Memo

Water & Earth Technologies, Inc.
Water Resources and Environmental Consulting

Date: November 2, 2010
To: Kevin Stewart
From: Markus Ritsch
Subject: **October 2010 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, 2010.

II. General System Analysis Summary

A total of 342,035 ALERT (legacy) data reports were analyzed from the ALERT 2 base station. Meteorological sensors account for 78 percent, water level sensors 6 percent, and rain sensors 4 percent of the total monthly records.

The system-wide radio traffic loading was 11,033 reports per day with an average hourly loading of 460 reports. The peak hourly traffic loading was 908 reports, which occurred on October 12, between 8:00 AM and 9:00 AM. A plot of monthly average and peak hourly traffic loading is provided.

A. Specific Issues Identified this Month

Performance of the following sensors (Table 1) was unacceptable this month.

Table 1. Rain Sensors with Unacceptable Performance Characteristics

Rain ID	Description	Timer	Event	Comments
540	Parker/Mississippi	82%	73%	Poor performance
1100	Louisville Rec Center	90%	72%	Poor performance
1660	SPR at Henderson	58%	26%	Poor performance
2230	Bear Cr below Blue	52%	86%	Poor performance
2240	Cold Spring Gulch Conf	44%	95%	Poor performance
2270	Cub Cr below Blue	44%	43%	Poor performance
2280	Kinney Peak	61%	61%	Poor performance
2970	Rampart Range Road	68%	9%	Poor performance
2990	Tomah Road	95%	100%	Sending 3-hr reports on ID 2993 (Unknown ID)
4040	Martin Gulch	87%	71%	Poor performance
4090	Magnolia	84%	90%	Large number of invalid reports
4270	Cannon Mountain	76%	86%	Poor performance
4330	Hansen	73%	53%	Poor performance

III. Rain Sensor Timer Reporting Summary

The following analysis assumes that each rain sensor has a 12-hour timer-reporting interval. The worst performing rain sensors for the month are summarized (Table 2).

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

Jan*	Feb*	Mar*	Apr	May	Jun	Jul	Aug	Sep	Oct*	Nov*	Dec*
--	--	--	2970	2970	2970	2980	2980	2230	--	--	--
--	--	--	3010	700	1710	2930	2930	4270	--	--	--
--	--	--	700	2240	4330	2990	2990	4040	--	--	--
--	--	--	4860	4330	2270	3020	3020	4330	--	--	--
--	--	--	4330	4490	2240	2810	2810	2240	--	--	--
--	--	--	4170	4270	4470	4330	4330	1710	--	--	--

***- Due to system start-up/shut-down, timer statistics are evaluated only when the entire network is operational between April 1 and October 15.**

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	18.31	Only the 1-mm rain sensors were included in the analysis
Median	17.00	Only the 1-mm rain sensors were included in the analysis
Standard deviation	8.28	Only the 1-mm rain sensors were included in the analysis
Mean plus three standard deviations	43	Only the 1-mm rain sensors were included in the analysis
Minimum total count	3	ID 1440 (Elbert Weather Station)
Maximum total count	57	ID 4710 (Ward C-1 Weather Station)

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	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			

***-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 6 or More in Sequential Count

Sensor Description	Sensor ID	Comment
SPR at Henderson	1660	Two jumps in sequential count between Oct 8 and Oct 15
Rampart Range Road	2970	Two jumps in sequential count between Oct 10 and Oct 12
Hansen Rain	4330	One jump on Oct 12

D. Sensor-by-Sensor Incrementing Count Summary

The system-wide reception rate of incrementing, 1-mm tip reports for the month was approximately 91 percent. A total of 2,776 incrementing reports were received and a total of 3,057 were expected. The total loss of incrementing reports for the month was approximately 9 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*
--	--	--	2970	700	2900	870	2270	110	--	--	--
--	--	--	700	2280	2190	540	2980	2970	--	--	--
--	--	--	940	2970	2930	2980	2280	720	--	--	--
--	--	--	430	2980	4330	2900	4090	1900	--	--	--
--	--	--	2900	2190	2980	4330	310	2270	--	--	--
--	--	--	4330	2240	2970	2230	4330	4040	--	--	--

***-Event statistics are skewed in these months and therefore not computed because system start-up/shut-down occurs. The rain network is operational between April 1 and October 15.**

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 hourly periods of highest radio traffic this month are shown (Table 7).

Table 7. Heavy Radio Traffic Periods

Peak Traffic Periods	Reports/hour	Hour Beginning
Peak Hourly Traffic	908	10/12/2010 8:00 AM
2nd Max	872	10/12/2010 9:00 AM
3rd Max	825	10/12/2010 7:00 AM
4th Max	704	10/25/2010 9:00 AM
5th Max	703	10/12/2010 10:00 AM

Each hour exceeding 500 reports was analyzed to quantify the number of missing rain reports for that hour (Figure 1). The following plot shows the loss of data as a function of data loading.

