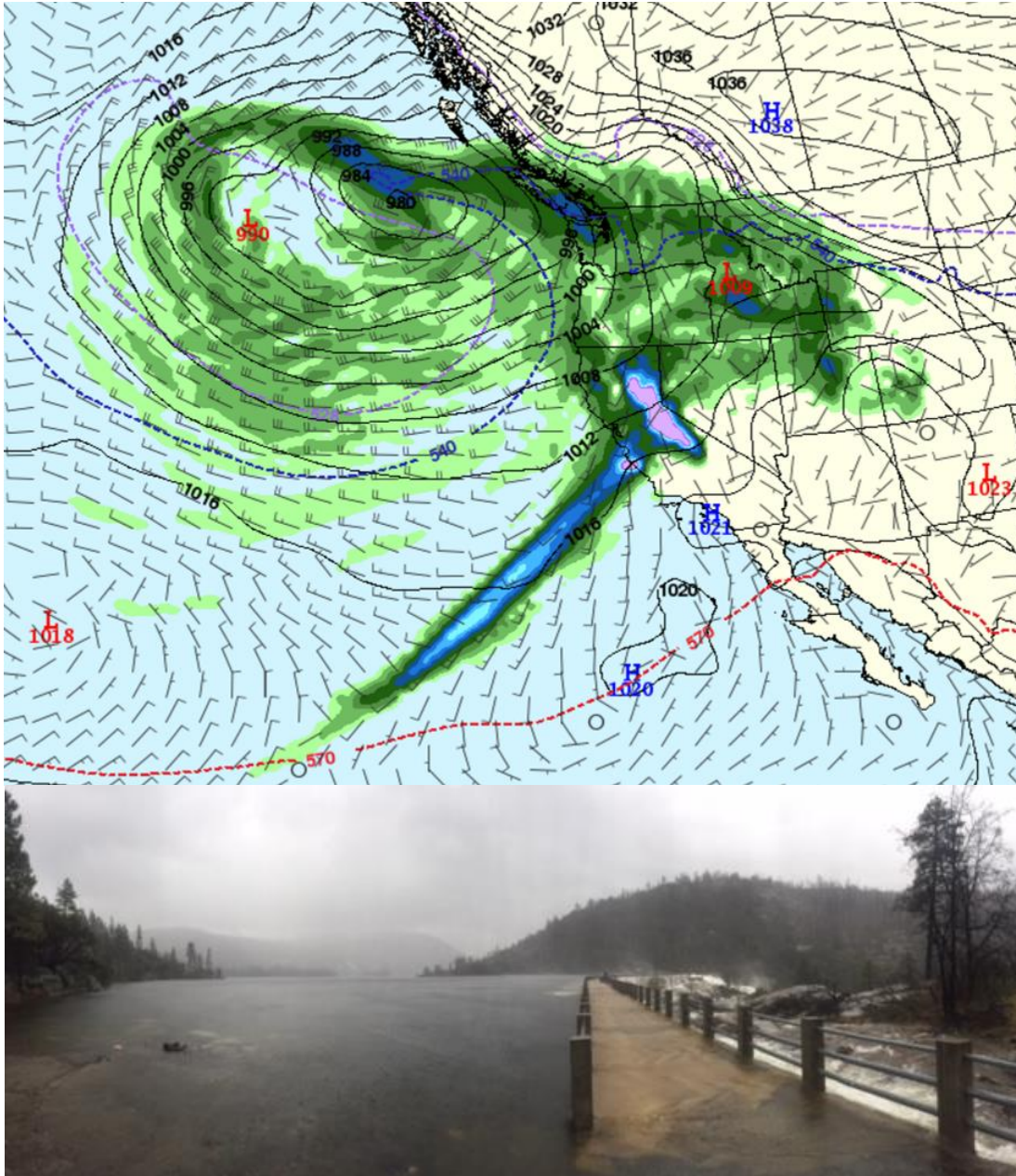


# San Francisco Public Utilities Commission Hydrological Conditions Report For December 2016

J. Chester, C. Graham, A. Mazurkiewicz, & M. Tsang, January 5, 2017



An atmospheric river, commonly known in California as the pineapple express, is a narrow band of concentrated moisture coming across the Pacific Ocean from the Hawaiian Tropics. The above image is of the forecasted weather for January 9, 2016. The atmospheric river hits the Sierra Nevada Mountains, rises and drops considerable moisture. The January 7-9 storm event was large enough to result in considerable inflows at all reservoirs, causing Eleanor to fill and spill. The photo above was spill in the 6,000 cfs range – eventual spill peaked at 11,000 cfs.

