

# Memo



**Date:** September 3, 2009  
**To:** Kevin Stewart and Chad Kudym  
**From:** Markus Ritsch  
**Subject:** August 2009 ALERT Data Analysis

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## 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 August 1 through August 31, 2009.

## II. General System Analysis Summary

A total of 329,363 ALERT data reports were analyzed from the ALERT 2 base station. Meteorological sensors account for 77 percent, water level sensors 8 percent, and rain sensors 4 percent of the total monthly records.

The system-wide radio traffic loading was 10,625 reports per day with an average hourly loading of 443 reports. The peak hourly traffic loading was 1,065 reports, which occurred on August 6, between 4:00 PM and 5:00 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 was unacceptable due to either poor timer performance, poor event performance, or due to the large number of invalid reports received.

**Table 1. Rain Sensors with Unacceptable Performance Characteristics**

Rain ID	Description	Timer	Event	Comments
2320	Choke Cherry Resvr	1.07	0.00	Data series is very noisy, many invalid reports
1530	Bear Creek @ Lowell	0.016	0.00	Only 9 data reports received all month and 6 were invalid
1350	Chatfield COE	0.048	0.045	Only 10 data reports received all month and 4 were invalid
2820	Haskins Gulch Conf	0.016	0.473	New radio installed on Aug 31 to report through West Creek
2900	Russelville Gulch-Douglas	0.290	0.260	Install amplifier during winter "off-season"
2360	Indian Hills	0.274	0.611	Missing data for 8/7/09 through 8/13/09
2350	Idledale	0.290	0.833	Missing data for 8/1/09 through 8/10/09
2970	Rampart Range Rd	0.516	0.656	Marginal path to West Creek
1460	Urban Farm	0.387	0.894	
2810	Pine Cliff Road	0.983	0.375	Poor event due to field calibration of rain gage
2860	CC at Stroh Rd	0.645	0.592	Marginal path to Blue Mt. – modify radio for West Creek
1640	SPR at Union Ave.	0.967	0.4	
1480	Third Creek at DIA	0.435	0.888	
2270	Cub Cr below Blue	0.709	0.961	Missing data for 8/1/09 through 8/7/09
2210	Hiwan G.C.	1.06	0.972	Large number of invalid reports on ID 2210 and 2213
1810	Sand Creek at mouth	0.564	0.85	

### 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 87 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				
1650	4200	1020	1640	2850	2270	2370	920				
1810	4490	1040	2270	2270	2850	2850	2360				
4250	4520	1720	1600	410	410	1350	2350				
4790	4790	1030	2850	540	540	1530	2900				
4300	4020	1550	1350	2320	1350	110	1460				

\*-Timer statistics are skewed in these months because system start-up occurs and the Blue Mountain repeater was down. The network is operational by April 1.

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	20	Only the 1-mm rain sensors were included in the analysis
Median	17	Only the 1-mm rain sensors were included in the analysis
Standard deviation	19.18	Only the 1-mm rain sensors were included in the analysis
Mean plus three standard deviations	77	Only the 1-mm rain sensors were included in the analysis
Minimum total count	2	Dakan Road (ID 2980)
Maximum total count	165	Expo Park (ID 420) – Influenced by Lawn Irrigation

#### 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					

### 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
Russelville Gulch	2900	Multiple jumps in tip count were observed throughout the month
Choke Cherry Reservoir	2320	Two jumps in tip count were observed throughout the month
Chatfield COE	1350	One jump in tip count exceeding 6 was observed during the month
Pine Cliff Road	2810	One jump in tip count exceeding 6 was observed during the month
Marston Lake North	1520	One jump in tip count exceeding 6 was observed during the month
Shop Creek	1710	One jump in tip count exceeding 6 was observed during the month
Flying J	850	One jump in tip count exceeding 6 was observed during the month
Cub Creek below Blue	2270	One jump in tip count exceeding 6 was observed during the month

### D. Sensor-by-Sensor Incrementing Count Summary

The system-wide reception rate of incrementing, 1-mm tip reports for the month was approximately 88.0 percent. A total of 2,812 incrementing reports were received and a total of 3,194 were expected. The total loss of incrementing reports for the month was approximately 11.96 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				
4490	4470	840	840	1350	540	2320	2810				
1420	4490	700	1640	2320	2320	2820	2320				
4040	4110	2840	2850	2850	110	110	2820				
4160	4510	1340	700	540	1350	1350	1350				
4470	4790	920	1350	1810	2350	2370	1640				

\* - Event statistics are poor in February and March 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

