Metropolitan Water District of Salt Lake & Sandy
Board Meeting Information
Last Update: January 16, 2019

Agenda Item: Consider approval of Utah State University water audits program for 2019

Objective: Provide an update to the board regarding the water audit contract and seek a recommendation for approval of the expenditure for another year.

Background: The District entered into a contract with Utah State University (USU) for water audits on April 28, 2015 that allows for five one-year extensions. The contract year begins February 1 and ends January 31. The current contract expires on January 31, 2019.

Water checks are conducted from mid-May through August for Salt Lake City and Sandy City residents and CII (commercial, industrial, and institutional) entities. Both member cities indicate continued support for the program. Although the member cities are aware of high water users in their service areas, the Water Audit Program is a voluntary program. When a resident or business requests a water audit, Utah State arranges for a Water Check employee, who is often a university student, to conduct the water check. The five steps of the Water Check process are as follows:

- Conducting a site walk-through;
- Conducting catch cup, pressure, soil/root depth tests;
- Analyzing site information and test data using a tablet-based application;
- Preparing a customized watering schedule, and;
- Explaining and summarizing Water Check results with the participant.

Due to the voluntary nature of the program, USU estimates program costs each year and $60,000 has been the best starting point. The number of water checks completed for residential and CII varies from year to year. In 2017, the cost for the water audit program was $57,500 or 4 percent less than the approved amount. However, in 2018, there was a shift to more institutional checks and larger property sizes which contributed to higher than normal program costs of $64,000 (7% more than the approved amount). The nature of institutional checks requires much more time and personnel on the ground. In addition, the water audit of the state capitol grounds (one of the institutional checks) had staff continuing their work well into October.

Committee Activity: During the November 27, 2018 Environmental Committee meeting, Kelly Kopp presented the results of the 2018 USU Water Audit Program (See Attachment). The committee recommended approval of a contract amount not to exceed $74,000 (the current FY budgeted amount is $75,000) for contract year February 1, 2019 through January 31, 2020. The increase to the contract will allow additional water audits to be completed, if requested, as well as provide funding for additional data analysis. It will also cover the $4,000 cost increase from 2018. The committee recommended approval by the full board. The board discussed the water audit contract during the December board meeting and requested additional information regarding the increased costs in 2018.

2018 contract (Feb 1, 2018- Jan 31, 2019)	$60,000
2018 cost increase	$4,000
Increase to contract	$10,000
February 1, 2019 proposed contract amount	**$74,000**

Options for Consideration:

1. Approve $60,000 contract amount consistent with prior years
2. Approve $70,000 contract amount which has additional funds for more water audits and analysis
3. Approve $74,000 contract amount which will pay for the $4,000 cost increase in 2018 as well as provide additional funds for more water audits and analysis
4. Other options as determined by the board.

Recommendation: Staff recommends option 3: Approval of 2019 Utah State University Water Audits program in an amount not to exceed $74,000.

2018 Water Check Program Report

Prepared for the Metropolitan Water District of Salt Lake and Sandy

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2018 WATER CHECK PROGRAM

Since 2005, the Water Check Program has been under the direct administration of Utah State University's (USU) Center for Water Efficient Landscaping (CWEL). Water Checks were conducted from mid-May through August of 2018, a time frame which corresponds to the availability of typical Water Check employees, who are often university students. Residential, as well as commercial, industrial and institutional (CII) Water Checks were conducted throughout the service area of the Metropolitan Water District of Salt Lake and Sandy (MWDSLS).

THE WATER CHECK PROCEDURE

The Water Check process consists of five steps:

- Conducting a site walk-through;
- Conducting catch cup, pressure, soil/root depth tests;
- Analyzing site information and test data using a tablet-based application;
- Preparing a customized watering schedule, and;
- Explaining and summarizing Water Check results with the participant.

In order to complete the assigned tasks in the allotted time period, and as a matter of safety precaution, employees are assigned to work in teams of two. A full work schedule may include five residential Water Checks per workday or may include several days at an institutional or commercial site, depending on the size of the site.

