

Memo

Date: June 10, 2018
To: Kevin Stewart
From: Markus Ritsch
Subject: May 2018 ALERT Data Analysis

I. ALERT Data Source

Raw ALERT data records extracted from the Urban Drainage and Flood Control District's NovaStar 5 base station were analyzed for the period May 1 through May 31, 2018.

II. General System Analysis Summary

The District receives data through both the legacy ALERT channel and through the ALERT2 (concentrator plus A2 self-reports) channel. The following quantifies the data reports received by each channel at Diamond Hill (Table 1).

Table 1. Reception of Data at Diamond Hill (Legacy, ALERT2 and Concentrator Reports from Recdatalog)

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Tot
Legacy ALERT (line 1)	208,189	170,938	214,572	224,711	215,631								1,034,041
Conc (line 2)	369,547	328,399	383,229	359,855	327,392								1,768,422
ALERT2 (line 4)	608,216	474,112	513,779	511,112	563,921								2,671,140
Westy ALERT2 (line 8)		472,878	513,257	549,423	601,462								2,137,020
Westy Conc (line 6)		327,438	382,812	386,882	382,751								1,479,883
TOTAL	1,185,952	1,773,765	2,007,649	2,031,983	2,091,157	0	0	0	0	0	0	0	9,090,506
Con/Leg	1.78	1.92	1.79	1.60	1.52	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.71
DataChr	713,367	590,020	715,298	743,578	765,183								3,527,446

A new ALERT2 receiver/decoder was installed in Westy, Colorado in January of 2018. This redundant data feed was added to NovaStar5 in late January. The new data feeds (lines 6 and 8) were added to both the Diamond Hill base station and to the Greenhouse base station for backup. Data from this new source will be quantified as part of this report.

The District operates two NovaStar5 base stations: the primary (ns5a) at Diamond Hill and a redundant base (ns5b) at Greenhouse Data. Additional analyses are conducted on the data received by these two base stations (Table 2). The data received by both base stations for the month are shown below.

The battery charger powering the ALERT2 decoder at Diamond Hill failed on April 22, 2018. The charger was replaced by OneRain on April 26, 2018. The number of ALERT2 and concentrator reports through Diamond Hill is decreased in April due to the failure of the battery charger. The ratio between legacy reports and concentrator reports is also decreased for these four days.

It seems that the data reception in May was better at Westy than at Diamond Hill. This may be showing that the radio path from some stations is better to Westy. It will be interesting to see if this trend continues in June.

Table 2. Comparison of Data Reception by ns5a and ns5b

NS5A (Diamond Hill)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Tot
Legacy	208,189	170,938	214,572	224,711	215,631								1,034,041
Concentrator	369,547	328,399	383,229	359,855	327,392								1,768,422
ALERT2	608,216	474,112	513,779	511,112	563,921								2,671,140
Westy (Conc)		327,438	382,812	386,882	382,751								1,479,883
Westy (A2)		472,878	513,257	549,423	601,462								2,137,020
NS5B (Greenhouse)													
Legacy	207,991	167,936	176,780	223,474	212,628								988,809
Concentrator	369,370	297,198	289,542	357,805	322,706								1,636,621
ALERT2	608,348	437,957	389,787	510,718	557,093								2,503,903
Westy (Conc)		304,809	292,048	386,008	382,805								1,365,670
Westy (A2)		446,873	398,421	548,228	601,760								1,995,282
Diff (NS5a-NS5b)													
Legacy (Digi One)	198	3,002	37,792	1,237	3,003	0	0	0	0	0	0	0	45,232
Concentrator (B2010)	177	31,201	93,687	2,050	4,686	0	0	0	0	0	0	0	131,801
ALERT2 (B2010)	-132	36,155	123,992	394	6,828	0	0	0	0	0	0	0	167,237
Westy (Conc)	0	22,629	90,764	874	-54	0	0	0	0	0	0	0	114,213
Westy (A2)	0	26,005	114,836	1,195	-298	0	0	0	0	0	0	0	141,738
Comments		Network issues experienced this month at DH	New line numbers were assigned at GH	Data script updated									

The daily ratio of concentrator to legacy reports is shown (Figure 1).

In March, the system configuration for data reception at Greenhouse was changed so that unique line numbers could be used to quantify data reports received uniquely at each base station. The automated script used to quantify reports was not updated until April. That's why the large discrepancy in reporting was quantified in March between Diamond Hill and Greenhouse. The new line numbering convention is as follows:

Primary Node Diamond Hill Base Station

-) Line 1 = Legacy ALERT
-) Line 2 = Concentrator from Diamond Hill Decoder
-) Line 4 = ALERT2 from Diamond Hill Decoder
-) Line 6 = Concentrator from Westminster Decoder
-) Line 8 = ALERT2 at Westminster Decoder

Backup Node Greenhouse Base Station

-) Line 1 = Legacy ALERT
-) Line 3 = Concentrator from Diamond Hill Decoder
-) Line 5 = ALERT2 from Diamond Hill Decoder
-) Line 7 = Concentrator from Westminster Decoder
-) Line 9 = ALERT2 at Westminster Decoder

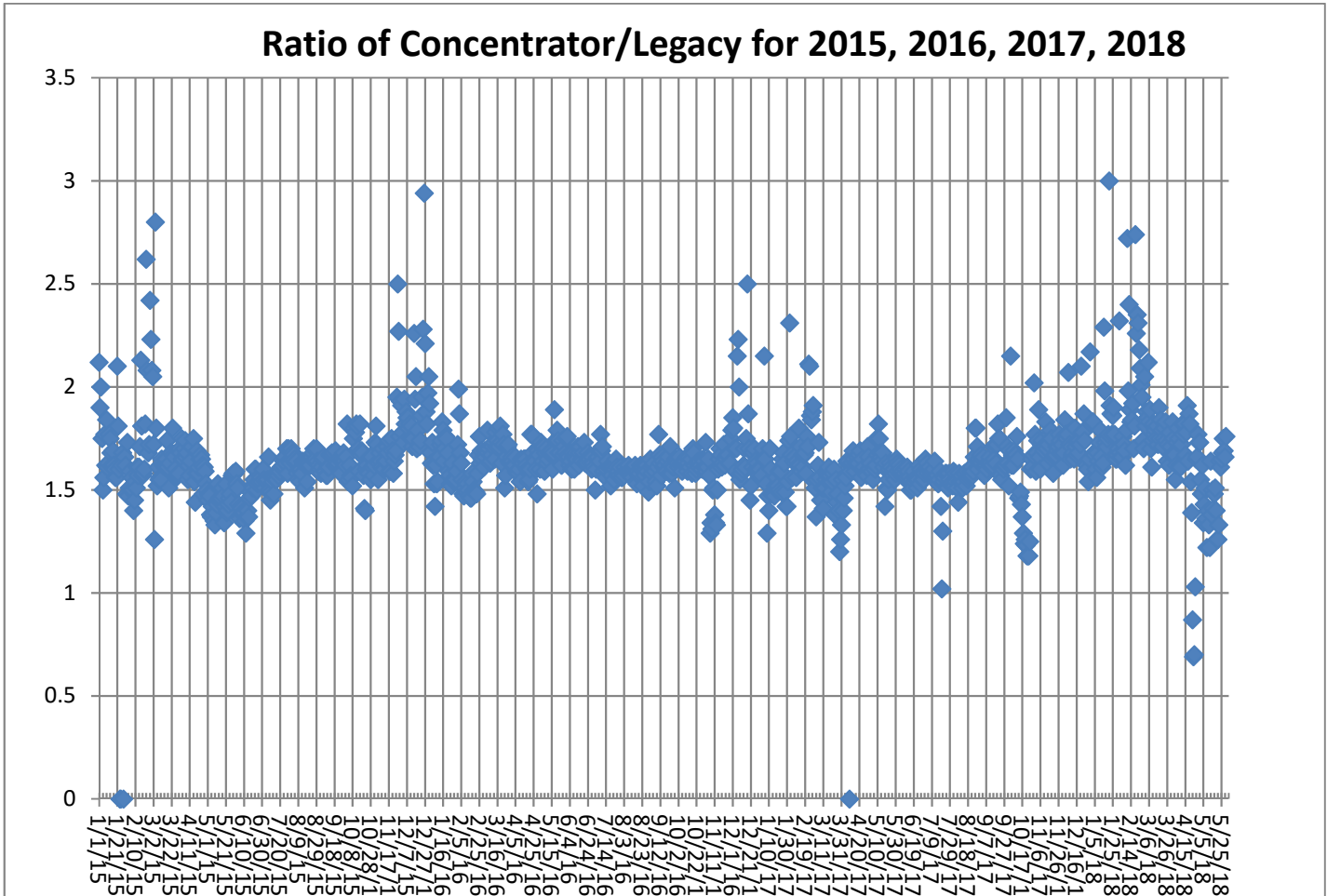


Figure 1. Daily Ratio of Concentrator Reports to Legacy Reports

The ratio becomes more volatile in the cold months as the Blue Mountain repeater has problems with legacy ALERT reporting when the temperature drops below zero.

The ratio on January 21, 2018 was very high with a value of 3. The system experienced a significant decrease in legacy ALERT reports on this day. The loss of ALERT legacy reports on January 21, 2018 are from Blue Mountain, Elbert, Urban Farm, and Marston Lake North. The most likely explanation is that the legacy ALERT output from the Blue Mountain repeater was down due to the cold weather experienced on both January 21 and January 15.

