Memo

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

Date: August 3, 2008

To: Kevin Stewart and Chad Kudym

From: Markus Ritsch

Subject: **July 2008 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 July 1 through July 31, 2008.

II. General System Analysis Summary

A total of 333,405 data records were analyzed from the ALERT 2 base station. Meteorological sensors account for 63 percent, water level sensors 8 percent, and rain sensors 3 percent of the total monthly records.

More than ninety-nine percent (99.86%) of the received data reports were flagged as "good" by the Nova Star validation process. Roughly 483 reports were flagged as "bad". Of these "bad" reports, 28 originated from the water level sensor at SPR at Henderson (ID 1659).

The system-wide radio traffic loading was 10,755 reports per day with an average hourly loading of 448 reports. The peak hourly traffic loading was 728 reports, which occurred on July 6, between 2:00 PM and 3:00 PM. A plot of monthly average and peak hourly traffic loading is provided.

A total of 1,214 reports were received from the Hayman rain sensors this month. These reports make up less than 1% of the total reports for the month.

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

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2190	1660	1350	1710	1600	1600	1600					
140	2190	110	540	540	110	1660					
4150	140	2190	1600	1710	950	4140					
4060	4170	1370	1350	4080	1710	1350					
4470	4150	620	710	4060	540	1710					
4530	4530	840	4330	4150	4530	4530					

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.

Sensor ID 1460 has a 24-hour timer reporting interval and is not included in the timer reporting analysis.

Sensor ID 1810 has an 18-hour timer reporting interval and is not included in the timer reporting analysis.

IV. Rain Sensor Event Reporting Summary

A. District-Wide Total Tip/Count Statistics

The incrementing reports from all 1-mm rain sensors (excluding Hayman sensors and excluding Aurora Town Hall-920) were analyzed to quantify the District-wide statistical total monthly tip summary (Table 2).

Table 2. District-Wide Total Tip/Count Statistical Summary

Statistical Parameter	Value	Comments
Mean	16.43	Only the 1-mm rain sensors were included in the analysis
Median	11.5	Only the 1-mm rain sensors were included in the analysis
Standard deviation	19	Only the 1-mm rain sensors were included in the analysis
Mean plus three standard deviations	73.43	Only the 1-mm rain sensors were included in the analysis
Minimum total count	1	Sensors 120, 330, 1040
Maximum total count	141	Expo Park (ID 420)

The highest reporting rain sensor this month was Expo Park (ID 420) with 141 tips. This sensor is influenced by irrigation sprinklers.

Other than Expo Park, one sensor (1500) reported more than the system-wide mean plus 3 standard deviations and is inspected manually.

a. Powers Park (ID 1500)

This sensor is also influenced by irrigation sprinklers. Nothing suspicious is evident in the incrementing count series, other than a lot of tips were recorded.

B. Monthly Average Tip/Count Summary

A monthly summary of the District-wide mean total tip/count is presented (Table 3).

Table 3. 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						

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

Several sensors had a jump in sequential count of more than six (Table 4). These large jumps are investigated through a manual inspection of the count series.

Table 4. Sensors with a Jump of More than 6 in Sequential Count

Sensor Description	Sensor ID	Comment
Brook Forest	2260	This sensor experienced a large jump in count on July 16 at 11:19:39 AM. The count series for the rest of the month looks reasonable. This single large jump could be due to site maintenance.
Castle Rock Weather	2750	This sensor recorded large jumps in count early in the month due to a standpipe/antenna mast grounding issue. The problem was resolved on July 9 and the station has reported correct rainfall since.

D. Sensor-by-Sensor Incrementing Count Summary

The system-wide reception rate of incrementing, 1-mm tip reports for the month was approximately 94 percent. A total of 2,260 incrementing reports were received and a total of 2,398 were expected. The total loss of incrementing reports for the month was approximately 6 percent. Those sensors with the worst rain event transmission performance characteristics are summarized (Table 5).

Table 5. Monthly Summary of Sensors with the Most Missed Tips

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1640	4520	2930	1710	1600	1600	1660					
2190	4820	540	1600	2320	2750	4820					
750	4530	2730	540	4150	2710	4080					
4570	4470	2210	700	1710	310	2340					
2990	4810	110	110	4710	4090	2330					
--	700	1350	840	1350	4170	4060					

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.

The incrementing data series for those sensors with an event performance of less than 70 % is manually inspected.

b. SPR at Henderson (ID 1660)

This sensor had only four total incrementing reports for the entire month. Two of the four incrementing reports were invalidated by the base due data corruption or bit-flip error.

c. Doudy Draw (ID 4820)

This sensor missed two of five incrementing reports for the month.

d. Twin Sisters (ID 4080)

This sensor experienced a large jump in count on July 8th at 8:09:52 PM. Nothing else is suspicious in the series for the remainder of the month.

V. Heavy Radio Traffic Analysis

Periods exceeding 700 messages per hour are analyzed independently in an attempt to identify rain tip sequences where 3 or more, sequential messages are lost.

