CEEn-2019CPST-002

SPANISH FORK CITY WATER DEMAND PEAK SHAVING

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Introduction

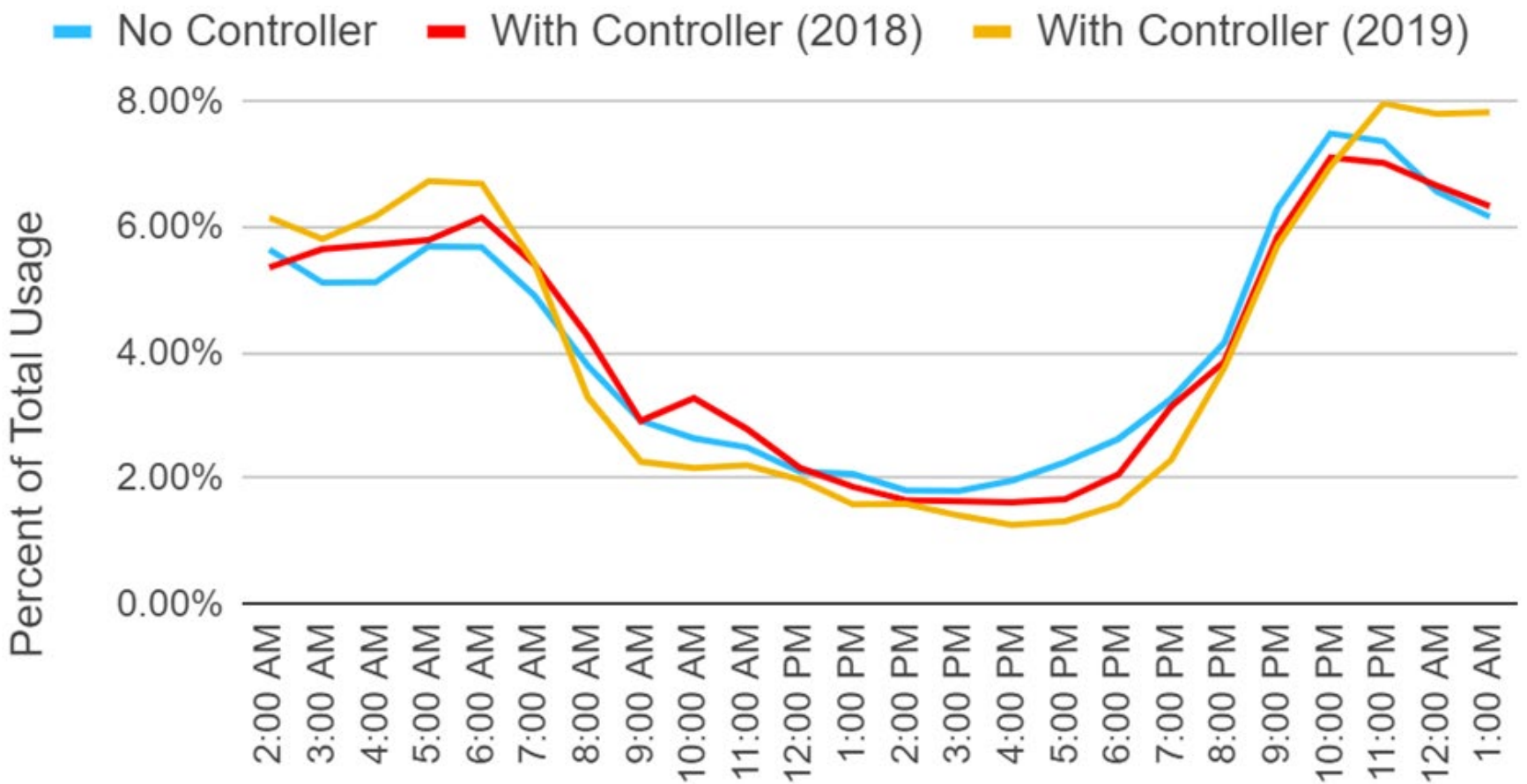
- For our project we were asked to deliver a report on the amount of money that Spanish Fork can save by installing smart water controllers in their city to implement peak shaving. Peak shaving refers to decreasing the peak demand of water supply by finding ways to distribute water more evenly throughout the day, reducing spikes in usage. This is a unique plan because it gives the city an incentive to save water. We used engineering economics, statistics, and an understanding of municipal water demand to evaluate the cost benefit of water demand peak shaving and increased system capacity as a result of Spanish Fork's water conservation program.

