

Memo



Date: November 3, 2009
To: Kevin Stewart
From: Markus Ritsch
Subject: October 2009 ALERT Data Analysis

I. ALERT Data Source

Raw ALERT data records extracted from the Urban Drainage and Flood Control District's Nova Star 4.0 base station (ALERT 2) were analyzed for the period October 1 through October 31, 2009.

II. General System Analysis Summary

A total of 320,482 ALERT data reports were analyzed from the ALERT 2 base station. Meteorological sensors account for 78 percent, water level sensors 7 percent, and rain sensors 5 percent of the total monthly records.

The system-wide radio traffic loading was 10,338 reports per day with an average hourly loading of 431 reports. The peak hourly traffic loading was 792 reports, which occurred on October 5, between 5:00 PM and 6:00 PM. A plot of monthly average and peak hourly traffic loading is provided.

A. Specific Issues Identified this Month

The performance of the following sensors, highlighted in yellow in the table below, was unacceptable this month.

Table 1. Rain Sensors with Unacceptable Performance Characteristics

Rain ID	Description	Timer	Event	Comments
100	Carr Street	0.67	0.75	Poor event performance
700	Toll Gate at 6th	0.40	0.73	Poor timer performance, large jump in count
850	Flying J	0.77	0.96	Poor timer performance
860	Sand Creek at Colfax	1.00	0.64	Poor event performance
900	Aurora Reservoir	0.85	1.0	Large number of invalid reports
920	Aurora Town Hall Wx	0.24	0.83	Poor timer performance and large number of invalid reports
1350	Chatfield COE	0.92	0.89	This sensor is much improved over previous months
1440	Elbert	0.85	0.75	Poor event performance, large jump in count series
1460	Urban Farm	0.32	0.47	Poor overall performance, large jump in count series
1480	Third Creek at DIA	0.37	0.47	Poor overall performance
1520	Marston Lake North	0.79	0.50	Poor event performance, large number of invalid reports
1530	Bear Creek @ Lowell	0.89	0.90	Sensor performance is improved over prior months but still a large number of invalid reports
1570	Brighton Ditch Wx	0.92	0.40	Poor event performance, several large jumps in count series
1700	Cherry Creek at Champa	--	--	No data for the month
2210	Hiwan G.C.	0.83	0.47	Poor event performance
2230	Bear Cr below Cub	0.66	0.71	Poor overall performance
2320	Choke Cherry Resvr	1.00	0.74	Large number of invalid reports
2900	Russelville Gulch	0.38	0.50	New amplifier installed 11/2/2009
2970	Rampart Range Rd	0.11	0.78	Testing new RF path direct to Diamond Hill
4030	Red Garden	0.97	0.92	Large number of invalid reports
4070	Bear Peak	0.94	0.93	This sensor is much improved over previous months
4330	Indian Ruins	0.66	0.95	Poor timer performance and large number of invalid reports

III. Rain Sensor Timer Reporting Summary

The following analysis assumes that each rain sensor has a 12-hour timer-reporting interval. System-wide, the ALERT 2 base station received approximately 90 percent of the non-incrementing timer reports. The worst performing rain sensors for the month are summarized (Table 1).

Table 2. Monthly Summary of Sensors with Poor Timer Performance (Sensor ID)

Jan*	Feb*	Mar*	Apr	May	Jun	Jul	Aug	Sep	Oct*	Nov	Dec
2850	4030	2840	1360	1350	2900	2270	1350	920	2970		
1650	4200	1020	1640	2850	2270	2370	920	1700	920		
1810	4490	1040	2270	2270	2850	2850	2360	2970	700		
4250	4520	1720	1600	410	410	1350	2350	2900	2920		
4790	4790	1030	2850	540	540	1530	2900	4330	1480		
4300	4020	1550	1350	2320	1350	110	1460	1480	2900		

*-Timer statistics are skewed in these months because system start-up/shut-down occurs. The rain/stage network is operational between April 1 and October 15. Only the weather stations remain operational throughout the year.

Sensor ID 1460 and 700 have a 24-hour timer-reporting interval and Sensor ID 1810 and 1640 have an 18-hour timer-reporting interval.

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.

IV. 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 3).

Table 3. District-Wide Total Tip/Count Statistical Summary

Statistical Parameter	Value	Comments
Mean	30.24	Only the 1-mm rain sensors were included in the analysis
Median	29.00	Only the 1-mm rain sensors were included in the analysis
Standard deviation	15.10	Only the 1-mm rain sensors were included in the analysis
Mean plus three standard deviations	75.30	Only the 1-mm rain sensors were included in the analysis
Minimum total count	1	Squaw Mountain (ID 2190)
Maximum total count	65	Bear Creek at Lowell (ID 1530)

B. Monthly Average Tip/Count Summary

A monthly summary of the District-wide mean total tip/count is presented (Table 4).

Table 4. 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			

*-Event statistics are skewed in these months because system start-up/shut-down occurs. The rain network is operational between April 1 and October 15. Only the weather stations remain operational throughout the year.

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

Several sensors experienced a large jump in the sequential tip count (Table 5).