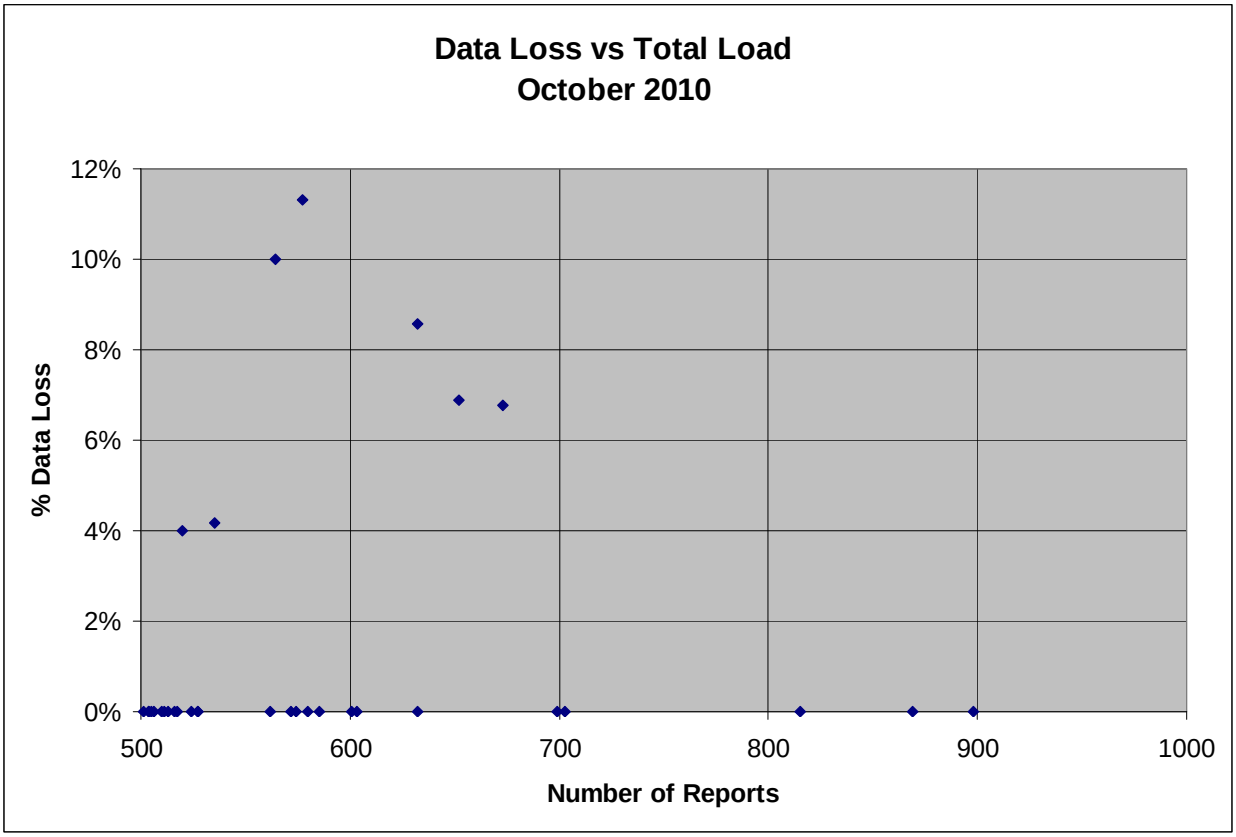

Figure 1. Data Loss vs. Data Loading

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 8).

Table 8. Summary of Unknown IDs

Description	Quantity
Total number of unknown IDs (IDs without a device definition)	211
Total reports from unknown IDs	533
Unknown IDs with only a single received report (potential noise)	159
Total reports from all IDs – RecData Log entire month	342,035
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. Shown below (Table 9) are the total reports received from unknown sensor IDs for each month of the year.

Table 9. Monthly Summary of Total Reports from Unknown IDs

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ave
2010	1,220	1,474	1,276	1,174	721	5,707	610	1,738	442	533			

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 10).

Table 10. Reports Received by Unknown IDs

Unknown Id	Reports
2993	243
1607	9
1651	4
1663	4
1954	4
2215	4
2239	4
2736	4
148	3
292	3
1409	3
1622	3
1624	3
1631	3
1949	3
4139	3
4858	3
164	2
487	2
676	2
707	2
739	2
748	2
1202	2
1423	2
1433	2
1443	2
1446	2
1449	2
1470	2
1653	2
2219	2
2222	2
2708	2
2713	2
2748	2
2759	2
2771	2
4031	2
4063	2
4081	2
4086	2
4087	2
4091	2
4094	2
4409	2
4426	2
4471	2
4607	2
4826	2
4839	2
4842	2

The “unknown” device reports are analyzed temporally to understand when they are received during the day (Table 11). 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 11. Temporal Distribution of Received Reports

Hour (AM)	Reports	Hour (PM)	Reports
0:00-00:59	44	12:00-12:59	44
1:00-1:59	7	1:00-1:59	7
2:00-2:59	7	2:00-2:59	11
3:00-3:59	40	3:00-3:59	43
4:00-4:59	7	4:00-4:59	30
5:00-5:59	9	5:00-5:59	7
6:00-6:59	46	6:00-6:59	52
7:00-7:59	15	7:00-7:59	30
8:00-8:59	12	8:00-8:59	11
9:00-9:59	44	9:00-9:59	37
10:00-10:59	7	10:00-10:59	8
11:00-11:59	11	11:00-11:59	4

VII. Sensors with Invalid Reports

The following precipitation sensors had a large number of invalid reports (bit flip/contention errors/random decode):