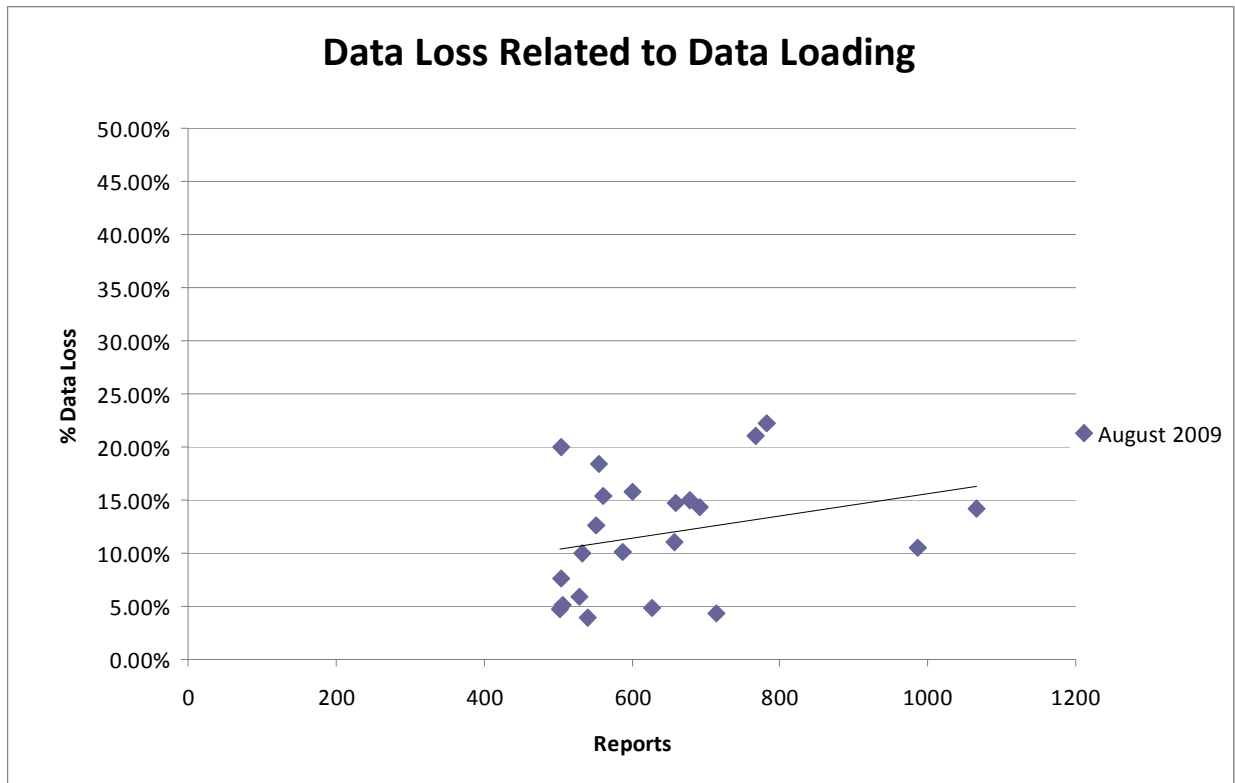
Periods exceeding 500 messages per hour are analyzed independently in an attempt to quantify data loss rates from rain sensors using the sequential tip count series.

### 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	1,065	8/6/2009 4:00 PM
2nd Max	986	8/6/2009 3:00 PM
3rd Max	783	8/6/2009 5:00 PM
4th Max	768	8/18/2009 1:00 PM
5th Max	714	8/25/2009 3:00 PM

Each hour exceeding 500 reports was analyzed to quantify the number of missing rain reports for that hour. The following plot shows the data loss 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)	300
Total reports from unknown IDs	529
Unknown IDs with only a single received report (potential noise)	241
Total reports from all IDs – RecData Log entire month	329,363
Unknown reports as a fraction of total reports	0.16%

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	Reports
1639	57
409	16
2224	16
4419	11
2329	11
2215	10
2216	9
2227	9
1599	8
2221	8
2217	7
2229	5
2222	5
2272	5
2239	5
4094	4
4031	4
4855	4
2219	4
2228	4
2271	3
4071	3
4029	3
611	3
4339	3
2736	3
4027	3
956	3
1215	2

1168	2
4663	2
4319	2
4026	2
4011	2
1549	2
1657	2
2849	2
2839	2
829	2
2828	2
1202	2
2816	2
1951	2
2388	2
2279	2
2278	2
1664	2
5716	2
667	2
5023	2
4788	2
4858	2
4863	2
6523	2
4856	2
149	2
4848	2
4796	2
4766	2

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	22	12:00-12:59	53
1:00-1:59	13	1:00-1:59	46
2:00-2:59	13	2:00-2:59	24
3:00-3:59	12	3:00-3:59	30
4:00-4:59	21	4:00-4:59	17
5:00-5:59	11	5:00-5:59	15
6:00-6:59	16	6:00-6:59	15
7:00-7:59	30	7:00-7:59	29
8:00-8:59	19	8:00-8:59	12
9:00-9:59	18	9:00-9:59	20
10:00-10:59	38	10:00-10:59	11
11:00-11:59	29	11:00-11:59	15

