

Memo

Date: April 4, 2014
To: Kevin Stewart
From: Markus Ritsch
Subject: March 2014 ALERT Data Analysis

I. ALERT Data Source

Raw ALERT data records extracted from the Urban Drainage and Flood Control District's NovaStar 5 base station were analyzed for the period March 1 through March 31, 2014.

II. General System Analysis Summary

In 2014 data will be received at the District through both the legacy ALERT channel and through the ALET2 (concentrator plus A2 self-reports) channel. The following table quantifies the data reception through each telemetry source. The West Creek repeater in Douglas County processes both incoming data on A1 and A2 but passes on only A2 format messages to Diamond Hill. All other repeaters in the system send data on both legacy and A2 channels.

Table 1. Reception of A1/A2 Data at Diamond Hill

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Legacy	320,303	214,698	279,782									
Concentrator	508,306	370,222	495,874									
ALERT2	129,855	86,506	110,086									
TOTAL	958,464	671,426	885,742	0	0	0	0	0	0	0	0	0
Conc+A2	638,161	456,728	605,960									
Conc/Leg	1.59	1.72	1.77									
DataChron	498,846	444,211	599,923									

The daily ratio of ALERT2 reports received versus legacy ALERT reports received is shown (Figure 1). In general periods where the ratio of A2 to legacy reports is high (greater than 2) correspond to a cold spell where the air temperature goes below freezing. The Blue Mountain repeater does not forward legacy ALERT reports when the temperature is below freezing. This results in a relative increase in data concentrator reports which drives up the ratio.

A second contributing factor to periods where the ratio is greater than 2 is the fact that the West Creek repeater in Douglas County only forwards A2 messages. On March 30 the ratio is greater than 2. This was a windy day and the Salisbury Park weather station sent more than 4,000 wind reports that came into the Diamond Hill base on the A2 channel only.