Project Tasks and Deliverables

1. Update the water demand curve.
2. Compare pre-conservation program water demand and current water demand.
3. Quantify peak demand shaving.
4. Determine the cost benefits of peak shaving.

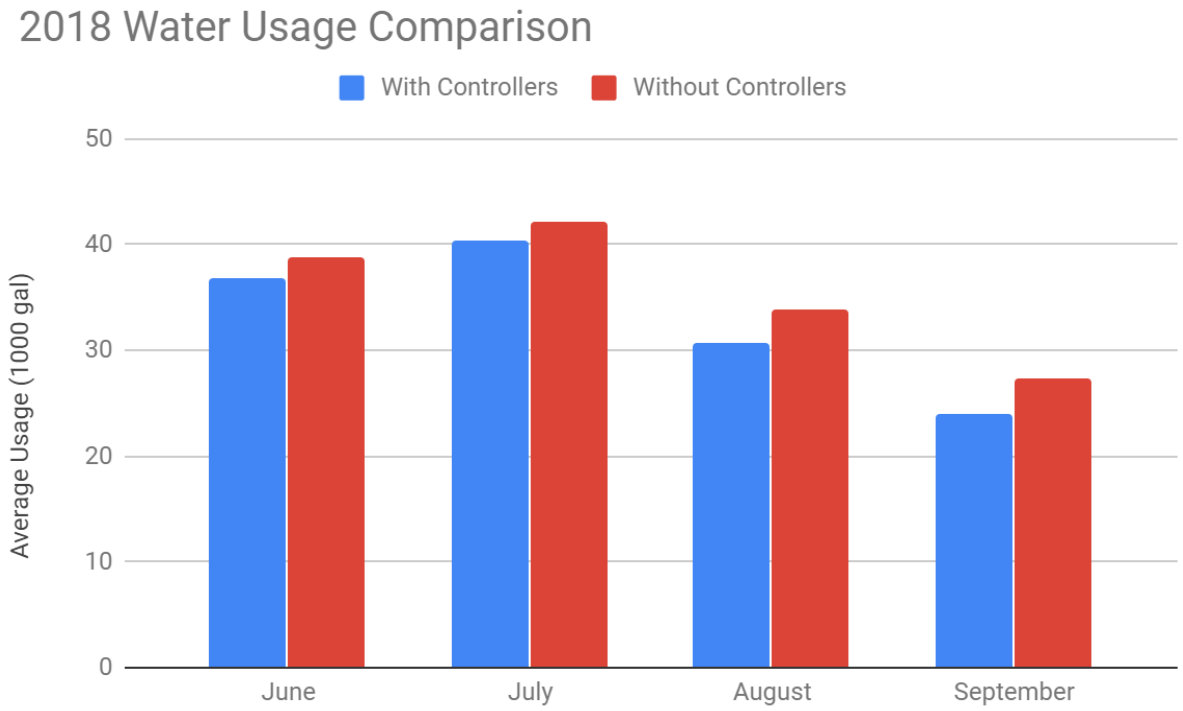
Design and Analysis

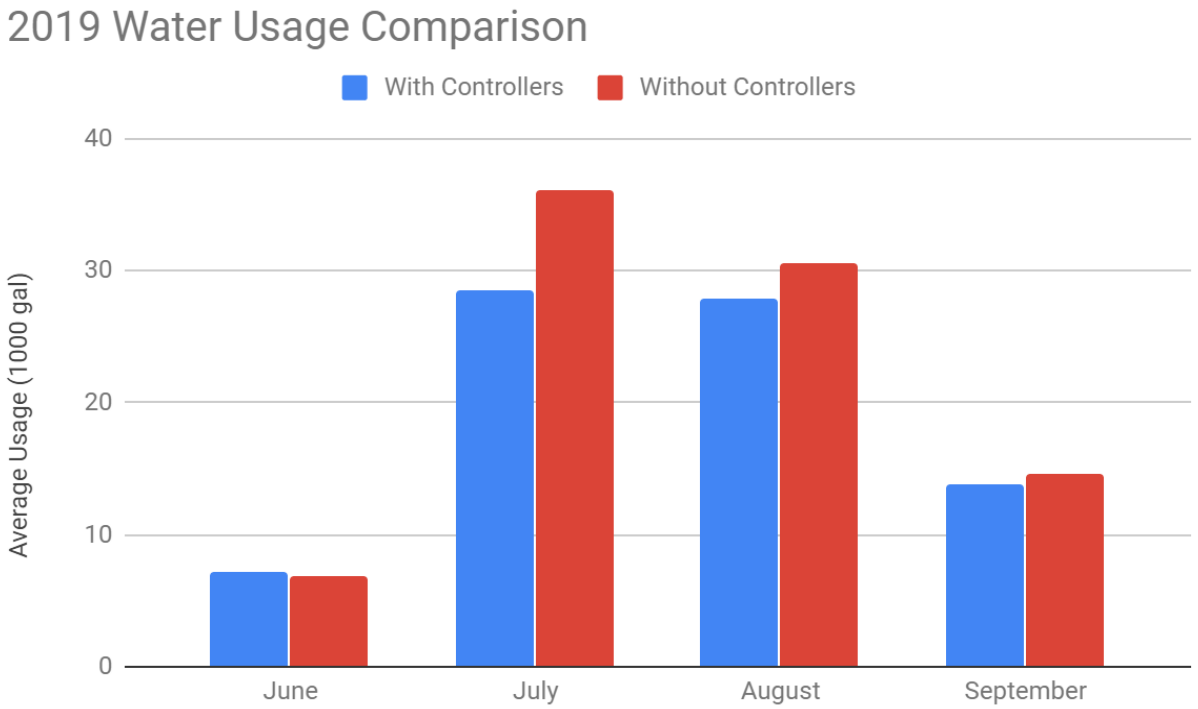
- **Average daily flow before and after controller installation for 2018 and 2019**



Design and Analysis Cont'd

- **Water Usage Comparison**





Design and Analysis Cont'd

- **Quantifying Peak Shaving**

		Peak Usage (ac-ft/hr)				
Year	Population	No Change	0.5% peak reduction to 7.07%	1% peak reduction to 6.57%	2% peak reduction to 5.57%	3.4% peak reduction to 4.17%
2019	43,331	2.16	2.02	1.87	1.59	1.18
2030	54,143	2.70	2.52	2.34	1.98	1.48
2040	64,607	3.22	3.01	2.79	2.36	1.77
2050	72,300	3.60	3.36	3.13	2.65	1.98
2060	78,300	3.90	3.64	3.38	2.87	2.14
2070	97,335	4.85	4.53	4.21	3.56	2.66
2080	120,998	6.03	5.63	5.23	4.43	3.31
2090	150,414	7.50	7.00	6.50	5.50	4.11
2100	186,981	9.32	8.70	8.08	6.84	5.11

Design and Analysis Cont'd

- **Peak Shaving Benefits**

	Required Storage (ac-ft)				
Year	No Change	0.5% Peak Reduction	1% Peak Reduction	2% Peak Reduction	3.4% Peak Reduction
2019	50	48	46	42	37
2030	58	55	53	48	41
2040	65	62	59	53	45
2050	70	67	64	57	48