Table 5. Sensors with a Jump of More than 6 in Sequential Count

Sensor Description	Sensor ID	Comment
Marston Lake North	1520	Multiple jumps in tip count were observed throughout the month
Toll Gate at 6 th	700	Two occurrences of a jump in count of more than 6
Quincy Reservoir	750	One occurrence of a jump in count of more than 6
Sand Cr. At Colfax	860	One occurrence of a jump in count of more than 6

D. Sensor-by-Sensor Incrementing Count Summary

The system-wide reception rate of incrementing, 1-mm tip reports for the month was approximately 92 percent. A total of 4,561 incrementing reports were received and a total of 4,980 were expected. The total loss of incrementing reports for the month was approximately 8.41 percent. Those sensors with the worst event transmission performance are summarized (Table 6).

Table 6. Monthly Summary of Sensors with the Most Missed Tips

Jan	Feb*	Mar*	Apr**	May	Jun	Jul	Aug	Sep	Oct*	Nov	Dec
140	4030	860	860	110	2900	2900	2900	2900	1570		
4490	4470	840	840	1350	540	2320	2810	1460	2210		
1420	4490	700	1640	2320	2320	2820	2320	1570	1480		
4040	4110	2840	2850	2850	110	110	2820	1440	1460		
4160	4510	1340	700	540	1350	1350	1350	1520	1520		
4470	4790	920	1350	1810	2350	2370	1640	4330	220		

* - Event statistics are poor in February, March, and October due to system start-up.

** - Poor event performance is evident at every station because the ALERT2 base station was unable to receive data for part of this month.

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.

V. Heavy Radio Traffic Analysis

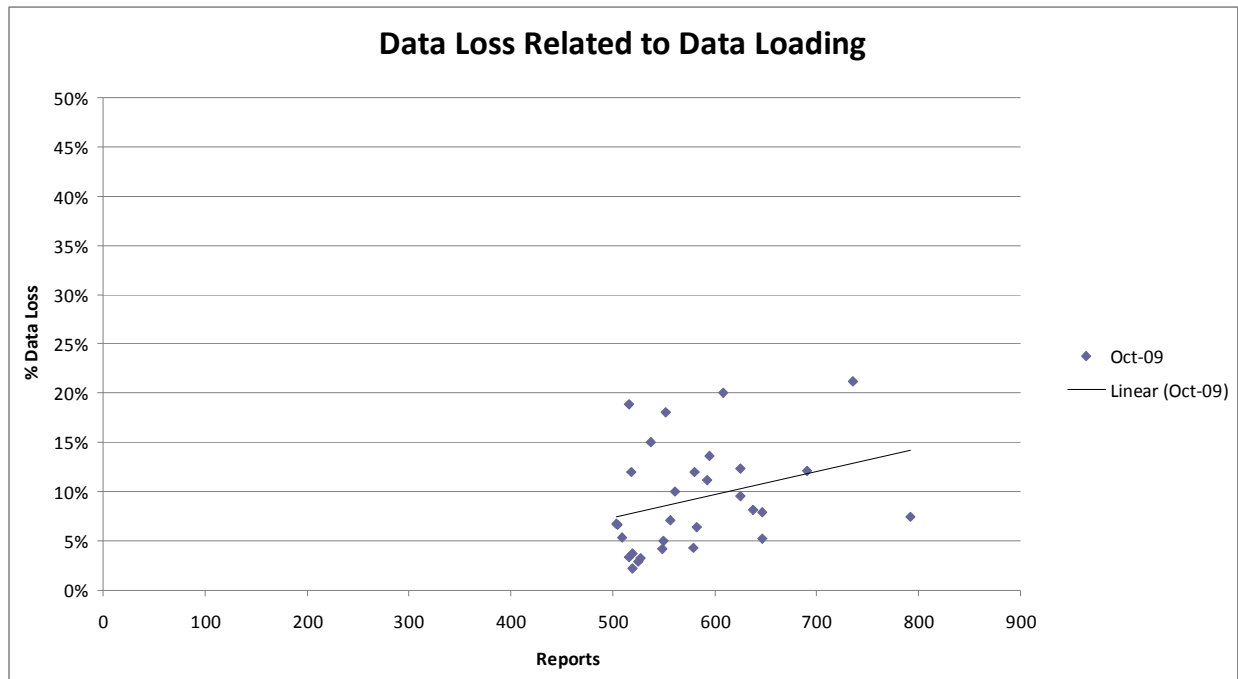
Periods exceeding 500 messages per hour were analyzed independently in an attempt to quantify data loss rates from rain sensors using the sequential tip count series.

A. The Heaviest Hourly Traffic Periods This Month

The hours of highest radio traffic this month include:

Peak Traffic Periods	Reports/hour	Hour Beginning
Peak Hourly Traffic	792	10/5/2009 5:00 PM
2nd Max	735	10/5/2009 6:00 PM
3rd Max	690	10/21/2009 12:00 PM
4th Max	647	10/30/2009 1:00 PM
5th Max	646	10/21/2009 12:00 AM

Each hour exceeding 500 reports was analyzed to quantify the number of missing rain reports for that hour. The following plot shows the loss of data as a function of data loading.



VI. 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 7).

Table 7. Summary of Unknown IDs

Description	Quantity
Total number of unknown IDs (IDs without a device definition)	437
Total reports from unknown IDs	966
Unknown IDs with only a single received report (potential noise)	279
Total reports from all IDs – RecData Log entire month	320,482
Unknown reports as a fraction of total reports	0.30%

The total number of reports from unknown sensors is very small relative to the total reports received for the month.

