



## TECHNICAL MEMORANDUM

DATE: September 12, 2016 Project No.: 693-20-16-01  
SENT VIA: EMAIL

TO: SRWA Technical Advisory Committee

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REVIEWED BY: Gerry Nakano, PE, RCE #29524

SUBJECT: Low Flow Velocity Calculations for Transmission Pipeline Alternatives for the SRWA Surface Water Supply Project

This Technical Memorandum (TM) presents velocity calculations estimated in the proposed SRWA treated water transmission pipelines during low demand periods. This analysis was requested at the SRWA Board Meeting of September 9, 2016, where the item to approve transmission pipeline diameters for Ceres and Turlock was continued to the next Board meeting (September 22, 2016), so that the Board could consider the additional information contained in this TM.

The Preliminary Phasing and Water Treatment Plant Sizing TM, dated June 16, 2016, presented example monthly surface water deliveries to Turlock and Ceres based on Phase 1 and Phase 2 capacity requests. Example monthly deliveries are based on the following assumptions:

- Monthly use patterns are based on historical average monthly production for Ceres (2000 through 2016) and Turlock (2005 through 2015);
- Monthly deliveries are based on projected annual demands for 2025 (Phase 1) and buildout (2035 for Ceres and 2040 for Turlock) for Phase 2;
- Surface water deliveries are maximized; and
- Minimum groundwater production of 2 million gallons per day (mgd) for Ceres and 3 mgd for Turlock, based on operating wells two hours/day to maintain water quality for wells without treatment systems, and six hours/day for wells with treatment systems.<sup>1</sup>

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<sup>1</sup> Turlock currently has four wells that are operated continuously: Wells 4, 8, 20 and 30, for water quality purposes, with a total daily capacity of 6.6 mgd. Calculations assume that once Turlock is using surface water, these wells could be retired. The minimum amount of 3 mgd is based on operating all other wells for two hours/day.

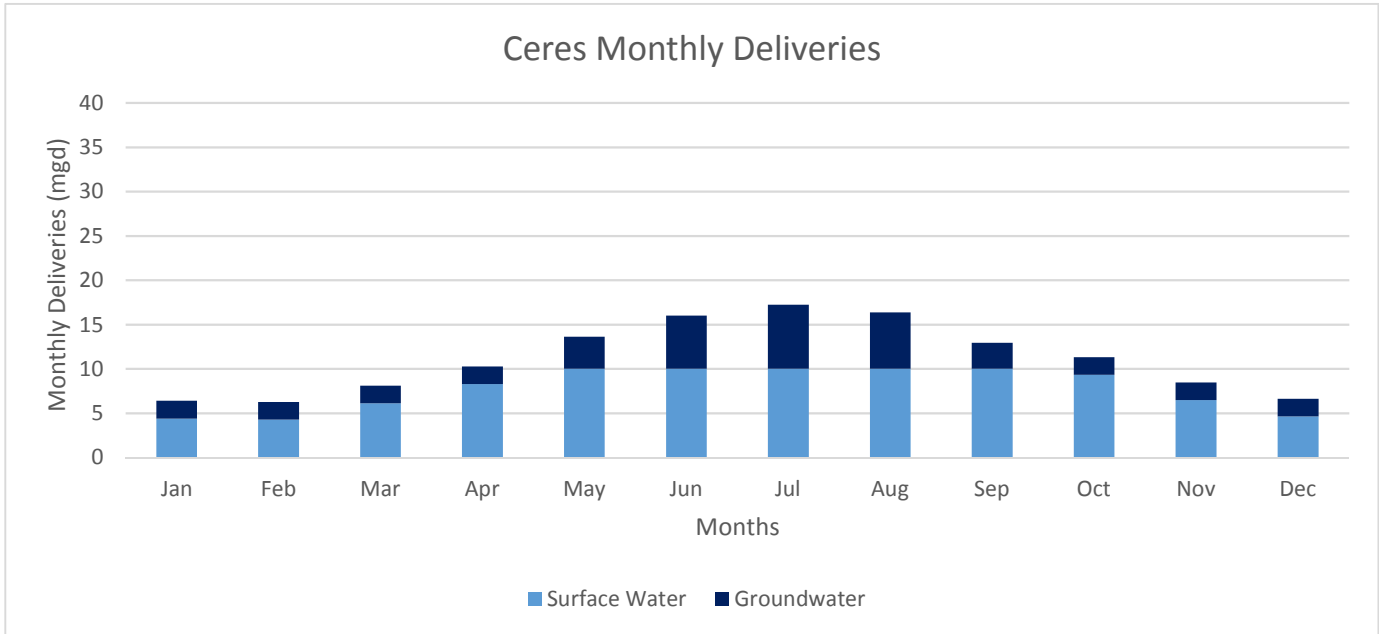
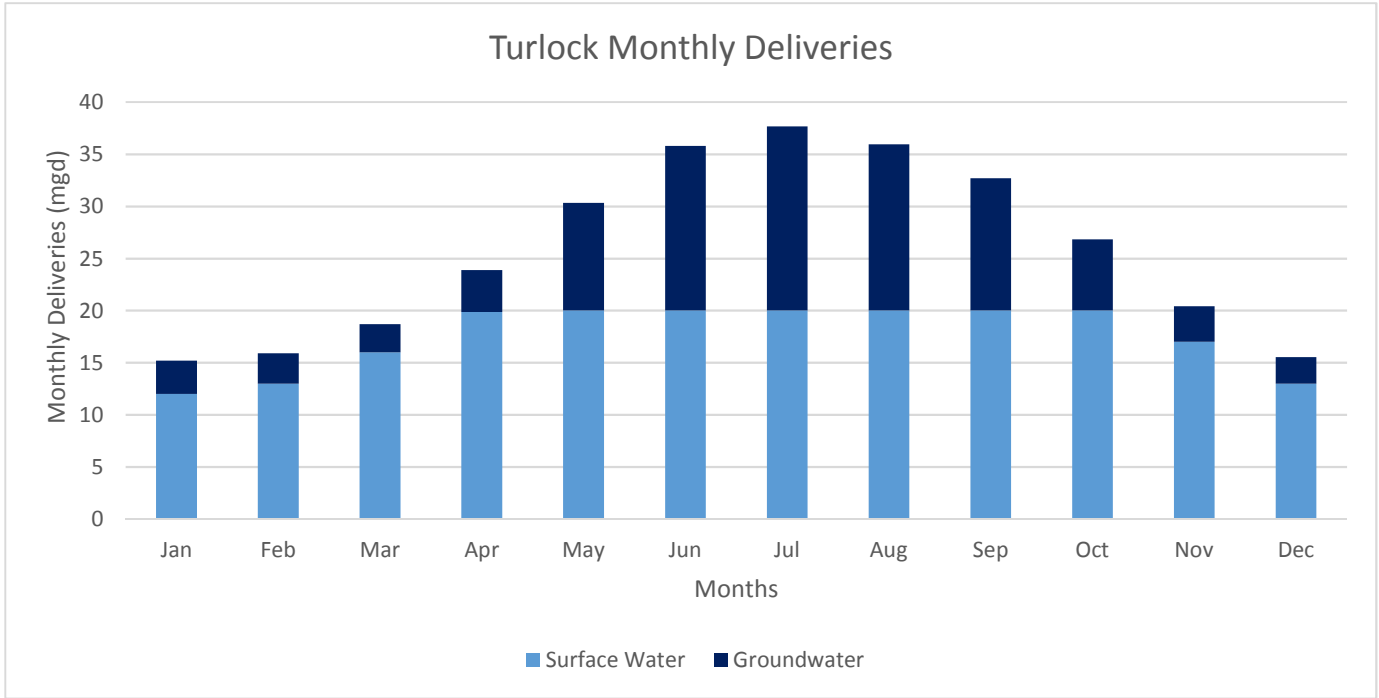
Figure 1 shows an example of normal year monthly deliveries of surface water for 2025. Normal year deliveries assume full contract deliveries of surface water.