Sensor ID	Description	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov
540	Parker/Mississippi	0	0	0	0	0	0	0	3	2	
700	Toll Gate @ 6th	0	0	0	0	3	0	1	0	0	
760	Mission Viejo Park	--	--	--	--	--	--	--	--	2	
1300	Hidden Lake	0	0	0	4	0	1	0	0	0	
1460	Urban Farm	1	3	2	1	0	0	0	0	0	
1530	Bear Creek at Lowell	12	13	10	6	0	0	0	0	0	
1600	Englewood Dam	--	--	--	--	--	--	--	--	2	
1900	Niver Detention	0	0	0	0	0	4	0	0	0	
2190	Squaw Mountain	0	0	0	0	0	0	0	2	0	
2320	Choke Cherry Resvr	1	7	3	4	5	0	3	0	3	
2750	Castle Rock WX	--	4	6	1	0	2	0	0	0	
2970	Rampart Range Road	--	3	0	1	0	0	0	0	0	
3010	East Plum Cr at Hwy 105	0	0	0	0	9	12	5	0	1	
4030	Red Garden	6	2	3	1	1	0	0	0	1	
4090	Magnolia	--	--	--	--	--	--	--	--	4	
4270	Cannon Mountain	--	--	--	--	--	--	3	2	0	
4330	Hansen	2	1	2	0	4	4	1	1	0	

VIII. Rainfall Alarms and Intensity Analysis

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

Urban Drainage and Flood Control District
ALERT Web Server

<<<<<<<<<<<<<<<<<<<<<<<<< RAINFALL RATE ALARMS >>>>>>>>>>>>>>>>>>>>>>>>>
No alarms logged for this month

General System Analysis

Database Name P:\A207-UDFCD-Data-Analysis\2010\10-2010\Novastar_extract_2010Oct

First Date in Database	10/1/10 12:00 AM	**Total Days**	31.0
Last Date in Database	10/31/10 11:59 PM	**Total Hours**	744.0

Total Records Analyzed 342035

Records by Group

Temperature	56515	17%
Relative Humidity	55171	16%
Wind Gust	55169	16%
Barometric Pressure	25313	7%
Wind Speed Average & Azimuth	21747	6%
Wind Direction	21336	6%
Wind Speed Average	21100	6%
Water Level PT-HSE	16723	5%
Precipitation	13943	4%
Solar Radiation	9519	3%
Battery Voltage HSE	7734	2%
Fuel Moisture	5918	2%
Fuel Temperature	5916	2%
Battery	4430	1%
Battery Voltage Analog	3807	1%
Battery Voltage Digital	3671	1%
Water Level Float	3099	1%
Soil Moisture	2914	1%
Repeater Status Report	2431	1%
Water Level PT	2282	1%
Wing Gust	734	0%
Repeater Pass List	619	0%
Unknown IDs	533	0%
Hayman Battery	517	0%
12Hr Status Report	487	0%
Battery Voltage	233	0%
Water Level	120	0%
Handar 585 ALARM Status	54	0%
Total	342035	

Records by Major Group

Meteorologic Sensors	265870	78%
Water Level Sensors	22104	6%
Sensor Status Transmissions	18803	5%
Soil and Fuel Sensors	14748	4%
Rain Sensors	13943	4%
Total	335468	

Traffic Loading Summary

Alert Reports	342035	
Average Daily Traffic	11033	
Average Hourly Traffic	460	
Median Hourly Traffic	452	hour beginning
Peak Hourly Traffic	908	10/12/10 8:00 AM
2nd Max	872	10/12/10 9:00 AM
3rd Max	825	10/12/10 7:00 AM
4th Max	704	10/25/10 9:00 AM
5th Max	703	10/12/10 10:00 AM