A cold spell in February likely contributed to the higher than expected ratio of concentration to legacy reporting.

The failure of the battery charger at the Diamond Hill ALERT2/Concentrator decoder for the period April 22 through April 26 is evident in the decreased ratios for these days.

A. Continuous Operation of Base Receiver/Decoder

Data was collected on a continuous basis for a total of 744 hours of operation. Outages of less than one hour are not identified.

B. Specific Issues Identified

Performance of the following sensors (Table 3) was questionable this month.

Table 3. Sensors with Poor Performance Characteristics

Sensor ID	Description	Comments
700	Toll Gate @ 6th	Poor timer performance
4470	Little Narrows	Poor event performance, underreporting rain.
3020	West Creek WX	ALERT2 station with drifting clock (negative latency)
2340	El Rancho	Poor timer and event performance
0, 1, 2	Unknown	Unknown IDS transmitted on legacy ALERT

C. ALERT2 Repeater Loading

The District's ALERT2 architecture utilizes 5 repeaters with a single transmit frequency (170.300 MHz) to Diamond Hill. The repeaters utilize a 20 second frame where each repeater is allocated a slot of specific size and an offset within the frame. The slot allocated to each repeater is sized appropriately to accommodate the total number of existing and future remote sites routed through that repeater. Each repeater is shown along with its designated slot (Table 4). Currently there is no pass-listing for the ALERT2 repeaters. Any remote ALERT2 site can be received by all repeaters and re-broadcast to the base except for West Creek which has an input frequency unique to Douglas County.

Table 4. ALERT2 Repeater Architecture

Repeater	Slot Size (sec)	Slot Offset (sec)	Source Address	ALERT2 Input Frequency (MHz)	ALERT2 Output Frequency (MHz) – received at Diamond Hill
West Creek	2	0	6001	169.425	170.300
Smoky	3	2	6502	169.525	170.300
Blue Mt.	4	5	6503	169.525	170.300
Lee Hill	3	9	6505	169.525	170.300
Gold Hill	3	12	6506	169.525	170.300
Magnolia	5	15	6507		170.300
Frame Size	20				

The following tables summarize the total number of reports received through each repeater (Table 5). This helps to quantify repeater loading for the ALERT2 backbone.

Table 5. ALERT2 Reports Received through Each Repeater (Only A2 Self Reports)

Month-Yr	West Creek (6001)	Smoky (6502)	Blue Mt. (6503)	Lee Hill (6505)	Gold Hill (6506)	TOTAL
Jan-15	0	44,501	44,636	44,783	39,007	172,927
Feb-15	0	58,543	56,150	61,160	57,764	233,617
Mar-15	346	73,198	69,604	77,968	65,323	286,439
Apr-15	595	73,711	69,568	79,215	72,310	295,399
May-15	5,259	78,694	72,340	86,297	77,174	319,764
Jun-15	11,987	72,449	65,742	82,998	69,570	302,746
Jul-15	28,595	75,379	71,394	79,026	74,041	328,435
Aug-15	28,409	92,299	84,057	84,363	87,211	376,339
Sep-15	26,809	84,143	84,776	84,289	85,123	365,140
Oct-15	19,775	82,683	83,390	63,475**	84,825	334,148
Nov-15	6,438	62,615	61,477	50,888	58,004	239,422
Dec-15	9,835	72,886	72,465	73,431	47,996	276,613
Jan-16	4,034	38,348	36,826	37,168	19,768	138,160
Feb-16	11,732	93,120	99,206	96,284	99,188	399,530
Mar-16	12,533	126,123	134,329	140,226	139,536	552,747
Apr-16	13,262	128,473	130,223	135,499	133,197	540,654
May-16	27,002	125,098	124,280	138,033	130,513	544,926
Jun-16	30,405	117,877	111,309	133,036	122,798	515,425
Jul-16	37,492	108,334	102,335	115,028	110,577	473,766
Aug-16	48,323	130,666	123,827	136,746	131,957	571,519
Sep-16	49,555	122,625	115,898	129,454	127,606	545,138
Oct-16	51,170	111,105	110,038	116,087	116,489	504,889
Nov-2016	47,039	72,761	92,941	100,083	99,508	412,332
Dec-2016	48,946	102,329	97,321	79,274	102,097	429,967
Jan-2017	47,286	50,748**	27,307**	97,947	104,689	327,977
Feb-2017	45,366	96,629	94,065	88,239	98,411	422,710
Mar-2017	53,021	87,160**	33,983**	121,578	126,722	422,464
Apr-2017	49,833	110,418	116,486	122,506	120,727	519,970
May-2017	54,375	128,362	128,310	118,908	134,173	564,128
Jun-2017	60,671	131,745	124,019	146,333	138,056	600,824
Jul-2017	58,442	137,750	130,136	146,134	139,778	612,240
Aug-2017	60,322	136,739	128,716	145,280	139,257	610,314
Sep-2017	58,388	146,759	135,632	157,248	150,762	648,789
Oct-2017	48,644	148,071	149,899	159,639	157,788	664,041
Nov-2017	39,868	123,026	134,197	141,153	140,478	578,722
Dec-2017	38,801	138,219	137,672	142,389	141,303	598,384
Jan-2018	45,373	140,341	139,290	141,045	142,167	608,216
Feb-2018	30,490	110,604	109,467	111,922	111,629	474,112
Mar-2018	72,863	110,844	106,466	112,417	111,189	513,779
Apr-2018	71,726	120,656	114,768	125,831	116,442	549,423
May-2018	44,674	132,258	125,752	144,129	117,108	563,921

** - The number of reports coming through these repeaters declined significantly

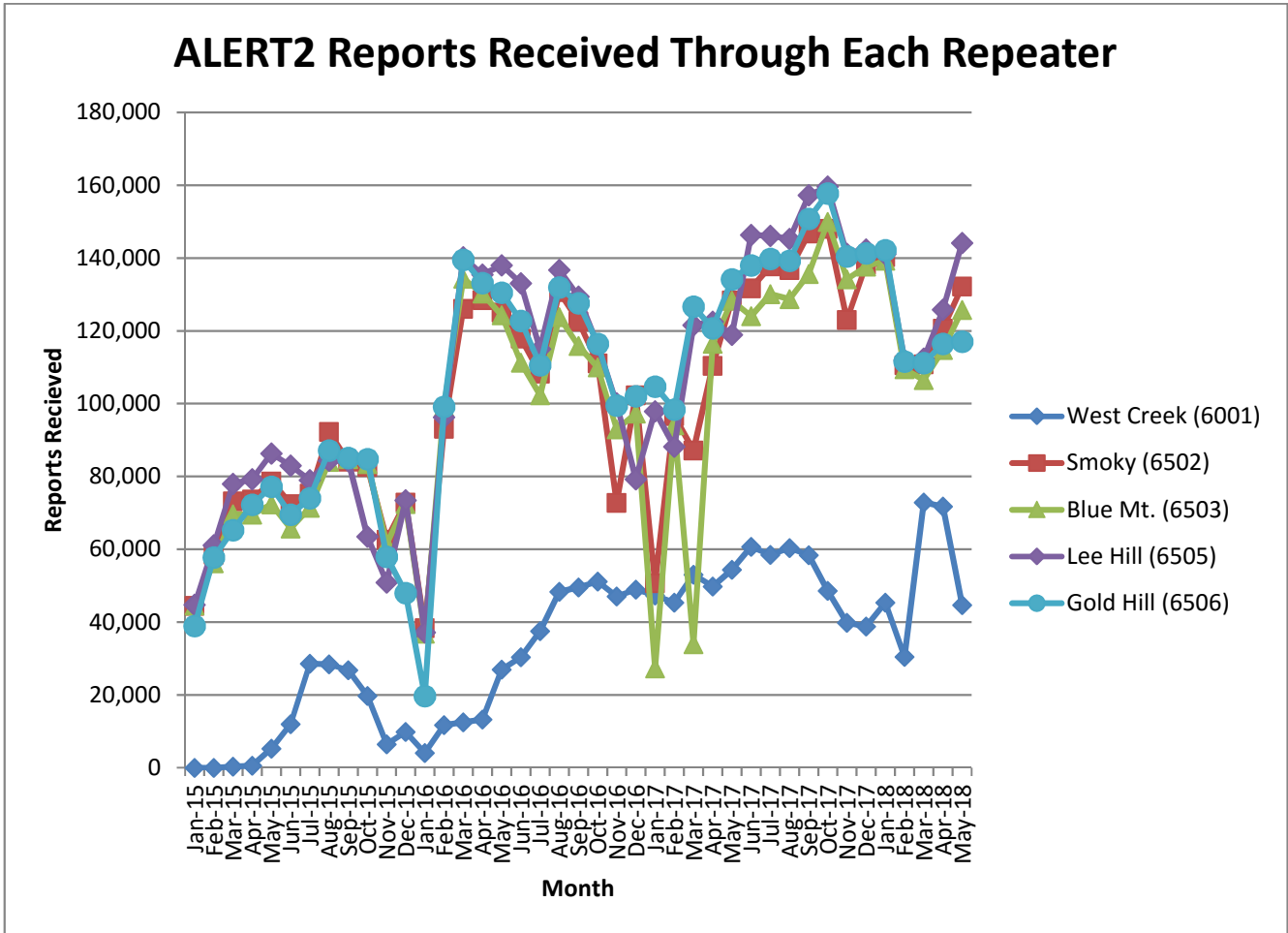


Figure 2. Reports received through each repeater (ALERT2 Only)

A convenient mechanism to track repeater performance throughout the year is to monitor total ALERT2 reports passed by each repeater. In general, each of the primary repeaters in the District process an equivalent number of ALERT2 reports because pass/block filtering is not being used. Several months are evident where the throughput of one repeater is not consistent with the other three.