Current Tuolumne System and Local Bay Area storage conditions are summarized in Table 1.

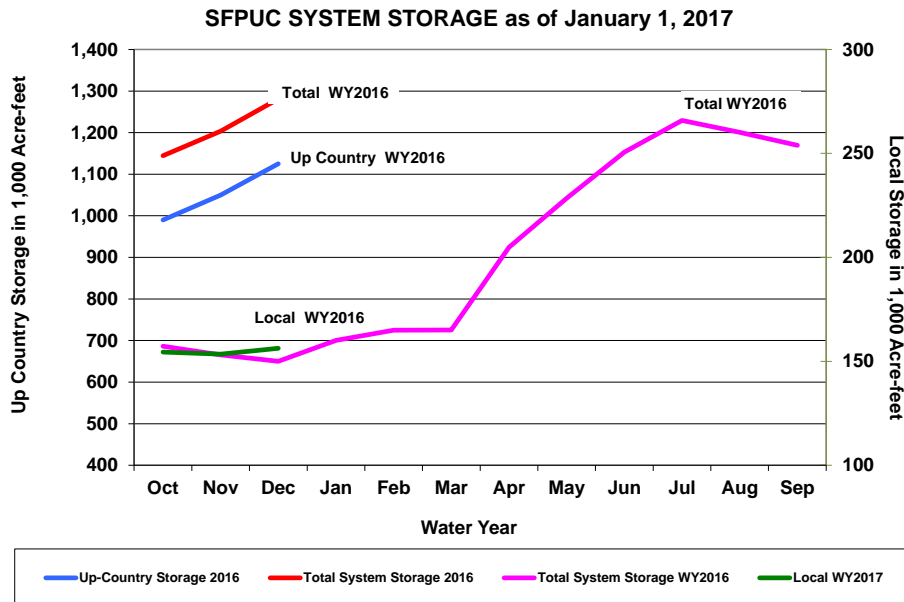
Table 1 Current Storage As of January 1, 2017							
Reservoir	Current Storage		Maximum Storage		Available Capacity		Percentage of Maximum Storage
	Acre-Feet	Millions of Gallons	Acre-Feet	Millions of Gallons	Acre-Feet	Millions of Gallons	
Tuolumne System							
Hetch Hetchy <sup>1</sup>	320,168		340,830		20,662		93.9%
Cherry <sup>2</sup>	241,796		268,810		27,014		90.0%
Lake Eleanor <sup>3</sup>	22,704		21,495		0		full
Water Bank	540,266		570,000		29,734		94.8%
Tuolumne Storage	1,124,934		1,201,135		77,410		93.7%
Local Bay Area Storage							
Calaveras <sup>4</sup>	34,909	11,375	96,824	31,550	61,915	20,175	36.1%
San Antonio	44,405	14,470	50,496	16,454	6,091	1,985	87.9%
Crystal Springs	55,640	18,130	58,377	19,022	2,737	892	95.3%
San Andreas	18,438	6,008	18,996	6,190	558	182	97.1%
Pilarcitos	2,788	908	2,995	976	207	67	93.1%
Total Local Storage	156,180	50,891	227,688	74,192	71,508	23,301	68.6%
Total System	1,281,114		1,428,823		148,918		89.7%

<sup>1</sup> Maximum Hetch Hetchy Reservoir storage with drum gates de-activated.

<sup>2</sup> Maximum Cherry Reservoir storage with flash-boards removed.

<sup>3</sup> Maximum Lake Eleanor storage with flash-boards removed.

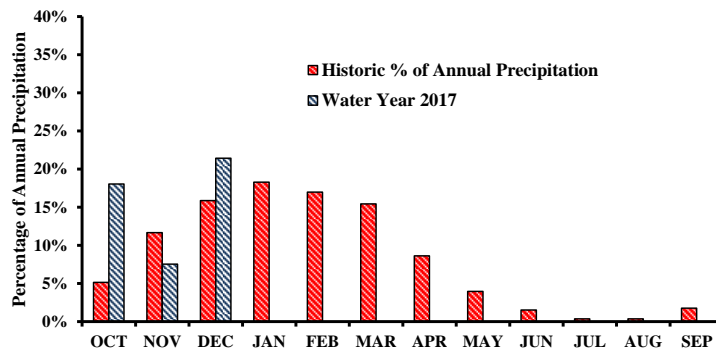
<sup>4</sup> Available capacity does not take into account current DSOD storage restrictions.