Rain Timer Performance

Analyze Rain Sensors

			12:25	Ave	87%
Rain Sensors	**Description**	**Rcv**	**Average Timer Interval**	**Exp**	**Performance**
100	Carr Street	47	12:53	62.00	76%
110	Ralston Reservoir	57	12:25	62.00	92%
120	West Woods	50	11:58	62.00	81%
140	Wx-Blue Mountain	56	12:47	62.00	90%
150	Nott Creek	59	12:27	62.00	95%
200	Leyden Reservoir	57	12:53	62.00	92%
210	Leyden Confluence	47	11:57	62.00	76%
220	Upper Leyden	54	13:49	62.00	87%
300	Van Bibber Park	47	12:32	62.00	76%
310	Guy Hill Ranch	56	12:11	62.00	90%
320	Sports Complex	50	11:57	62.00	81%
330	Van Bibber @ Hwy 93	58	12:39	62.00	94%
400	Montview Park	58	12:25	62.00	94%
410	Kelly Dam	59	12:11	62.00	95%
420	Expo Park	58	12:10	62.00	94%
430	Utah Park	38	13:19	62.00	61%
440	Fire Station #7	58	12:39	62.00	94%
500	Havana Park	60	12:11	62.00	97%
510	Virginia Court	57	12:30	62.00	92%
520	Jewell Detention	45	11:57	62.00	73%
530	Fire Station #19	58	12:25	62.00	94%
540	Parker/Mississippi	51	14:18	62.00	82%
600	Harvard Gulch Park	59	12:37	62.00	95%
610	Harvard @ Jackson	58	12:24	62.00	94%
620	Quincy/Highline	58	12:11	62.00	94%
630	Temple Pond at DTC	59	11:56	62.00	95%
640	Goldsmith @ Eastman	59	12:30	62.00	95%
650	Iliff Pond	61	11:57	62.00	98%
700	Toll Gate @ 6th	40	17:46	62.00	65%
710	Horseshoe Park Drop	60	12:11	62.00	97%
720	Confluence Pond	59	11:58	62.00	95%
730	No Name @ Quincy	56	12:38	62.00	90%
750	Wx-Quincy Reservoir	56	12:55	62.00	90%
760	Mission Viejo Park	61	11:57	62.00	98%
800	Sable Ditch @ 18th	61	12:10	62.00	98%
810	Granby Ditch @ 6th	59	12:25	62.00	95%
820	ETG @ Buckley	59	12:25	62.00	95%
830	Side Creek Park	60	12:11	62.00	97%
840	Fire Station 12	59	12:26	62.00	95%
850	Flying J	57	12:55	62.00	92%
860	Sand Cr at Colfax	57	12:56	62.00	92%
870	Murphy Creek GC	60	12:00	62.00	97%
900	Wx-Aurora Reservoir	60	12:00	62.00	97%
920	Wx-Aurora Town Hall	61	12:00	62.00	98%
940	Sampson Gulch	59	12:10	62.00	95%
950	Piney at Liverpool	60	12:11	62.00	97%
970	Pump Sta 3	60	12:00	62.00	97%
1000	Maple Grove Resv.	58	12:38	62.00	94%
1010	Denver West	60	12:11	62.00	97%
1030	NREL/S. Table Mtn.	58	12:11	62.00	94%
1040	Lena @ U.S. Hwy 6	58	12:24	62.00	94%
1050	Jeffco Fairgrounds	59	12:11	62.00	95%
1060	Heritage Square	58	12:11	62.00	94%
1100	Louisville Rec Ctr	56	12:53	62.00	90%

1110	Gunbarrel	57	12:39	62.00	92%
1200	Broomfield 3207	45	12:49	62.00	73%
1310	LDC at 64th	57	12:25	62.00	92%
1320	SPR at 3rd Ave	60	12:10	62.00	97%
1330	Roslyn	56	12:14	62.00	90%
1340	Sanderson at Xavier	60	12:13	62.00	97%
1350	Chatfield COE	61	12:00	62.00	98%
1360	Denver Zoo	60	12:13	62.00	97%
1370	West Metro FS13	57	12:54	62.00	92%
1400	Upper Sloan Det.	60	11:57	62.00	97%
1420	Wx-Diamond Hill	58	12:28	62.00	94%
1440	Wx-Elbert	59	12:26	62.00	95%
1460	Wx-Urban Farm	59	12:26	62.00	95%
1480	Third Creek at DIA	56	12:58	62.00	90%
1500	Powers Park	58	12:30	62.00	94%
1520	Wx-Marston Lake North	55	13:13	62.00	89%
1530	Bear Creek @ Lowell	55	13:23	62.00	89%
1550	Lakewood CC	58	12:26	62.00	94%
1570	Wx-Brighton Ditch	57	12:14	62.00	92%
1600	Englewood Dam	62	11:57	62.00	100%
1620	Slaughterhouse Glch	60	12:10	62.00	97%
1640	SPR at Union Ave.	60	12:00	62.00	97%
1660	SPR at Henderson	36	14:21	62.00	58%
1700	Cherry Cr @ Champa	61	12:00	62.00	98%
1710	Shop Creek	53	13:28	62.00	85%
1720	Cherry Cr @ Steele	60	12:24	62.00	97%
1800	Sand Creek Park	58	12:38	62.00	94%
1810	Sand Creek at mouth	59	12:11	62.00	95%
1900	Niver Detention	61	11:57	62.00	98%
1920	Wx-Brighton	61	12:00	62.00	98%
2190	Wx-Squaw Mountain	60	12:13	62.00	97%
2210	Wx-Hiwan G.C.	61	12:13	62.00	98%
2230	Bear Cr below Cub	32	14:37	62.00	52%
2240	Cold Sprg Glch conf	27	18:14	62.00	44%
2250	Rosedale	37	11:57	62.00	60%
2260	Brook Forest	39	11:58	62.00	63%
2270	Cub Cr below Blue	27	11:57	62.00	44%
2280	Kinney Peak	38	11:58	62.00	61%
2310	Genesee Village	37	12:21	62.00	60%
2320	Choke Cherry Resvr	172		62.00	
2330	Morrison	56	12:42	62.00	90%
2340	El Rancho	38	11:57	62.00	61%
2350	Idledale	35	13:12	62.00	56%
2360	Indian Hills	38	12:45	62.00	61%
2370	Red Rocks Park	54	13:12	62.00	87%
2710	Wx-Highlands Ranch WTP	61	12:00	62.00	98%
2730	Wx-Salisbury Park	61	12:00	62.00	98%
2750	Wx-Castle Rock	60	12:13	62.00	97%
2810	Pine Cliff Road	54	12:15	62.00	87%
2820	Haskins Gulch Conf	52	12:58	62.00	84%
2840	Sulphur Gulch	54	12:14	62.00	87%
2850	Cherry Cr bl Bayou Glch	49	13:35	62.00	79%
2860	CC at Stroh Rd	55	12:12	62.00	89%
2870	Cottonwood (Apache)	57	11:57	62.00	92%
2900	Russelville Gulch-Douglas	55	12:00	62.00	89%
2910	East Cherry Cr-Douglas	53	12:15	62.00	85%
2920	West Cherry Head-Douglas Cnty	54	12:15	62.00	87%
2930	Wx-Spring Valley Rd-DougCnty	58	12:13	62.00	94%
2940	Willow Creek - DougCnty	55	12:14	62.00	89%