WATER CHECK PROGRAM DATA

Analysis of Water Check data consists of descriptive statistics to describe the data, analysis of water savings from selected Water Check populations to determine the impact of Water Checks on total water savings, and development of statistical relationships and models for use in customer water budget development. New developments in the ongoing program are also noted.

Data collected in the program includes, but is not limited to:

- Participant information (i.e. own vs. rent, number of individuals in household);
- Landscape and parcel data (i.e. square footage of parcel, turf, hardscape);
- Irrigation system data (i.e. existing irrigation schedule, location of broken heads), and;
- Program marketing data (i.e. how did participants learn about the program).

PARTICIPATION DATA

From 2005-2018, 2,410 residential Water Checks were conducted in MWDSLS service area, along with 86 CII Checks (Table 1).

The number of residential checks completed in Salt Lake City increased from 64 to 79 in 2018, while the number of residential checks completed in Sandy decreased from 121 to 53.

Considering CII Checks, in Salt Lake City in 2018, a comprehensive Water Check of the Utah State Capitol grounds was completed. Institutional Checks were also completed at 14 public parks in Sandy City in 2018.

Table 1. Number of residential and CII Water Checks for the MWDSLS service area, 2005-2018.

	SLCPU		Sandy		MWDSLS	
	Residential	*CII*	*Residential*	*CII*	*Residential*	*CII*
2005	50	0	34	2	84	2
2006	62	7	29	1	91	8
2007	58	13	29	0	87	13
2008	170	2	52	1	222	3
2009	158	5	76	1	234	6
2010	203	14	50	1	253	15
2011	104	6	38	0	142	6
2012	104	0	45	0	149	0
2013	185	4	52	2	237	6
2014	206	1	44	0	250	1
2015	141	8	46	0	187	8
2016	104	2	53	0	157	2
2017	64	0	121	1	185	1
2018	79	1	53	14	132	15
Total	*1688*	*63*	*722*	*23*	*2410*	*86*

LANDSCAPE AND PARCEL DATA

Parcel size data as it relates to landscaped and irrigated area are essential for detailed analyses of water use on a per-parcel basis. Among 2018 residential participants within the SLCPU service area, average parcel size was 11,663 ft^2, and irrigated landscape area as a percent of lot size was 54% (Table 2). These numbers reflect an increase in the average size of landscapes evaluated in 2017 (10,751 ft^2), and a slight decrease in the percentage of irrigated landscape area (55%).

Among Sandy City's residential participants in 2018, average parcel size was 11,422 ft^2, and irrigated landscape area as a percent of lot size was 53% (Table 2). These numbers reflect a decrease in the average size of landscapes evaluated in 2017 (12,377 ft^2), as well as a decrease in the percentage of irrigated landscape area (59%).

Table 2. Average residential parcel and landscaped areas in the MWDSLS service area (2018).

	SLCPU		Sandy		MWDSLS	
	ft^2	*% of Parcel*	*ft^2*	*% of Parcel*	*ft^2*	*% of Parcel*
Avg. Parcel Area	11,663		11,422		11,543	
Avg. Hardscape Area	4348	37%	4218	37%	4283	37%
Avg. Turf Area	3936	34%	4981	44%	4458	39%
Avg. Other Irrigated Area	2333	20%	1107	10%	1720	15%
Avg. Total Irrigated Area	6269	54%	6087	53%	6178	54%

IRRIGATION SYSTEM DATA

Water Check Program employees tested the precipitation rates, distribution uniformities and dynamic pressures of "testable" zones for each irrigation system evaluated. Precipitation rate is the rate at which irrigation water is applied per unit of time measured in inches per hour (in/hr). Distribution uniformity (DU) refers to how evenly the irrigation system applies water to a given area and is often expressed as a percentage or a decimal. Dynamic pressure is defined as a property of a moving flow of liquid expressed as pounds per square inch (psi).

Overhead spray irrigation heads are designed to apply a continuous stream of water and are fitted with nozzles. These heads are generally designed to cover relatively small areas with spray radii between 3 and 15 feet, and a specified operating pressure between 15 and 30 psi. Spray head precipitation rates generally vary from 1 to 2.5 inches per hour.