**Figure 1: Monthly system storage for Water Year 2017**

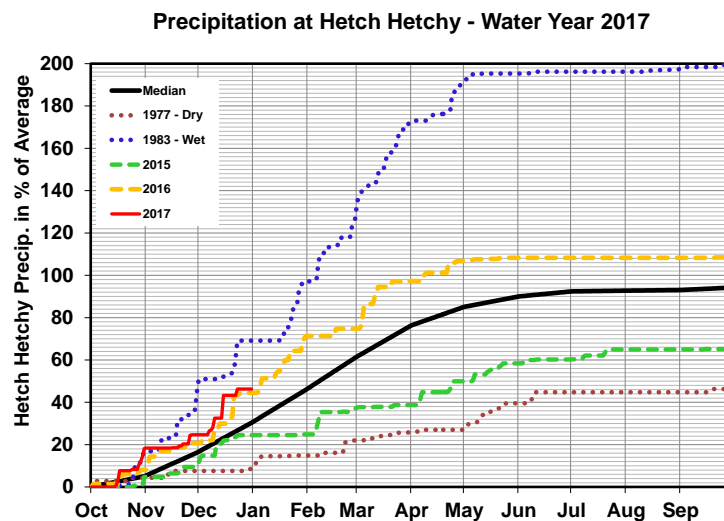
## Hetch Hetchy System Precipitation Index <sup>5/</sup>

*Current Month:* The December six-station precipitation index was 7.73 inches, or 134.9% of the average index for the month.



**Figure 2:** Monthly distribution of the Hetch Hetchy Six-station precipitation index as percent of the annual average precipitation.

*Cumulative Precipitation to Date:* The accumulated six-station precipitation index for water year 2017 is 16.83 inches, which is 47.3% of the average annual water year total, or 143.8% of average annual to date. Hetch Hetchy received 7.66 inches precipitation in December, a total of 16.4 inches for water year 2017. The cumulative Hetch Hetchy precipitation is shown in Figure 3 in red.



**Figure 3:** Water year 2017 cumulative precipitation measured at Hetch Hetchy Reservoir through December 31<sup>st</sup>, 2016. Precipitation at the Hetch Hetchy gauge for wet, dry, median, and WY 2016 are included for comparison purposes.

<sup>5/</sup>The precipitation index is computed using six Sierra precipitation stations and is an indicator of the wetness of the basin for the water year to date. The index is computed as the average of the six stations and is expressed in inches and in percent.

## Tuolumne Basin Unimpaired Inflow

Unimpaired inflow to SFPUC reservoirs and the Tuolumne River at La Grange as of December 31<sup>st</sup>, 2016 is summarized below in Table 2.

<b>Table 1</b>								
<b>Unimpaired Inflow (Acre-Feet)</b>								
	December 2016				October 1, 2016 through December 31, 2016			
	Observed Flow	Median <sup>6</sup>	Average <sup>6</sup>	Percent of Average	Observed Flow	Median <sup>6</sup>	Average <sup>6</sup>	Percent of Average
Inflow to Hetch Hetchy Reservoir	48,010	12,039	20,973	228.9%	125,507	28,667	40,852	307.2%
Inflow to Cherry Reservoir and Lake Eleanor	61,632	14,006	23,946	257.4%	142,557	31,552	45,136	315.8%
Tuolumne River at La Grange	170,015	48,166	88,566	192.0%	364,520	95,724	150,540	242.1%
Water Available to the City (WAC)	68,013	1,449	37,212	182.8%	146,820	5,372	52,756	278.3%

<sup>6</sup> Hydrologic Record: 1920 – 2015

## Hetch Hetchy System Operations

The instream release schedule at Hetch Hetchy Reservoir for the month of December was year type A (normal to wet conditions). This year type is based upon accumulated runoff from October 1<sup>st</sup>, 2015 through August 31<sup>st</sup>, 2016. The Hetch Hetchy instream release requirement was 50 cfs for December. The cumulative precipitation since October 1, 2016 at Hetch Hetchy Reservoir meets the criteria of a water year type A. Hetch Hetchy release for January will be 50 cfs.

Draft and releases from Hetch Hetchy Reservoir during the month of December totaled 41,788 acre-feet to meet SJPL deliveries, instream release requirements, and reservoir management goals. Around 21,000 acre-feet of this draft was taken to control Hetch Hetchy storage going into the winter shutdown. Additional draft is scheduled to be taken in January for reservoir management.