2950	DC Public Works	52	12:31	62.00	84%
2960	Indian Creek	52	13:00	62.00	84%
2970	Rampart Range Rd	42	12:19	62.00	68%
2980	Dakan Rd	50	12:31	62.00	81%
2990	Wx-Tomah Rd-DougCnty	59	12:13	62.00	95%
3010	EPC at Hwy 105	52	12:49	62.00	84%
3020	Wx-West Creek WX	57	12:46	62.00	92%
4010	Cresent	56	13:11	62.00	90%
4020	Rio Grande	59	12:25	62.00	95%
4030	Red Garden	57	12:41	62.00	92%
4040	Martin Gulch	54	13:12	62.00	87%
4050	Walker Ranch	62	11:57	62.00	100%
4060	Lakeshore	58	12:41	62.00	94%
4070	Bear Peak	58	12:25	62.00	94%
4080	Twin Sisters	57	12:41	62.00	92%
4090	Magnolia	52	14:05	62.00	84%
4100	Filter Plant	59	12:26	62.00	95%
4110	Betasso	61	11:59	62.00	98%
4130	Swiss Peaks	55	12:29	62.00	89%
4140	Logan Mill	57	12:12	62.00	92%
4150	Gold Hill	55	12:43	62.00	89%
4160	Sunshine	58	12:41	62.00	94%
4170	Pine Brook	58	12:26	62.00	94%
4180	Gold Lake	55	12:43	62.00	89%
4190	Slaughterhouse	56	13:11	62.00	90%
4200	Lazy Acres	58	12:42	62.00	94%
4220	Fling's	57	12:46	62.00	92%
4230	Golden Age	55	12:54	62.00	89%
4240	Sunset	53	13:16	62.00	85%
4250	Geer Canyon	60	11:58	62.00	97%
4260	Taylor Mountain	58	12:12	62.00	94%
4270	Cannon Mountain	47	14:18	62.00	76%
4290	Red Hill	53	13:55	62.00	85%
4300	Big Elk Park	60	11:57	62.00	97%
4310	Johnny Park	57	12:41	62.00	92%
4330	Hansen Rain	45	15:33	62.00	73%
4340	Riverside	57	12:41	62.00	92%
4350	Conifer Hill	57	12:26	62.00	92%
4360	Justice Center	60	11:57	62.00	97%
4470	Little Narrows	50	14:21	62.00	81%
4490	Apple Valley	47	14:49	62.00	76%
4510	Pinewood Springs	47	14:57	62.00	76%
4520	Eagle Ridge	60	12:11	62.00	97%
4530	Winiger Ridge	52	13:54	62.00	84%
4550	Boulder Jail	57	12:39	62.00	92%
4570	St. Antons	56	12:31	62.00	90%
4710	Wx-Ward C-1	57	12:34	62.00	92%
4730	Wx-Sugarloaf	54	13:16	62.00	87%
4750	Wx-Louisville Lake	54	13:26	62.00	87%
4770	Wx-Cal-Wood Ranch	58	12:13	62.00	94%
4790	Wx-Button Rock	54	13:12	62.00	87%
4810	Shanahan Ridge	60	12:10	62.00	97%
4820	Doudy Draw	58	12:12	62.00	94%
4830	SBC @ San Souci	58	12:11	62.00	94%
4840	SBC@S Boulder Ditch	58	12:24	62.00	94%
4850	Porphory Mtn	59	12:28	62.00	95%
4860	Fairview Peak	54	12:49	62.00	87%
5720	Four Mile Creek	28	0:00	62.00	45%
5730	West Creek	47	12:34	62.00	76%

5740	Trail Creek	53	12:15	62.00	85%
5760	Cheeseman	3	0:00	62.00	5%
5770	Lazy Gulch	46	14:38	62.00	74%
5780	Monument Gulch	3	18:00	62.00	5%
5790	Flying G	55	12:15	62.00	89%
5800	Goose Creek	3	12:00	62.00	5%
5810	Stump Bump	55	12:14	62.00	89%
5820	Corral Creek	47	14:12	62.00	76%
5830	Platte Springs	47	12:00	62.00	76%
5860	Cedar Mountain	50	13:12	62.00	81%
5880	Hackett Mountain	63	11:23	62.00	102%
5940	Log Jumper	48	12:18	62.00	77%