A. The Heaviest Hourly Traffic Periods This Month

The hourly periods of highest radio traffic this month include:

- July 6 from 2:00 PM to 3:00 PM (728 reports)
- July 18 from 7:00 PM to 8:00 PM (661 reports)
- July 24 from 4:00 PM to 5:00 PM (646 reports)
- July 8 from 3:00 PM to 4:00 PM (644 reports)
- July 8 from 2:00 PM to 3:00 PM (643 reports)

B. July 6, 2008

The heaviest traffic period occurred on July 6th. The distribution of hourly traffic around the peak hour is summarized:

- July 6 from 12:00 PM to 1:00 PM (530 reports)
- July 6 from 1:00 PM to 2:00 PM (558 reports)
- July 6 from 2:00 PM to 3:00 PM (728 reports)
- July 6 from 3:00 PM to 4:00 PM (618 reports)
- July 6 from 4:00 PM to 5:00 PM (538 reports)

Incrementing rain records from the 1-mm gages for the heavy radio traffic period were examined to characterize the loss of sequential incrementing tip transmissions (Table 6). During the heavy traffic period, a total of 237 reports were expected and only 224 were received yielding a loss of approximately 5.5% of the incrementing transmissions.

Table 6. Peak Traffic Analysis - Loss of Incrementing Tip Reports

	Occurrences of lost sequential tip reports during period			
Heavy Traffic Period (July 6, 2008)	**Loss of 2 sequential tips**	**Loss of 3 sequential tips**	**Loss of 4 sequential tips**	**Loss of 5 sequential tips**
12:00 PM to 5:00 PM	0	0	0	0

The hourly traffic rates experienced during the storm on the morning of July 6th were only on the order of 600 to 700 transmissions per hour. No sensor experienced a loss of sequential tip counts.

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)	135
Total reports from unknown IDs	173
Unknown IDs with only a single received report (potential noise)	122
Total reports from all IDs – RecData Log entire month	277,476
Unknown reports as a fraction of total reports	0.06%

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).

Table 8. Reports Received by Unknown IDs

Sensor ID	Reports
1663	20
2754	6
2753	4
2749	3
4093	2
1293	2
409	2
4796	2
4091	2
4856	2
2736	2
2232	2
4828	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	8	12:00-12:59	7
1:00-1:59	6	1:00-1:59	7
2:00-2:59	0	2:00-2:59	9
3:00-3:59	3	3:00-3:59	8
4:00-4:59	12	4:00-4:59	8
5:00-5:59	4	5:00-5:59	8
6:00-6:59	2	6:00-6:59	11
7:00-7:59	6	7:00-7:59	7
8:00-8:59	5	8:00-8:59	8
9:00-9:59	6	9:00-9:59	9
10:00-10:59	11	10:00-10:59	3
11:00-11:59	19	11:00-11:59	6

VII. Issues Identified this Month

Sensors with a large number of invalid reports:

1. **Castle Rock Weather (ID 2744)** - Wind Gust with 52,
2. **Highland Ranch WTP (ID 2704)** - Wind Gust with 36 reports,
3. **Salisbury Park (ID 2724)** - Wind Gust with 29 reports,
4. **SPR at Henderson (ID 1659)** - Water Level with 28 reports, and
5. **Sugarloaf (ID 4724)** - Wind Gust with 23 reports.

Sensors reporting frequently (over reporting):

6. **Quincy Reservoir (ID 749 - Wind)** with 5,533 reports,
7. **Boulder Creek at Broadway (ID 4583 - Water Level)** with 3,555 (OneRain reports that wave action triggers many transmissions due to a delta set at 0.1 feet), and
8. **Salisbury Park (ID 2727 - Wind)** with 3,533 reports.

Sensors reporting infrequently (under reporting):

9. **Englewood Dam (ID 1605 – Battery)** with 46 reports,
10. **SPR at Henderson (ID 1665 – Battery)** with 45 reports, and
11. **ETG @ Buckley (ID 823 – Water Level)** with 20 reports.

Poor timer reporting:

The following sensors reported for the entire month and showed poor timer performance.

12. **Englewood Dam (ID 1600)** - Only 76% of the timer reports were received.
13. **SPR at Henderson (ID 1660)** - Only 74% of the timer reports were received.
14. **Logan Mill (ID 4140) -** Only 74% of the timer reports received for the entire month.
15. **Chatfield COE (ID 1350) -** Only 76% of the timer reports received for the entire month.
16. **Shop Creek (ID 1710)** - Only 76% of the timer reports were received from this sensor.

Poor event reporting:

The following sensors reported for the entire month and showed poor event performance.

17. **SPR at Henderson (ID 1660)** - Only 50% of the event reports were received.
18. **Doudy Draw (ID 4820)** - Only 60% of the event reports were received.
19. **Twin Sisters (ID 4080)** - Only 68% of the event reports were received from this sensor.

Low rain total:

20. **West Woods (ID 120) -** This sensor recorded only 1 tip for the entire month.
21. **Van Bibber @ Hwy 93 (ID 330) -** This sensor recorded only 1 tip for the entire month.
22. **Lena @ US Hwy 6 (1040) –** This sensor recorded only 1 tip for the month.