32,237 acre-feet of draft was made from Cherry Reservoir during the month of December to meet instream release requirements and to meet reservoir management goals. About 8,545 acre-feet of water was transferred via pumping from Lake Eleanor to Cherry Reservoir in December. The required minimum instream release from Cherry Reservoir and Lake Eleanor was 5 cfs in December. In the month of January, the required minimum instream release from Cherry Reservoir and Lake Eleanor is 5 cfs.

## Regional System Treatment Plant Production

The Harry Tracy Water Treatment Plant average production rate for December was 40 MGD. The Sunol Valley Water Treatment Plant average production for the month was 27 MGD.

## Local System Water Delivery

The average December delivery rate was 142 MGD which is a 9% decrease below the November delivery rate of 156 MGD.

## Local Precipitation

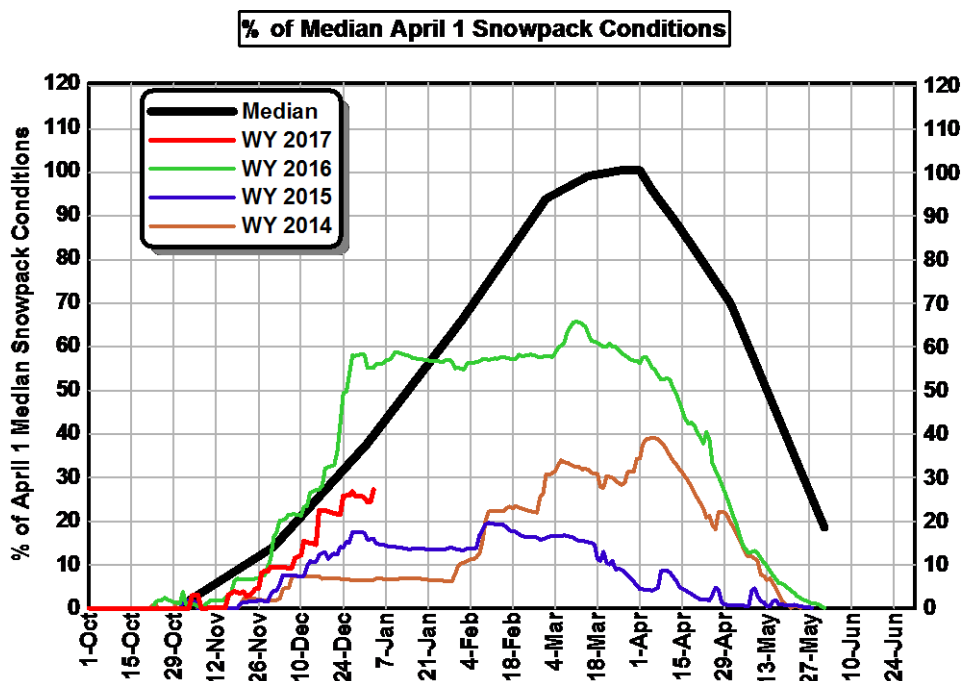
Three rain events in December pushed rain fall totals above average across local watersheds. The December rainfall summary is presented in Table 3.

Reservoir	Month Total (inches)	Percentage of Average for the Month	Water Year to Date <sup>7</sup> (inches)	Percentage of Average for the Year-to-Date <sup>7</sup>
Pilarcitos	10.08	140 %	20.13	143 %
Lower Crystal Springs	6.03	135 %	13.51	143 %
Calaveras	3.93	109 %	8.00	108 %

<sup>7</sup> WY 2017: Oct. 2016 through Sep. 2017.