Network outages were experienced on February 22 and February 23 which decreased the reception of data at the base station from all repeaters.

The following tables summarize the system-wide latency of ALERT2 self-reports (Table 6 and Table 7).

Table 6. System-Wide Latency of ALERT2 Self-Reports (seconds)

Statistical Parameter	Value (sec)	Comments
Mean	117.33	The average time it took a report from the field to reach the base
Minimum	-23	The minimum time it took for a report to go from the field to the base
Maximum	36100	The maximum time it took for a report to go from the field to the base

Table 7. Summary of ALERT2 System-Wide Latency (seconds)

Statistical Parameter	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Mean	48.79	51.82	60.96	75.43	117.33							
Minimum	-34	-23	-23	-963	-23							
Maximum	37677	33597	30677	42277	36100							
Station with Max Latency	West Creek WX	West Creek WX	West Creek WX	West Creek WX	West Creek WX							

The negative latencies are observed only from the station West Creek WX. This is a HydroLynx transmitter. It is likely that the clock on this transmitter is drifting badly. A new ALERT2 board was installed in mid May 2018 at this station. The large latencies should be corrected in the June report.

D. Rain Sensor Timer Reporting Summary

The following analysis assumes that each legacy rain sensor has a 12-hour timer-reporting interval and each A2 rain sensor has a 1-hour timer-reporting interval. The worst performing rain sensors for the month are summarized (Table 8).

Table 8. Monthly Summary of Sensors with Poor Timer Performance (Sensor ID)

Jan*	Feb*	Mar*	Apr	May	Jun	Jul	Aug	Sep	Oct*	Nov*	Dec*
2790	2790	2340	2790	700							
4550	3020	2360	2240	2330							
1660	1110	2230	2340	2340							
2330	3010	2250	2330	2850							
2980	1660	2270	3020	1620							
5940	4550	2350	5720	4870							

*- Only sensors that operate year-round (weather stations and stations in Boulder County) are included for the analysis in these months.

Sensors identified as having poor timer performance in multiple months are shaded with unique colors. A developing trend can thus be identified from the color shading as the year progresses.

III. Rain Sensor Event Reporting Summary

A. District-Wide Total Tip/Count Statistics

The incrementing reports from all 1-mm rain sensors were analyzed to quantify the District-wide statistical total monthly tip summary (Table 9). For the months of January, February, March, October, November and December only the stations that operate year-round are included in the rain event analysis. These stations include all weather stations and the stations in Boulder County.

Table 9. District-Wide Total Tip/Count Statistical Summary

Statistical Parameter	Value	Comments
Mean	64.17	Only the 1-mm rain sensors were included in the analysis
Median	60	Only the 1-mm rain sensors were included in the analysis
Standard deviation	26.80	Only the 1-mm rain sensors were included in the analysis
Mean plus three standard deviations	144	Only the 1-mm rain sensors were included in the analysis
Mean minus two standard deviations	10.49	Only the 1-mm rain sensors were included in the analysis
Minimum total count	7	Little Narrows (4470)
Maximum total count	155	SBC @ S Boulder Road (4840)
Sensors showing NO rain for the month		None
Sensors greater than 3 SD (over reporting)	2	SBC @ San Souci (4830), SBC @ S Boulder Road (4840)

B. Monthly Average Tip/Count Summary

A monthly summary of the District-wide mean total tip/count is presented (Table 10).

Table 10. Monthly Summary of District-Wide Mean Total 1-mm Tip/Count

Year	Jan*	Feb*	Mar*	Apr	May	Jun	Jul	Aug	Sep	Oct*	Nov*	Dec*	Ave
2006	4.62	5.92	18.39	20.47	19.44	13.75	74.03	46.89	24.17	41.13	5.04	16.45	24.19
2007	11.56	5.40	29.75	65.03	68.30	15.87	36.20	46.38	22.13	29.50	6.54	11.29	29.00
2008	4.05	7.38	12.26	20.57	54.82	26.06	16.43	90.20	37.54	19.59	2.82	9.24	25.08
2009	6.33	3.11	11.37	59.26	63.45	68.00	65.00	20.00	27.29	30.24	11.00	5.60	30.89
2010	5.97	11.90	32.54	70.57	39.63	56.04	50.23	31.01	4.18	18.31	8.30	3.31	27.67
2011	6.78	7.45	7.54	33.94	92.68	39.42	90.87	18.25	37.67	25.73	10.41	13.59	32.03
2012	4.89	13.57	2.35	30.17	38.97	19.35	73.03	11.31	48.81	22.32	2.98	4.18	22.66
2013	2.96	14.31	21.86	35.96	45.87	16.39	52.33	50.63	229.74	29.64	5.86	4.00	42.46
2014	6.88	11.86	25.91	29.30	77.30	29.16	99.73	43.59	50.96	29.26	13.36	8.11	35.45
2015	9.88	24.42	20.78	69.75	143.07	86.93	54.59	29.95	7.16	53.28	22.08	10.80	44.39
2016	4.68	9.91	32.30	52.10	49.40	40.50	24.20	31.00	8.86	7.51	8.56	8.74	23.23
2017	13.3	5.84	27.70	39.10	99.60	15.33	40.80	44.58	40.74	31.88	7.38	5.35	31.13
2018	4.70	8.34	29.1	24.53	64.17								
Ave	6.66	9.95	20.91	42.37	65.90	32.83	52.11	35.68	41.48	26.03	8.03	7.74	28.32

*- Only sensors that operate year-round (weather stations and stations in Boulder County) are included for the analysis in these months.

C. Sensors with a Jump of Six or More in the Sequential Count

No sensors experienced a large jump in the sequential tip count (Table 11).

Table 11. Sensors with a Jump of 6 or More in Sequential Count

Sensor Description	Sensor ID	Comment
Slaughterhouse Glch	1620	All >6 tips were breaks in data
El Rancho	2340	Missed 7 tips on 5/04, and 8 tips on 5/28
Happy Canyon at N Surrey Dr	2880	All >6 tips were breaks in data

D. Sensor-by-Sensor Incrementing Count Summary

The system-wide reception rate of incrementing, 1-mm tip reports for the month was approximately 96 percent. A total of 12,308 incrementing reports were received and a total of 12,819 reports were expected. The total loss of incrementing reports for the month was approximately 4 percent. Those sensors with the worst event transmission performance are summarized (Table 12).

Table 12. Monthly Summary of Sensors with the Worst Performance

Jan*	Feb*	Mar*	Apr	May	Jun	Jul	Aug	Sep	Oct*	Nov*	Dec*
1700	2810	2270	2270	4470							
2980	1110	2230	1620	2340							
4790	540	4870	1710	2330							
4320	2330	940	2240	4270							
3010	4330	100140	4270	1620							
3030	3020	1530	4870	100420							

*-Only sensors that are operational year-round (weather stations and stations in Boulder County) are included for the analysis in these months.

Sensors identified as having poor event performance in multiple months are shaded with unique colors. A developing trend can thus be identified from the color shading as the year progresses.

IV. Unknown Device Analysis – Received Data Log

The ALERT IDs present in the audio signal received by the decoder are compared against a list of “active” device IDs that are defined within NovaStar. Those IDs received by the decoder that are not defined within NovaStar are considered to be “unknown” and may be the result of radio noise or problems with the telemetry system. The reception of “unknown” device reports for the month is summarized (Table 13).

Table 13. Summary of Unknown IDs

Description	Concentrator	Legacy	A2
Total number of unknown IDs (IDs without a device definition)	267	270	0
Total reports from unknown IDs	749	893	0
Unknown IDs with only a single received report (potential noise)	171	184	0
Total reports from all IDs – RecData Log entire month	327,392	215,631	563,921
Unknown reports as a fraction of total reports	0.23%	0.41%	0.00%

The total number of reports from unknown sensors is very small relative to the total reports received for the month. Shown below (Table 14) are the total reports received from unknown sensor IDs for each month of the year.

Table 14. Monthly Summary of Total Reports from Unknown IDs (Concentrator)

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2010	1,220	1,474	1,276	1,174	721	5,707	610	1,738	442	533	2,857	6,396
2011	1,231	2,165	3,065	1,254	2,051	439	489	456	191	683	747	861
2012	692	750	1,575	977	5,469	11,016	453	683	774	2,657	3,854	5,466
2013	4,265	994	1,100	2,589	3,623	6,973	5,230	1,070	4,429	781	13,459	1,213
2014	870	4,284	2,399	2,104	25,746	1,832	3,983	268	369	448	470	1,099
2015	542	9,137	1,524	1,007	946	699	1,179	1,860	1,153	1,063	600	619
2016	323	1,241	3,085	3,586	1,268	945	1,408	2,029	1,413	753	617	879
2017	11,875	844	1,207	3,700	2,693	642	610	6,678	780	5,097	3,532	3,282
2018	788	771	1,178	936	749							

The fraction of reports from unknown sensors relative to the total number of reports is shown below (Table 15).