High rain total:

23. **Expo Park (ID 420) –** This sensor recorded a total of 141 tips for the month. This station is noted for being influenced by sprinkler irrigation.
24. **Powers Park (ID 1500) –** This sensor recorded a total of 104 tips for the month. This station is noted for being influenced by sprinkler irrigation.
25. **Temple Pond at DTC (ID 630) -** This sensor recorded a total of 64 tips for the month. This station is noted for being influenced by sprinkler irrigation.

Large Jump in Sequential Count (bit flip errors/contention loss/transmitter problems):

26. **Brook Forest (ID 2260)** - This sensor experienced a large jump in count on July 16 at 11:19:39 AM. The count series for the rest of the month looks reasonable. This single large jump could be due to site maintenance.
27. **Castle Rock Weather (ID 2750)** - This sensor recorded large jumps in count early in the month due to a standpipe/antenna mast grounding issue. The problem was resolved on July 9 and the station has reported correct rainfall since.

Reports from "Unknown Sensors":

28. The following table shows the "unknown" sensor IDs and the total number of reports received during the month. These reports indicate the existence of transmitters that are sending information on an ID that is not currently defined within NovaStar.

Sensor ID	Reports
1663	20
2754	6
2753	4
2749	3
4093	2
1293	2
409	2
4796	2
4091	2
4856	2
2736	2
2232	2
4828	2

General System Analysis

Database Name P:\A207-UDFCD-Data-Analysis\2008_July\Novastar_extract_2008July.mdb

First Date in Database	7/1/08 12:00 AM	**Total Days**	31.0
Last Date in Database	7/31/08 11:59 PM	**Total Hours**	744.0

Total Records Analyzed 333405

Records by Group

None-ALERT-ID	55315	17%
Wind Gust	47392	14%
Temperature	43153	13%
Relative Humidity	40085	12%
Wind Direction	20245	6%
Barometric Pressure	18415	6%
Water Level PT-HSE	17936	5%
Wind Speed Average	16695	5%
Wind Speed Average & Azimu	15455	5%
Precipitation	11205	3%
Solar Radiation	8858	3%
Battery Voltage HSE	7354	2%
Water Level Float	4845	1%
Fuel Temperature	3659	1%
Fuel Moisture	3643	1%
Battery Voltage Analog	3444	1%
Battery Voltage Digital	2988	1%
Soil Moisture	2905	1%
Water Level PT	2288	1%
Precipitation - Mean	1503	0%
Hayman Precipitation	1214	0%
Repeater Pass List	615	0%
Repeater Status Report	489	0%
12Hr Status Report	350	0%
Precipitation - Test	247	0%
Battery	242	0%
Longmont Flow Gage	228	0%
Battery Voltage	121	0%
Handar 585 ALARM Status	62	0%
Longmont Water Level PT	59	0%
Solar Power	1	0%
Total	331011	

Records by Major Group

Meteorologic Sensors	210298	63%
Water Level Sensors	25356	8%
Sensor Status Transmission	15303	5%
Rain Sensors	11205	3%
Soil and Fuel Sensors	10207	3%
Total	272369	

Records by Validation Type

Good	0	332922	99.86%
Questionable	1	483	0.14%
	Total	333405	

Sensors With Most Invalid Data

Description	**Sensor**	**Reports**
Castle Rock	2744	52
Highlands Ranch WTP	2704	36
Salisbury Park	2724	29
SPR at Henderson	1659	28
Sugarloaf	4724	23

Traffic Loading Summary

Alert Reports	333405	
Average Daily Traffic	10755	
Average Hourly Traffic	448	
Median Hourly Traffic	444	hour beginning
Peak Hourly Traffic	728	7/6/08 2:00 PM
2nd Max	661	7/18/08 7:00 PM
3rd Max	646	7/24/08 4:00 PM
4th Max	644	7/8/08 3:00 PM
5th Max	643	7/8/08 2:00 PM