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 8. Reports Received by Unknown IDs

Unknown Sensor ID	Number of Reports
1470	27
1423	24
1458	16
1454	16
1415	14
1934	13
2811	12
1534	10
1953	9
1926	9
1631	9
1531	9
1950	9
1443	9
1453	8
202	8
2748	8
1954	8
1929	8
1919	8
1501	7
1529	7
1502	7
1486	7
2775	7
910	6
1933	6
152	6
2746	6
1590	6
1167	6
1446	6

1923	6
2239	5
4031	5
1447	5
1457	5
2754	5
1478	5
1506	5
912	5
2352	5
1168	5
207	5
1949	5
1938	5
4047	5
915	5
2715	5
2706	4
1410	4
1413	4
1450	4
1637	4
1948	4
4663	4
1918	4
1587	4
2716	4
2753	4
2756	4
2776	4
2808	4
4054	4
1915	4

The “unknown” device reports are analyzed temporally to understand when they are received during the day (Table 9). The goal of this analysis is to determine a pattern of occurrence that may correspond to a source of noise in the system, such as the use of a wireless microphone nearby.

Table 9. Temporal Distribution of Unknown Reports

Hour (AM)	Reports	Hour (PM)	Reports
0:00-00:59	30	12:00-12:59	40
1:00-1:59	62	1:00-1:59	31
2:00-2:59	42	2:00-2:59	23
3:00-3:59	54	3:00-3:59	23
4:00-4:59	48	4:00-4:59	21
5:00-5:59	58	5:00-5:59	25
6:00-6:59	79	6:00-6:59	42
7:00-7:59	48	7:00-7:59	34
8:00-8:59	46	8:00-8:59	50
9:00-9:59	25	9:00-9:59	68
10:00-10:59	22	10:00-10:59	75
11:00-11:59	20	11:00-11:59	64

VII. Sensors with Invalid Reports

Precipitation sensors with a large number of invalid reports (bit flip/contention errors/random decode):

Sensor ID	Description	July Reports	August Reports	Sept Reports	Oct Reports
310	Guy Hill Ranch	0	0	3	2
330	Van Bibber @ Hwy 93	4	0	0	0
630	Temple Pond at DTC	0	0	3	0
850	Flying J	0	9	3	0
900	Aurora Reservoir	0	0	0	5
920	Aurora Town Hall Wx	3	0	1	16
1350	Chatfield COE	1	4	0	0
1420	Diamond Hill	0	0	0	3
1460	Urban Farm	0	0	0	3
1530	Bear Creek at Lowell	2	5	0	8
2210	Hiwan G.C.	12	6	2	0
2230	Bear Cr below Cub	6	3	3	0
2240	Cold Sprg Glch conf	4	0	0	0
2270	Cub Cr below Blue	3	0	0	1
2320	Choke Cherry Resvr	8	3	3	3
2370	Red Rocks Park	0	5	0	0
2810	Pine Cliff Road	6	0	0	2
2820	Haskins Gulch Conf	5	4	0	0
2860	CC at Stroh Rd	3	7	1	0
4030	Red Garden	2	4	3	4
4070	Bear Peak	0	0	3	1
4260	Taylor Mountain	4	0	0	0
4330	Indian Ruins	0	0	7	5
4770	Cal-Wood Ranch	3	0	0	0
4790	Button Rock	0	0	3	0

The following rainfall intensity summary is presented to corroborate the rainfall rate alarms.

10 Minute Peak Intensities				
Station	Date	Tips	Inches	in/hr
860	10/21/09 4:38 PM	9	0.354	2.126
1520	10/21/09 8:41 PM	9	0.354	2.126
1520	10/22/09 8:41 PM	9	0.354	2.126
4790	10/6/09 1:22 PM	9	0.354	2.126
220	10/6/09 12:36 AM	8	0.315	1.890
2210	10/26/09 7:45 PM	8	0.315	1.890
700	10/31/09 11:58 AM	7	0.276	1.654
140	10/5/09 4:06 PM	6	0.236	1.417
220	10/21/09 12:38 PM	6	0.236	1.417
1480	10/22/09 4:18 PM	6	0.236	1.417
2210	10/22/09 7:44 PM	6	0.236	1.417
1460	10/5/09 11:30 PM	5	0.197	1.181
1460	10/30/09 12:35 PM	5	0.197	1.181
1480	10/31/09 3:42 PM	5	0.197	1.181
1570	10/27/09 11:56 PM	5	0.197	1.181
2210	10/30/09 7:45 PM	5	0.197	1.181
2230	10/26/09 12:42 PM	5	0.197	1.181
2320	10/26/09 2:05 PM	5	0.197	1.181