Table 15. Monthly Percent of Unknown Sensor Reports (Concentrator)

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2010	0.42%	0.56%	0.38%	0.32%	0.20%	1.61%	0.17%	0.49%	0.13%	0.16%	0.93%	1.88%
2011	0.39%	0.73%	0.90%	0.37%	0.58%	0.12%	0.12%	0.05%	0.12%	0.18%	0.22%	0.26%
2012	0.30%	0.25%	0.43%	0.26%	1.37%	2.74%	0.11%	0.18%	0.20%	0.72%	1.15%	1.62%
2013	1.40%	0.31%	0.29%	0.60%	0.37%	0.61%	0.82%	0.21%	0.96%	0.31%	5.37%	0.23%
2014	0.14%	0.94%	0.40%	0.34%	3.95%	0.34%	0.66%	0.03%	0.03%	0.07%	0.11%	0.26%
2015	0.15%	2.25%	0.34%	0.22%	0.19%	0.14%	0.26%	0.42%	0.29%	0.24%	0.15%	0.15%
2016	0.10%	0.30%	0.69%	0.82%	0.28%	0.22%	0.33%	0.50%	0.36%	0.18%	0.17%	0.22%
2017	3.29%	0.23%	0.31%	0.97%	0.58%	0.16%	0.16%	1.16%	0.21%	1.40%	0.96%	0.87%
2018	0.21%	0.23%	0.31%	0.26%	0.23%							

Any month shaded in yellow has an excessive number of reports from unknown sensors.

A number of “unknown” sensors had multiple reports, which may indicate the existence of a transmitter that is sending information on an ID that is not currently defined within NovaStar. The unknown IDs with multiple reports including the number of reports received by each are shown (Table 16).

Table 16. Reports Received by Unknown IDs

Concentrator		Legacy ALERT		Comment
Unknown ID	Reports	Unknown ID	Reports	
		0,1,2	59,59,91	Legacy reports for IDs 0,1,2 only
2271	57	2271	57	Cub Creek Below Blue Crk possibly sending invalid ID
2272	57	2272	57	Cub Creek Below Blue Crk possibly sending invalid ID
1567	22	1567	22	Lakewood Gulch @10 th possibly sending invalid ID
3071	20			Newlin Gulch at Jordan Road possibly sending invalid ID

V. Sensors with Invalid Reports

The sensors below (Table 17 and Table 18) have the largest number of invalid decodes as determined by the validation process defined at the District NovaStar5 base station. These invalid reports may indicate poor radio paths (bit flip/contention errors/random decode) or validation criteria that do not match the physical installation at the site.

Table 17. Rain Sensors with the Most Invalid Reports

Sensor ID	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1530-Bear Cr. At Lowell	10	5	3	4	1							
2810-Pine Cliff Rd.	14	10	10	6	6							
2880-Happy Canyon	--	--	47*	--	77*							
3010-Wx-EPC @ 105	3	5	7	5	1							
3050-E/W Trailhead	7	12	3	9	--							
4030-Red Garden	--	3	3	--	--							
4330-Hansen	--	3	--	--	1							
4240-Sunset	1	4	2	1	1							
4790-Wx-Button Rock	--	--	--	1	2							

*-Happy Canyon (2880) All invalid data points are because this station went through maintenance to upgrade to ALERT2.

Table 18. Level Sensors with the Most Invalid Reports

Sensor ID	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
413-Kelly Dam	--	--	5	--	12							
403-Montview Park	1171**	766**	411**	--	--							
213-Leyden Confluence	--	--	3	--	--							
723-WTG above Conf Pond	--	--	3	--	2							
1523-Marston Lake North	9	7	10	8	4							
1649-SPR at 19 th Street	--	--	1	4	--							
2223-Evergreen Lake	--	--	2	2	--							
2273-Cub Cr below Blue	--	--	3	--	--							
2803-Columbine Open Space	--	--	--	1	3							
2813-Pine Cliff Road	15	13	9	10	3							
3013-EPC@Hwy 105	18	20	8	10	9							
4383-Eldorado Springs	--	4	1	--	1							

**-Montview Park (403) All data values are marked as questionable data values because they exceeded an allowable upper boundary. Kate Malers developed a new rating for this site which needs to be incorporated into both NovaStar5 and Contrail in 2018.

VI. Rainfall Alarms and Intensity Analysis

The following rainfall rate alarms from the Urban Drainage and Flood Control District NovaStar 5.0 Web Server were identified this month.

Point ID	Point Name	Trigger Name	Alarm Time
4320	Lee Hill Rain Precipitation-BO	FMC-BA 0.25" in 10 Min Rainfall	5/9/2018 13:31
4750	Louisville Lake Precipitation-BO	Boulder County 10 minute rainfall	5/12/2018 19:11
4070	Bear Peak Precipitation-BO	Boulder County 10 minute rainfall	5/14/2018 12:20
4830	SBC at San Souci Precipitation-BO	Boulder County 10 minute rainfall	5/18/2018 15:12
4840	SBC at S. Boulder D Precipitation-BO	Boulder County 10 minute rainfall	5/18/2018 15:16
4830	SBC at San Souci Precipitation-BO	Boulder County 1 hour rainfall	5/18/2018 15:20
4830	SBC at San Souci Precipitation-BO	Boulder County 10 minute rainfall	5/18/2018 15:23
4840	SBC at S. Boulder D Precipitation-BO	Boulder County 1 hour rainfall	5/18/2018 15:26
4840	SBC at S. Boulder D Precipitation-BO	Boulder County 10 minute rainfall	5/18/2018 15:27
4110	Betasso Precipitation-BO	Boulder County 10 minute rainfall	5/18/2018 15:38
4110	Betasso Precipitation-BO	FMC-BA 0.50" in 30 Min Rainfall	5/18/2018 15:38
4840	SBC at S. Boulder D Precipitation-BO	Boulder County 10 minute rainfall	5/18/2018 15:39
4110	Betasso Precipitation-BO	FMC-BA 0.75" in 1 Hour Rainfall	5/18/2018 15:43
4110	Betasso Precipitation-BO	Boulder County 1 hour rainfall	5/18/2018 15:47
4110	Betasso Precipitation-BO	Boulder County 10 minute rainfall	5/18/2018 15:49
4550	Jail Precipitation-BO	Boulder County 1 hour rainfall	5/18/2018 16:25
1110	Gunbarrel Precipitation-BO	Boulder County 1 hour rainfall	5/18/2018 16:38
2960	Indian Creek Precipitation-DG	Douglas County 10 minute rainfall	5/28/2018 16:30
100290	Plum Creek at Sedalia Precipitation-DG	Douglas County 10 minute rainfall	5/28/2018 16:34
2880	Happy Canyon at North Surrey Drive Precip-DG	Douglas County 10 minute rainfall	5/28/2018 16:51
920	Aurora Town Hall Precipitation-AR	Plains 10 minute rainfall	5/28/2018 16:59
4160	Sunshine Precipitation-BO	FMC-BA 0.25" in 10 Min Rainfall	5/30/2018 17:09
4880	Whispering Pines Precipitation-BO	FMC-BA 0.25" in 10 Min Rainfall	5/30/2018 17:11
4320	Lee Hill Rain Precipitation-BO	FMC-BA 0.25" in 10 Min Rainfall	5/30/2018 17:12
4160	Sunshine Precipitation-BO	FMC-BA 0.50" in 30 Min Rainfall	5/30/2018 17:19
4100	Filter Plant Precipitation-BO	FMC-BA 0.50" in 30 Min Rainfall	5/30/2018 17:24
4100	Filter Plant Precipitation-BO	Boulder County 10 minute rainfall	5/30/2018 17:26
4100	Filter Plant Precipitation-BO	FMC-BA 0.75" in 1 Hour Rainfall	5/30/2018 17:34

General System Analysis

Database Name P:\A207-UDFCD-Data-Analysis\2018\05-2018\2018May.mdb

Summarize

First Date in Database	5/1/18 12:00 AM	Total Days	31.0
Last Date in Database	6/1/18 12:00 AM	Total Hours	744.0

Total Records Analyzed 1,106,944

Records by Group	Legacy	%	Concentrator	%	ALERT	%
Wind Data	68,073	32%	116,092	35%	126,059	22%
Temperature	31,056	14%	52,629	16%	91,594	16%
Relative Humidity	30,368	14%	47,416	14%	59,955	11%
Water Level	20,325	9%	22,293	7%	73,342	13%
Precipitation	16,593	8%	20,544	6%	63,944	11%
Barometric Pressure	13,143	6%	21,601	7%	866	0%
Battery Voltage	10,837	5%	22,093	7%	84,595	15%
Fuel Moisture	5,948	3%	5,976	2%	0	0%
Fuel Temperature	5,939	3%	5,961	2%	0	0%
Solar Radiation	5,064	2%	5,200	2%	20,082	4%
Soil Moisture	2,996	1%	2,990	1%	0	0%
Repeater Status Report	2,431	1%	2,019	1%	0	0%
Unknown	893	0%	749	0%	0	0%
ET-Hourly	622	0%	742	0%	0	0%
Repeater Pass List	538	0%	60	0%	0	0%
12Hr Status Report	329	0%	344	0%	2,751	0%
Not Used	241	0%	282	0%	0	0%
Water Temp	118	0%	119	0%	0	0%
Handar 585 ALARM Status	74	0%	74	0%	0	0%
ET-Daily	32	0%	33	0%	0	0%
Solar Power	11	0%	11	0%	0	0%
GPS Lock	0	0%	164	0%	34,253	6%
Flasher Status	0	0%	0	0%	6,480	1%
	0	0%	0	0%	0	0%
Total	215,631	100%	327,392	100%	563,921	100%