Rain Timer Performance

Analyze Rain Sensors

			systemwide average (days) 0.5213		90%
Rain Sensors	**Description**	**Rcv**	**Average Timer Interval**	**Exp**	**Performance**
100	Carr Street	58	12:37	62.00	94%
110	Ralston Reservoir	55	12:54	62.00	89%
120	West Woods	59	11:58	62.00	95%
130	Simms Street	57	12:49	62.00	92%
140	Blue Mountain	60	12:13	62.00	97%
150	Nott Creek	57	12:44	62.00	92%
200	Leyden Reservoir	59	12:23	62.00	95%
220	Upper Leyden	61	12:00	62.00	98%
300	Van Bibber Park	58	12:37	62.00	94%
310	Guy Hill Ranch	57	12:54	62.00	92%
320	Sports Complex	58	12:36	62.00	94%
330	Van Bibber @ Hwy 93	59	12:23	62.00	95%
410	Kelly Dam	54	13:47	62.00	87%
420	Expo Park	55	12:19	62.00	89%
440	Fire Station #7	59	12:11	62.00	95%
500	Havana Park	49	12:57	62.00	79%
520	Jewell Detention	54	12:14	62.00	87%
530	Fire Station #19	59	12:23	62.00	95%
540	Parker/Mississippi	56	13:06	62.00	90%
600	Harvard Gulch Park	59	12:11	62.00	95%
610	Harvard @ Jackson	59	12:09	62.00	95%
620	Quincy/Highline	54	13:29	62.00	87%
630	Temple Pond at DTC	51	12:23	62.00	82%
650	Iliff Pond	61	11:57	62.00	98%
700	Toll Gate @ 6th	55	12:57	62.00	89%
710	Horseshoe Park Drop	56	12:55	62.00	90%
720	Confluence Pond	58	12:44	62.00	94%
730	No Name @ Quincy	60	11:57	62.00	97%
740	Smoky Hill	60	12:13	62.00	97%
750	Quincy Reservoir	60	11:57	62.00	97%
760	Mission Viejo Park	57	12:20	62.00	92%
800	Sable Ditch @ 18th	56	13:05	62.00	90%
810	Granby Ditch @ 6th	61	11:57	62.00	98%
820	ETG @ Buckley	60	12:10	62.00	97%
830	Side Creek Park	57	12:26	62.00	92%
840	Fire Station 12	60	12:12	62.00	97%
850	Flying J	49	15:00	62.00	79%
860	Sand Cr at Colfax	110	6:44	62.00	177%
870	Murphy Creek GC	56	12:14	62.00	90%
900	Aurora Reservoir	58	12:46	62.00	94%
920	Aurora Town Hall Wx	58	12:20	62.00	94%
940	Sampson Gulch	59	12:26	62.00	95%
950	Piney at Liverpool	58	12:25	62.00	94%
1000	Maple Grove Resv.	58	12:36	62.00	94%
1010	Denver West	57	12:53	62.00	92%
1020	Lena @ Nolte Pond	59	12:24	62.00	95%
1030	NREL/S. Table Mtn.	57	12:52	62.00	92%
1040	Lena @ U.S. Hwy 6	57	12:52	62.00	92%
1050	Jeffco Fairgrounds	60	12:10	62.00	97%
1060	Heritage Square	58	12:37	62.00	94%
1100	Louisville Rec Ctr	55	13:21	62.00	89%
1110	Gunbarrel	48	14:53	62.00	77%
1300	Hidden Lake	57	12:24	62.00	92%
1310	LDC at 64th	61	12:10	62.00	98%
1320	SPR at 3rd Ave	58	12:37	62.00	94%
1330	Roslyn	60	12:12	62.00	97%
1340	Sanderson at Xavier	57	12:55	62.00	92%

1350	Chatfield COE	47	13:23	62.00	76%
1360	Denver Zoo	58	12:13	62.00	94%
1370	West Metro FS13	57	12:59	62.00	92%
1420	Diamond Hill	58	12:39	62.00	94%
1440	Elbert	59	12:27	62.00	95%
1460	Stapleton	29	23:59	62.00	47%
1480	Third Creek at DIA	59	12:26	62.00	95%
1500	Powers Park	56	12:25	62.00	90%
1520	Marston Lake North	62	11:59	62.00	100%
1530	Bear Creek @ Lowell	60	12:09	62.00	97%
1540	Sanderson at Xavier	58	12:23	62.00	94%
1550	Lakewood CC	56	13:57	62.00	90%
1570	Brighton Ditch Wx	58	12:13	62.00	94%
1600	Englewood Dam	47	14:24	62.00	76%
1610	Holly Dam	58	12:35	62.00	94%
1620	Slaughterhouse Glch	58	12:37	62.00	94%
1630	SPR at Dartmouth	59	12:34	62.00	95%
1660	SPR at Henderson	46	15:34	62.00	74%
1700	Cherry Cr @ Champa	57	12:40	62.00	92%
1710	Shop Creek	47	15:54	62.00	76%
1720	Cherry Cr @ Steele	57	12:38	62.00	92%
1810	Sand Creek at mouth	38	18:31	62.00	61%
1900	Niver Detention	57	12:49	62.00	92%
1920	Brighton	59	12:26	62.00	95%
2190	Squaw Mountain	58	12:32	62.00	94%
2210	Hiwan G.C.	57	12:28	62.00	92%
2220	Evergreen Lake	60	12:10	62.00	97%
2230	Bear Cr below Cub	58	12:39	62.00	94%
2240	Cold Sprg Glch conf	60	11:58	62.00	97%
2250	Rosedale	57	13:00	62.00	92%
2260	Brook Forest	58	12:26	62.00	94%
2270	Cub Cr below Blue	57	12:27	62.00	92%
2280	Kinney Peak	58	12:39	62.00	94%
2310	Genesee Village	59	12:25	62.00	95%
2330	Morrison	54	13:22	62.00	87%
2340	El Rancho	52	13:15	62.00	84%
2350	Idledale	57	12:55	62.00	92%
2360	Indian Hills	58	12:11	62.00	94%
2370	Red Rocks Park	59	12:23	62.00	95%
2710	Highlands Ranch WTP	61	12:00	62.00	98%
2730	Salisbury Park	61	12:00	62.00	98%
2750	Castle Rock	72	9:12	62.00	116%
2810	Pine Cliff Road	58	12:13	62.00	94%
2820	Haskins Gulch Conf	56	12:27	62.00	90%
2840	Sulphur Gulch	59	12:26	62.00	95%
2850	Cherry Cr bl Bayou Glch	57	12:57	62.00	92%
2920	West Cherry Head-Douglas Cnty	54	12:15	62.00	87%
2930	Spring Valley Rd - DougCnty	59	12:14	62.00	95%
2940	Willow Creek - DougCnty	55	12:00	62.00	89%
2990	Tomah Rd-Douglas Cnty	60	12:13	62.00	97%
4010	Cresent	52	14:18	62.00	84%
4020	Rio Grande	60	12:11	62.00	97%
4030	Red Garden	57	12:52	62.00	92%
4040	Martin Gulch	59	12:12	62.00	95%
4050	Walker Ranch	59	12:24	62.00	95%
4060	Lakeshore	51	13:17	62.00	82%
4070	Bear Peak	57	12:12	62.00	92%
4080	Twin Sisters	56	12:57	62.00	90%
4090	Magnolia	49	14:24	62.00	79%
4100	Filter Plant	58	12:26	62.00	94%
4110	Betasso	58	12:26	62.00	94%
4130	Swiss Peaks	58	12:42	62.00	94%