Rain Event Performance

Analyze Rain Sensors

		Reports Received	2,776
	Systemwide Avg	Total Tips	3,057
	90.81%	Data Loss	9.19%

Rain ID	Performance	1-tips	2-tips	3-tips	4-tips	5-tips	6-tips	>6-tips	Rcv	Exp	Miss	Hold	Bucket
2970	9%	2	0	0	1	0	1	2	4	44	42	0	0.0393701
1660	26%	4	0	0	0	1	0	1	5	19	14	0	0.0393701
2270	43%	5	2	0	2	0	1	0	10	23	13	0	0.0393701
4330	53%	8	1	0	0	0	0	1	9	17	8	0	0.0393701
2280	61%	12	6	1	0	0	1	0	20	33	13	0	0.0393701
4040	71%	13	1	3	0	0	0	0	17	24	7	0	0.0393701
1100	72%	9	3	1	0	0	0	0	13	18	5	0	0.0393701
540	73%	6	1	1	0	0	0	0	8	11	3	0	0.0393701
2980	74%	13	7	0	0	0	0	0	20	27	7	0	0.0393701
4750	75%	12	2	0	1	0	0	0	15	20	5	0	0.0393701
4550	80%	10	1	1	0	0	0	0	12	15	3	0	0.0393701
430	81%	19	6	0	0	0	0	0	25	31	6	0	0.0393701
310	81%	14	2	1	0	0	0	0	17	21	4	0	0.0393701
4790	81%	10	3	0	0	0	0	0	13	16	3	0	0.0393701
1110	81%	19	1	2	0	0	0	0	22	27	5	0	0.0393701
4490	82%	7	2	0	0	0	0	0	9	11	2	0	0.0393701
4520	82%	7	2	0	0	0	0	0	9	11	2	0	0.0393701
120	83%	12	3	0	0	0	0	0	15	18	3	0	0.0393701
1530	83%	8	2	0	0	0	0	0	10	12	2	0	0.0393701
2960	85%	9	2	0	0	0	0	0	11	13	2	0	0.0393701
2860	86%	10	2	0	0	0	0	0	12	14	2	0	0.0393701
2900	86%	10	2	0	0	0	0	0	12	14	2	0	0.0393701
4270	86%	21	4	0	0	0	0	0	25	29	4	0	0.0393701
2230	86%	17	1	1	0	0	0	0	19	22	3	0	0.0393701
4350	86%	16	3	0	0	0	0	0	19	22	3	0	0.0393701
4250	87%	11	2	0	0	0	0	0	13	15	2	0	0.0393701
4360	87%	11	2	0	0	0	0	0	13	15	2	0	0.0393701
4470	87%	11	2	0	0	0	0	0	13	15	2	0	0.0393701
1200	88%	6	1	0	0	0	0	0	7	8	1	0	0.0393701
2330	88%	12	2	0	0	0	0	0	14	16	2	0	0.0393701
4730	88%	18	3	0	0	0	0	0	21	24	3	0	0.0393701
440	88%	13	2	0	0	0	0	0	15	17	2	0	0.0393701
760	88%	13	2	0	0	0	0	0	15	17	2	0	0.0393701
900	88%	13	2	0	0	0	0	0	15	17	2	0	0.0393699
4810	88%	13	2	0	0	0	0	0	15	17	2	0	0.0393701
1480	88%	20	3	0	0	0	0	0	23	26	3	0	0.0393701
410	89%	7	1	0	0	0	0	0	8	9	1	0	0.0393701
2360	89%	14	2	0	0	0	0	0	16	18	2	0	0.0393701
2750	89%	7	1	0	0	0	0	0	8	9	1	0	0.0393701
4190	89%	23	1	1	0	0	0	0	25	28	3	0	0.0393701
210	89%	16	0	1	0	0	0	0	17	19	2	0	0.0393701
1570	90%	23	3	0	0	0	0	0	26	29	3	0	0.0393701
1640	90%	8	1	0	0	0	0	0	9	10	1	0	0.0393701
2920	90%	8	1	0	0	0	0	0	9	10	1	0	0.0393701
4070	90%	17	0	1	0	0	0	0	18	20	2	0	0.0393701
4080	90%	25	1	1	0	0	0	0	27	30	3	0	0.0393701
4290	90%	8	1	0	0	0	0	0	9	10	1	0	0.0393701
4090	90%	26	1	1	0	0	0	0	28	31	3	0	0.0393701
4230	90%	17	2	0	0	0	0	0	19	21	2	0	0.0393701
4220	91%	35	4	0	0	0	0	0	39	43	4	0	0.0393701
400	91%	9	1	0	0	0	0	0	10	11	1	0	0.0393701
530	91%	9	1	0	0	0	0	0	10	11	1	0	0.0393701
600	91%	9	1	0	0	0	0	0	10	11	1	0	0.0393701
1460	91%	9	1	0	0	0	0	0	10	11	1	0	0.0393701
4710	91%	47	5	0	0	0	0	0	52	57	5	0	0.0393701
140	91%	19	2	0	0	0	0	0	21	23	2	0	0.0393701
1000	92%	10	1	0	0	0	0	0	11	12	1	0	0.0393701
1310	92%	10	1	0	0	0	0	0	11	12	1	0	0.0393701
2190	92%	10	1	0	0	0	0	0	11	12	1	0	0.0393701
2250	92%	20	2	0	0	0	0	0	22	24	2	0	0.0393701
2820	92%	10	1	0	0	0	0	0	11	12	1	0	0.0393701
2850	92%	10	1	0	0	0	0	0	11	12	1	0	0.0393701
4300	92%	32	3	0	0	0	0	0	35	38	3	0	0.0393701
110	92%	11	1	0	0	0	0	0	12	13	1	0	0.0393701
520	92%	11	1	0	0	0	0	0	12	13	1	0	0.0393701
1400	92%	11	1	0	0	0	0	0	12	13	1	0	0.0393701
2210	93%	23	2	0	0	0	0	0	25	27	2	0	0.0393701
4530	93%	23	2	0	0	0	0	0	25	27	2	0	0.0393701
750	93%	12	1	0	0	0	0	0	13	14	1	0	0.0393701
2340	93%	12	1	0	0	0	0	0	13	14	1	0	0.0393701
2840	93%	12	1	0	0	0	0	0	13	14	1	0	0.0393701