Traffic Loading Summary	Legacy	Concentrator	ALERT
Alert Reports	215,631	327,392	563,744
Average Daily Traffic	6,956	10,561	18,185
Average Hourly Traffic	290	440	758
Median Hourly Traffic	283	465	773
Peak Hourly Traffic	676	1,023	1,214
2nd Max	661	933	1,182
3rd Max	647	930	1,149
4th Max	630	921	1,147
5th Max	628	912	1,089

	hour beginning	hour beginning
May 2, 5:00 PM	May 14, 1:00 PM	May 28, 4:00 PM
May 3, 4:00 AM	May 2, 7:00 PM	May 14, 12:00 PM
May 3, 7:00 AM	May 3, 10:00 AM	
May 14, 1:00 PM	May 2, 5:00 PM	May 14, 1:00 PM
May 28, 5:00 PM	May 3, 7:00 AM	May 2, 7:00 PM

Rain Timer Performance

Analyze Rain Sensors

0.50

0.944

Rain Sensors	Description	Rcv	Timer	Exp	Performance
700	Toll Gate @ 6th	34	13:42	62	55%
2330	Morrison	36	18:54	62	58%
2340	El Rancho	39	14:08	62	63%
2850	Cherry Cr bl Bayou Glch	40	12:13	62	65%
1620	Slaughterhouse Glch	45	14:03	62	73%
4870	SBC @ SB Road	46	13:32	62	74%
1710	Shop Creek	47	15:00	62	76%
4510	Pinewood Springs	48	13:33	62	77%
2280	Kinney Peak	49	13:54	62	79%
2980	Dakan Rd	49	14:16	62	79%
4140	Logan Mill	49	11:57	62	79%
4470	Little Narrows	49	14:36	62	79%
5720	Four Mile Creek	49	14:09	62	79%
2900	Russelville Gulch-Douglas	50	14:00	62	81%
2940	Willow Creek - DougCnty	50	10:45	62	81%
100260	Wx-A2-Trumbull (Hayman) - Precip	606	1:00	744	81%
1660	SPR at Henderson	51	13:25	62	82%
4270	Cannon Mountain	51	13:19	62	82%
3010	WX-EPC at Hwy 105	52	13:48	62	84%
2230	Bear Cr below Cub	53	12:14	62	85%
4490	Apple Valley	53	13:24	62	85%
4790	Wx-Button Rock	53	12:18	62	85%
2360	Indian Hills	54	12:16	62	87%
4290	Red Hill	54	12:16	62	87%
650	Iliff Pond	55	12:31	62	89%
540	Parker/Mississippi	56	12:12	62	90%
940	Aurora Regional Pond	56	12:44	62	90%
1360	Denver Zoo	56	12:43	62	90%
1400	Upper Sloan Det.	56	12:31	62	90%
2320	Choke Cherry Resvr	56	12:00	62	90%
4040	Martin Gulch	56	12:33	62	90%
420	Expo Park	57	12:12	62	92%
620	Quincy/Highline	57	12:12	62	92%
720	Confluence Pond	57	12:42	62	92%
1010	Denver West	57	11:57	62	92%
1040	Lena @ U.S. Hwy 6	57	12:31	62	92%
2270	Cub Cr below Blue	57	12:30	62	92%
2370	Red Rocks Park	57	11:58	62	92%
2710	Wx-Highlands Ranch WTP	57	12:29	62	92%
2750	Wx-Castle Rock	57	13:02	62	92%
2960	Indian Creek	57	12:00	62	92%
4070	Bear Peak	57	12:15	62	92%
4180	Gold Lake	57	12:15	62	92%
4200	Lazy Acres	57	12:18	62	92%
4230	Golden Age	57	12:15	62	92%
330	Van Bibber @ Hwy 93	58	11:20	62	94%
430	Utah Park	58	12:14	62	94%
1100	Louisville Rec Ctr	58	12:13	62	94%
1200	Broomfield 3207	58	12:14	62	94%
1500	Powers Park	58	12:47	62	94%
1530	Bear Creek @ Lowell	58	12:12	62	94%
2820	Haskins Gulch Conf	58	12:16	62	94%
2890	Spruce Mt - Douglas	58	12:45	62	94%
2910	East Cherry Cr-Douglas	58	12:30	62	94%

2920	West Cherry Head-Douglas Cnty	58	12:16	62	94%
4110	Betasso	58	12:17	62	94%
4250	Geer Canyon	58	12:35	62	94%
4330	Hansen Rain	58	12:33	62	94%
4340	Riverside	58	12:16	62	94%
4360	Justice Center	58	12:13	62	94%
4770	Wx-Cal-Wood Ranch	58	12:00	62	94%
4830	SBC @ San Souci	58	11:57	62	94%
100150	A2-Sellers Gulch at Haystack Precip	696	1:00	744	94%
110	Ralston Reservoir	59	12:14	62	95%
140	Wx-Blue Mountain	59	12:17	62	95%
210	Leyden Confluence	59	12:13	62	95%
300	Van Bibber Park	59	12:14	62	95%
410	Kelly Dam	59	12:12	62	95%
500	Havana Park	59	12:12	62	95%
610	Harvard @ Jackson	59	12:12	62	95%
1370	West Metro FS13	59	12:13	62	95%
1460	Wx-Urban Farm	59	12:30	62	95%
1520	Wx-Marston Lake North	59	12:30	62	95%
1640	SPR at Union Ave.	59	12:11	62	95%
2250	Rosedale	59	12:14	62	95%
3030	WX-Bingham Lake Park	59	12:15	62	95%
4030	Red Garden	59	11:59	62	95%
4080	Twin Sisters	59	12:14	62	95%
4220	Fling's	59	12:16	62	95%
4320	Lee Hill Rain 2012	59	12:16	62	95%
4530	Winiger Ridge	59	12:13	62	95%
4810	Shanahan Ridge	59	11:57	62	95%
5940	Log Jumper	59	12:01	62	95%
3020	Wx-West Creek WX	708	1:00	744	95%
2880	Happy Canyon at N Surrey Dr	185	1:00	194	95%
100140	A2-Upper Sellers Gulch Precip	710	1:00	744	95%
220	Upper Leyden	60	12:00	62	97%
310	Guy Hill Ranch	60	11:57	62	97%
320	Sports Complex	60	11:58	62	97%
400	Montview Park	60	12:00	62	97%
520	Jewell Detention	60	11:57	62	97%
630	Temple Pond at DTC	60	11:57	62	97%
710	Horseshoe Park Drop	60	11:58	62	97%
730	No Name @ Quincy	60	12:26	62	97%
760	Mission Viejo Park	60	12:12	62	97%
810	Granby Ditch @ 6th	60	12:12	62	97%
840	Fire Station 12	60	12:00	62	97%
1320	SPR at 3rd Ave	60	12:12	62	97%
1350	Chatfield COE	60	12:00	62	97%
1440	Wx-Elbert	60	12:15	62	97%
1480	Third Creek at DIA	60	12:14	62	97%
1570	Wx-Brighton Ditch	60	12:15	62	97%
1600	Englewood Dam	60	12:12	62	97%
1700	Cherry Cr @ Champa	60	12:14	62	97%
1720	Cherry Cr @ Steele	60	12:12	62	97%
1800	Sand Creek Park	60	12:12	62	97%
1900	Niver Detention	60	11:57	62	97%
2240	Cold Sprg Glch conf	60	11:13	62	97%
2350	Idledale	60	12:14	62	97%
2840	Sulphur Gulch	60	11:59	62	97%
2860	CC at Stroh Rd	60	11:57	62	97%
2930	Wx-Spring Valley Rd-DougCnty	60	12:15	62	97%
2950	DC Public Works	60	12:00	62	97%