## VII. Reporting Issues Identified this Month

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

Sensor ID	Description	July Reports	August Reports	Sept Reports
850	Flying J	0	9	
1530	Bear Creek at Lowell	2	5	
2370	Red Rocks Park	0	5	
1350	Chatfield COE	1	4	
4030	Red Garden	2	4	
2210	Hiwan G.C.	12	6	
2320	Choke Cherry Resvr	8	3	
2230	Bear Cr below Cub	6	3	
2810	Pine Cliff Road	6	0	
2820	Haskins Gulch Conf	5	4	
2240	Cold Sprg Glch conf	4	0	
330	Van Bibber @ Hwy 93	4	0	
4260	Taylor Mountain	4	0	
2270	Cub Cr below Blue	3	0	
920	Aurora Town Hall Wx	3	0	
2860	CC at Stroh Rd	3	7	
4770	Cal-Wood Ranch	3	0	



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

<b>10 Minute Peak Intensities</b>					
<b>Station</b>	<b>Date</b>	<b>Tips</b>	<b>Inches</b>	<b>in/hr</b>	
760	8/25/2009 2:53:34 PM	18	0.709	4.252	
430	8/6/2009 3:33:53 PM	17	0.669	4.016	
640	8/6/2009 3:22:00 PM	15	0.591	3.543	
1710	8/25/2009 3:05:20 PM	15	0.591	3.543	
820	8/6/2009 3:44:21 PM	13	0.512	3.071	
920	8/6/2009 3:37:57 PM	13	0.512	3.071	
1420	8/9/2009 8:40:20 PM	13	0.512	3.071	
2850	8/17/2009 10:14:51 PM	13	0.512	3.071	
2990	8/25/2009 1:48:55 PM	13	0.512	3.071	

<b>1 Hour Peak Intensities</b>			
<b>Station</b>	<b>Date</b>	<b>Tips</b>	<b>Inches</b>
640	8/6/09	33	1.299
430	8/6/09	31	1.220
2850	8/17/09	29	1.142
760	8/25/09	28	1.102
2990	8/25/09	26	1.024



# General System Analysis

**Database Name**

P:\A207-UDFCD-Data-Analysis\2009\08-2009\Novastar\_extract\_2009Aug.mdb

**First Date in Database**

8/1/09 12:00 AM

**Total Days**

31.0

**Last Date in Database**

8/31/09 11:59 PM

**Total Hours**

744.0

**Total Records Analyzed**

329363

**Records by Group**

Wind Gust	56790	17%
Relative Humidity	53180	16%
Temperature	52281	16%
Barometric Pressure	24519	7%
Wind Direction	20689	6%
Water Level PT-HSE	19364	6%
Wind Speed Average	18569	6%
Wind Speed Average & Azimuth	17276	5%
Precipitation	13713	4%
Solar Radiation	9201	3%
Battery Voltage HSE	7810	2%
Fuel Temperature	5519	2%
Fuel Moisture	5506	2%
Water Level Float	4119	1%
Battery Voltage Digital	3824	1%
Battery Voltage Analog	3675	1%
Water Level PT	3178	1%
Soil Moisture	2886	1%
Battery	2075	1%
Repeater Status Report	1557	0%
Wing Gust	734	0%
Hayman Battery	642	0%
Repeater Pass List	614	0%
12Hr Status Report	548	0%
Battery Voltage	280	0%
Handar 585 ALARM Status	66	0%
Water Level	66	0%
Hayman Stage	52	0%
<b>Total</b>	<b>328733</b>	

**Records by Major Group**

Meteorologic Sensors	252505	77%
Water Level Sensors	26661	8%
Sensor Status Transmissions	18094	5%
Soil and Fuel Sensors	13911	4%
Rain Sensors	13713	4%
<b>Total</b>	<b>324884</b>	

**Records by Validation Type**

Good	0	392647	119%
Questionable	1	822	0%
<b>Total</b>		<b>393469</b>	

**Sensors With Most Invalid Data**

Description	Sensor	Reports
Quincy Reservoir	755	52
Castle Rock	2744	43
Hiwan G.C.	2213	35
Louisville Lake	4744	26
Salisbury Park	2724	25

**Traffic Loading Summary**

Alert Reports	329363	
Average Daily Traffic	10625	
Average Hourly Traffic	443	
Median Hourly Traffic	436	hour beginning
Peak Hourly Traffic	1065	8/6/09 4:00 PM
2nd Max	986	8/6/09 3:00 PM
3rd Max	783	8/6/09 5:00 PM
4th Max	768	8/18/09 1:00 PM
5th Max	714	8/25/09 3:00 PM