4060	93%	24	2	0	0	0	0	0	26	28	2	0	0.0393701
4770	93%	25	2	0	0	0	0	0	27	29	2	0	0.0393701
700	93%	13	1	0	0	0	0	0	14	15	1	0	0.0393701
720	93%	13	1	0	0	0	0	0	14	15	1	0	0.0393701
830	93%	13	1	0	0	0	0	0	14	15	1	0	0.0393701
840	93%	13	1	0	0	0	0	0	14	15	1	0	0.0393701
4100	93%	13	1	0	0	0	0	0	14	15	1	0	0.0393701
4150	93%	27	0	1	0	0	0	0	28	30	2	0	0.0393701
800	94%	14	1	0	0	0	0	0	15	16	1	0	0.0393701
860	94%	14	1	0	0	0	0	0	15	16	1	0	0.0393701
4180	94%	28	2	0	0	0	0	0	30	32	2	0	0.0393701
4840	94%	14	1	0	0	0	0	0	15	16	1	0	0.0393701
300	94%	15	1	0	0	0	0	0	16	17	1	0	0.0393701
850	94%	15	1	0	0	0	0	0	16	17	1	0	0.0393701
4820	94%	15	1	0	0	0	0	0	16	17	1	0	0.0393701
2870	94%	16	1	0	0	0	0	0	17	18	1	0	0.0393701
4030	94%	16	1	0	0	0	0	0	17	18	1	0	0.0393701
4510	94%	16	1	0	0	0	0	0	17	18	1	0	0.0393701
970	95%	17	1	0	0	0	0	0	18	19	1	0	0.0393701
2240	95%	17	1	0	0	0	0	0	18	19	1	0	0.0393701
4110	95%	17	1	0	0	0	0	0	18	19	1	0	0.0393701
4830	95%	17	1	0	0	0	0	0	18	19	1	0	0.0393701
4020	95%	20	1	0	0	0	0	0	21	22	1	0	0.0393701
920	96%	23	1	0	0	0	0	0	24	25	1	0	0.0393701
2320	96%	24	1	0	0	0	0	0	25	26	1	1	0.0393701
4130	96%	25	1	0	0	0	0	0	26	27	1	0	0.0393701
4340	97%	27	1	0	0	0	0	0	28	29	1	0	0.0393701
4160	97%	28	1	0	0	0	0	0	29	30	1	0	0.0393701
4240	97%	28	1	0	0	0	0	0	29	30	1	0	0.0393701
4570	97%	31	1	0	0	0	0	0	32	33	1	0	0.0393701
1500	97%	32	1	0	0	0	0	0	33	34	1	0	0.0393701
4260	97%	34	1	0	0	0	0	0	35	36	1	0	0.0393701
630	98%	46	1	0	0	0	0	0	47	48	1	0	0.0393701
100	100%	17	0	0	0	0	0	0	17	17	0	0	0.0393701
150	100%	27	0	0	0	0	0	0	27	27	0	0	0.0393701
200	100%	12	0	0	0	0	0	0	12	12	0	0	0.0393701
220	100%	16	0	0	0	0	0	0	16	16	0	0	0.0393701
320	100%	15	0	0	0	0	0	0	15	15	0	0	0.0393701
330	100%	14	0	0	0	0	0	0	14	14	0	0	0.0393701
420	100%	13	0	0	0	0	0	0	13	13	0	0	0.0393701
500	100%	21	0	0	0	0	0	0	21	21	0	0	0.0393701
510	100%	25	0	0	0	0	0	0	25	25	0	0	0.0393701
610	100%	11	0	0	0	0	0	0	11	11	0	0	0.0393701
620	100%	11	0	0	0	0	0	0	11	11	0	0	0.0393701
640	100%	24	0	0	0	0	0	0	24	24	0	0	0.0393701
650	100%	13	0	0	0	0	0	0	13	13	0	0	0.0393701
710	100%	16	0	0	0	0	0	0	16	16	0	0	0.0393701
730	100%	8	0	0	0	0	0	0	8	8	0	0	0.0393701
810	100%	15	0	0	0	0	0	0	15	15	0	0	0.0393701
820	100%	15	0	0	0	0	0	0	15	15	0	0	0.0393701
870	100%	19	0	0	0	0	0	0	19	19	0	0	0.0393701
940	100%	18	0	0	0	0	0	0	18	18	0	0	0.0393699
950	100%	17	0	0	0	0	0	0	17	17	0	0	0.0393701
1010	100%	18	0	0	0	0	0	0	18	18	0	0	0.0393701
1030	100%	17	0	0	0	0	0	0	17	17	0	0	0.0393701
1040	100%	6	0	0	0	0	0	0	6	6	0	0	0.0393701
1050	100%	16	0	0	0	0	0	0	16	16	0	0	0.0393701
1060	100%	4	0	0	0	0	0	0	4	4	0	0	0.0393701
1320	100%	10	0	0	0	0	0	0	10	10	0	0	0.0393701
1330	100%	15	0	0	0	0	0	0	15	15	0	0	0.0393701
1340	100%	14	0	0	0	0	0	0	14	14	0	0	0.0393701
1350	100%	16	0	0	0	0	0	0	16	16	0	0	0.0393701
1360	100%	11	0	0	0	0	0	0	11	11	0	0	0.0393701
1370	100%	16	0	0	0	0	0	0	16	16	0	0	0.0393701
1420	100%	15	0	0	0	0	0	0	15	15	0	0	0.0393701
1440	100%	3	0	0	0	0	0	0	3	3	0	0	0.0393701
1520	100%	13	0	0	0	0	0	0	13	13	0	0	0.0393701
1550	100%	16	0	0	0	0	0	0	16	16	0	0	0.0393701
1600	100%	7	0	0	0	0	0	0	7	7	0	0	0.0393701
1620	100%	6	0	0	0	0	0	0	6	6	0	0	0.0393701
1700	100%	8	0	0	0	0	0	0	8	8	0	0	0.0393701
1710	100%	18	0	0	0	0	0	0	18	18	0	0	0.0393701
1720	100%	12	0	0	0	0	0	0	12	12	0	0	0.0393701
1800	100%	14	0	0	0	0	0	0	14	14	0	0	0.0393701