4140	Logan Mill	46	14:53	62.00	74%
4150	Gold Hill	55	12:44	62.00	89%
4160	Sunshine	61	11:58	62.00	98%
4170	Pine Brook	52	13:44	62.00	84%
4180	Gold Lake	53	13:23	62.00	85%
4190	Slaughterhouse	58	12:26	62.00	94%
4200	Lazy Acres	47	15:30	62.00	76%
4220	Fling's	60	12:12	62.00	97%
4230	Golden Age	56	12:56	62.00	90%
4240	Sunset	47	14:29	62.00	76%
4250	Geer Canyon	60	12:10	62.00	97%
4260	Taylor Mountain	58	12:12	62.00	94%
4270	Cannon Mountain	58	12:25	62.00	94%
4290	Red Hill	60	12:11	62.00	97%
4300	Big Elk Park	57	12:29	62.00	92%
4310	Johnny Park	61	11:57	62.00	98%
4340	Riverside	60	12:11	62.00	97%
4350	Conifer Hill	55	13:16	62.00	89%
4360	Justice Center	58	12:37	62.00	94%
4470	Little Narrows	55	13:24	62.00	89%
4490	Apple Valley	58	12:38	62.00	94%
4510	Pinewood Springs	54	13:03	62.00	87%
4520	Eagle Ridge	58	12:27	62.00	94%
4530	Winiger Ridge	48	14:53	62.00	77%
4560	Lyons Diversion NSV	50	14:53	62.00	81%
4570	St. Antons	48	13:53	62.00	77%
4710	Ward C-1	56	13:06	62.00	90%
4730	Sugarloaf	59	12:13	62.00	95%
4750	Louisville Lake	59	12:25	62.00	95%
4770	Cal-Wood Ranch	57	12:44	62.00	92%
4790	Button Rock	53	13:01	62.00	85%
4810	Shanahan Ridge	58	12:24	62.00	94%
4820	Doudy Draw	53	13:38	62.00	85%
4830	SBC @ San Souci	58	12:36	62.00	94%
4840	SBC@S Boulder Ditch	60	12:10	62.00	97%
4850	Porphory Mtn	52	12:34	62.00	84%
4860	Fairview Peak	52	13:11	62.00	84%