# Rain Timer Performance

Analyze Rain Sensors

n Timer Performance

Rain ID	Description	Rcv	Timer	Ave Exp	0.866022099 Performance
1350	Chatfield COE	3	5:34	62.00	5%
920	Aurora Town Hall Wx	17	7:38	62.00	27%
2360	Indian Hills	17	9:51	62.00	27%
2350	Idledale	18	4:29	62.00	29%
2900	Russelville Gulch-Douglas	18	22:09	62.00	29%
1460	Urban Farm	24	4:14	62.00	39%
1480	Third Creek at DIA	27	11:58	62.00	44%
2970	Rampart Range Rd	32	17:04	62.00	52%
700	Toll Gate @ 6th	34	20:48	62.00	55%
1810	Sand Creek at mouth	35	10:18	62.00	56%
2860	CC at Stroh Rd	40	15:50	62.00	65%
4330	Indian Ruins	43	16:41	62.00	69%
2270	Cub Cr below Blue	44	12:38	62.00	71%
4850	Porphyry Mtn	46	15:10	62.00	74%
1570	Brighton Ditch Wx	47	12:34	62.00	76%
4750	Louisville Lake	48	14:16	62.00	77%
310	Guy Hill Ranch	49	14:36	62.00	79%
1660	SPR at Henderson	49	15:02	62.00	79%
4140	Logan Mill	50	14:29	62.00	81%
4200	Lazy Acres	50	14:26	62.00	81%
320	Sports Complex	51	13:26	62.00	82%
1310	LDC at 64th	51	13:59	62.00	82%
1500	Powers Park	51	13:14	62.00	82%
2310	Genesee Village	51	13:56	62.00	82%
2840	Sulphur Gulch	51	13:51	62.00	82%
4150	Gold Hill	51	14:12	62.00	82%
4220	Fling's	51	13:04	62.00	82%
4530	Winiger Ridge	51	14:15	62.00	82%
1010	Denver West	52	14:15	62.00	84%
1360	Denver Zoo	52	13:02	62.00	84%
4270	Cannon Mountain	52	13:52	62.00	84%
4570	St. Antons	52	14:02	62.00	84%
150	Nott Creek	53	13:46	62.00	85%
870	Murphy Creek GC	53	13:15	62.00	85%
1340	Sanderson at Xavier	53	13:28	62.00	85%
2250	Rosedale	53	13:00	62.00	85%
4130	Swiss Peaks	53	13:27	62.00	85%
4240	Sunset	53	13:38	62.00	85%
4470	Little Narrows	53	12:54	62.00	85%
100	Carr Street	54	13:24	62.00	87%
140	Blue Mountain	54	13:13	62.00	87%
330	Van Bibber @ Hwy 93	54	13:19	62.00	87%
540	Parker/Mississippi	54	13:11	62.00	87%
1320	SPR at 3rd Ave	54	12:55	62.00	87%
1440	Elbert	54	13:36	62.00	87%
1550	Lakewood CC	54	12:57	62.00	87%
1710	Shop Creek	54	13:15	62.00	87%
2230	Bear Cr below Cub	54	13:00	62.00	87%
2340	El Rancho	54	12:42	62.00	87%
2950	DC Public Works	54	12:43	62.00	87%
4090	Magnolia	54	13:22	62.00	87%
4170	Pine Brook	54	13:40	62.00	87%
4180	Gold Lake	54	13:40	62.00	87%
4510	Pinewood Springs	54	13:03	62.00	87%