Rotor heads provide single or multiple streams of water to the landscape and distribute water in an arc pattern, typically ranging from 40 to 360 degrees. The spray radius for most rotor heads is 20 to 150 feet with a precipitation rate between 1 to 1.5 inches per hour. Additionally, rotor heads operate under a wide range of dynamic pressures, ranging from 20 and 100 psi.

Figure 1. Examples of a rotor sprinkler head (L) and an overhead spray sprinkler head (R).

In 2018, the number of individual sprinkler zone tests increased from 106 in 2017 to 309 in the SLCPU service area and decreased from 214 in 2017 to 182 in Sandy City. In total, 491 zone tests were conducted in 2018 (residential and CII). Average sprinkler precipitation rates varied, with spray heads applying higher precipitation rates than rotor heads or MSMT heads. Average DUs of both spray and rotor heads were less than what is achievable according to manufacturer's specifications, regardless of head type (65% and 75% DU are considered achievable for spray and rotor heads, respectively).

Across the MWDSLS service area, tested spray zones averaged 1.57 in/hr, with DUs averaging 57%, and dynamic pressure averaging 44 PSI. Tested rotor zones averaged 0.75 in/hr, with DUs averaging 63%, and dynamic pressure averaging 66 PSI. Tested MSMT zones averaged 0.54 in/hr, with DUs averaging 67%, and dynamic pressure averaging 51 psi. Though it is not a recommended design practice, we observed spray and rotor sprinkler heads being operated in the same zone on many properties. Average precipitation rate for mixed zones was 1.05 in/hr with DUs averaging 56%, and dynamic pressure averaging 52 PSI.

Compared to previous years, precipitation rates of spray and rotor sprinkler heads are consistent. The DUs measured in 2018 are slightly higher for rotor zones and reflect an improving trend over previous years. Dynamic operating pressure in rotor zones increased significantly in 2018 to an average of 66 psi, as compared to 40 psi in 2017. While observed

pressures for rotor zones are not excessive for many types of rotary sprinklers, the dynamic pressures observed in spray zones, averaging 43 PSI, exceed typical manufacturer's specifications for optimum efficiency of application. Having observed this pattern over several seasons, USU-CWEL has included information on high dynamic system pressures and solutions to the issue in Extension publications. We also recommend that the District and its member agencies consider rebate programs for pressure-reducing sprinkler heads.

PROGRAM MARKETING DATA

Each year, we ask program participants why they participate in the program and how they learned about the service. In 2018, as in previous years, most participants (36%) stated that they were interested in saving water (Figure 2). A desire to gain knowledge and education about landscaping was second (29%), followed by saving money (21%), and landscape problems (13%). One percent of participants had moved to a new home and were seeking assistance in managing their new irrigation systems.

