

Appendix E - Base Case TM



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Water Resources Planning and Management

MEMORANDUM

TO: LACSD STAFF
FROM: GARY FISKE
SUBJECT: KEY BASE CASE RESULTS
DATE: AUGUST 29, 2007

The purpose of this memorandum is to summarize some of the key *Confluence* model results for our base case. We have made a variety of changes to the base case assumptions since our June 19 workshop based in part on feedback from staff. The major changes include:

- Revised demand forecast.
- Groundwater: We've added 5 already-approved and near-term wells. Each has a nominal pumping capacity of 50 gpm and is scheduled to come on line in 2009. In addition, we have refined our assumptions about groundwater recharge to more closely duplicate the results that the District has reported for the existing wells.
- We're assuming a 15.8% rate for lost and unaccounted for water.¹
- Conveyance to the lake through the Grass Valley tunnel is now limited to a 2-year rolling average of 800 afy.

KEY RESULTS

The following discussion focuses on 3 key results:

- Water supply reliability, i.e. how well the system serves customer demand

¹ Note that, subsequent to the development of this memorandum, it was determined that an assumption of a reduction in the LUAF rate to 9% should be made for the base case and for all alternatives. The results in the remainder of this memo reflect that change.

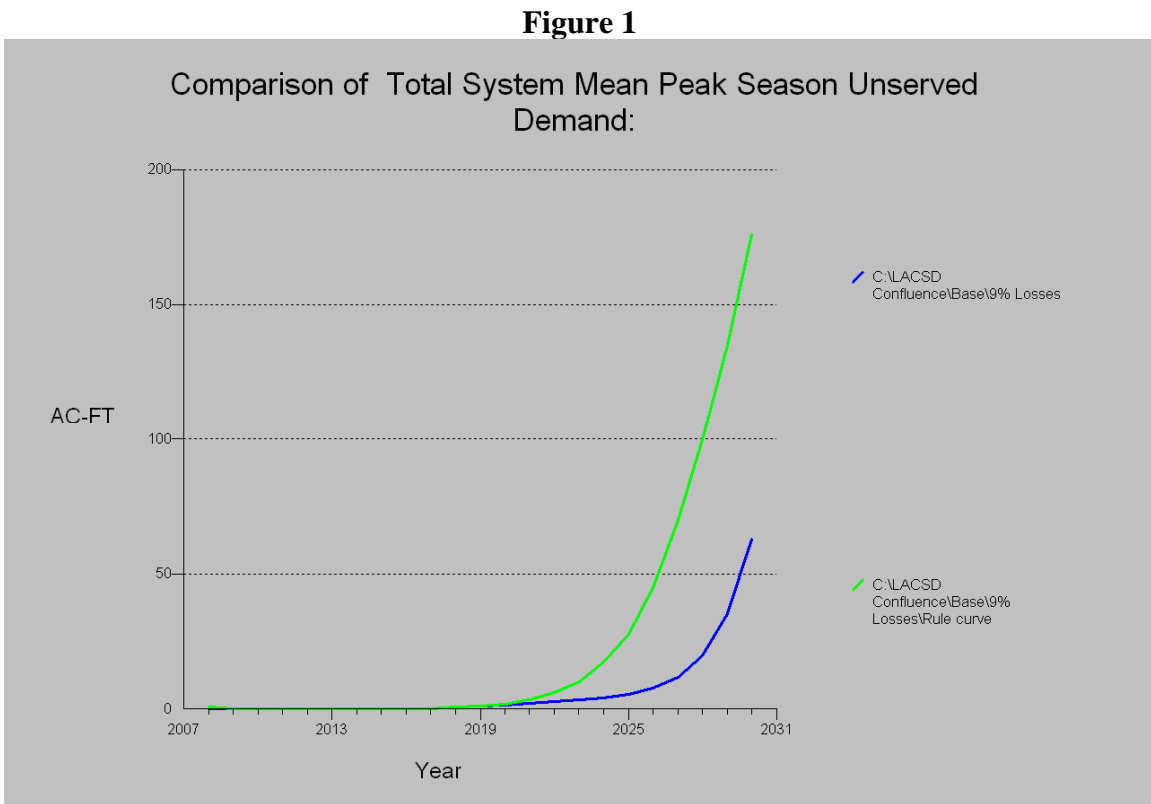
- Cost.
- Lake level, i.e. how often and by how much the lake falls below the 5100 foot elevation.