4860	Fairview Peak	54	12:51	62.00	87%
300	Van Bibber Park	55	12:56	62.00	89%
610	Harvard @ Jackson	55	13:10	62.00	89%
640	Goldsmith @ Eastman	55	12:39	62.00	89%
1030	NREL/S. Table Mtn.	55	13:24	62.00	89%
1050	Jeffco Fairgrounds	55	13:12	62.00	89%
1300	Hidden Lake	55	13:09	62.00	89%
1700	Cherry Cr @ Champa	55	12:28	62.00	89%
4060	Lakeshore	55	13:09	62.00	89%
4080	Twin Sisters	55	13:25	62.00	89%
4300	Big Elk Park	55	12:42	62.00	89%
4730	Sugarloaf	55	13:23	62.00	89%
4820	Doudy Draw	55	13:09	62.00	89%
210	Leyden Confluence	56	13:07	62.00	90%
1040	Lena @ U.S. Hwy 6	56	12:39	62.00	90%
1420	Diamond Hill	56	12:44	62.00	90%
1620	Slaughterhouse Glch	56	12:24	62.00	90%
2240	Cold Sprg Glch conf	56	13:09	62.00	90%
2280	Kinney Peak	56	13:02	62.00	90%
4010	Crescent	56	12:53	62.00	90%
4050	Walker Ranch	56	13:07	62.00	90%
420	Expo Park	57	12:50	62.00	92%
520	Jewell Detention	57	12:41	62.00	92%
720	Confluence Pond	57	12:26	62.00	92%
2990	Tomah Rd-Douglas Cnty	57	12:27	62.00	92%
3020	West Creek WX	57	12:42	62.00	92%
4040	Martin Gulch	57	12:54	62.00	92%
4160	Sunshine	57	12:52	62.00	92%
440	Fire Station #7	58	12:39	62.00	94%
630	Temple Pond at DTC	58	12:16	62.00	94%
800	Sable Ditch @ 18th	58	12:10	62.00	94%
820	ETG @ Buckley	58	12:37	62.00	94%
1110	Gunbarrel	58	12:37	62.00	94%
1330	Roslyn	58	12:00	62.00	94%
1400	Upper Sloan Det.	58	12:37	62.00	94%
1800	Sand Creek Park	58	11:57	62.00	94%
2260	Brook Forest	58	12:27	62.00	94%
2850	Cherry Cr bl Bayou Glch	58	12:27	62.00	94%
2910	East Cherry Cr-Douglas	58	12:41	62.00	94%
2920	West Cherry Head-Douglas Cnty	58	12:14	62.00	94%
2930	Spring Valley Rd - DougCnty	58	12:13	62.00	94%
2980	Dakan Rd	58	12:38	62.00	94%
4100	Filter Plant	58	12:25	62.00	94%
4290	Red Hill	58	12:37	62.00	94%
4340	Riverside	58	12:41	62.00	94%
4810	Shanahan Ridge	58	12:11	62.00	94%
4840	SBC@S Boulder Ditch	58	12:11	62.00	94%
510	Virginia Court	59	12:15	62.00	95%
620	Quincy/Highline	59	12:10	62.00	95%
650	Iliff Pond	59	12:23	62.00	95%
710	Horseshoe Park Drop	59	12:11	62.00	95%
750	Quincy Reservoir	59	12:24	62.00	95%
760	Mission Viejo Park	59	11:57	62.00	95%
810	Granby Ditch @ 6th	59	12:36	62.00	95%
1370	West Metro FS13	59	12:14	62.00	95%
1720	Cherry Cr @ Steele	59	12:38	62.00	95%
2730	Salisbury Park	59	12:27	62.00	95%
2940	Willow Creek - DougCnty	59	12:13	62.00	95%
4020	Rio Grande	59	12:24	62.00	95%

4030	Red Garden	59	12:26	62.00	95%
4110	Betasso	59	12:25	62.00	95%
4230	Golden Age	59	12:11	62.00	95%
4250	Geer Canyon	59	12:24	62.00	95%
4260	Taylor Mountain	59	12:26	62.00	95%
4520	Eagle Ridge	59	12:27	62.00	95%
4710	Ward C-1	59	12:13	62.00	95%
4770	Cal-Wood Ranch	59	12:28	62.00	95%
4790	Button Rock	59	12:54	62.00	95%
4830	SBC @ San Souci	59	12:23	62.00	95%
120	West Woods	60	12:09	62.00	97%
220	Upper Leyden	60	12:00	62.00	97%
500	Havana Park	60	11:57	62.00	97%
730	No Name @ Quincy	60	12:10	62.00	97%
840	Fire Station 12	60	12:13	62.00	97%
850	Flying J	60	11:19	62.00	97%
900	Aurora Reservoir	60	12:13	62.00	97%
940	Sampson Gulch	60	12:09	62.00	97%
970	Pump Sta 3	60	12:13	62.00	97%
1000	Maple Grove Resv.	60	12:23	62.00	97%
1060	Heritage Square	60	11:57	62.00	97%
1200	Broomfield 3207	60	12:10	62.00	97%
1640	SPR at Union Ave.	60	12:32	62.00	97%
1900	Niver Detention	60	11:58	62.00	97%
1920	Brighton	60	12:00	62.00	97%
2960	Indian Creek	60	12:13	62.00	97%
4190	Slaughterhouse	60	12:11	62.00	97%
4310	Johnny Park	60	12:11	62.00	97%
4350	Conifer Hill	60	12:26	62.00	97%
4360	Justice Center	60	12:09	62.00	97%
4550	Boulder Jail	60	12:10	62.00	97%
430	Utah Park	61	11:58	62.00	98%
530	Fire Station #19	61	12:10	62.00	98%
600	Harvard Gulch Park	61	12:09	62.00	98%
830	Side Creek Park	61	12:10	62.00	98%
1100	Louisville Rec Ctr	61	11:57	62.00	98%
2190	Squaw Mountain	61	12:00	62.00	98%
2810	Pine Cliff Road	61	12:13	62.00	98%
4070	Bear Peak	61	12:10	62.00	98%
4490	Apple Valley	61	12:10	62.00	98%
2710	Highlands Ranch WTP	62	11:50	62.00	100%
1600	Englewood Dam	63	11:31	62.00	102%
2750	Castle Rock	63	11:47	62.00	102%
1520	Marston Lake North	64	11:28	62.00	103%
200	Leyden Reservoir	66	10:58	62.00	106%
2210	Hiwan G.C.	66	11:32	62.00	106%
2330	Morrison	67	10:53	62.00	108%
400	Montview Park	69	10:25	62.00	111%
410	Kelly Dam	74	9:05	62.00	119%
860	Sand Cr at Colfax	116	6:19	124.00	94%
1530	Bear Creek @ Lowell	1		62.00	2%
2320	Choke Cherry Resvr	133		124.00	107%
2820	Haskins Gulch Conf	1		62.00	2%