General System Analysis

P:\A207-UDFCD-Data-Analysis\2009\10-2009\Novastar_extract_2009Oct.mdb

Database Name

First Date in Database

10/1/2009

Last Date in Database

10/31/2009

Total Days

31

Total Hours

744

Total Records Analyzed

320,482

Records by Group

Temperature	54,030	16.9%
Relative Humidity	52,289	16.3%
Wind Gust	47,369	14.8%
Wind Speed Average & Azimuth	24,904	7.8%
Barometric Pressure	24,623	7.7%
Wind Direction	19,962	6.2%
Wind Speed Average	19,252	6.0%
Precipitation	15,077	4.7%
Water Level PT-HSE	13,954	4.4%
Solar Radiation	9,082	2.8%
Battery Voltage HSE	7,870	2.5%
Fuel Temperature	5,310	1.7%
Fuel Moisture	5,304	1.7%
Water Level Float	4,961	1.5%
Battery Voltage Digital	3,866	1.2%
Battery Voltage Analog	3,619	1.1%
Water Level PT	2,053	0.6%
Repeater Status Report	1,996	0.6%
Battery	1,429	0.4%
12Hr Status Report	614	0.2%
Repeater Pass List	607	0.2%
Wing Gust	417	0.1%
Hayman Battery	385	0.1%
Battery Voltage	248	0.1%
Soil Moisture	112	0.0%
Water Level	61	0.0%
Solar Power	27	0.0%
Hayman Stage	18	0.0%
Handar 585 ALARM Status	13	0.0%
Total	319,452	99.7%

Records by Major Group

Meteorologic Sensors	251,511	78.5%
Water Level Sensors	20,968	6.5%
Sensor Status Transmissions	18,612	5.8%
Rain Sensors	15,077	4.7%
Soil and Fuel Sensors	10,726	3.3%
Total	316,894	

Traffic Loading Summary

Alert Reports	320,482	
Average Daily Traffic	10,338	
Average Hourly Traffic	431	
Median Hourly Traffic	422	hour beginning
Peak Hourly Traffic	792	10/5/09 5:00 PM
2nd Max	735	10/5/09 6:00 PM
3rd Max	690	10/21/09 12:00 PM
4th Max	647	10/30/09 1:00 PM
5th Max	646	10/21/09 12:00 AM

Rain Timer Performance

n Timer Performance

Analyze Rain Sensors

12:30

Ave

0.81672427

Rain ID	Description	Rcv	Timer	Exp	Performance
100	Carr Street	42	12:32	62.00	68%
110	Ralston Reservoir	38	13:27	62.00	61%
120	West Woods	54	12:49	62.00	87%
140	Blue Mountain	57	12:30	62.00	92%
150	Nott Creek	61	11:57	62.00	98%
200	Leyden Reservoir	40	12:19	62.00	65%
210	Leyden Confluence	43	12:16	62.00	69%
220	Upper Leyden	33	14:08	62.00	53%
300	Van Bibber Park	58	12:12	62.00	94%
310	Guy Hill Ranch	57	12:26	62.00	92%
320	Sports Complex	26	19:00	62.00	42%
330	Van Bibber @ Hwy 93	41	11:56	62.00	66%
400	Montview Park	45	12:36	62.00	73%
410	Kelly Dam	45	12:56	62.00	73%
420	Expo Park	46	12:20	62.00	74%
430	Utah Park	46	12:45	62.00	74%
440	Fire Station #7	57	11:57	62.00	92%
500	Havana Park	48	12:34	62.00	77%
510	Virginia Court	55	12:14	62.00	89%
520	Jewell Detention	58	12:27	62.00	94%
530	Fire Station #19	57	12:44	62.00	92%
540	Parker/Mississippi	53	13:22	62.00	85%
600	Harvard Gulch Park	52	11:57	62.00	84%
610	Harvard @ Jackson	49	11:39	62.00	79%
620	Quincy/Highline	57	12:28	62.00	92%
630	Temple Pond at DTC	46	12:44	62.00	74%
640	Goldsmith @ Eastman	48	12:16	62.00	77%
650	Iliff Pond	50	11:57	62.00	81%
700	Toll Gate @ 6th	25	0:00	62.00	40%
710	Horseshoe Park Drop	50	12:15	62.00	81%
720	Confluence Pond	51	12:13	62.00	82%
730	No Name @ Quincy	50	11:57	62.00	81%
750	Quincy Reservoir	65	10:40	62.00	105%
760	Mission Viejo Park	59	12:26	62.00	95%
800	Sable Ditch @ 18th	44	13:31	62.00	71%
810	Granby Ditch @ 6th	49	11:57	62.00	79%
820	ETG @ Buckley	48	12:14	62.00	77%
830	Side Creek Park	60	11:57	62.00	97%
840	Fire Station 12	44	12:55	62.00	71%
850	Flying J	48	12:00	62.00	77%
860	Sand Cr at Colfax	93	6:16	62.00	150%
870	Murphy Creek GC	44	14:40	62.00	71%
900	Aurora Reservoir	53	12:46	62.00	85%
920	Aurora Town Hall Wx	15	10:00	62.00	24%
940	Sampson Gulch	58	12:12	62.00	94%
970	Pump Sta 3	58	12:00	62.00	94%
1000	Maple Grove Resv.	58	12:44	62.00	94%
1010	Denver West	56	12:30	62.00	90%
1030	NREL/S. Table Mtn.	57	12:13	62.00	92%
1040	Lena @ U.S. Hwy 6	58	12:13	62.00	94%
1050	Jeffco Fairgrounds	60	11:57	62.00	97%
1060	Heritage Square	54	13:16	62.00	87%
1100	Louisville Rec Ctr	59	12:12	62.00	95%
1110	Gunbarrel	61	11:57	62.00	98%