3080	Tallman Gulch	60	12:14	62	97%
4010	Crescent	60	11:58	62	97%
4060	Lakeshore	60	12:13	62	97%
4170	Pine Brook	60	12:15	62	97%
4240	Sunset	60	12:14	62	97%
4710	Wx-Ward C-1	60	12:00	62	97%
4820	Doudy Draw	60	11:57	62	97%
4880	Whispering Pines	60	11:57	62	97%
3050	East/West Trailhead	723	1:00	744	97%
6601	Wx-A2-Magnolia WX-Precip	182	4:00	186	98%
120	West Woods	61	11:58	62	98%
150	Nott Creek	61	11:57	62	98%
200	Leyden Reservoir	61	11:57	62	98%
510	Virginia Court	61	11:58	62	98%
640	Goldsmith @ Eastman	61	11:58	62	98%
800	Sable Ditch @ 18th	61	11:57	62	98%
820	ETG @ Buckley	61	11:57	62	98%
830	Side Creek Park	61	12:00	62	98%
850	Flying J	61	12:00	62	98%
950	Piney at Liverpool	61	11:57	62	98%
970	Pump Sta 3	61	12:00	62	98%
1060	Heritage Square	61	11:57	62	98%
1110	Gunbarrel	61	11:58	62	98%
1420	Wx-A2-Diamond Hill	61	12:00	62	98%
2210	Wx-Hiwan G.C.	61	12:00	62	98%
2310	Genesee Village	61	11:42	62	98%
2730	Wx-Salisbury Park	61	12:00	62	98%
2870	Cottonwood (Apache)	61	12:00	62	98%
2990	Wx-Tomah Rd-DougCnty	61	12:00	62	98%
4020	Rio Grande	61	11:58	62	98%
4050	Walker Ranch	61	12:13	62	98%
4100	Filter Plant	61	12:00	62	98%
4130	Swiss Peaks	61	11:57	62	98%
4160	Sunshine	61	11:49	62	98%
4190	Slaughterhouse	61	12:14	62	98%
4260	Taylor Mountain	61	11:58	62	98%
4300	Big Elk Park	61	11:43	62	98%
4310	Johnny Park	61	12:13	62	98%
4350	Conifer Hill	61	11:57	62	98%
4520	Eagle Ridge	61	12:00	62	98%
4550	Boulder Jail	61	11:57	62	98%
4570	St. Antons	61	11:59	62	98%
4730	Wx-Sugarloaf	61	12:00	62	98%
4750	Wx-Louisville Lake	61	12:00	62	98%
4860	Fairview Peak	61	12:00	62	98%
5810	Stump Bump	61	12:00	62	98%
100100	A2-Blackstone Precip	61	12:00	62	98%
100110	A2-ETG @ Hampden Precip	61	12:00	62	98%
2800	Columbine Open Space	736	1:00	744	99%
100270	Wx-A2-WestCreek (Hayman) - Precip	738	1:00	744	99%
100500	Upper Coal Creek at Camp Eden Rd - Precipitation	738	1:00	744	99%
3060	Fire Sta 47	739	1:00	744	99%
2810	Pine Cliff Road	741	1:00	744	100%
100240	A2-Westerly Cr Dam Precip	741	1:00	744	100%
100300	A2-CoalCreek at McCaslin - Precip	741	1:00	744	100%
100420	A2-Thorncreek - Precip	741	1:00	744	100%
3040	CC @ Russelville Road Precip	742	1:00	744	100%
4850	Porphyry Mtn	742	1:00	744	100%
100160	A2-Sand Creek at Colfax Precip	742	1:00	744	100%

100	A2-Carr Street	743	1:00	744	100%
870	A2-Murphy Creek GC	743	1:00	744	100%
1000	A2-Maple Grove Resv.	743	1:00	744	100%
1310	LDC at 64th	743	1:00	744	100%
1340	Sanderson at Xavier	743	1:00	744	100%
3070	A2-Newlin Gulch Precip	743	1:00	744	100%
100230	A2-Havana Pond Precip	743	1:00	744	100%
100290	A2-PlumCr at Sedalia - Precip	743	1:00	744	100%
100320	A2-Weir Gulch - Precip	743	1:00	744	100%
100410	A2-Brantner Gulch - Precip	743	1:00	744	100%
440	Fire Station #7	62	11:44	62	100%
530	Fire Station #19	62	11:57	62	100%
600	Harvard Gulch Park	62	11:58	62	100%
750	Wx-Quincy Reservoir	62	12:00	62	100%
1030	NREL/S. Table Mtn.	62	11:57	62	100%
1300	Hidden Lake	62	11:58	62	100%
1550	Lakewood CC	62	11:57	62	100%
1920	Wx-Brighton	62	12:00	62	100%
2260	Brook Forest	62	11:58	62	100%
4090	Magnolia	62	11:57	62	100%
4840	SBC@S Boulder Ditch	62	11:57	62	100%
5730	West Creek	62	11:48	62	100%
5740	Trail Creek	62	12:00	62	100%
5860	Cedar Mountain	62	11:47	62	100%
5880	Hackett Mountain	62	11:58	62	100%
100200	Wx-A2-OneRain Weather - Precipitation	62	12:00	62	100%
920	Wx-Aurora Town Hall	63	11:32	62	100%
4150	Gold Hill	63	11:23	62	100%
1050	Jeffco Fairgrounds	64	11:02	62	100%
2970	Rampart Range Rd-Satellite	254		254	100%
5900	Horse Creek-Satellite	606		606	100%
3090	A2-Highland Heritage Park	745	1:00	744	100%

Rain Event Performance	Reports Received	Reports Received	12,308	Analyze Rain Sensors							<<show stations with zero rain (1=yes, 0=no)							
	Systemwide Avg	Total Tips	12,819															
	95.65%	Data Loss	3.99%															
Description	Sensor	Performance	1-tips	2-tips	3-tips	4-tips	5-tips	6-tips	>6-tips	Rcv	Exp	Miss	Hold	Bucket				
Little Narrows	4470	43%	1	1	0	1	0	0	0	3	7	4	0	0.0393701				
El Rancho	2340	59%	28	2	1	1	0	0	3	32	54	22	0	0.0393701	Mean		64.17	
Morrison	2330	70%	36	17	2	1	0	0	0	56	80	24	0	0.0393701	Median		60	
Cannon Mountain	4270	76%	48	9	4	1	0	0	0	62	82	20	1	0.0393701	St. Dev		26.75	
Slaughterhouse Glch	1620	80%	15	0	0	0	1	0	1	16	20	4	0	0.0393701	Mean plus 3 SD		144.4	
A2-Thorncreek - Precip	100420	81%	54	12	2	0	0	0	0	68	84	16	0	0.0393701	Mean minus 2 SD		10.67	
Red Hill	4290	83%	69	3	4	0	0	1	0	77	93	16	0	0.0393701	Min		7	
Toll Gate @ 6th	700	85%	29	6	0	0	0	0	0	35	41	6	2	0.0393701	Max		155	
SPR at Henderson	1660	86%	26	3	1	0	0	0	0	30	35	5	0	0.0393701				
Pinewood Springs	4510	86%	50	10	0	0	0	0	0	60	70	10	0	0.0393701				
SBC @ SB Road	4870	86%	67	5	2	1	0	0	0	75	87	12	0	0.0393701				
Dakan Rd	2980	87%	46	8	0	0	0	0	0	54	62	8	0	0.0393701				
Aurora Regional Pond	940	87%	32	1	0	0	1	0	0	34	39	5	0	0.0393701				
Ralston Reservoir	110	88%	59	4	1	1	0	0	0	65	74	9	0	0.0393701				
Niver Detention	1900	88%	27	2	1	0	0	0	0	30	34	4	0	0.0393701				
Wx-Button Rock	4790	88%	47	5	1	0	0	0	0	53	60	7	0	0.0393701				
Wx-Castle Rock	2750	88%	33	5	0	0	0	0	0	38	43	5	0	0.0393701				
Martin Gulch	4040	89%	83	10	1	0	0	0	0	94	106	12	0	0.0393701				
Iliff Pond	650	89%	42	6	0	0	0	0	0	48	54	6	0	0.0393701				
A2-Upper Sellers Gulch Precip	100140	89%	37	2	0	1	0	0	0	40	45	5	0	0.0393701				
Havana Park	500	90%	39	3	1	0	0	0	0	43	48	5	0	0.0393701				
Wx-Elbert	1440	90%	25	1	1	0	0	0	0	27	30	3	0	0.0393701				
Jewell Detention	520	90%	52	4	1	0	0	0	0	57	63	6	0	0.0393701				
Kinney Peak	2280	91%	62	5	1	0	0	0	0	68	75	7	0	0.0393701				
Wx-A2-Trumbull (Hayman) - Precip	100260	91%	35	4	0	0	0	0	0	39	43	4	0	0.0393701				
Confluence Pond	720	91%	38	2	1	0	0	0	0	41	45	4	0	0.0393701				
Log Jumper	5940	91%	39	4	0	0	0	0	0	43	47	4	0	0.0393701				
Fire Station 12	840	92%	30	3	0	0	0	0	0	33	36	3	0	0.0393701				
Spruce Mt - Douglas	2890	92%	43	2	1	0	0	0	0	46	50	4	0	0.0393701				
Cub Cr below Blue	2270	92%	33	1	1	0	0	0	0	35	38	3	0	0.0393701				
Sable Ditch @ 18th	800	92%	44	2	1	0	0	0	0	47	51	4	0	0.0393701				
Eagle Ridge	4520	92%	66	4	1	0	0	0	0	71	77	6	0	0.0393701				
Wx-Louisville Lake	4750	92%	91	6	1	0	0	0	0	98	106	8	0	0.0393701				
Bear Cr below Cub	2230	93%	63	3	1	0	0	0	0	67	72	5	0	0.0393701				
Hansen Rain	4330	93%	92	4	0	1	0	0	0	97	104	7	0	0.0393701				
Granby Ditch @ 6th	810	93%	40	1	1	0	0	0	0	42	45	3	0	0.0393701				
Choke Cherry Resvr	2320	93%	66	5	0	0	0	0	0	71	76	5	0	0.0393701				
Wx-Ward C-1	4710	93%	67	3	1	0	0	0	0	71	76	5	0	0.0393701				
Expo Park	420	93%	53	4	0	0	0	0	0	57	61	4	0	0.0393701				
Cold Sprg Glch conf	2240	94%	29	0	1	0	0	0	0	30	32	2	0	0.0393701				
Justice Center	4360	94%	101	5	1	0	0	0	0	107	114	7	0	0.0393701				
Red Rocks Park	2370	94%	72	5	0	0	0	0	0	77	82	5	0	0.0393701				
Wx-Brighton Ditch	1570	94%	59	4	0	0	0	0	0	63	67	4	0	0.0393701				
Quincy/Highline	620	94%	45	3	0	0	0	0	0	48	51	3	0	0.0393701				
Chatfield COE	1350	94%	46	3	0	0	0	0	0	49	52	3	0	0.0393701				
Broomfield 3207	1200	94%	31	2	0	0	0	0	0	33	35	2	0	0.0393701				
Virginia Court	510	94%	48	3	0	0	0	0	0	51	54	3	0	0.0393701				
Louisville Rec Ctr	1100	94%	32	2	0	0	0	0	0	34	36	2	1	0.0393701				
Wx-Marston Lake North	1520	95%	65	4	0	0	0	0	0	69	73	4	0	0.0393701				
Indian Hills	2360	95%	67	2	1	0	0	0	0	70	74	4	0	0.0393701				
WX-Bingham Lake Park	3030	95%	66	4	0	0	0	0	0	70	74	4	0	0.0393701				
Wx-A2-WestCreek (Hayman) - Precip	100270	95%	33	2	0	0	0	0	0	35	37	2	0	0.0393701				
Cherry Cr bl Bayou Glch	2850	95%	83	5	0	0	0	0	0	88	93	5	0	0.0393701				
Upper Leyden	220	95%	72	4	0	0	0	0	0	76	80	4	0	0.0393701				
SPR at 3rd Ave	1320	95%	54	3	0	0	0	0	0	57	60	3	0	0.0393701				
Sand Creek Park	1800	95%	37	0	1	0	0	0	0	38	40	2	0	0.0393701				
Tallman Gulch	3080	95%	36	2	0	0	0	0	0	38	40	2	0	0.0393701				