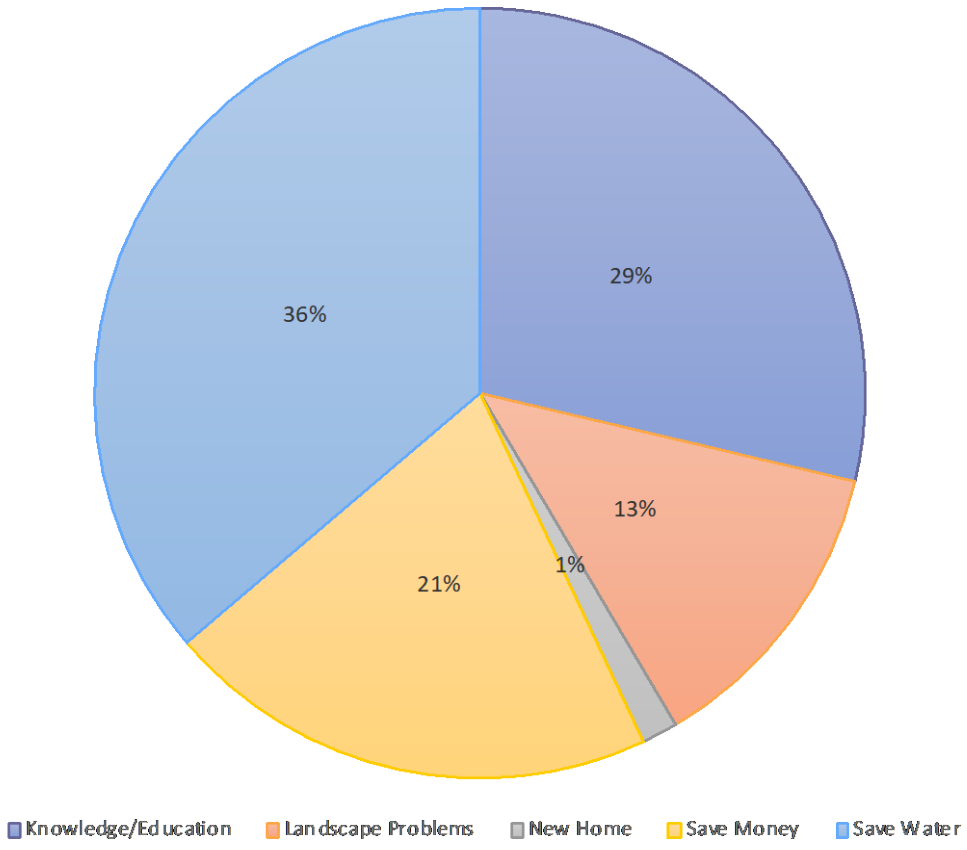

Figure 2. Reasons for participation in the Water Check Program (2018).

In 2018, most participants learned about the program through television, radio, or newspaper advertisement (29%), followed by word-of-mouth (25%), and websites (20%). These responses were followed by water provider (16%), USU Extension (7%), and garden fairs and public events (3%). Additional candid responses included email, friends, Google™, and "Sandy's letter".