1200	Broomfield 3207	60	12:11	62.00	97%
1300	Hidden Lake	61	11:58	62.00	98%
1310	LDC at 64th	57	12:41	62.00	92%
1320	SPR at 3rd Ave	59	12:11	62.00	95%
1330	Roslyn	51	12:16	62.00	82%
1340	Sanderson at Xavier	54	12:00	62.00	87%
1350	Chatfield COE	57	12:13	62.00	92%
1360	Denver Zoo	38	16:17	62.00	61%
1370	West Metro FS13	49	14:00	62.00	79%
1400	Upper Sloan Det.	58	12:29	62.00	94%
1420	Diamond Hill	57	12:48	62.00	92%
1440	Elbert	53	12:30	62.00	85%
1460	Urban Farm	20	23:59	62.00	32%
1480	Third Creek at DIA	23	21:56	62.00	37%
1500	Powers Park	48	12:57	62.00	77%
1520	Marston Lake North	49	12:17	62.00	79%
1530	Bear Creek @ Lowell	55	13:24	62.00	89%
1550	Lakewood CC	54	12:32	62.00	87%
1570	Brighton Ditch Wx	57	12:00	62.00	92%
1600	Englewood Dam	47	12:35	62.00	76%
1620	Slaughterhouse Glch	45	13:36	62.00	73%
1640	SPR at Union Ave.	61	12:00	62.00	98%
1660	SPR at Henderson	60	12:25	62.00	97%
1710	Shop Creek	52	14:00	62.00	84%
1720	Cherry Cr @ Steele	59	12:12	62.00	95%
1800	Sand Creek Park	47	12:32	62.00	76%
1810	Sand Creek at mouth	59	12:24	62.00	95%
1900	Niver Detention	54	13:14	62.00	87%
1920	Brighton	51	13:06	62.00	82%
2190	Squaw Mountain	55	13:21	62.00	89%
2210	Hiwan G.C.	52	12:49	62.00	84%
2230	Bear Cr below Cub	41	15:21	62.00	66%
2240	Cold Sprg Glch conf	52	13:51	62.00	84%
2250	Rosedale	50	13:56	62.00	81%
2260	Brook Forest	58	12:41	62.00	94%
2270	Cub Cr below Blue	44	14:21	62.00	71%
2280	Kinney Peak	54	12:59	62.00	87%
2310	Genesee Village	59	12:14	62.00	95%
2320	Choke Cherry Resvr	231		62.00	100%
2330	Morrison	53	12:52	62.00	85%
2340	El Rancho	58	12:39	62.00	94%
2350	Idledale	55	12:43	62.00	89%
2360	Indian Hills	58	12:48	62.00	94%
2370	Red Rocks Park	57	13:21	62.00	92%
2710	Highlands Ranch WTP	61	11:44	62.00	98%
2730	Salisbury Park	61	11:45	62.00	98%
2750	Castle Rock	61	11:59	62.00	98%
2810	Pine Cliff Road	34	12:24	62.00	55%
2820	Haskins Gulch Conf	33	12:23	62.00	53%
2840	Sulphur Gulch	25	11:59	62.00	40%
2850	Cherry Cr bl Bayou Glch	26	11:59	62.00	42%
2860	CC at Stroh Rd	28	11:57	62.00	45%
2870	Cottonwood (Apache)	26	13:00	62.00	42%
2900	Russelville Gulch-Douglas	24	13:12	62.00	39%
2910	East Cherry Cr-Douglas	27	12:30	62.00	44%
2920	West Cherry Head-Douglas Cnty	20	16:14	62.00	32%
2930	Spring Valley Rd - DougCnty	58	12:41	62.00	94%
2940	Willow Creek - DougCnty	25	12:32	62.00	40%
2950	DC Public Works	32	12:49	62.00	52%

2960	Indian Creek	31	14:08	62.00	50%
2970	Rampart Range Rd	7	12:00	62.00	11%
2980	Dakan Rd	35	12:24	62.00	56%
2990	Tomah Rd-Douglas Cnty	60	12:00	62.00	97%
3020	West Creek WX	58	12:14	62.00	94%
4010	Crescent	49	14:24	62.00	79%
4020	Rio Grande	58	12:12	62.00	94%
4030	Red Garden	60	12:14	62.00	97%
4040	Martin Gulch	58	12:15	62.00	94%
4050	Walker Ranch	58	12:47	62.00	94%
4060	Lakeshore	56	12:45	62.00	90%
4070	Bear Peak	58	12:28	62.00	94%
4080	Twin Sisters	53	13:29	62.00	85%
4090	Magnolia	51	13:13	62.00	82%
4100	Filter Plant	59	12:29	62.00	95%
4110	Betasso	57	12:51	62.00	92%
4130	Swiss Peaks	56	12:59	62.00	90%
4140	Logan Mill	50	12:34	62.00	81%
4150	Gold Hill	53	13:33	62.00	85%
4160	Sunshine	58	11:58	62.00	94%
4170	Pine Brook	52	13:59	62.00	84%
4180	Gold Lake	52	13:49	62.00	84%
4190	Slaughterhouse	57	12:45	62.00	92%
4200	Lazy Acres	58	12:29	62.00	94%
4220	Fling's	48	13:54	62.00	77%
4230	Golden Age	60	12:11	62.00	97%
4240	Sunset	48	13:06	62.00	77%
4250	Geer Canyon	61	11:58	62.00	98%
4260	Taylor Mountain	59	12:12	62.00	95%
4270	Cannon Mountain	53	13:31	62.00	85%
4290	Red Hill	56	12:16	62.00	90%
4300	Big Elk Park	59	12:42	62.00	95%
4310	Johnny Park	52	13:09	62.00	84%
4330	Indian Ruins	41	14:45	62.00	66%
4340	Riverside	57	12:42	62.00	92%
4350	Conifer Hill	58	12:13	62.00	94%
4360	Justice Center	56	12:33	62.00	90%
4470	Little Narrows	44	16:29	62.00	71%
4490	Apple Valley	58	12:13	62.00	94%
4510	Pinewood Springs	49	14:12	62.00	79%
4520	Eagle Ridge	57	12:30	62.00	92%
4530	Winiger Ridge	56	13:17	62.00	90%
4550	Boulder Jail	60	11:57	62.00	97%
4570	St. Antons	51	13:56	62.00	82%
4710	Ward C-1	60	11:58	62.00	97%
4730	Sugarloaf	56	13:02	62.00	90%
4750	Louisville Lake	58	12:30	62.00	94%
4770	Cal-Wood Ranch	55	12:38	62.00	89%
4790	Button Rock	56	12:24	62.00	90%
4810	Shanahan Ridge	58	12:15	62.00	94%
4820	Doudy Draw	51	11:58	62.00	82%
4830	SBC @ San Souci	59	12:28	62.00	95%
4840	SBC@S Boulder Ditch	58	12:29	62.00	94%
4850	Porphory Mtn	54	13:06	62.00	87%
4860	Fairview Peak	32	13:30	62.00	52%