Indian Creek	2960	95%	56	3	0	0	0	0	0	0	59	62	3	0	0.0393701
Twin Sisters	4080	95%	56	3	0	0	0	0	0	0	59	62	3	0	0.0393701
Betasso	4110	95%	131	7	0	0	0	0	0	0	138	145	7	0	0.0393701
Genesee Village	2310	95%	76	4	0	0	0	0	0	0	80	84	4	0	0.0393701
Cherry Cr @ Steele	1720	95%	39	2	0	0	0	0	0	0	41	43	2	0	0.0393701
Wx-Aurora Town Hall	920	95%	59	3	0	0	0	0	0	0	62	65	3	0	0.0393701
LDC at 64th	1310	95%	40	2	0	0	0	0	0	0	42	44	2	1	0.0393701
Denver Zoo	1360	95%	60	3	0	0	0	0	0	0	63	66	3	0	0.0393701
SPR at Union Ave.	1640	95%	40	2	0	0	0	0	0	0	42	44	2	0	0.0393701
Lee Hill Rain 2012	4320	95%	101	3	1	0	0	0	0	0	105	110	5	0	0.0393701
Four Mile Creek	5720	95%	20	1	0	0	0	0	0	0	21	22	1	0	0.0393701
Trail Creek	5740	95%	20	1	0	0	0	0	0	0	21	22	1	0	0.0393701
Harvard @ Jackson	610	96%	41	2	0	0	0	0	0	0	43	45	2	0	0.0393701
Jeffco Fairgrounds	1050	96%	82	4	0	0	0	0	0	0	86	90	4	0	0.0393701
East Cherry Cr-Douglas	2910	96%	41	2	0	0	0	0	0	0	43	45	2	0	0.0393701
Stump Bump	5810	96%	21	1	0	0	0	0	0	0	22	23	1	0	0.0393701
WX-EPC at Hwy 105	3010	96%	43	2	0	0	0	0	0	0	45	47	2	0	0.0393701
Walker Ranch	4050	96%	65	3	0	0	0	0	0	0	68	71	3	0	0.0393701
SBC @ San Souci	4830	96%	137	6	0	0	0	0	0	0	143	149	6	0	0.0393701
Bear Creek @ Lowell	1530	96%	69	3	0	0	0	0	0	0	72	75	3	0	0.0393701
Shop Creek	1710	96%	46	2	0	0	0	0	0	0	48	50	2	0	0.0393701
Lazy Acres	4200	96%	92	4	0	0	0	0	0	0	96	100	4	0	0.0393701
Conifer Hill	4350	96%	70	3	0	0	0	0	0	0	73	76	3	0	0.0393701
Shanahan Ridge	4810	96%	122	5	0	0	0	0	0	0	127	132	5	0	0.0393701
Red Garden	4030	96%	102	2	1	0	0	0	0	0	105	109	4	0	0.0393701
Lena @ U.S. Hwy 6	1040	96%	77	3	0	0	0	0	0	0	80	83	3	0	0.0393701
Geer Canyon	4250	96%	103	4	0	0	0	0	0	0	107	111	4	0	0.0393701
Happy Canyon at N Surrey Dr	2880	96%	53	2	0	0	0	0	0	1	55	57	2	0	0.0393701
Third Creek at DIA	1480	96%	53	2	0	0	0	0	0	0	55	57	2	0	0.0393701
Utah Park	430	97%	80	3	0	0	0	0	0	0	83	86	3	0	0.0393701
Johnny Park	4310	97%	54	2	0	0	0	0	0	0	56	58	2	0	0.0393701
Apple Valley	4490	97%	56	0	1	0	0	0	0	0	57	59	2	0	0.0393701
Fling's	4220	97%	60	2	0	0	0	0	0	0	62	64	2	0	0.0393701
A2-CoalCreek at McCaslin - Precip	100300	97%	95	3	0	0	0	0	0	0	98	101	3	0	0.0393701
Haskins Gulch Conf	2820	97%	65	2	0	0	0	0	0	0	67	69	2	0	0.0393701
A2-Weir Gulch - Precip	100320	97%	65	2	0	0	0	0	0	0	67	69	2	0	0.0393701
Bear Peak	4070	97%	98	3	0	0	0	0	0	0	101	104	3	0	0.0393701
Goldsmith @ Eastman	640	97%	33	1	0	0	0	0	0	0	34	35	1	0	0.0393701
Rio Grande	4020	97%	100	3	0	0	0	0	0	0	103	106	3	0	0.0393701
Heritage Square	1060	97%	68	2	0	0	0	0	0	0	70	72	2	0	0.0393701
Lakeshore	4060	97%	71	2	0	0	0	0	0	0	73	75	2	0	0.0393701
A2-Sand Creek at Colfax Precip	100160	97%	36	1	0	0	0	0	0	0	37	38	1	0	0.0393701
Gold Lake	4180	97%	73	2	0	0	0	0	0	0	75	77	2	0	0.0393701
Lakewood CC	1550	97%	74	2	0	0	0	0	0	0	76	78	2	0	0.0393701
Sulphur Gulch	2840	97%	37	1	0	0	0	0	0	0	38	39	1	0	0.0393701
Wx-Cal-Wood Ranch	4770	97%	74	2	0	0	0	0	0	0	76	78	2	0	0.0393701
Wx-Brighton	1920	98%	39	1	0	0	0	0	0	0	40	41	1	0	0.0393701
Denver West	1010	98%	79	2	0	0	0	0	0	0	81	83	2	0	0.0393701
ETG @ Buckley	820	98%	40	1	0	0	0	0	0	0	41	42	1	0	0.0393701
Sanderson at Xavier	1340	98%	80	2	0	0	0	0	0	0	82	84	2	0	0.0393701
Idledale	2350	98%	80	2	0	0	0	0	0	0	82	84	2	0	0.0393701
Doudy Draw	4820	98%	120	3	0	0	0	0	0	0	123	126	3	0	0.0393701
Slaughterhouse	4190	98%	82	2	0	0	0	0	0	0	84	86	2	0	0.0393701
Rosedale	2250	98%	84	2	0	0	0	0	0	0	86	88	2	0	0.0393701
Cherry Cr @ Champa	1700	98%	43	1	0	0	0	0	0	0	44	45	1	0	0.0393701
Parker/Mississippi	540	98%	44	1	0	0	0	0	0	0	45	46	1	0	0.0393701
Wx-Spring Valley Rd-DougCnty	2930	98%	44	1	0	0	0	0	0	0	45	46	1	0	0.0393701
Willow Creek - DougCnty	2940	98%	44	1	0	0	0	0	0	0	45	46	1	0	0.0393701
Fire Sta 47	3060	98%	45	1	0	0	0	0	0	0	46	47	1	0	0.0393701
A2-Westerly Cr Dam Precip	100240	98%	46	1	0	0	0	0	0	0	47	48	1	0	0.0393701
Nott Creek	150	98%	95	2	0	0	0	0	0	0	97	99	2	0	0.0393701
Pine Cliff Road	2810	98%	48	1	0	0	0	0	0	0	49	50	1	0	0.0393701