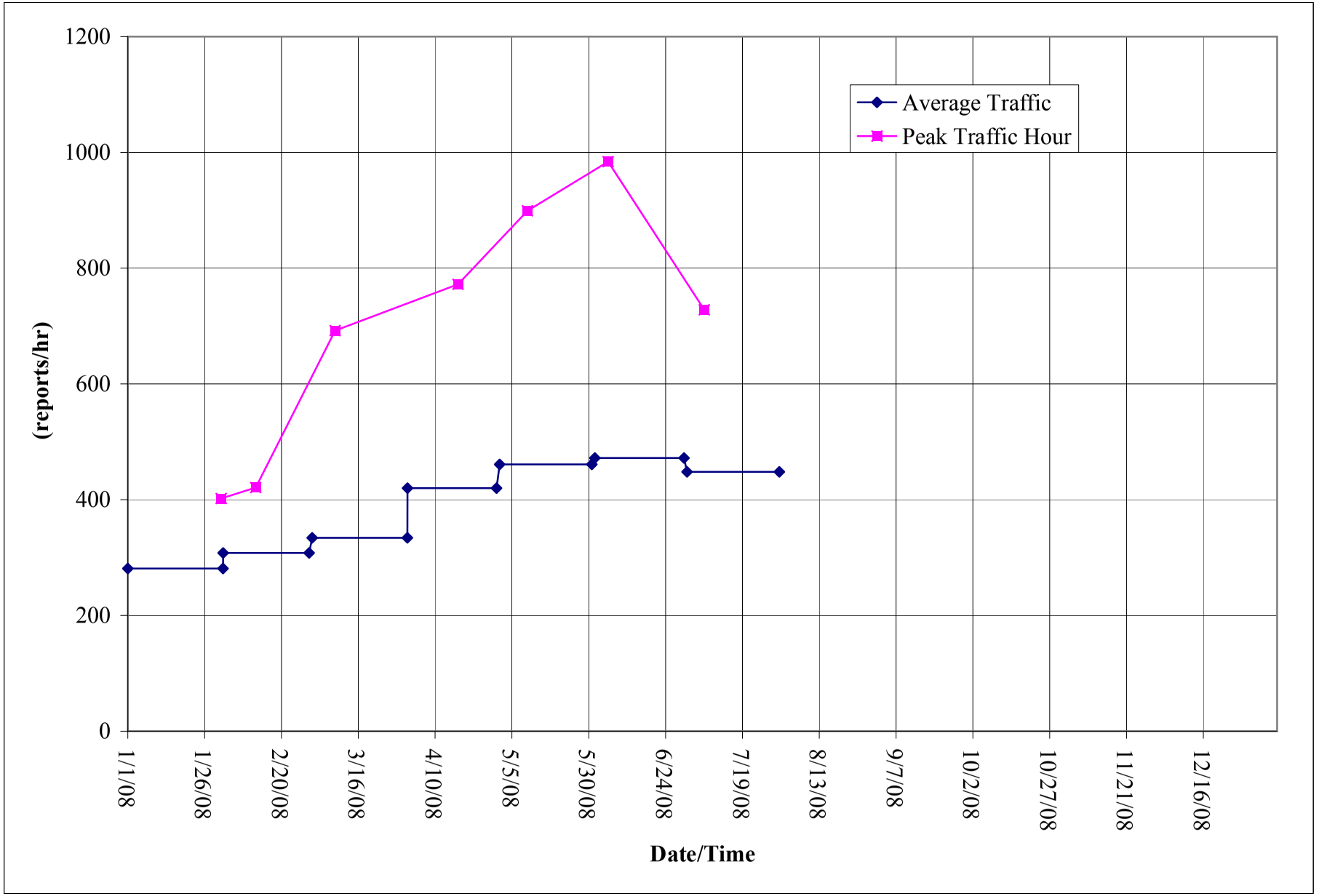
Rain Event Performance

Analyze Rain Sensors

	Reports Received	2260	
Systemwide Avg	Total Tips	2398	
94%	Data Loss	5.75%	

Rain Sensor	Performance	1-tips	2-tips	3-tips	4-tips	5-tips	6-tips	>6-tips	Rcv	Exp	Miss	Hold	Bucket
420	97%	134	2	1	0	0	0	0	137	141	4	0	0.0393701
1500	99%	102	1	0	0	0	0	0	103	104	1	0	0.0393701
730	96%	63	3	0	0	0	0	0	66	69	3	0	0.0393701
630	95%	58	3	0	0	0	0	0	61	64	3	0	0.0393701
760	94%	54	4	0	0	0	0	0	58	62	4	0	0.0393701
500	93%	50	4	0	0	0	0	0	54	58	4	0	0.0393701
870	91%	46	5	0	0	0	0	0	51	56	5	11	0.0393701
2190	100%	52	0	0	0	0	0	0	52	52	0	0	0.0393701
1550	98%	48	1	0	0	0	0	0	49	50	1	0	0.0393701
920	98%	43	1	0	0	0	0	0	44	45	1	0	0.0393701
720	98%	40	1	0	0	0	0	0	41	42	1	0	0.0393701
4710	83%	26	7	0	0	0	0	0	33	40	7	0	0.0393701
4260	95%	36	0	1	0	0	0	0	37	39	2	0	0.0393701
2850	95%	34	2	0	0	0	0	0	36	38	2	0	0.0393701
750	89%	29	4	0	0	0	0	0	33	37	4	0	0.0393701
2930	91%	29	3	0	0	0	0	0	32	35	3	0	0.0393701
4180	97%	31	1	0	0	0	0	0	32	33	1	0	0.0393701
150	94%	28	2	0	0	0	0	0	30	32	2	0	0.0393701
4220	91%	26	3	0	0	0	0	0	29	32	3	0	0.0393701
940	93%	26	2	0	0	0	0	0	28	30	2	0	0.0393699
4300	97%	28	1	0	0	0	0	0	29	30	1	0	0.0393701
2990	100%	29	0	0	0	0	0	0	29	29	0	0	0.0393701
740	96%	26	1	0	0	0	0	0	27	28	1	0	0.0393701
830	82%	19	3	1	0	0	0	0	23	28	5	1	0.0393701
4190	96%	26	1	0	0	0	0	0	27	28	1	0	0.0393701
4270	100%	26	0	0	0	0	0	0	26	26	0	0	0.0393701
4790	81%	17	3	1	0	0	0	0	21	26	5	0	0.0393701
1570	84%	19	1	0	1	0	0	0	21	25	4	0	0.0393701
2250	100%	25	0	0	0	0	0	0	25	25	0	0	0.0393701
2940	88%	19	3	0	0	0	0	0	22	25	3	0	0.0393701
950	100%	24	0	0	0	0	0	0	24	24	0	0	0.0393701
4340	96%	22	1	0	0	0	0	0	23	24	1	0	0.0393701
4470	92%	21	0	1	0	0	0	0	22	24	2	0	0.0393701