Rain Event Performance														
		Reports Received	4,561	Analyze Rain Sensors										
Systemwide Avg		Total Tips	4,980											
91.59%		Data Loss	8.41%											
Rain ID	Performance	1-tips	2-tips	3-tips	4-tips	5-tips	6-tips	>6-tips	Rcv	Exp	Miss	Hold	Bucket	
1570	40%	2	0	1	0	1	0	0	4	10	6	0	0.0393701	
2210	47%	6	0	0	0	1	1	1	8	17	9	0	0.0393701	
1480	47%	6	0	0	0	1	1	0	8	17	9	0	0.0393701	
1460	47%	5	2	0	0	2	0	1	9	19	10	0	0.0393701	
1520	50%	4	3	1	0	1	0	3	9	18	9	0	0.0393701	
220	50%	4	0	0	0	0	1	1	5	10	5	0	0.0393701	
840	50%	6	1	2	2	0	0	0	11	22	11	0	0.0393701	
2900	50%	2	0	0	1	0	0	0	3	6	3	0	0.0393701	
860	64%	5	3	1	0	0	0	1	9	14	5	0	0.0393701	
4820	69%	24	6	3	1	0	0	0	34	49	15	0	0.0393701	
2230	71%	20	3	0	1	1	0	0	25	35	10	0	0.0393701	
2860	71%	3	2	0	0	0	0	0	5	7	2	0	0.0393701	
140	72%	15	2	0	0	0	1	0	18	25	7	0	0.0393701	
700	74%	10	3	1	0	0	0	2	14	19	5	0	0.0393701	
2320	74%	21	6	0	0	1	0	0	28	38	10	0	0.0393701	
1440	75%	4	2	0	0	0	0	0	6	8	2	0	0.0393701	
100	75%	2	1	0	0	0	0	0	3	4	1	0	0.0393701	
2910	75%	2	1	0	0	0	0	0	3	4	1	0	0.0393701	
2250	77%	20	2	1	1	0	0	0	24	31	7	0	0.0393701	
2270	78%	23	4	2	0	0	0	0	29	37	8	0	0.0393701	
2970	79%	9	1	1	0	0	0	0	11	14	3	0	0.0393701	
4570	80%	17	2	0	1	0	0	0	20	25	5	0	0.0393701	
2870	80%	6	2	0	0	0	0	0	8	10	2	0	0.0393701	
2730	83%	14	0	0	1	0	0	0	15	18	3	0	0.0393701	
920	83%	9	0	1	0	0	0	0	10	12	2	0	0.0393701	
1800	83%	8	2	0	0	0	0	0	10	12	2	0	0.0393701	
730	84%	17	4	0	0	0	0	0	21	25	4	0	0.0393701	
2280	84%	23	3	1	0	0	0	0	27	32	5	0	0.0393701	
620	85%	35	2	1	1	0	0	0	39	46	7	0	0.0393701	
4510	85%	41	2	0	2	0	0	0	45	53	8	0	0.0393701	
800	86%	16	1	1	0	0	0	0	18	21	3	0	0.0393701	
4470	86%	44	4	2	0	0	0	0	50	58	8	0	0.0393701	
320	87%	11	2	0	0	0	0	0	13	15	2	0	0.0393701	
3020	88%	27	0	0	0	1	0	0	28	32	4	0	0.0393701	
970	88%	6	1	0	0	0	0	0	7	8	1	0	0.0393701	
4790	88%	42	1	0	0	0	1	0	44	50	6	0	0.0393701	
4230	88%	13	2	0	0	0	0	0	15	17	2	0	0.0393701	
940	89%	35	5	0	0	0	0	0	40	45	5	0	0.0393699	
2240	89%	36	3	1	0	0	0	0	40	45	5	0	0.0393701	
4730	89%	21	3	0	0	0	0	0	24	27	3	0	0.0393701	
4750	89%	14	2	0	0	0	0	0	16	18	2	0	0.0393701	
4010	89%	22	3	0	0	0	0	0	25	28	3	0	0.0393701	
1350	89%	38	3	1	0	0	0	0	42	47	5	0	0.0393701	
4830	89%	45	6	0	0	0	0	0	51	57	6	0	0.0393701	
4130	90%	24	3	0	0	0	0	0	27	30	3	0	0.0393701	
4270	90%	16	2	0	0	0	0	0	18	20	2	0	0.0393701	
1200	90%	8	1	0	0	0	0	0	9	10	1	0	0.0393701	
2750	90%	8	1	0	0	0	0	0	9	10	1	0	0.0393701	
2980	90%	8	1	0	0	0	0	0	9	10	1	0	0.0393701	
2370	90%	43	2	0	1	0	0	0	46	51	5	0	0.0393701	
1420	90%	43	3	1	0	0	0	0	47	52	5	0	0.0393701	
2340	90%	17	2	0	0	0	0	0	19	21	2	0	0.0393701	
750	91%	26	3	0	0	0	0	1	29	32	3	0	0.0393701	
4060	91%	26	3	0	0	0	0	0	29	32	3	0	0.0393701	
1530	91%	53	6	0	0	0	0	0	59	65	6	0	0.0393701	
4810	91%	53	6	0	0	0	0	0	59	65	6	0	0.0393701	
610	91%	28	1	1	0	0	0	0	30	33	3	0	0.0393701	
710	91%	18	2	0	0	0	0	0	20	22	2	0	0.0393701	
1340	91%	47	5	0	0	0	0	0	52	57	5	0	0.0393701	
4160	91%	39	2	1	0	0	0	0	42	46	4	0	0.0393701	
1330	91%	19	2	0	0	0	0	0	21	23	2	0	0.0393701	
1920	91%	19	2	0	0	0	0	0	21	23	2	0	0.0393701	
1620	92%	30	3	0	0	0	0	0	33	36	3	0	0.0393701	
4490	92%	30	3	0	0	0	0	0	33	36	3	0	0.0393701	
1060	92%	20	2	0	0	0	0	0	22	24	2	0	0.0393701	
4310	92%	42	4	0	0	0	0	0	46	50	4	0	0.0393701	
1720	92%	44	2	1	0	0	0	0	47	51	4	0	0.0393701	
4030	92%	43	4	0	0	0	0	0	47	51	4	0	0.0393701	
510	92%	33	3	0	0	0	0	0	36	39	3	0	0.0393701	
500	92%	23	0	1	0	0	0	0	24	26	2	0	0.0393701	
4350	93%	34	3	0	0	0	0	0	37	40	3	0	0.0393701	
4150	93%	23	2	0	0	0	0	0	25	27	2	0	0.0393701	
4070	93%	35	3	0	0	0	0	0	38	41	3	0	0.0393701	