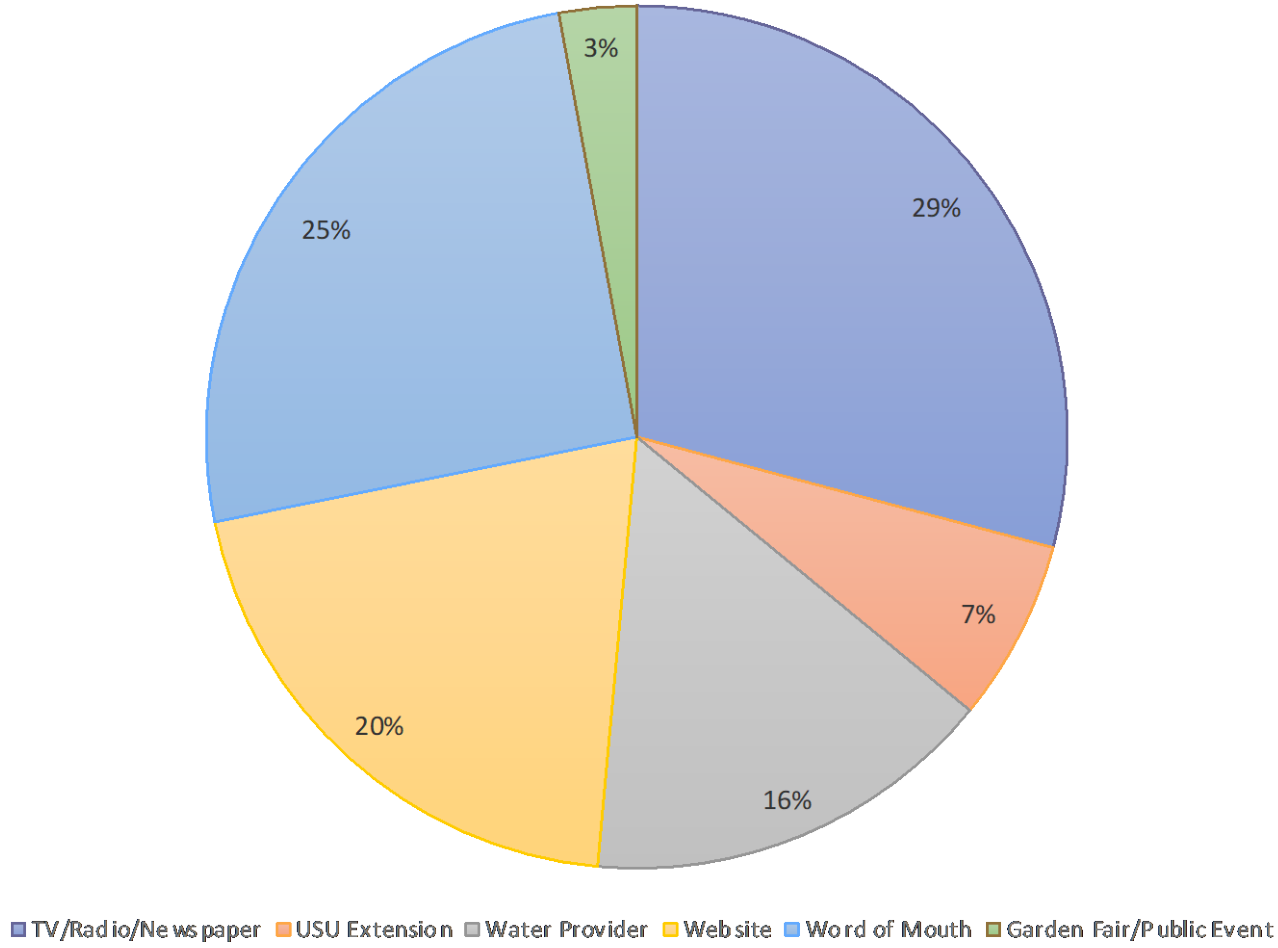

Figure 3. How participants learned about the program (2018).

WATER SAVINGS ANALYSIS

In concert with the application utilized for program data collection, a Structured Query Language (SQL) database is utilized to analyze program related water savings.

Table 3. Average monthly irrigation water use (gallons) of program participants before Water Check participation, average monthly irrigation water use single family residences in Salt Lake City (gallons), and average monthly irrigation water use (gallons) of program participants in the year following Water Check participation in Salt Lake City (2013-2017).

Year	Average Monthly Use of Participants (Before Check)	Average Monthly Use of SFR in SLC*	Average Monthly Use of Participants (After Check)
2013	23,309	13,800	17,635
2014	15,658	13,600	15,139
2015	16,133	13,300	18,225
2016	16,007	12,600	19,739

*SFR-Single family residences (representing 64,500 Salt Lake City residences each year).

In each of the years analyzed, program participants used more water for irrigation than the average use for single family residences in Salt Lake City, prior to the Water Check (Table 3). However, in 2013, 2014, and 2016, irrigation water use of program participants aligned more closely to average use for single family residences in the city. This finding may indicate that a water conservation ethic has been more widely adopted in the city. However, as irrigation water use of program participants has aligned more closely with city averages, water use for some participants has increased in the year(s) following a Water Check. Whether or not this trend continues, remains to be seen in coming years and local weather conditions must also be considered.

Table 4. Average monthly irrigation water use (gallons) one-year prior to Water Check participation and average monthly irrigation water use (gallons) in the year(s) following Water Check participation in Salt Lake City (2013-2017).

2012	2013	2014	2015	2016	2017
23,309	WC*	6774	6862	4853	4207
—	15,658	WC	713	-177	1024
—	—	16,133	WC	-3198	-984
—	—	—	16,007	WC	-3732

*WC-Year of Water Check participation.

Considering long-term water savings, program participants in 2013 were able to reduce water use each year following a Water Check and have maintained a reduction in ongoing analyses (Table 4). Program participants in 2014, had water use closer to the average monthly use for single family residences in the city in 2014. These participants also reduced usage following a Check. 2015 and 2016 participants also used less irrigation water prior to Water Check participation, when compared to 2013 (Table 3), and some increased water use in the year(s) following a Water Check (Table 4). As mentioned, this finding may reflect participation from residences that were already conservative in their water use, as well as local weather conditions. Of note, are the ongoing savings associated with participants from 2013 and 2014 that have continued through 2017.