Rain Event Performance				Analyze Rain Sensors										
		Reports Received	2,812											
	Systemwide Avg	Total Tips	3,194											
	88.04%	Data Loss	11.96%											
Rain ID	Performance	1-tips	2-tips	3-tips	4-tips	5-tips	6-tips	>6-tips	Rcv	Exp	Miss	Hold	Bucket	
2320	39%	16	3	0	0	0	0	4	23	59	36	1	0.0393701	
2900	26%	3	0	0	1	0	0	2	6	23	17	0	0.0393701	
850	83%	16	4	0	0	0	0	1	20	24	4	0	0.0393701	
1350	5%	1	0	0	0	0	0	1	1	22	0	0	0.0393701	
1520	67%	6	2	0	0	0	0	1	8	12	2	0	0.0393701	
1710	79%	22	4	1	0	0	0	1	27	34	6	0	0.0393701	
2270	96%	24	1	0	0	0	0	1	25	26	1	0	0.0393701	
2810	38%	10	1	0	1	0	0	1	12	32	4	0	0.0393701	
100	100%	14	0	0	0	0	0	0	14	14	0	0	0.0393701	
120	89%	7	1	0	0	0	0	0	8	9	1	0	0.0393701	
140	86%	5	1	0	0	0	0	0	6	7	1	0	0.0393701	
150	82%	7	2	0	0	0	0	0	9	11	2	0	0.0393701	
200	100%	18	0	0	0	0	0	0	18	18	0	0	0.0393701	
210	88%	13	2	0	0	0	0	0	15	17	2	0	0.0393701	
220	75%	7	1	1	0	0	0	0	9	12	3	1	0.0393701	
300	91%	9	1	0	0	0	0	0	10	11	1	0	0.0393701	
310	100%	6	0	0	0	0	0	0	6	6	0	0	0.0393701	
320	83%	8	2	0	0	0	0	0	10	12	2	0	0.0393701	
330	67%	2	2	0	0	0	0	0	4	6	2	0	0.0393701	
400	91%	18	2	0	0	0	0	0	20	22	2	0	0.0393701	
410	100%	20	0	0	0	0	0	0	20	20	0	0	0.0393701	
420	96%	153	6	0	0	0	0	0	159	165	6	0	0.0393701	
430	97%	105	3	0	0	0	0	0	108	111	3	0	0.0393701	
440	91%	28	3	0	0	0	0	0	31	34	3	0	0.0393701	
500	98%	46	1	0	0	0	0	0	47	48	1	0	0.0393701	
510	98%	40	1	0	0	0	0	0	41	42	1	0	0.0393701	
520	97%	33	1	0	0	0	0	0	34	35	1	0	0.0393701	
530	85%	9	2	0	0	0	0	0	11	13	2	0	0.0393701	
540	100%	12	0	0	0	0	0	0	12	12	0	0	0.0393701	
600	100%	5	0	0	0	0	0	0	5	5	0	0	0.0393701	
610	92%	10	1	0	0	0	0	0	11	12	1	0	0.0393701	
620	97%	33	1	0	0	0	0	0	34	35	1	0	0.0393701	
630	93%	60	3	1	0	0	0	0	64	69	5	0	0.0393701	
640	85%	29	4	1	0	0	0	0	34	40	6	0	0.0393701	
650	89%	16	0	1	0	0	0	0	17	19	2	1	0.0393701	
700	94%	16	1	0	0	0	0	0	17	18	1	1	0.0393701	
710	90%	17	2	0	0	0	0	0	19	21	2	0	0.0393701	
720	93%	25	2	0	0	0	0	0	27	29	2	0	0.0393701	
730	100%	18	0	0	0	0	0	0	18	18	0	0	0.0393701	
750	96%	21	1	0	0	0	0	0	22	23	1	0	0.0393701	
760	99%	69	1	0	0	0	0	0	70	71	1	0	0.0393701	
800	84%	13	3	0	0	0	0	0	16	19	3	0	0.0393701	
810	91%	18	2	0	0	0	0	0	20	22	2	0	0.0393701	
820	92%	21	2	0	0	0	0	0	23	25	2	0	0.0393701	
830	100%	18	0	0	0	0	0	0	18	18	0	1	0.0393701	
840	55%	6	2	2	1	0	0	0	11	20	9	0	0.0393701	
860	56%	5	1	3	0	0	0	0	9	16	7	0	0.0393701	
870	100%	26	0	0	0	0	0	0	26	26	0	0	0.0393701	
900	100%	14	0	0	0	0	0	0	14	14	0	0	0.0393699	
920	80%	30	6	0	1	0	0	0	37	46	9	0	0.0393701	
940	94%	15	1	0	0	0	0	0	16	17	1	0	0.0393699	
970	96%	26	1	0	0	0	0	0	27	28	1	0	0.0393701	
1000	76%	9	4	0	0	0	0	0	13	17	4	0	0.0393701	
1010	86%	16	1	1	0	0	0	0	18	21	3	0	0.0393701	
1030	70%	5	1	1	0	0	0	0	7	10	3	0	0.0393701	
1040	89%	14	2	0	0	0	0	0	16	18	2	0	0.0393701	
1050	86%	16	3	0	0	0	0	0	19	22	3	0	0.0393701	
1060	95%	17	1	0	0	0	0	0	18	19	1	0	0.0393701	
1100	100%	6	0	0	0	0	0	0	6	6	0	0	0.0393701	
1110	100%	5	0	0	0	0	0	0	5	5	0	0	0.0393701	
1200	100%	9	0	0	0	0	0	0	9	9	0	0	0.0393701	
1300	100%	12	0	0	0	0	0	0	12	12	0	0	0.0393701	
1310	85%	9	2	0	0	0	0	0	11	13	2	0	0.0393701	
1320	89%	14	2	0	0	0	0	0	16	18	2	0	0.0393701	
1330	95%	17	1	0	0	0	0	0	18	19	1	0	0.0393701	
1340	81%	10	3	0	0	0	0	0	13	16	3	0	0.0393701	
1360	90%	23	3	0	0	0	0	0	26	29	3	0	0.0393701	
1370	78%	21	2	1	1	0	0	0	25	32	7	0	0.0393701	
1400	83%	8	2	0	0	0	0	0	10	12	2	0	0.0393701	
1420	95%	19	1	0	0	0	0	0	20	21	1	0	0.0393701	
1440	90%	16	2	0	0	0	0	0	18	20	2	0	0.0393701	
1460	89%	15	2	0	0	0	0	0	17	19	2	0	0.0393701	
1480	89%	7	1	0	0	0	0	0	8	9	1	0	0.0393701	