1370	93%	36	3	0	0	0	0	0	39	42	3	0	0.0393701
4200	93%	36	3	0	0	0	0	0	39	42	3	0	0.0393701
4250	93%	53	2	1	0	0	0	0	56	60	4	0	0.0393701
4840	93%	52	4	0	0	0	0	0	56	60	4	0	0.0393701
440	93%	40	3	0	0	0	0	0	43	46	3	0	0.0393701
1600	94%	27	2	0	0	0	0	0	29	31	2	0	0.0393701
4710	94%	27	2	0	0	0	0	0	29	31	2	0	0.0393701
530	94%	41	3	0	0	0	0	0	44	47	3	0	0.0393701
1550	94%	41	3	0	0	0	0	0	44	47	3	0	0.0393701
110	94%	14	1	0	0	0	0	0	15	16	1	0	0.0393701
1360	94%	46	1	1	0	0	0	0	48	51	3	0	0.0393701
330	94%	15	1	0	0	0	0	0	16	17	1	0	0.0393701
4240	94%	15	1	0	0	0	0	0	16	17	1	0	0.0393701
1000	94%	31	2	0	0	0	0	0	33	35	2	0	0.0393701
540	94%	32	2	0	0	0	0	0	34	36	2	0	0.0393701
1710	94%	32	2	0	0	0	0	0	34	36	2	0	0.0393701
2260	94%	32	2	0	0	0	0	0	34	36	2	0	0.0393701
4080	94%	16	1	0	0	0	0	0	17	18	1	0	0.0393701
2330	95%	49	3	0	0	0	0	0	52	55	3	1	0.0393701
4140	95%	33	2	0	0	0	0	0	35	37	2	0	0.0393701
4190	95%	33	2	0	0	0	0	0	35	37	2	0	0.0393701
4180	95%	17	1	0	0	0	0	0	18	19	1	0	0.0393701
4170	95%	35	2	0	0	0	0	0	37	39	2	0	0.0393701
870	95%	18	1	0	0	0	0	0	19	20	1	0	0.0393701
4330	95%	38	2	0	0	0	0	0	40	42	2	0	0.0393701
1900	95%	19	1	0	0	0	0	0	20	21	1	0	0.0393701
1500	95%	40	2	0	0	0	0	0	42	44	2	0	0.0393701
1030	95%	20	1	0	0	0	0	0	21	22	1	0	0.0393701
1050	96%	21	1	0	0	0	0	0	22	23	1	0	0.0393701
4260	96%	21	1	0	0	0	0	0	22	23	1	0	0.0393701
2710	96%	44	0	1	0	0	0	0	45	47	2	0	0.0393701
4550	96%	44	2	0	0	0	0	0	46	48	2	0	0.0393701
1320	96%	45	2	0	0	0	0	0	47	49	2	0	0.0393701
850	96%	23	1	0	0	0	0	0	24	25	1	0	0.0393701
2360	96%	48	2	0	0	0	0	0	50	52	2	0	0.0393701
4220	96%	25	1	0	0	0	0	0	26	27	1	0	0.0393701
300	96%	26	1	0	0	0	0	0	27	28	1	0	0.0393701
650	96%	26	1	0	0	0	0	0	27	28	1	0	0.0393701
410	97%	27	1	0	0	0	0	0	28	29	1	0	0.0393701
830	97%	27	1	0	0	0	0	0	28	29	1	0	0.0393701
1300	97%	27	1	0	0	0	0	0	28	29	1	0	0.0393701
4090	97%	27	1	0	0	0	0	0	28	29	1	0	0.0393701
4340	97%	27	1	0	0	0	0	0	28	29	1	0	0.0393701
4100	97%	28	1	0	0	0	0	0	29	30	1	0	0.0393701
600	97%	29	1	0	0	0	0	0	30	31	1	0	0.0393701
1010	97%	29	1	0	0	0	0	0	30	31	1	0	0.0393701
4020	97%	29	1	0	0	0	0	0	30	31	1	0	0.0393701
1310	97%	31	1	0	0	0	0	0	32	33	1	0	0.0393701
4110	97%	31	1	0	0	0	0	0	32	33	1	0	0.0393701
1400	97%	32	1	0	0	0	0	0	33	34	1	0	0.0393701
4040	97%	33	1	0	0	0	0	0	34	35	1	0	0.0393701
520	97%	34	1	0	0	0	0	0	35	36	1	0	0.0393701
760	97%	34	1	0	0	0	0	0	35	36	1	0	0.0393701
4530	97%	35	1	0	0	0	0	0	36	37	1	0	0.0393701
1810	97%	36	1	0	0	0	0	0	37	38	1	0	0.0393701
1040	98%	38	1	0	0	0	0	0	39	40	1	0	0.0393701
420	98%	40	1	0	0	0	0	0	41	42	1	0	0.0393701
430	98%	40	1	0	0	0	0	0	41	42	1	0	0.0393701
2310	98%	41	1	0	0	0	0	0	42	43	1	0	0.0393701
1640	98%	45	1	0	0	0	0	0	46	47	1	0	0.0393701
2990	98%	46	1	0	0	0	0	0	47	48	1	0	0.0393701
4290	98%	54	1	0	0	0	0	0	55	56	1	0	0.0393701
630	98%	56	1	0	0	0	0	0	57	58	1	0	0.0393701
4360	98%	61	1	0	0	0	0	0	62	63	1	0	0.0393701
1110	100%	38	0	0	0	0	0	0	38	38	0	0	0.0393701
1100	100%	33	0	0	0	0	0	0	33	33	0	0	0.0393701
810	100%	28	0	0	0	0	0	0	28	28	0	0	0.0393701
150	100%	27	0	0	0	0	0	0	27	27	0	0	0.0393701
640	100%	26	0	0	0	0	0	0	26	26	0	0	0.0393701
4300	100%	26	0	0	0	0	0	0	26	26	0	0	0.0393701
120	100%	25	0	0	0	0	0	0	25	25	0	0	0.0393701
400	100%	25	0	0	0	0	0	0	25	25	0	0	0.0393701
2350	100%	25	0	0	0	0	0	0	25	25	0	0	0.0393701
4520	100%	25	0	0	0	0	0	0	25	25	0	0	0.0393701
4770	100%	25	0	0	0	0	0	0	25	25	0	0	0.0393701
1660	100%	24	0	0	0	0	0	0	24	24	0	0	0.0393701
820	100%	22	0	0	0	0	0	0	22	22	0	0	0.0393701