Subject to available delivery capacities and water availability, in each month the groundwater supplies are dispatched first to meet demand followed by CLAWA I. We then compared two alternative ways of operating the lake and CLAWA II:

1. Draw from the lake if the lake level is very high, then use CLAWA II to its maximum availability, and then if necessary, draw additional water from the lake to meet remaining demands. (This is the rule-curve-based approach we discussed in the workshop.) Of course, lake withdrawals are limited by the SWRCB 1566 afy limitation.
2. Take full advantage of CLAWA II by maximizing its usage before drawing any water from the lake.

Reliability

Figure 1 compares the average peak-season unserved demand using these two operational approaches.



The green (upper) curve is based on the first (rule curve based) approach; the blue (lower) curve is based on the second (maximize CLAWA II) approach. We see that maximizing CLAWA and minimizing lake draws result in better reliability. Intuitively, this is because we hit the 1566 af limit much less often, thereby avoiding potentially large end-of-summer shortages.

We can learn more by comparing the probabilities of experiencing particular peak-season shortages. Figure 2 shows these probabilities for the rule-curve-based approach, and Figure 3 shows them for the ‘maximize CLAWA’ approach.

Figure 2
Rule-Curve-Based Operations

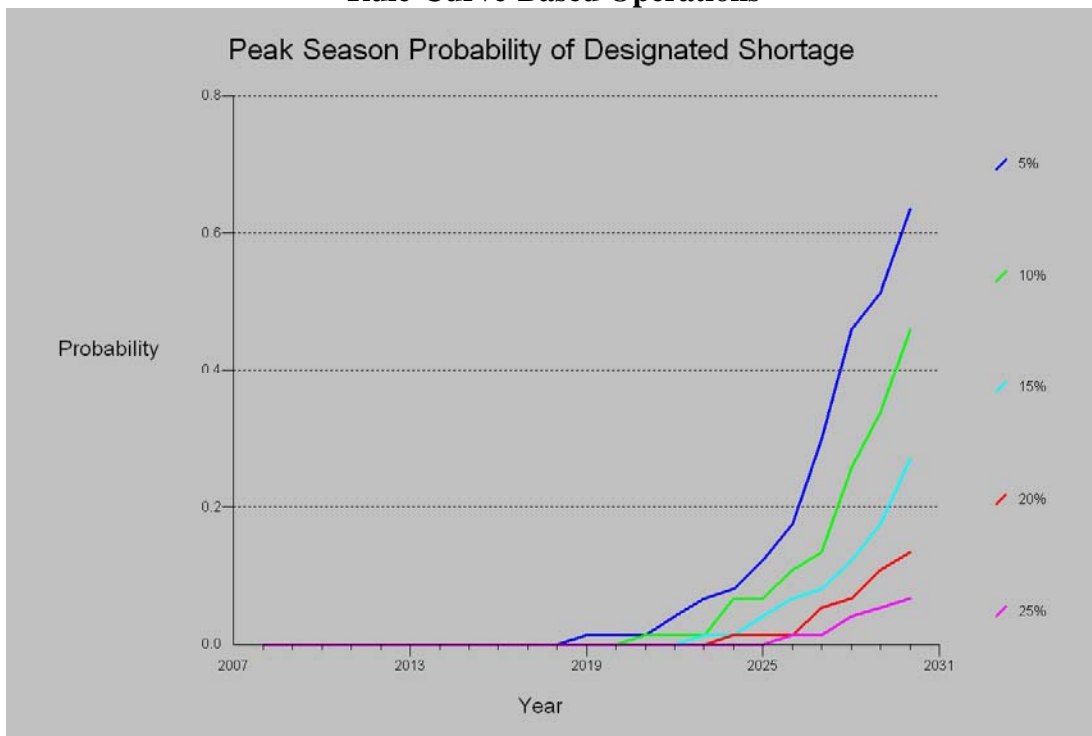
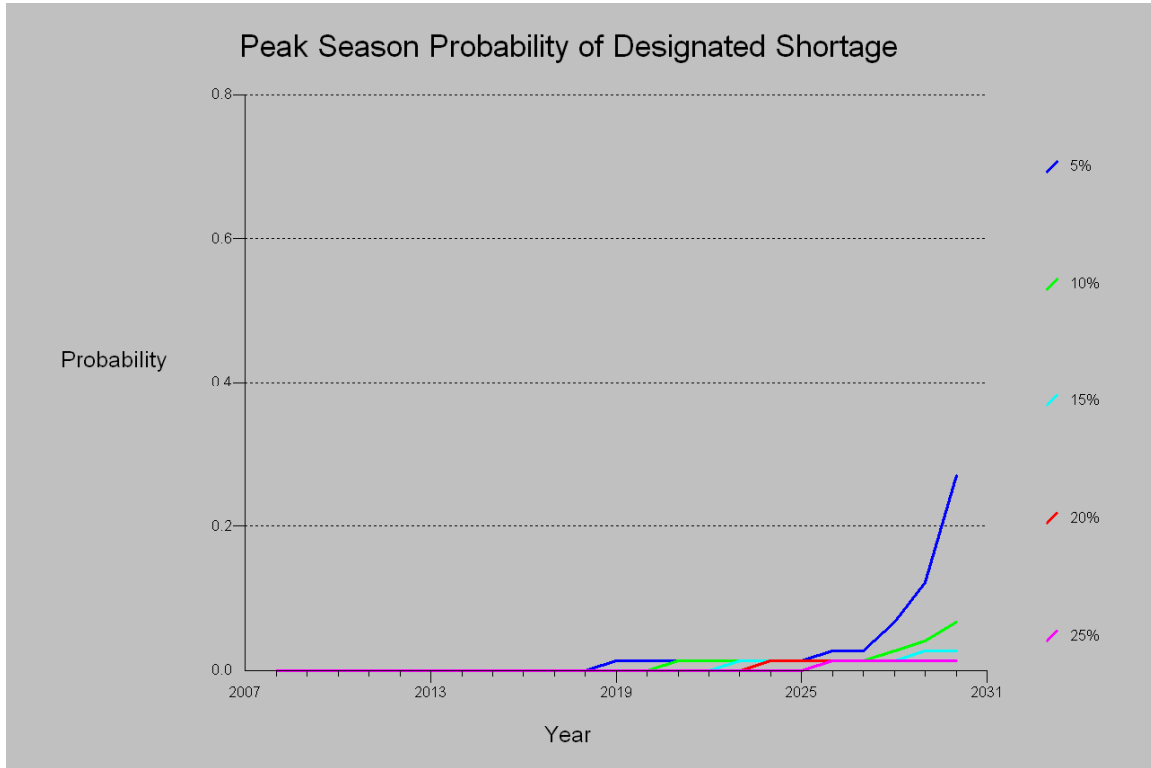


Figure 3
Maximize CLAWA



Each curve in the above charts show the probability of having a peak-season shortage as least as big as the levels shown on the right. Thus, for example, the dark blue (upper) curve shows the probability of at a shortage at least as large as 5%.

Both ways of operating the system perform well through about 2017. At that point, the rule-curve-based approach starts to show increasingly-larger shortages. If CLAWA usage is maximized, noticeable shortages don't begin to show up until around 2025. In the latter years of the planning period, neither operating regime can adequately serve demand, although maximizing CLAWA usage does a much better job than a rule-curve based approach. Even after 2025, the likelihood of large shortages is extremely small if the system is operated in this fashion.