NEW PROGRAM DEVELOPMENTS

In the spring of 2018, SLCDPU partnered with Program Administrator Kopp on a grant application to the USU Extension Water Initiative grant program ($48,750). In August of 2018, we learned that our application was successful and we have begun a pilot project to add geographic information system (GIS) capabilities to the Water Check application. By incorporating existing GIS capacity from the Utility, we will be able to develop irrigation system maps for properties that we evaluate and will also be able geo-locate irrigation and landscape problems on these maps. Both Iron and Washington County Water Conservancy Districts have expressed interest in partnering on this effort going forward.

APPENDIX A. SANDY CITY PARKS

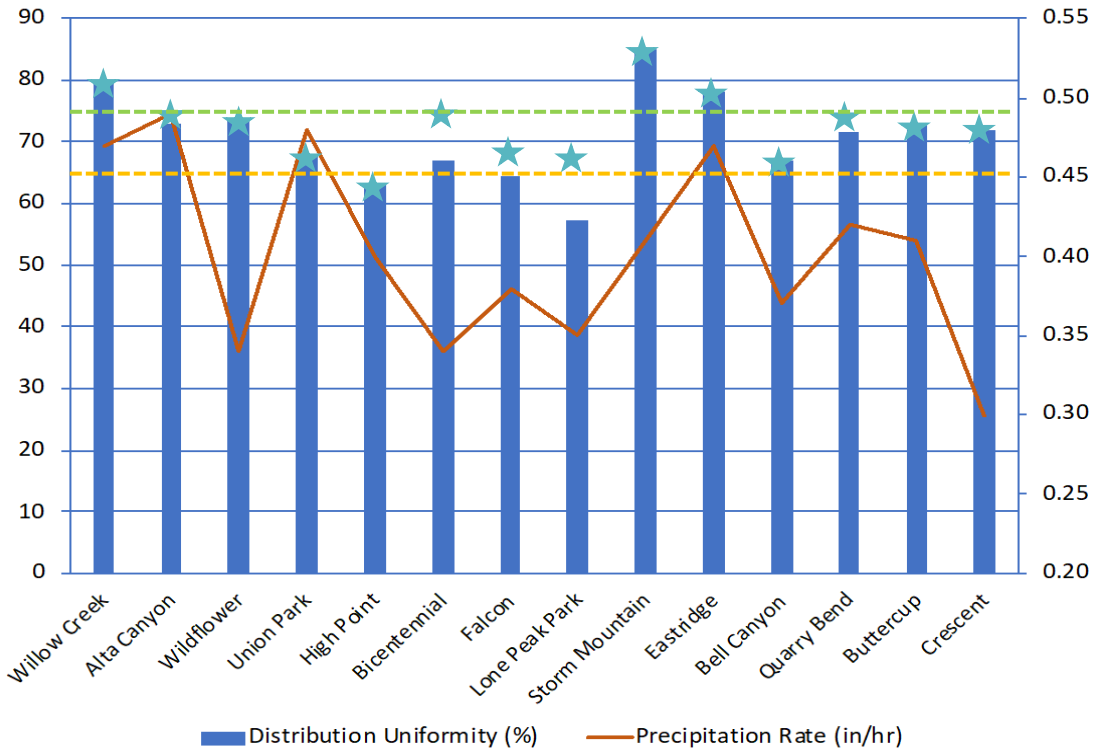

Figure 4. Average distribution uniformity (%) and precipitation rates (in/hr) for Sandy City Parks (2018). Stars indicate the highest distribution uniformity measured at each park. Dashed lines indicate achievable levels of distribution uniformity, 65% (orange) and 75% (green).

Table 4. Average distribution uniformity (%), highest measured distribution uniformity (%), and average precipitation rate (in/hr) for Sandy City Parks (2018).

