Memo

Date:	Tuesday, October 06, 2020
Project:	Water Supply Analysis TM
To:	Doug Rodderick, NID
From:	Megan Lionberger, P.E. and Sergio Jimenez, P.E.
Subject:	Alternative 5-year drought based on the repeated average of the five-consecutive driest years in the 1976-2011 period of record

DWR recently released its Urban Water Management Plan draft guidebook for public review. The guidebook directs urban water suppliers to include a water service reliability assessment for a normal year, a single dry year and a five-consecutive-year drought. The following screenshot from the guidebook describes the definition of a five-year drought. While it directs the water supplier to use the driest five-year sequence within the historical period of record, DWR will allow suppliers to characterize the five-year drought differently.

- **Five-Consecutive-Year Drought**. The five-consecutive year drought for the DRA would be the driest five-year historical sequence for the Supplier (Water Code Section 10612). For the water service reliability assessment, Suppliers are encouraged to use the same five-year sequence for their water service reliability assessment. However, they may choose to use a different five-consecutive year dry period such as the lowest average water supply available to the Supplier for five years in a row. Suppliers are encouraged to characterize the five-consecutive year drought in a manner that is best suited for understanding and managing their water service reliability.

From Section 7.7.7.1, https://water.ca.gov/-/media/DWR-Website/Web-Pages/Programs/Water-Use-And-Efficiency/Urban-Water-Use-Efficiency/Urban-Water-Management-Plans/Draft-2020-UWMP-Guidebook.pdf?la=en&hash=266FE747760481ACF779F0F2AAEE615314693456

NID asked HDR to modify the 5-year drought recently developed for the Water Supply Analysis Technical Memorandum (TM), presented as Table 3-1, to use the repeated average of the 5-consecutive driest years in the 1976-2011 2070 Median climate change hydrologic period of record. Figure 1 shows the 5-year running average watershed runoff. The five driest consecutive years are 1987 through 1991. Year types for these 5 years based on the Smartsville Index are 1987 - critically dry, 1988 - dry, 1989 - above normal, 1990 - dry, and 1991 – dry.

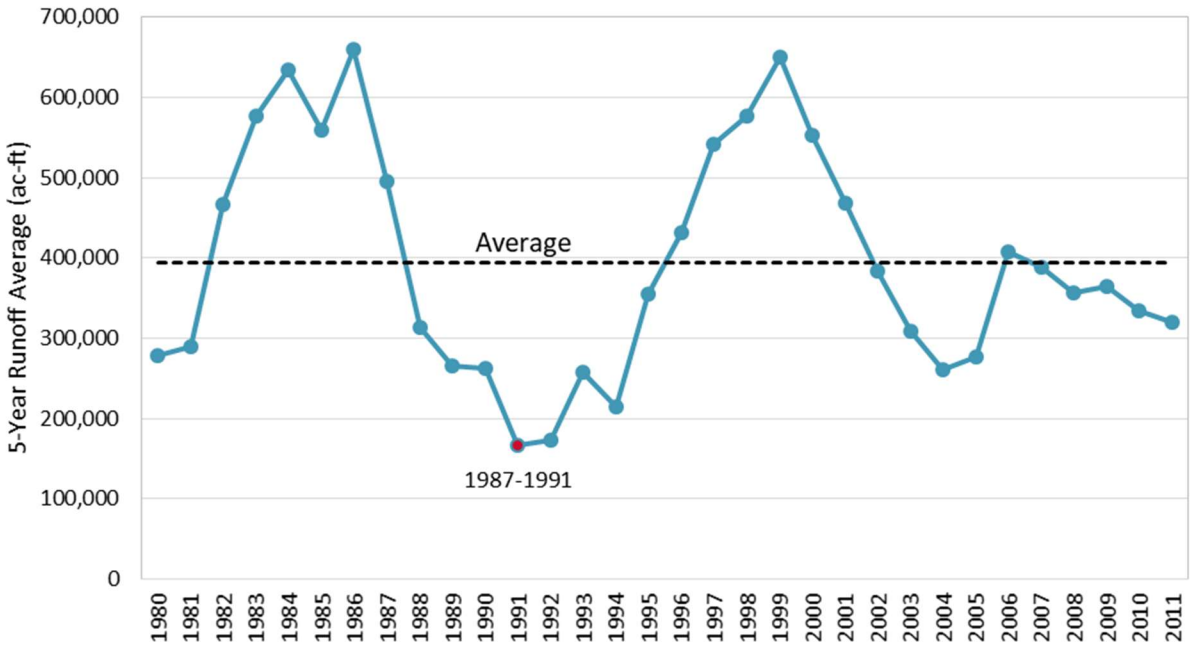

Figure 1. Running five-year average water runoff, showing the 1987-1991 five-year minimum.