1500	87%	75	8	1	1	0	0	0	85	98	13	0	0.0393701
1550	93%	23	2	0	0	0	0	0	25	27	2	0	0.0393701
1570	69%	5	4	0	0	0	0	0	9	13	4	0	0.0393701
1600	93%	12	1	0	0	0	0	0	13	14	1	0	0.0393701
1620	96%	26	1	0	0	0	0	0	27	28	1	0	0.0393701
1640	40%	1	2	0	0	1	0	0	4	10	6	0	0.0393701
1660	91%	19	2	0	0	0	0	0	21	23	2	0	0.0393701
1700	86%	15	3	0	0	0	0	0	18	21	3	0	0.0393701
1720	85%	9	2	0	0	0	0	0	11	13	2	0	0.0393701
1800	93%	24	2	0	0	0	0	0	26	28	2	0	0.0393701
1810	85%	15	1	1	0	0	0	0	17	20	3	0	0.0393701
1900	90%	8	1	0	0	0	0	0	9	10	1	0	0.0393701
1920	100%	8	0	0	0	0	0	0	8	8	0	0	0.0393701
2190	100%	8	0	0	0	0	0	0	8	8	0	0	0.0393701
2210	91%	19	2	0	0	0	0	0	21	23	2	1	0.0393701
2230	94%	15	1	0	0	0	0	0	16	17	1	0	0.0393701
2240	95%	17	1	0	0	0	0	0	18	19	1	0	0.0393701
2250	100%	28	0	0	0	0	0	0	28	28	0	1	0.0393701
2260	96%	25	1	0	0	0	0	0	26	27	1	0	0.0393701
2280	90%	24	3	0	0	0	0	0	27	30	3	0	0.0393701
2310	90%	16	2	0	0	0	0	0	18	20	2	0	0.0393701
2330	95%	17	1	0	0	0	0	0	18	19	1	0	0.0393701
2340	96%	22	1	0	0	0	0	0	23	24	1	0	0.0393701
2350	83%	8	2	0	0	0	0	0	10	12	2	0	0.0393701
2360	61%	8	1	1	0	1	0	0	11	18	7	0	0.0393701
2710	79%	26	3	0	0	0	1	0	30	38	8	0	0.0393701
2730	87%	11	2	0	0	0	0	0	13	15	2	0	0.0393701
2750	96%	23	1	0	0	0	0	0	24	25	1	0	0.0393701
2820	47%	4	3	1	0	0	1	0	9	19	10	0	0.0393701
2840	85%	9	2	0	0	0	0	0	11	13	2	0	0.0393701
2850	89%	44	6	0	0	0	0	0	50	56	6	0	0.0393701
2860	59%	11	2	1	1	1	0	0	16	27	11	0	0.0393701
2910	100%	17	0	0	0	0	0	0	17	17	0	0	0.0393701
2920	94%	16	1	0	0	0	0	0	17	18	1	0	0.0393701
2930	100%	11	0	0	0	0	0	0	11	11	0	0	0.0393701
2940	100%	7	0	0	0	0	0	0	7	7	0	0	0.0393701
2950	95%	34	2	0	0	0	0	0	36	38	2	0	0.0393701
2960	100%	20	0	0	0	0	0	0	20	20	0	0	0.0393701
2970	66%	14	4	2	1	0	0	0	21	32	11	0	0.0393701
2980	100%	2	0	0	0	0	0	0	2	2	0	0	0.0393701
2990	97%	27	1	0	0	0	0	0	28	29	1	0	0.0393701
3020	93%	24	2	0	0	0	0	0	26	28	2	0	0.0393701
4010	75%	2	1	0	0	0	0	0	3	4	1	0	0.0393701
4020	83%	4	1	0	0	0	0	0	5	6	1	1	0.0393701
4030	100%	9	0	0	0	0	0	0	9	9	0	0	0.0393701
4040	100%	7	0	0	0	0	0	0	7	7	0	0	0.0393701
4050	100%	5	0	0	0	0	0	0	5	5	0	0	0.0393701
4060	86%	5	1	0	0	0	0	0	6	7	1	0	0.0393701
4070	100%	5	0	0	0	0	0	0	5	5	0	0	0.0393701
4080	100%	14	0	0	0	0	0	0	14	14	0	0	0.0393701
4090	100%	4	0	0	0	0	0	0	4	4	0	0	0.0393701
4100	100%	3	0	0	0	0	0	0	3	3	0	0	0.0393701
4110	75%	2	1	0	0	0	0	0	3	4	1	0	0.0393701
4130	100%	4	0	0	0	0	0	0	4	4	0	0	0.0393701
4140	100%	6	0	0	0	0	0	0	6	6	0	0	0.0393701
4150	100%	4	0	0	0	0	0	0	4	4	0	0	0.0393701
4160	100%	6	0	0	0	0	0	0	6	6	0	0	0.0393701
4170	100%	4	0	0	0	0	0	0	4	4	0	0	0.0393701
4180	100%	15	0	0	0	0	0	0	15	15	0	0	0.0393701
4190	100%	8	0	0	0	0	0	0	8	8	0	0	0.0393701
4200	100%	7	0	0	0	0	0	0	7	7	0	0	0.0393701
4220	94%	14	1	0	0	0	0	0	15	16	1	0	0.0393701
4230	100%	7	0	0	0	0	0	0	7	7	0	0	0.0393701
4240	100%	3	0	0	0	0	0	0	3	3	0	0	0.0393701
4250	100%	7	0	0	0	0	0	0	7	7	0	0	0.0393701
4260	100%	17	0	0	0	0	0	0	17	17	0	0	0.0393701
4270	100%	23	0	0	0	0	0	0	23	23	0	0	0.0393701
4290	100%	7	0	0	0	0	0	0	7	7	0	0	0.0393701
4300	92%	11	1	0	0	0	0	0	12	13	1	0	0.0393701
4310	100%	14	0	0	0	0	0	0	14	14	0	0	0.0393701
4330	82%	7	2	0	0	0	0	0	9	11	2	0	0.0393701
4340	94%	16	1	0	0	0	0	0	17	18	1	0	0.0393701
4350	85%	15	1	1	0	0	0	0	17	20	3	0	0.0393701
4360	100%	2	0	0	0	0	0	0	2	2	0	0	0.0393701
4470	75%	4	2	0	0	0	0	0	6	8	2	0	0.0393701
4490	100%	3	0	0	0	0	0	0	3	3	0	0	0.0393701
4510	94%	16	1	0	0	0	0	0	17	18	1	0	0.0393701