	Ave. Distribution Uniformity (%)	Highest Measured Distribution Uniformity (%)	Average Precipitation Rate (in/hr)
Willow Creek	80	80	0.47
Alta Canyon	73	74	0.49
Wildflower	74	74	0.34
Union Park	68	68	0.48
High Point	63	63	0.40
Bicentennial	67	73	0.34
Falcon	65	69	0.38
Lone Peak Park	57	68	0.35
Storm Mountain	85	85	0.41
Eastridge	78	78	0.47
Bell Canyon	67	67	0.37
Quarry Bend	72	74	0.42
Buttercup	73	73	0.41
Crescent	72	83	0.30

APPENDIX B. UTAH STATE CAPITOL

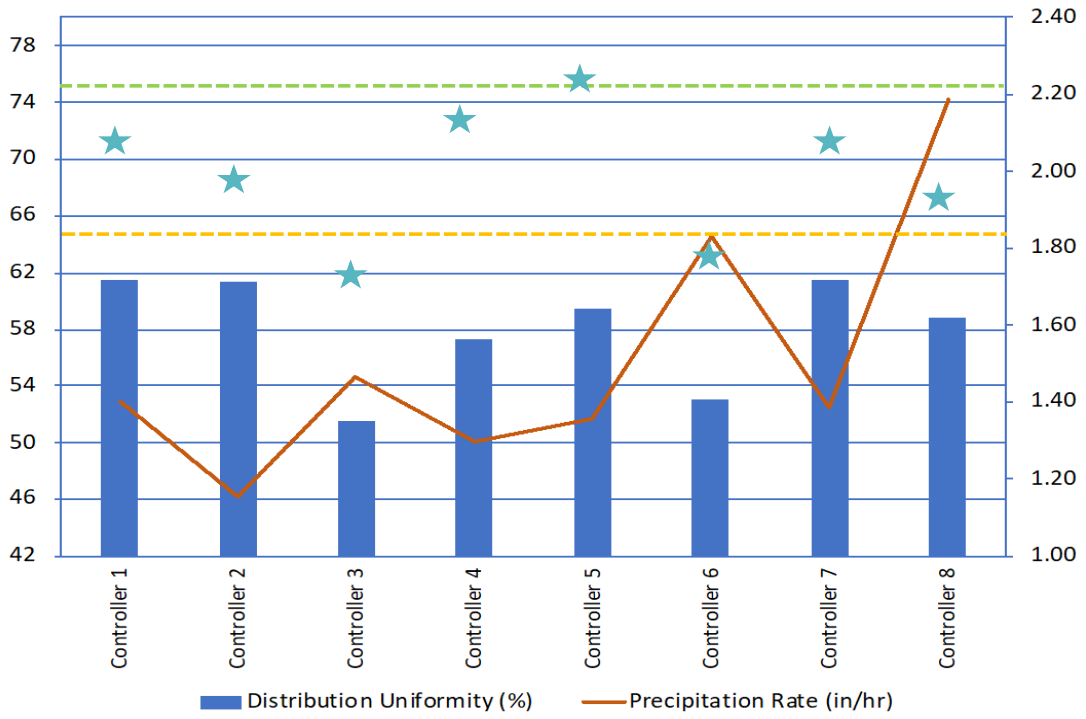

Figure 5. Average distribution uniformity (%) and precipitation rates (in/hr) for the Utah State Capitol (2018). Stars indicate the highest distribution uniformity measured in each controller area. Dashed lines indicate achievable levels of distribution uniformity, 65% (orange) and 75% (green).

Table 5. Average distribution uniformity (%), highest measured distribution uniformity (%), and average precipitation rate (in/hr) for Sandy City Parks (2018).

	Ave. Distribution Uniformity (%)	Highest Measured Distribution Uniformity (%)	Average Precipitation Rate (in/hr)
Controller 1	61	72	1.40
Controller 2	61	68	1.15
Controller 3	52	62	1.47
Controller 4	57	73	1.30
Controller 5	60	76	1.36
Controller 6	53	63	1.83
Controller 7	61	72	1.39
Controller 8	59	67	2.19