2060	75	71	67	60	50
2070	88	83	79	70	57
2080	104	99	93	82	66
2090	125	118	111	97	78
2100	150	142	133	116	92

Greater than current capacity of 68 ac-ft
Greater than buildout capacity of 91 ac-ft
Greater than buildout capacity of 112 ac-ft

Discussion of Results

91 ac-ft Storage Upgrade Year, Cost, and Savings

Ugrade Cost: $7,529,903.57

Upgrade Year	2040	2050	2060	2060	2080
PV of Cost	$4,169,125.04	$3,102,220.57	$2,308,343.45	$2,308,343.45	$1,278,073.80
Savings	-	$1,066,904.47	$1,860,781.59	$1,860,781.59	$2,891,051.24

112 ac-ft Storage Upgrade Year, Cost, and Savings

Ugrade Cost: $14,475,302.65

Upgrade Year	2040	2050	2060	2060	2080
PV of Cost	$8,014,624.11	$5,963,633.03	$4,437,503.05	$4,437,503.05	$2,456,937.85
Savings	-	$2,050,991.08	$3,577,121.06	$3,577,121.06	$5,557,686.27

Conclusions

- Peak reduction is a great and sustainable alternative to increasing water supply.
- A peak reduction of .5% would save Spanish Fork over $2,000,000.
- A peak reduction of 3.5% would delay necessary water line upgrades by 40 years.

Recommendations

- Discontinue or alter the peak shaving demand curve through a rolling average.
- Implement peak shaving if the ULS connection is not made.
- Consider these cost benefits of peak shaving for future implementation.

The End

Any Questions?