DC Public Works	2950	98%	48	1	0	0	0	0	0	0	49	50	1	0	0.0393701		
SBC@S Boulder Ditch	4840	98%	149	3	0	0	0	0	0	0	152	155	3	0	0.0393701		
Temple Pond at DTC	630	98%	100	2	0	0	0	0	0	0	102	104	2	0	0.0393701		
Powers Park	1500	98%	101	2	0	0	0	0	0	0	103	105	2	0	0.0393701		
Fire Station #19	530	98%	51	1	0	0	0	0	0	0	52	53	1	0	0.0393701		
Kelly Dam	410	98%	53	1	0	0	0	0	0	0	54	55	1	0	0.0393701		
Pump Sta 3	970	98%	53	1	0	0	0	0	0	0	54	55	1	0	0.0393701		
West Metro FS13	1370	98%	55	1	0	0	0	0	0	0	56	57	1	0	0.0393701		
Winger Ridge	4530	98%	57	1	0	0	0	0	0	0	58	59	1	0	0.0393701		
Golden Age	4230	98%	58	1	0	0	0	0	0	0	59	60	1	0	0.0393701		
Big Elk Park	4300	98%	58	1	0	0	0	0	0	0	59	60	1	0	0.0393701		
West Woods	120	98%	59	1	0	0	0	0	0	0	60	61	1	0	0.0393701		
Leyden Reservoir	200	98%	59	1	0	0	0	0	0	0	60	61	1	0	0.0393701		
Rampart Range Rd-Satellite	2970	98%	59	1	0	0	0	0	0	0	60	61	1	0	0.0393701		
Upper Sloan Det.	1400	98%	60	1	0	0	0	0	0	0	61	62	1	0	0.0393701		
Sports Complex	320	99%	65	1	0	0	0	0	0	0	66	67	1	0	0.0393701		
Taylor Mountain	4260	99%	69	1	0	0	0	0	0	0	70	71	1	0	0.0393701		
Russelville Gulch-Douglas	2900	99%	70	1	0	0	0	0	0	0	71	72	1	0	0.0393701		
Leyden Confluence	210	99%	71	1	0	0	0	0	0	0	72	73	1	0	0.0393701		
Logan Mill	4140	99%	75	1	0	0	0	0	0	1	76	77	1	0	0.0393701		
Wx-Hiwan G.C.	2210	99%	76	1	0	0	0	0	0	0	77	78	1	0	0.0393701		
Pine Brook	4170	99%	106	1	0	0	0	0	0	0	107	108	1	0	0.0393701		
Gold Hill	4150	99%	123	1	0	0	0	0	0	0	124	125	1	0	0.0393701		
Boulder Jail	4550	99%	123	1	0	0	0	0	0	0	124	125	1	0	0.0393701		
Wx-West Creek WX	3020	100%	53	0	0	0	0	0	0	1	53	53	0	0	0.0393701		
A2-Brantner Gulch - Precip	100410	100%	37	0	0	0	0	0	0	0	37	37	0	0	0.0393701		
A2-Carr Street	100	100%	65	0	0	0	0	0	0	0	65	65	0	0	0.0393701		
Wx-Blue Mountain	140	100%	93	0	0	0	0	0	0	0	93	93	0	0	0.0393701		
Van Bibber Park	300	100%	59	0	0	0	0	0	0	0	59	59	0	0	0.0393701		
Guy Hill Ranch	310	100%	61	0	0	0	0	0	0	0	61	61	0	0	0.0393701		
Van Bibber @ Hwy 93	330	100%	36	0	0	0	0	0	0	0	36	36	0	0	0.0393701		
Montview Park	400	100%	55	0	0	0	0	0	0	0	55	55	0	0	0.0393701		
Fire Station #7	440	100%	52	0	0	0	0	0	0	0	52	52	0	0	0.0393701		
Harvard Gulch Park	600	100%	68	0	0	0	0	0	0	0	68	68	0	0	0.0393701		
Horseshoe Park Drop	710	100%	41	0	0	0	0	0	0	0	41	41	0	0	0.0393701		
No Name @ Quincy	730	100%	54	0	0	0	0	0	0	0	54	54	0	0	0.0393701		
Wx-Quincy Reservoir	750	100%	49	0	0	0	0	0	0	0	49	49	0	0	0.0393701		
Mission Viejo Park	760	100%	41	0	0	0	0	0	0	0	41	41	0	0	0.0393701		
Side Creek Park	830	100%	43	0	0	0	0	0	0	0	43	43	0	0	0.0393701		
Flying J	850	100%	47	0	0	0	0	0	0	0	47	47	0	2	0.0393701		
A2-Murphy Creek GC	870	100%	37	0	0	0	0	0	0	0	37	37	0	0	0.0393701		
Piney at Liverpool	950	100%	55	0	0	0	0	0	0	0	55	55	0	0	0.0393701		
A2-Maple Grove Resv.	1000	100%	60	0	0	0	0	0	0	0	60	60	0	0	0.0393701		
NREL/S. Table Mtn.	1030	100%	11	0	0	0	0	0	0	0	11	11	0	0	0.0393701		
Gunbarrel	1110	100%	119	0	0	0	0	0	0	0	119	119	0	0	0.0393701		
Hidden Lake	1300	100%	38	0	0	0	0	0	0	0	38	38	0	0	0.0393701		
Wx-A2-Diamond Hill	1420	100%	42	0	0	0	0	0	0	0	42	42	0	0	0.0393701		
Wx-Urban Farm	1460	100%	55	0	0	0	0	0	0	0	55	55	0	0	0.0393701		
Englewood Dam	1600	100%	47	0	0	0	0	0	0	0	47	47	0	0	0.0393701		
Brook Forest	2260	100%	85	0	0	0	0	0	0	0	85	85	0	0	0.0393701		
Wx-Highlands Ranch WTP	2710	100%	42	0	0	0	0	0	0	0	42	42	0	0	0.0393701		
Wx-Salisbury Park	2730	100%	37	0	0	0	0	0	0	0	37	37	0	0	0.0393701		
Columbine Open Space	2800	100%	52	0	0	0	0	0	0	0	52	52	0	0	0.0393701		
CC at Stroh Rd	2860	100%	48	0	0	0	0	0	0	0	48	48	0	0	0.0393701		
Cottonwood (Apache)	2870	100%	48	0	0	0	0	0	0	0	48	48	0	0	0.0393701		
West Cherry Head-Douglas Cnty	2920	100%	43	0	0	0	0	0	0	0	43	43	0	0	0.0393701		
Wx-Tomah Rd-DougCnty	2990	100%	59	0	0	0	0	0	0	0	59	59	0	0	0.0393701		
CC @ Russelville Road Precip	3040	100%	44	0	0	0	0	0	0	0	44	44	0	0	0.0393701		
East/West Trailhead	3050	100%	58	0	0	0	0	0	0	0	58	58	0	0	0.0393701		
A2-Newlin Gulch Precip	3070	100%	44	0	0	0	0	0	0	0	44	44	0	0	0.0393701		
A2-Highland Heritage Park	3090	100%	62	0	0	0	0	0	0	0	62	62	0	1	0.0393701		
Crescent	4010	100%	92	0	0	0	0	0	0	0	92	92	0	0	0.0393701		

Magnolia	4090	100%	96	0	0	0	0	0	0	96	96	0	0	0.0393701		
Filter Plant	4100	100%	119	0	0	0	0	0	0	119	119	0	0	0.0393701		
Swiss Peaks	4130	100%	86	0	0	0	0	0	0	86	86	0	1	0.0393701		
Sunshine	4160	100%	106	0	0	0	0	0	0	106	106	0	0	0.0393701		
Sunset	4240	100%	64	0	0	0	0	0	0	64	64	0	0	0.0393701		
Riverside	4340	100%	74	0	0	0	0	0	0	74	74	0	0	0.0393701		
St. Antons	4570	100%	70	0	0	0	0	0	0	70	70	0	0	0.0393701		
Wx-Sugarloaf	4730	100%	78	0	0	0	0	0	0	78	78	0	0	0.0393701		
Whispering Pines	4880	100%	94	0	0	0	0	0	0	94	94	0	0	0.0393701		
West Creek	5730	100%	26	0	0	0	0	0	0	26	26	0	0	0.0393701		
Cedar Mountain	5860	100%	19	0	0	0	0	0	0	19	19	0	0	0.0393701		
Hackett Mountain	5880	100%	18	0	0	0	0	0	0	18	18	0	0	0.0393701		
Horse Creek-Satellite	5900	100%	18	0	0	0	0	0	0	18	18	0	0	0.0393701		
A2-Blackstone Precip	100100	100%	40	0	0	0	0	0	0	40	40	0	0	0.0393701		
A2-ETG @ Hampden Precip	100110	100%	46	0	0	0	0	0	0	46	46	0	0	0.0393701		
A2-Sellers Gulch at Haystack Precip	100150	100%	48	0	0	0	0	0	0	48	48	0	0	0.0393701		
A2-Havana Pond Precip	100230	100%	38	0	0	0	0	0	0	38	38	0	0	0.0393701		
A2-PlumCr at Sedalia - Precip	100290	100%	60	0	0	0	0	0	0	60	60	0	0	0.0393701		
Upper Coal Creek at Camp Eden Rd - Precipitation	100500	100%	83	0	0	0	0	0	0	83	83	0	0	0.0393701		
		Total Tips	11863	394	40	8	2	1								
Porphory Mtn	4850	98%	282	3	1	0	0	0	0	286	291	5	0	0.01		
Fairview Peak	4860	98%	320	6	0	0	0	0	0	326	332	6	3	0.01		
Wx-A2-Magnolia WX-Precip	6601	100%	252	1	0	0	0	0	0	253	254	1	0	0.01		
Wx-A2-OneRain Weather - Precipitation	100200	89%	291	30	2	2	0	0	0	325	365	40	7	0.01		

2018 Monthly Peak Hour ALERT Radio Traffic Summary