1810	100%	11	0	0	0	0	0	0	11	11	0	0	0.0393701
1900	100%	11	0	0	0	0	0	0	11	11	0	0	0.0393701
1920	100%	19	0	0	0	0	0	0	19	19	0	0	0.0393701
2260	100%	8	0	0	0	0	0	0	8	8	0	0	0.0393701
2310	100%	21	0	0	0	0	0	0	21	21	0	0	0.0393701
2350	100%	17	0	0	0	0	0	0	17	17	0	0	0.0393701
2370	100%	17	0	0	0	0	0	0	17	17	0	0	0.0393701
2710	100%	11	0	0	0	0	0	0	11	11	0	0	0.0393701
2730	100%	12	0	0	0	0	0	0	12	12	0	0	0.0393701
2810	100%	17	0	0	0	0	0	0	17	17	0	0	0.0393701
2910	100%	9	0	0	0	0	0	0	9	9	0	0	0.0393701
2930	100%	9	0	0	0	0	0	0	9	9	0	0	0.0393701
2940	100%	15	0	0	0	0	0	0	15	15	0	0	0.0393701
2950	100%	12	0	0	0	0	0	0	12	12	0	0	0.0393701
2990	100%	15	0	0	0	0	0	0	15	15	0	0	0.0393701
3020	100%	23	0	0	0	0	0	0	23	23	0	0	0.0393701
4010	100%	18	0	0	0	0	0	0	18	18	0	0	0.0393701
4050	100%	18	0	0	0	0	0	0	18	18	0	0	0.0393701
4140	100%	25	0	0	0	0	0	0	25	25	0	0	0.0393701
4170	100%	14	0	0	0	0	0	0	14	14	0	0	0.0393701
4200	100%	20	0	0	0	0	0	0	20	20	0	0	0.0393701
4310	100%	23	0	0	0	0	0	0	23	23	0	0	0.0393701
	Total Tips	**2,584**	**167**	**17**	**4**	**1**	**3**	**4**	**2,776**	**3,057**	**283**	**1**	
4850	92%	99	8	1	0	0	0	0	108	118	10	0	0.01
4860	85%	73	8	2	1	0	0	0	84	99	15	0	0.01
3010	90%	65	6	1	0	0	0	0	72	80	8	0	0.01
5720	91%	19	2	0	0	0	0	0	21	23	2	0	0.0393701
5730	89%	7	1	0	0	0	0	0	8	9	1	0	0.0393701
5740	96%	23	1	0	0	0	0	0	24	25	1	0	0.0393701
5760	29%	1	0	0	0	0	1	0	2	7	5	0	0.0393701
5770	100%	20	0	0	0	0	0	0	20	20	0	0	0.0393701
5790	95%	18	1	0	0	0	0	0	19	20	1	0	0.0393701
5800	53%	7	1	0	1	0	1	0	10	19	9	0	0.0393701
5810	90%	18	0	1	0	0	0	1	19	21	2	1	0.0393701
5820	96%	21	1	0	0	0	0	0	22	23	1	0	0.0393701
5830	100%	15	0	0	0	0	0	0	15	15	0	0	0.0393701
5860	100%	20	0	0	0	0	0	0	20	20	0	0	0.0393701
5880	91%	20	0	1	0	0	0	8	21	23	2	0	0.0393701
5940	87%	17	3	0	0	0	0	0	20	23	3	0	0.0393701

Monthly Traffic Loading