January has the lowest demands and correspondingly, the lowest monthly deliveries of surface water. January delivery estimates were used to calculate pipeline velocities for the alternative size pipelines. These calculations are summarized in Table 1 for 2020 through 2040.

<b>Table 1. Transmission Pipeline Velocities for Lowest Delivery Month</b>					
	2020	2025	2030	2035	2040
<b>Ceres Transmission Pipeline</b>					
Estimated January Delivery, mgd <sup>(a)</sup>	3	4	6	7	7
Velocity for 30-inch diameter, ft/s	1.0	1.4	1.8	2.3	2.3
Velocity for 36-inch diameter, ft/s	0.7	1.0	1.3	1.6	1.6
<b>Turlock Transmission Pipeline</b>					
Estimated January Delivery, mgd <sup>(a)</sup>	11	12	14	16	18
Velocity for 42-inch diameter, ft/s	1.8	1.9	2.3	2.6	2.9
Velocity for 48-inch diameter, ft/s	1.4	1.5	1.7	2.0	2.2
<sup>(a)</sup> Assumes that 2.0 mgd of groundwater would be conjunctively used to meet Ceres demands, and 3 mgd of groundwater would be conjunctively used to meet Turlock demands, so deliveries shown are for surface water only.					

For the Ceres transmission pipeline, velocities are about 30 percent lower for the larger diameter pipeline. For the Turlock transmission pipeline, velocities are about 25 percent lower. Although overall velocities are low for each of the alternatives evaluated, smaller pipelines with higher velocities will help in the management of water quality under lower demand conditions.

The Recommended Transmission Pipeline Sizing for the SRWA Surface Water Supply Project TM, dated August 22, 2016 recommended selection of a 30-inch diameter transmission pipeline for Ceres and a 42-inch diameter transmission pipeline for Turlock, because they are the most cost-effective diameters evaluated, and could accommodate some flow increases beyond the planned design flowrates, which would allow participation by other small regional project partners with demands less than 1 mgd. Based on this supplemental analysis, West Yost Associates continues to recommend these transmission pipeline diameters for the project.



Notes:

1. Turlock average surface water delivery 18 mgd (19,700 AFY); average groundwater delivery 8 mgd (9,100 AFY).
2. Ceres average surface water delivery 8 mgd (8,700 AFY); average groundwater delivery 3 mgd (3,100 AFY).



**Figure 1**  
**Example Normal Year Deliveries,**  
**Year 2025**

SRWA  
Surface Water Supply Project