4050	100%	22	0	0	0	0	0	0	22	22	0	0	0.0393701
900	100%	20	0	0	0	0	0	0	20	20	0	0	0.0393699
720	100%	17	0	0	0	0	0	0	17	17	0	0	0.0393701
200	100%	16	0	0	0	0	0	0	16	16	0	0	0.0393701
210	100%	16	0	0	0	0	0	0	16	16	0	0	0.0393701
310	100%	11	0	0	0	0	0	0	11	11	0	0	0.0393701
2810	100%	10	0	0	0	0	0	0	10	10	0	0	0.0393701
2840	100%	8	0	0	0	0	0	0	8	8	0	0	0.0393701
2930	100%	8	0	0	0	0	0	0	8	8	0	0	0.0393701
2850	100%	7	0	0	0	0	0	0	7	7	0	0	0.0393701
2950	100%	7	0	0	0	0	0	0	7	7	0	0	0.0393701
2820	100%	6	0	0	0	0	0	0	6	6	0	0	0.0393701
2960	100%	6	0	0	0	0	0	0	6	6	0	0	0.0393701
2940	100%	3	0	0	0	0	0	0	3	3	0	0	0.0393701
2920	100%	2	0	0	0	0	0	0	2	2	0	0	0.0393701
2190	100%	1	0	0	0	0	0	0	1	1	0	0	0.0393701
	Total Tips	4,242	264	29	12	9	5	10	4,561	4,980	419	1	

Monthly Traffic Loading