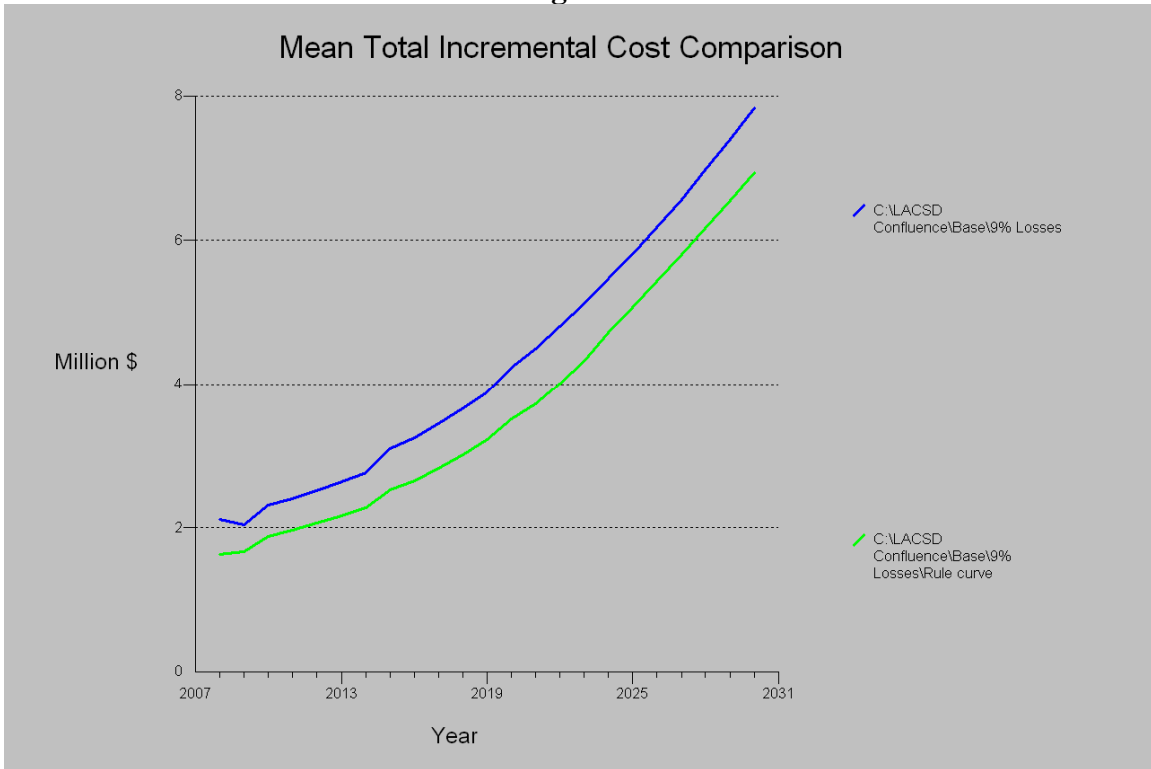
The implication of this is that the District could potentially meet demand for at least another 10 years with base case supplies (including approved and near-term wells). This can be stretched to between 15 and 20 years by maximizing the use of the CLAWA II resource.

Cost

Of course, CLAWA supplies are expensive, and the additional supply reliability associated with maximizing CLAWA utilization comes with a cost. Figure 4 compares

the expected annual costs of the two approaches. (Note that not all of our base case cost assumptions have been finalized, so these results should be regarded as preliminary.)

Figure 4



The annual cost differences climb from around \$500,000 to \$900,000. In other words, by 2030, achieving additional supply reliability by maximizing CLAWA usage will cost the District an additional \$900,000 annually. (Note that we are assuming that the cost structure of the current CLAWA II agreement continue indefinitely. Maximizing CLAWA usage also moves up by about 3 years the point at which the existing agreement is exhausted, at which point the costs may well increase.)

Lake Level

Figures 5 and 6 show the fraction of peak-season days when the lake would be above various elevations in the years 2015 and 2030 respectively.