4310	100%	23	0	0	0	0	0	0	23	23	0	0	0.0393701
4570	90%	17	2	0	0	0	0	0	19	21	2	0	0.0393701
850	90%	16	2	0	0	0	0	0	18	20	2	0	0.0393701
900	100%	20	0	0	0	0	0	0	20	20	0	0	0.0393699
310	89%	15	2	0	0	0	0	0	17	19	2	0	0.0393701
440	89%	15	2	0	0	0	0	0	17	19	2	0	0.0393701
4080	68%	11	0	0	2	0	0	0	13	19	6	0	0.0393701
4510	95%	17	1	0	0	0	0	0	18	19	1	0	0.0393701
4530	89%	15	2	0	0	0	0	0	17	19	2	0	0.0393701
140	100%	18	0	0	0	0	0	0	18	18	0	0	0.0393701
1440	100%	18	0	0	0	0	0	0	18	18	0	0	0.0393701
2820	89%	15	0	1	0	0	0	0	16	18	2	0	0.0393701
4130	89%	14	2	0	0	0	0	0	16	18	2	1	0.0393701
4350	94%	16	1	0	0	0	0	0	17	18	1	0	0.0393701
4770	94%	16	1	0	0	0	0	0	17	18	1	0	0.0393701
2270	94%	15	1	0	0	0	0	0	16	17	1	0	0.0393701
4150	88%	13	2	0	0	0	0	0	15	17	2	0	0.0393701
710	100%	16	0	0	0	0	0	0	16	16	0	0	0.0393701
1710	93%	13	1	0	0	0	0	0	14	15	1	1	0.0393701
1920	100%	15	0	0	0	0	0	0	15	15	0	0	0.0393701
4160	93%	13	1	0	0	0	0	0	14	15	1	0	0.0393701
520	93%	12	1	0	0	0	0	0	13	14	1	0	0.0393701
840	86%	11	0	1	0	0	0	0	12	14	2	1	0.0393701
2840	93%	12	1	0	0	0	0	0	13	14	1	0	0.0393701
4020	100%	14	0	0	0	0	0	0	14	14	0	0	0.0393701
1340	100%	13	0	0	0	0	0	0	13	13	0	0	0.0393701
2210	100%	13	0	0	0	0	0	0	13	13	0	0	0.0393701
2730	100%	13	0	0	0	0	0	0	13	13	0	0	0.0393701
4010	92%	11	1	0	0	0	0	0	12	13	1	0	0.0393701
4240	100%	13	0	0	0	0	0	0	13	13	0	0	0.0393701
1010	92%	10	1	0	0	0	0	0	11	12	1	0	0.0393701
1370	100%	12	0	0	0	0	0	0	12	12	0	0	0.0393701
1480	100%	12	0	0	0	0	0	0	12	12	0	0	0.0393701
2280	92%	10	1	0	0	0	0	0	11	12	1	0	0.0393701
2340	75%	6	3	0	0	0	0	0	9	12	3	1	0.0393701
2350	100%	12	0	0	0	0	0	0	12	12	0	0	0.0393701
2810	92%	10	1	0	0	0	0	0	11	12	1	0	0.0393701
4040	100%	12	0	0	0	0	0	0	12	12	0	0	0.0393701
4230	92%	10	1	0	0	0	0	0	11	12	1	0	0.0393701

