MEMORANDUM

To: Tom Stokely and Mike Deas
From: Greg Kamman
Date: May 22, 1998
Subject: Carryover Storage Analysis
Simulated (1928-1934) Period

Recently, we discussed various methods to simulate an intense drought period as part of the carryover storage analysis. As you are aware, we decided to simulate a series of representative water year-types similar to those experienced during the 1928-1934 drought. The progression of year-types experienced over this period are listed in the second column of the attached tables.

As a first step in completing these simulations, I prepared a series of water budgets that represent the change in storage of Trinity Lake from one year to the next during the 1928-1934 progression of year-types and according to Trinity Division operations[1] associated with each proposed flow alternative. As indicated in column three of these tables, there is a net annual decrease in Trinity Lake storage during dry and critically dry year-types. These values are based on PROSIM output of our representative dry and critically dry year-types (1990 and 1977, respectively). The amount of these annual decreases are quite variable between proposed flow alternatives. The tables also indicate if and when the Lake would go dry under a suite of carryover storage scenarios. For example, when starting with 1250K ac-ft of storage under the No Action alternative, Trinity Lake would go dry after the third year of this representative drought. Only when carryover storage is greater than approximately 1750K ac-ft would there be enough water to last through the entire 7 year period. Even then, the remaining storage may not provide enough cool-water pool to meet downstream temperature objectives.

The Flow Study and 40% Inflow alternatives appear to be the only alternatives which would provide sufficient water over the entire drought period to maintain desired operations. The Flow Study alternative maintains the greatest reservoir storage volumes over this period. Given the poor performance of the 40% Inflow alternative during our previous simulations, we will likely only need to simulate droughts using a couple Flow Study alternative scenarios (maybe 1000K and 1500K ac-ft carryover storage scenarios). At this point, I doubt that there is much reason to try any of the No Action alternative simulations, but we can discuss this in the near future.

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[1] It is quite likely that operations would change during drought periods. However, we do not have the knowledge or expertise to define what such changes. Thus, this analysis uses operations consistant with the earlier PROSIM simulations and evaluations.

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NO ACTION ALTERNATIVE

Year	Water Yr-type	An. delta Storage (ac-ft)	750K Cum. Storage (ac-ft)	1000K Cum. Storage (ac-ft)	1250K Cum. Storage (ac-ft)	1500K Cum. Storage (ac-ft)	1750K Cum. Storage (ac-ft)	2000K Cum. Storage (ac-ft)
1928	normal	136,160	***886,160***	***1,136,160***	***1,386,160***	***1,636,160***	***1,886,160***	***2,136,160***
1929	crit. dry	-701,980	***184,180***	***434,180***	***684,180***	***934,180***	***1,184,180***	***1,434,180***
1930	dry	-104,220	***79,960***	***329,960***	***579,960***	***829,960***	***1,079,960***	***1,329,960***
1931	crit. dry	-701,980	-622,020	-372,020	-122,020	***127,980***	***377,980***	***627,980***
1932	dry	-104,220	-726,240	-476,240	-226,240	***23,760***	***273,760***	***523,760***
1933	dry	-104,220	-830,460	-580,460	-330,460	-80,460	***169,540***	***419,540***
1934	dry	-104,220	-934,680	-684,680	-434,680	-184,680	***65,320***	***315,320***

FLOW STUDY ALTERNATIVE

Year	Water Yr-type	An. delta Storage (ac-ft)	750K Cum. Storage (ac-ft)	1000K Cum. Storage (ac-ft)	1250K Cum. Storage (ac-ft)	1500K Cum. Storage (ac-ft)	1750K Cum. Storage (ac-ft)	2000K Cum. Storage (ac-ft)
1928	normal	-23,515	***886,160***	***1,136,160***	***1,386,160***	***1,636,160***	***1,886,160***	***2,136,160***
1929	crit. dry	-340,823	***545,337***	***795,337***	***1,045,337***	***1,295,337***	***1,545,337***	***1,795,337***
1930	dry	-17,460	***527,877***	***777,877***	***1,027,877***	***1,277,877***	***1,527,877***	***1,777,877***
1931	crit. dry	-340,823	***187,054***	***437,054***	***687,054***	***937,054***	***1,187,054***	***1,437,054***
1932	dry	-17,460	***169,594***	***419,594***	***669,594***	***919,594***	***1,169,594***	***1,419,594***
1933	dry	-17,460	***152,134***	***402,134***	***652,134***	***902,134***	***1,152,134***	***1,402,134***
1934	dry	-17,460	***134,674***	***384,674***	***634,674***	***884,674***	***1,134,674***	***1,384,674***

40% INFLOW ALTERNATIVE

Year	Water Yr-type	An. delta Storage (ac-ft)	750K Cum. Storage (ac-ft)	1000K Cum. Storage (ac-ft)	1250K Cum. Storage (ac-ft)	1500K Cum. Storage (ac-ft)	1750K Cum. Storage (ac-ft)	2000K Cum. Storage (ac-ft)
1928	normal	207,760	***886,160***	***1,136,160***	***1,386,160***	***1,636,160***	***1,886,160***	***2,136,160***
1929	crit. dry	-363,915	***522,245***	***772,245***	***1,022,245***	***1,272,245***	***1,522,245***	***1,772,245***
1930	dry	-89,732	***432,513***	***682,513***	***932,513***	***1,182,513***	***1,432,513***	***1,682,513***
1931	crit. dry	-363,915	***68,598***	***318,598***	***568,598***	***818,598***	***1,068,598***	***1,318,598***
1932	dry	-89,732	-21,134	***228,866***	***478,866***	***728,866***	***978,866***	***1,228,866***
1933	dry	-89,732	-110,866	***139,134***	***389,134***	***639,134***	***889,134***	***1,139,134***
1934	dry	-89,732	-200,598	***49,402***	***299,402***	***549,402***	***799,402***	***1,049,402***

MAXIMUM FLOW ALTERNATIVE

Year	Water Yr-type	An. delta Storage (ac-ft)	750K Cum. Storage (ac-ft)	1000K Cum. Storage (ac-ft)	1250K Cum. Storage (ac-ft)	1500K Cum. Storage (ac-ft)	1750K Cum. Storage (ac-ft)	2000K Cum. Storage (ac-ft)
1928	normal	960	***886,160***	***1,136,160***	***1,386,160***	***1,636,160***	***1,886,160***	***2,136,160***
1929	crit. dry	-343,179	***542,981***	***792,981***	***1,042,981***	***1,292,981***	***1,542,981***	***1,792,981***
1930	dry	-343,610	***199,371***	***449,371***	***699,371***	***949,371***	***1,199,371***	***1,449,371***
1931	crit. dry	-343,179	-143,808	***106,192***	***356,192***	***606,192***	***856,192***	***1,106,192***
1932	dry	-343,610	-487,418	-237,418	***12,582***	***262,582***	***512,582***	***762,582***
1933	dry	-343,610	-831,028	-581,028	-331,028	-81,028	***168,972***	***418,972***
1934	dry	-343,610	-1,174,638	-924,638	-674,638	-424,638	-174,638	***75,362***