Figure 5

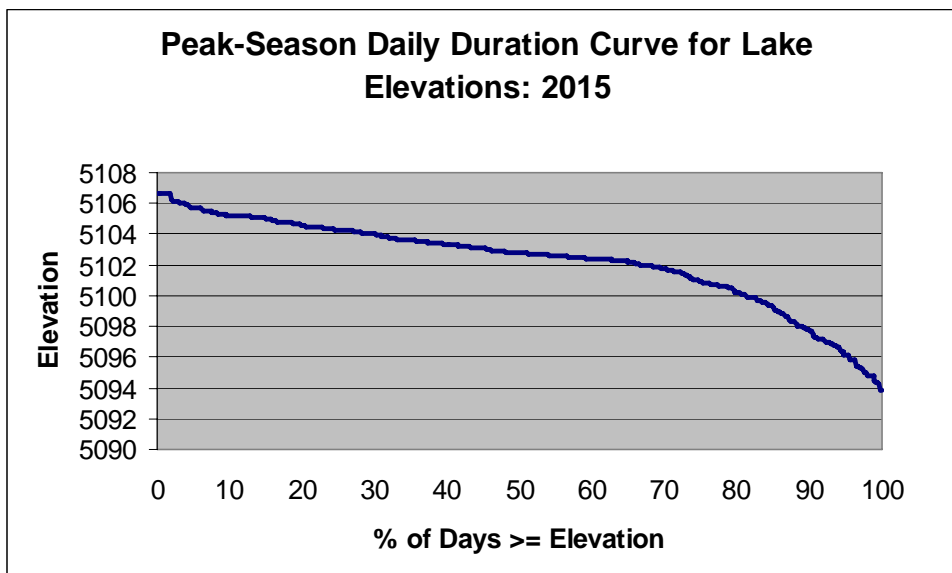
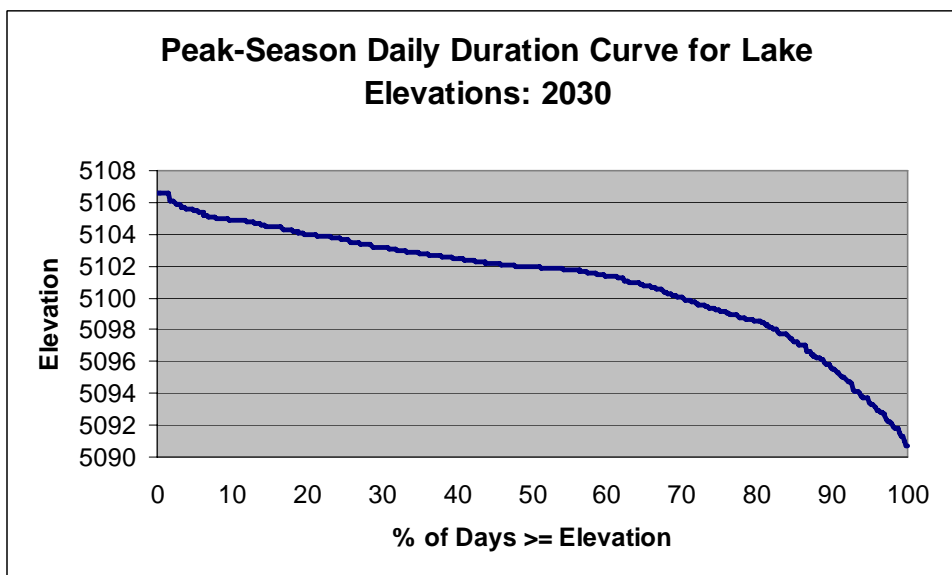


Figure 6



In 2015, lake is at or above 5100 feet about 80% of the peak-season days. By 2030, this falls to just over 70%. In 2015, the lowest lake elevation, under the most adverse conditions, is around 5094 feet. By 2030, this falls to just under 5091 feet.

(In the pre-Labor-Day period (June-August), the lake levels are somewhat higher than the entire June-October peak season. In 2015, the lake is above 5100 feet about 85% of the time; in 2030, 80%.)

(Note that these curves are not affected by which of the two operating strategies is used. This is because the additional withdrawals from the lake under the rule-curve-based operations occur when the lake is very full, often when it is spilling and, therefore, do not have a significant effect on lake levels.)

The District must determine whether these lake level profiles are satisfactory. While there appears to be no need to add new supplies in the near term to improve reliability, there may be a need to do so to reduce the likelihood of low lake levels.