DEERE & AULT
CONSULTANTS, INC.

December 7, 2017

Ms. Margaret Medellin, P.E.
Utilities Portfolio Manager
City of Aspen Utilities
130 South Galena Street
Aspen, Colorado 81611

Re: Calculation of Storage Demand for the City of Aspen

Dear Ms. Medellin:

The purpose of this letter is to present the findings and describe our analysis of the anticipated storage demand for the City of Aspen. This analysis was informed by simulated streamflow and water demand data developed by Headwaters Corporation (Headwaters). The data provided by Headwaters included adjusted streamflows based on recorded historical flows during the 1970 through 1994 period. The City's water demand was based on previous projections for the year 2064. This analysis identified 1977 as the year with the most severe water shortage. While the entire period of data was simulated, the 1977 dry-year event, as affected by uncertainties identified by Headwaters, was found to be the determining factor for calculating storage demand. In addition, we analyzed consecutive dry year events in order to determine if such an occurrence would change the required storage volume.

DATA AND ASSUMPTIONS

This analysis utilized the water supply and demand data developed by Headwaters, and described in a report dated November 30, 2017, entitled, "*Aspen's Water Future: Estimating the Number and Severity of Potential Future Water Shortages.*" In particular, we utilized the 1 in 100 probability dry-year event developed by Headwaters to inform the reservoir operations model.

Because the details of the physical capacities and characteristics of potential storage infrastructure have not been fully developed, we made several assumptions about the performance and operating characteristics of the storage infrastructure. These assumptions included the following:

1. The storage vessel(s) will exhibit approximately 25 percent losses annually. These losses could be attributed to evaporation, vegetative transpiration, leakage, transportation losses, and other unforeseen losses.

2. The storage vessel(s) will be operated to maintain the maximum possible storage volume at all times. This assumption is not applicable to all water storage reservoirs, as factors such as seasonal water quality concerns, runoff management, and other considerations often dictate that less than full conditions are desirable for at least a portion of most years. Because these potential factors

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are unknown at this time, we assumed operations would maximize operational storage at all times. We compensated for the possibility that this might not occur by assuming an adequately large residual pool to accommodate alternative operations.

3. The residual pool that is left in the storage vessel(s) after the largest simulated drawdown of the storage volume was assumed to be one third of the storage capacity. This would allow for contents less than one hundred percent of the reservoir capacity at the initiation of all critical dry-year events. In addition, this would allow for events that would either be more severe than the projected hydrologic conditions, or would be compounded by other exacerbating factors. An example of one such factor would be that a portion of in-situ storage vessel contents is difficult to recover, and may not be available during extreme drawdown conditions. This would also allow for a conservation pool in any open reservoirs that would avoid the environmental and aesthetic impacts of a completely drained reservoir.

4. We assumed the water rights exercised to fill the storage vessel(s) would be senior to, and therefore would not be curtailed by, any downstream in-stream flow rights. This assumption is consistent with the exercise of Aspen's conditional Castle Creek and Maroon Creek storage water rights.

RESULTS

Based on the data provided by Headwaters and the assumptions described above, we determined that the required storage capacity for the City of Aspen is approximately 8,500 acre-feet. This storage capacity is driven entirely by seasonal conditions, as even consecutive dry-year events provide enough snowmelt water supply to recover the necessary storage volume each year. The attached **Figure 1** shows the simulated storage volume before, during, and after the critical dry-year event. **Figure 2** shows the available storage inflows and necessary outflows before, during, and after the critical dry-year event.

Please let me know if you have any questions, or would like to discuss this analysis.

Sincerely,

DEERE & AULT CONSULTANTS, INC.

Jason M. Brothers, P.E.
Associate/Project Manager

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Figure 1. Reservoir Operation Model

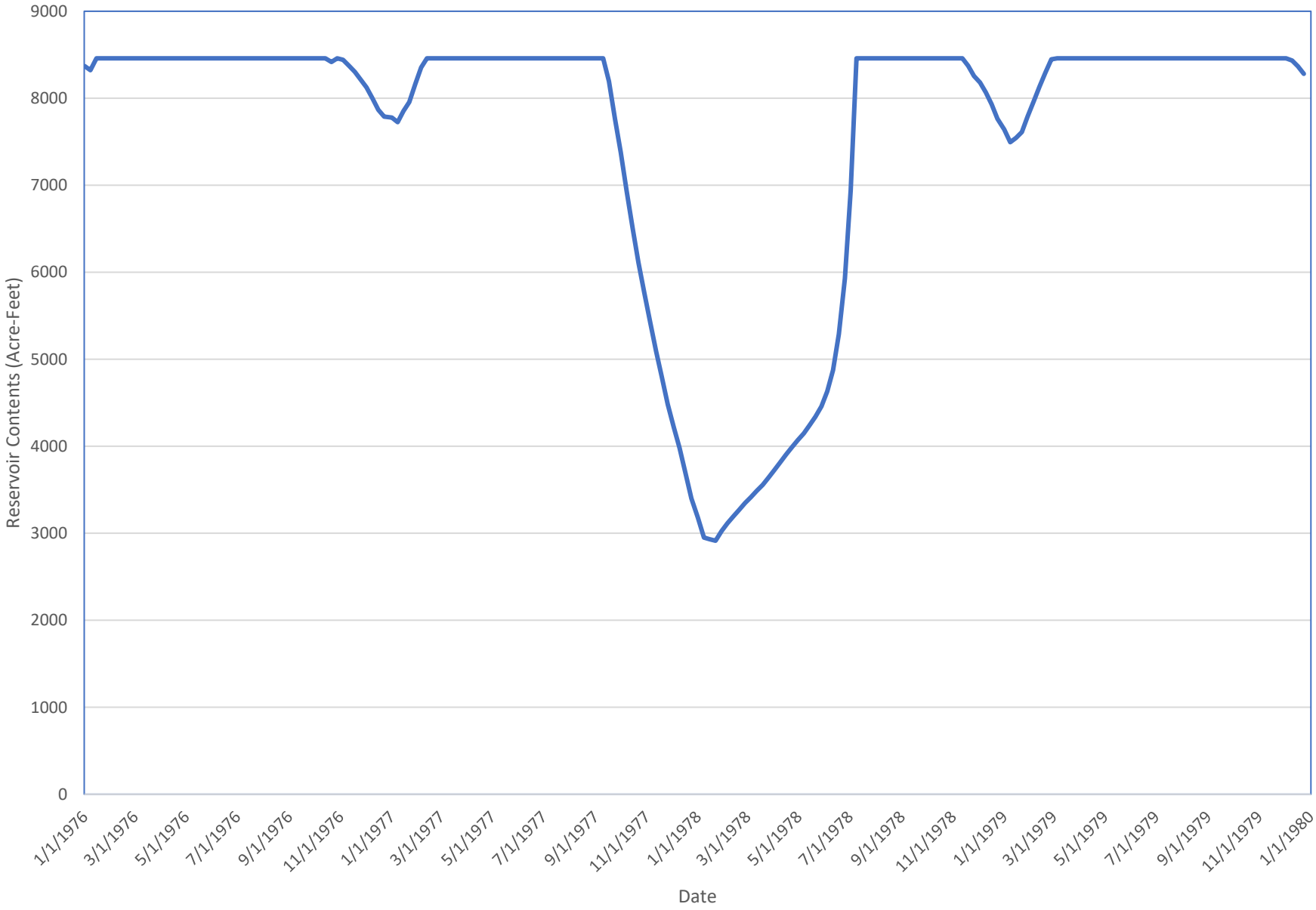

Figure 2. Reservoir Inflows and Outflows