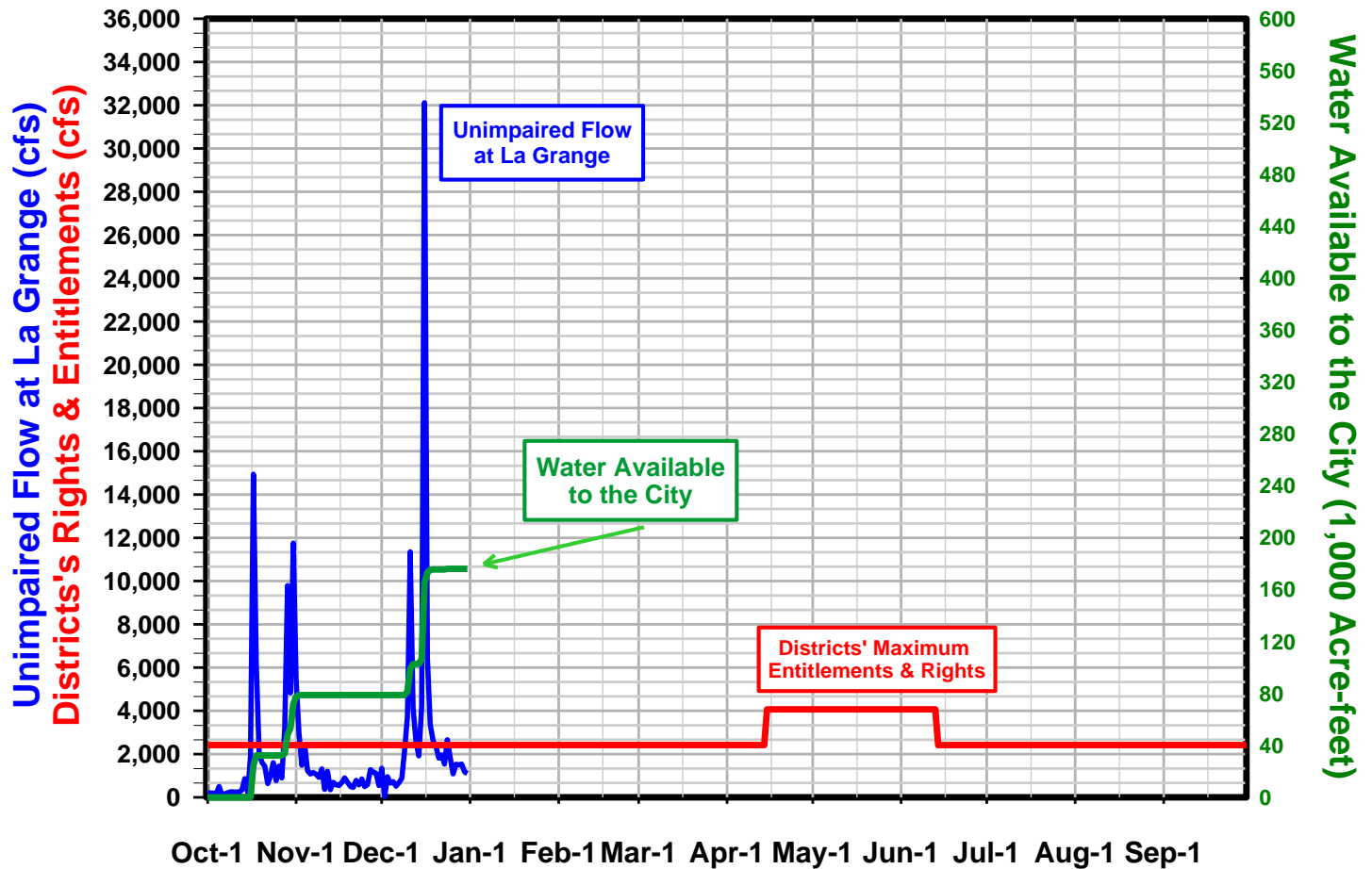
## Snowmelt and Water Supply

December precipitation was well above average, keeping us above average for the year to date. Reservoir inflows have correspondingly been above average, maintaining Reservoir storages at our seasonal targets for all of December. The high precipitation has not resulted in above average snow, however, as many of the storms have been relatively warm. The 10-station snow index was at 75% of normal to date on January 1.



**Figure 4:** Snowpack conditions as of January 1. The above average precipitation has not resulted in above average snowpack, as many of the fall storms have been relatively warm. Precipitation events in the first two weeks of January should increase the overall snowpack.

## Unimpaired Flow at La Grange & Water Available to the City



### Water Year 2017

**Figure 5:** Calculated unimpaired flow at La Grange and the allocation of flows between the Districts and the City. Water available to the City between October 1 and January 1 is 146,820 acre-feet.

cc	HHWP Records	Graham, Chris	Mazurkiewicz, Adam	Ritchie, Steve
	Briggs, David	Hale, Barbara	Meier, Steve	Sheehan, Charles
	Carlin, Michael	Hannaford, Margaret	Moses, Matt	Sandkulla, Nicole
	Chester, John	Hörger, Brent	Patterson, Mike	Tsang, Michael
	DeGraca, Andrew	Kelly, Harlan	Perl, Charles	Williams, Mike
	Dhakal, Amod	Kehoe, Paula	Pluche, Rebecca	
	Dufour, Alexis	Lehr, Dan	Nelson, Chris	
	Gambon, Paul	Levin, Ellen	Ramirez, Tim	