4520	92%	11	1	0	0	0	0	0	12	13	1	0	0.0393701
4530	85%	9	2	0	0	0	0	0	11	13	2	0	0.0393701
4550	100%	10	0	0	0	0	0	0	10	10	0	0	0.0393701
4570	82%	7	2	0	0	0	0	0	9	11	2	0	0.0393701
4710	92%	11	1	0	0	0	0	0	12	13	1	0	0.0393701
4730	100%	3	0	0	0	0	0	0	3	3	0	0	0.0393701
4750	100%	3	0	0	0	0	0	0	3	3	0	0	0.0393701
4770	100%	14	0	0	0	0	0	0	14	14	0	0	0.0393701
4790	100%	13	0	0	0	0	0	0	13	13	0	0	0.0393701
4810	100%	8	0	0	0	0	0	0	8	8	0	0	0.0393701
4820	100%	6	0	0	0	0	0	0	6	6	0	0	0.0393701
4830	83%	4	1	0	0	0	0	0	5	6	1	0	0.0393701
4840	75%	2	1	0	0	0	0	0	3	4	1	0	0.0393701
	<b>Total Tips</b>	<b>2,565</b>	<b>207</b>	<b>21</b>	<b>8</b>	<b>3</b>	<b>2</b>	<b>12</b>	<b>2,812</b>	<b>3,194</b>	<b>342</b>	<b>8</b>	

# Monthly Traffic Loading

