 | 90 | 218 | 338 | 90 | 248 | 349 | 90 | 259 | 358 | 90 | 268 |
| | | | | | | | | | | | | | | |
| 4 | 4 | 1987 | 569 | 264 | 305 | 580 | 264 | 316 | 513 | 265 | 248 | 532 | 272 | 260 |
| 5 | 5 | 1988 | 503 | 258 | 245 | 499 | 258 | 241 | 511 | 269 | 242 | 504 | 269 | 235 |
| 4 | 4 | 1989 | 782 | 324 | 458 | 781 | 336 | 445 | 818 | 357 | 461 | 818 | 396 | 422 |
| 5 | 5 | 1990 | 668 | 200 | 468 | 657 | 199 | 458 | 674 | 214 | 460 | 668 | 212 | 456 |
| 5 | 5 | 1991 | 500 | 134 | 366 | 499 | 242 | 258 | 506 | 216 | 290 | 507 | 272 | 235 |
| 5 | 5 | 1992 | 600 | 90 | 510 | 705 | 90 | 615 | 643 | 100 | 543 | 721 | 173 | 548 |

**Figure ~~3~~ 9** – exceedance of Table ~~2~~ 3 drawdowns




The drawdown differences (the difference in drawdown between the H3plus and NAA scenarios) in 1932 and 1933 are 155 and -157 taf respectively, offsetting each other since the end of 1933 condition is the same in both models. It is noted that these drawdown differences are the third highest and the absolute lowest of all drawdown differences in the entire period of record, as shown by the large blue dots in Figure ~~4~~10. This demonstrates that the differences in the operation between the BA NAA and H3+ scenarios in this brief period are at the edges of the WaterFix effects depicted by BA modeling. It is not reasonable to use this as a basis to criticize the viability of an entire study result.

**Figure ~~4~~ 10** – Drawdown Differences



Mr. Weaver's related claim is that BA modeling does not properly represent the flow management standard off-ramp. But this is the same exact logic used in the MBK studies, which ARWA used to help form their opinions of the BA models. Mr. Weaver's testimony, that the logic resulted in unreasonable swings in release conditions, shows that he has "cherry-picked" a rare condition. I examined the 984-month period of record for significant month-to-month-to-month bobbles in flow levels, both low-high-low, and high-low-high. Table ~~3~~ 4 summarizes how many instances occur for these conditions in the BA, NoCC, and MBK studies. The very low numbers of these instances indicates that they are rare situations which fall into the category of model results that a reasonable modeler would consider as indicative of a difficult single-month solution that should not be interpreted literally. These instances are not the result of specific logic that calls for such operations but rather are examples of rare outlier conditions that do not depict real-time operations and should not be singled out as representative of the larger set of model results.

**Table ~~3~~ 4** – Tally of large swings in Nimbus Release

| | # of High-Low-High Instances >1000 <800 >1000 | # of Low-High-Low Instances <800 >1000 <800 |
|---|---|---|
| **BA NAA** | 3 | 8 |
| **BA H3+** | 2 | 5 |
| **NoCC NAA** | 1 | 1 |
| **NoCC H3+** | 1 | 5 |
| **MBK NAA** | 2 | 3 |
| **MBK Alt4A** | 2 | 4 |

## Conclusions

ARWA conclusions about storage impacts of the WaterFix are wrong, based on inappropriate comparison of MBK modeling with historical hydrology to BA modeling with climate change hydrology. If BA modeling is re-run using historical hydrology, there are minimal impacts to Folsom storage from implementation of the WaterFix.

Reclamation contends that selective criticism of one storage result, caused by a single month release difference, cherry-picked from within a critically dry period, under which conditions it is acknowledged by the protestant that CalSim does not represent specific operational decisions, is not an appropriate foundation from which to conclude that WaterFix will cause enduring impacts to storage at Folsom or flows in the American River.