4490	92%	10	1	0	0	0	0	0	11	12	1	0	0.0393701
620	82%	7	2	0	0	0	0	0	9	11	2	0	0.0393701
4200	82%	7	2	0	0	0	0	0	9	11	2	0	0.0393701
4520	91%	9	1	0	0	0	0	0	10	11	1	1	0.0393701
2240	100%	10	0	0	0	0	0	0	10	10	0	0	0.0393701
2260	100%	10	0	0	0	0	0	1	10	10	0	0	0.0393701
4060	80%	6	2	0	0	0	0	0	8	10	2	0	0.0393701
4090	100%	10	0	0	0	0	0	0	10	10	0	0	0.0393701
4290	100%	10	0	0	0	0	0	0	10	10	0	0	0.0393701
860	100%	9	0	0	0	0	0	0	9	9	0	0	0.0393701
2920	89%	7	1	0	0	0	0	0	8	9	1	0	0.0393701
4140	89%	7	1	0	0	0	0	0	8	9	1	0	0.0393701
4730	89%	7	1	0	0	0	0	0	8	9	1	0	0.0393701
220	88%	6	1	0	0	0	0	0	7	8	1	0	0.0393701
700	88%	6	1	0	0	0	0	0	7	8	1	0	0.0393701
810	100%	8	0	0	0	0	0	0	8	8	0	0	0.0393701
1050	100%	8	0	0	0	0	0	0	8	8	0	0	0.0393701
2310	100%	8	0	0	0	0	0	0	8	8	0	0	0.0393701
4070	88%	6	1	0	0	0	0	0	7	8	1	0	0.0393701
820	86%	5	1	0	0	0	0	0	6	7	1	0	0.0393701
1350	86%	5	1	0	0	0	0	0	6	7	1	0	0.0393701
1520	100%	7	0	0	0	0	0	0	7	7	0	0	0.0393701
2230	100%	7	0	0	0	0	0	0	7	7	0	0	0.0393701
2370	100%	7	0	0	0	0	0	0	7	7	0	0	0.0393701
4050	100%	7	0	0	0	0	0	0	7	7	0	0	0.0393701
1330	100%	6	0	0	0	0	0	0	6	6	0	0	0.0393701
1530	100%	6	0	0	0	0	0	0	6	6	0	0	0.0393701
2360	83%	4	1	0	0	0	0	0	5	6	1	0	0.0393701
4110	100%	6	0	0	0	0	0	0	6	6	0	0	0.0393701
1030	100%	5	0	0	0	0	0	0	5	5	0	1	0.0393701
1060	100%	5	0	0	0	0	0	0	5	5	0	0	0.0393701
1810	100%	5	0	0	0	0	0	0	5	5	0	0	0.0393701
4100	100%	5	0	0	0	0	0	0	5	5	0	0	0.0393701
4250	100%	5	0	0	0	0	0	0	5	5	0	0	0.0393701
4810	100%	5	0	0	0	0	0	0	5	5	0	0	0.0393701
4820	60%	1	2	0	0	0	0	0	3	5	2	0	0.0393701
410	100%	4	0	0	0	0	0	0	4	4	0	0	0.0393701
530	100%	4	0	0	0	0	0	0	4	4	0	0	0.0393701
540	100%	4	0	0	0	0	0	0	4	4	0	0	0.0393701
600	100%	4	0	0	0	0	0	0	4	4	0	0	0.0393701
1360	100%	4	0	0	0	0	0	0	4	4	0	0	0.0393701
1660	50%	0	2	0	0	0	0	0	2	4	2	0	0.0393701
1700	100%	4	0	0	0	0	0	0	4	4	0	0	0.0393701
1720	100%	4	0	0	0	0	0	0	4	4	0	0	0.0393701
2330	75%	2	1	0	0	0	0	0	3	4	1	0	0.0393701
4170	100%	4	0	0	0	0	0	0	4	4	0	0	0.0393701
110	100%	3	0	0	0	0	0	0	3	3	0	0	0.0393701
200	100%	3	0	0	0	0	0	0	3	3	0	0	0.0393701
300	100%	3	0	0	0	0	0	0	3	3	0	0	0.0393701
320	100%	3	0	0	0	0	0	0	3	3	0	0	0.0393701
1000	100%	3	0	0	0	0	0	0	3	3	0	0	0.0393701
1110	100%	3	0	0	0	0	0	0	3	3	0	0	0.0393701
1300	100%	3	0	0	0	0	0	0	3	3	0	0	0.0393701
1320	100%	3	0	0	0	0	0	0	3	3	0	0	0.0393701
1420	100%	3	0	0	0	0	0	0	3	3	0	0	0.0393701
1460	100%	3	0	0	0	0	0	0	3	3	0	0	0.0393701
1620	100%	3	0	0	0	0	0	0	3	3	0	0	0.0393701
2710	100%	3	0	0	0	0	0	0	3	3	0	0	0.0393701
4030	100%	3	0	0	0	0	0	0	3	3	0	0	0.0393701
100	100%	2	0	0	0	0	0	0	2	2	0	0	0.0393701
610	100%	2	0	0	0	0	0	0	2	2	0	0	0.0393701
650	100%	2	0	0	0	0	0	0	2	2	0	0	0.0393701
800	100%	2	0	0	0	0	0	0	2	2	0	0	0.0393701
1100	100%	2	0	0	0	0	0	0	2	2	0	0	0.0393701
1310	100%	2	0	0	0	0	0	0	2	2	0	0	0.0393701
1600	100%	2	0	0	0	0	0	0	2	2	0	0	0.0393701
1900	100%	2	0	0	0	0	0	0	2	2	0	1	0.0393701
4360	100%	2	0	0	0	0	0	0	2	2	0	0	0.0393701
4750	100%	2	0	0	0	0	0	0	2	2	0	0	0.0393701
4830	100%	2	0	0	0	0	0	0	2	2	0	0	0.0393701
4840	100%	2	0	0	0	0	0	0	2	2	0	0	0.0393701
120	100%	1	0	0	0	0	0	0	1	1	0	0	0.0393701
330	100%	1	0	0	0	0	0	0	1	1	0	0	0.0393701
1040	100%	1	0	0	0	0	0	0	1	1	0	0	0.0393701
	Total Tips	**2135**	**115**	**7**	**3**	**0**	**0**	**1**	**2260**	**2398**	**138**	**19**	


1200
1000
800
600
400
200
0
(reports/hr)
Average Traffic
Peak Traffic Hour
1/1/08
1/26/08
2/20/08
3/16/08
4/10/08
5/5/08
5/30/08
6/24/08
7/19/08
8/13/08
9/7/08
10/2/08
10/27/08
11/21/08
12/16/08
Date/Time