The analysis presented in Table 3-1 of the Supply TM was updated using the average watershed runoff for 1987 through 1991 for each year of the drought, shown in Table 1, below. In addition to watershed runoff, environmental flow requirements and PG&E contract purchase values were also updated. The average environmental flow requirement and PG&E contract purchase for Water Years 1987-1991 were assumed for each year of the analysis. An assessment of the total annual supply indicated that the first two years of the drought had sufficient supply for normal operations with no demand reduction requirements. Year 3 available supply results in drought stage I of the NID drought management plan, with a voluntary usage reduction of 10-20%. Assuming a 10% reduction in usage in Year 3, Year 4 available supply results in a drought stage 2, requiring a 10-25% usage reduction. A 15% reduction in usage was assumed. Carryover storage was completely exhausted by the end of Year 4 resulting in a water supply shortage of approximately 5,000 ac-ft. The available supply in Year 5 results in a second year of drought stage 2, and a 15% reduction in usage was similarly applied resulting in a water supply shortage of approximately 3,000 ac-ft.

Table 2. Summary of 2070 5-Year Drought Water Supply, assuming average 1987 through 1991 conditions.

Analysis Variable	Avg. Year	Hypothetical 5-Year Drought				
		Year 1	Year 2	Year 3	Year 4	Year 5
Watershed Runoff (ac-ft) [1]	383,500	166,640	166,640	166,640	166,640	166,640
Available Carryover Storage (ac-ft) [2,3]	87,500	87,500	52,824	18,148	328	0
Contract Purchases from PG&E (ac-ft) [4]	7,500	33,320	33,320	33,320	33,320	33,320
Recycled Water (ac-ft) [5]	5,300	5,300	5,300	5,300	5,300	5,300
Total Supply (ac-ft) [6]	***483,800***	***292,760***	***258,084***	***223,408***	***205,588***	***205,260***
Environmental Flow Requirement (ac-ft) [7]	46,200	31,000	31,000	31,000	31,000	31,000
Total Demand Before Reduction (ac-ft) [8]	255,136	239,936	239,936	239,936	239,936	239,936
Drought Action Stage [9]	-	-	-	I	II	II
Drought Demand Reduction [9]	0%	0%	0%	10%	15%	15%
Total Demand with Reduction (ac-ft) [8]	255,136	239,936	239,936	223,080	210,615	208,596
Water Supply Shortage (ac-ft) [10]	0	0	0	0	-5,027	-3,336

1 Period of record average, and Water Years 1987-1991 average watershed run-off are based on results of the Hydrologic Analysis TM under median climate change conditions, per NID water rights (see Section 2.1 of the Water Supply TM).
2 Average available carryover storage is usable storage simulated by the HEC-ResSim model (average October 15 carryover storage minus 9,218 ac-ft dead storage) based on FERC FEIS minimum flows, 2060 projected demands from the Raw Water Demand Model Update, and 2070 median climate change hydrology developed in the Hydrologic Analysis TM.
3 Carryover storage represents conditions at beginning water year and is calculated as the previous year's carryover storage plus the previous year's total supply minus the previous year's total demand with reduction.
4 Estimated 1987-1991 average contract purchases from PG&E. Estimates based on Appendix B of the Coordinated Operations Agreement. Availability is subject to hydrologic conditions.
5 Projected municipal recycled water supply from 2015 UWMP.
6 Total supply is equal to watershed runoff + available carryover storage + contract purchases from PG&E + recycled water.
7 Estimated 1987-1991 average environmental flow requirement, based the Smartsville Index and historical DWR Bulletin 120 data.
8 Total demand is equal to customer demand + environmental flow requirement.
9 Based on NID's 2015 Drought Management Plan.
10 Total Supply minus the total demand with reduction, if less than 0.