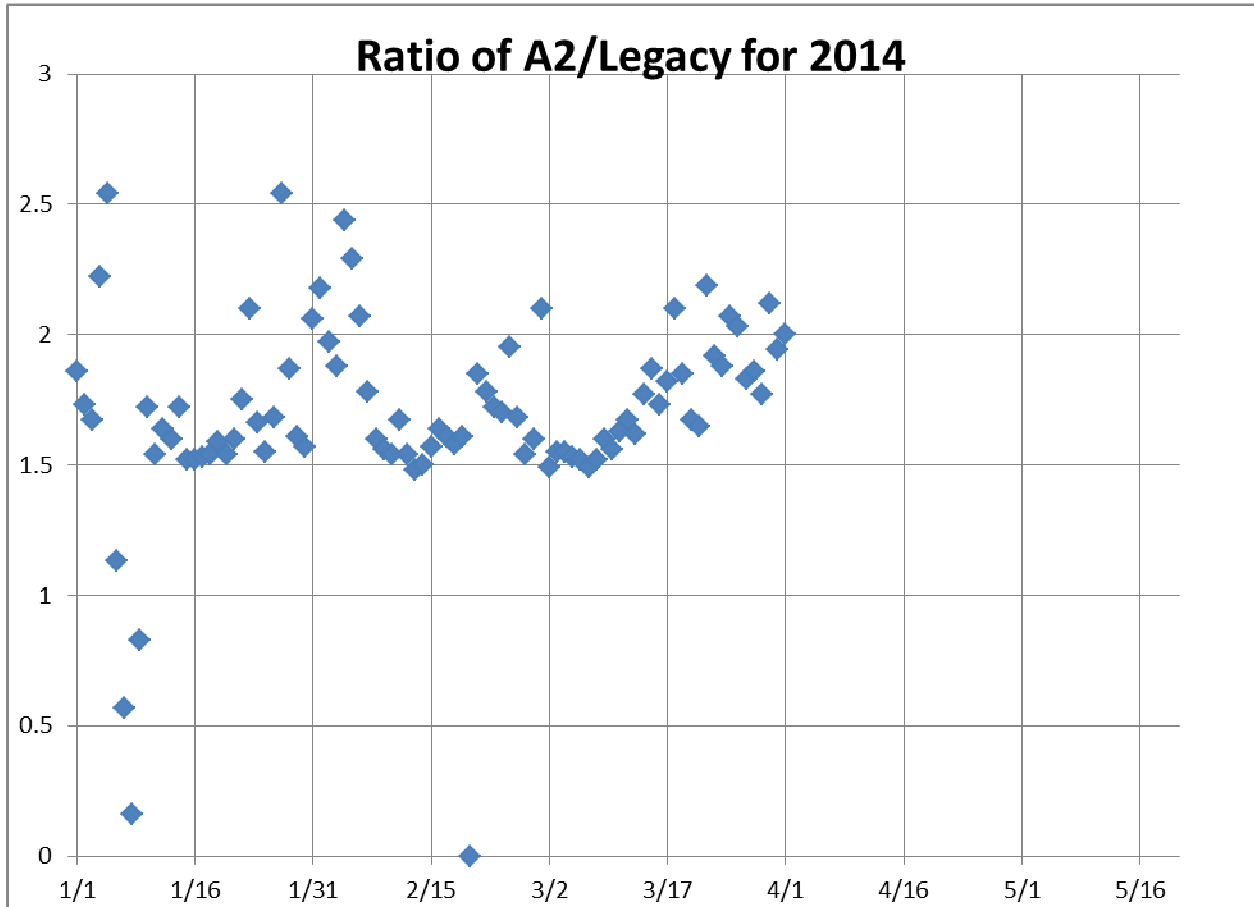


Figure 1. Daily Ratio of ALERT2/Legacy Reports

A. Continuous Operation of Base Receiver/Decoder

The NS5 base station was **NOT** in continuous operation for the entire month. The NS5 base was down on March 9th from 2:00 am to 3:00 am. It looks as though the VM server made a time change to account for Daylight Savings Time and moved the clock forward one hour at 2:00 am.....so the base was in operation but the clock change makes it look as if no data was received for an entire hour.

B. Specific Issues Identified this Month

Performance of the following sensors (Table 2) was questionable this month.

Table 2. Sensors with Poor Performance Characteristics

Sensor ID	Description	Timer	Event	Comments
2790	Wx – W. Cherry Creek	35%	75%	Site was down for half the month.
2710	Wx-Highland Ranch WTP	66%	95%	
4470	Little Narrows	68%	92%	
100110	A2 - ETG @ Hampden	81%	83%	Erroneous reports received March 8, 14, 20 th
1000	A2-Maple Grove	98%	97%	OneRain conducted field maintenance on March 14
3010	Wx – EPC at Hwy 105	84%	88%	
0	Sensor ID of zero (0) incoming on both Conc and Legacy (March 10 - March 28)			

On April 4, 2014 Dave Leader from HydroLynx wrote, “There was a period of time where I was logging 0 for an ID number not defined in the database instead of the number received. For example on 03/10/2014 at 10:46:15 UDFCD received 4 reports from 429,430,435,433. ID 429 was not defined in the database and was displayed a ID: 0 in the receive data log file. I fixed this problem on 03/28.”

C. Performance of New A2 Sites

Currently there are only a handful of remote sites operating on the new A2 protocol. The “event” performance of these sites is tracked throughout the 2014 flood season in the table below.

Table 3. Event Performance of New A2 Sites (percent)

Description	ID	Install Date	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug*	Sep*	Oct	Nov	Dec
Heritage Regional Park	3090	03/14/2013	n/a	n/a	100									
ETG @ Hampden	100110	05/01/2013	n/a	n/a	83									
Blackstone	100100	05/03/2013	n/a	n/a	100									
Newlin Gulch	3070	05/24/2013	100	83	100									
Carr Street	100	05/31/2013	n/a	n/a	100									
Maple Grove	1000	05/20/2013	100	90	97									
Haystack Road	100150	02/26/2014	n/a	n/a	100									
New site 2014														
New site 2014														
New site 2014														
New site 2014														
New site 2014														

The event performance of the A2 self-reporting sites will be tracked over the flood monitoring season.

D. 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 4).

Table 4. Monthly Summary of Sensors with Poor Timer Performance (Sensor ID)

Jan*	Feb*	Mar*	Apr	May	Jun	Jul	Aug	Sep	Oct*	Nov*	Dec*
4470	2710	2790									
2710	4470	2710									
2330	2730	4470									
4870	4550	4870									
920	3010	3010									
3010	4330	4330									

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

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

III. Rain Sensor Event Reporting Summary

A. District-Wide Total Tip/Count Statistics

The incrementing reports from all 1-mm rain sensors were analyzed to quantify the District-wide statistical total monthly tip summary (Table 5). For the months of January, February, March, October, November and December only the stations that operate year-round are included in the rain event analysis. These stations include all weather stations and the stations in Boulder County.

Table 5. District-Wide Total Tip/Count Statistical Summary

Statistical Parameter	Value	Comments
Mean	25.91	Only the 1-mm rain sensors were included in the analysis
Median	27	Only the 1-mm rain sensors were included in the analysis
Standard deviation	10.90	Only the 1-mm rain sensors were included in the analysis
Mean plus three standard deviations	58.61	Only the 1-mm rain sensors were included in the analysis
Minimum total count	1	WX – Elbert (1440)
Maximum total count	56	Shanahan Ridge (4810)

B. Monthly Average Tip/Count Summary

A monthly summary of the District-wide mean total tip/count is presented (Table 6).

Table 6. Monthly Summary of District-Wide Mean Total 1-mm Tip/Count

Year	Jan*	Feb*	Mar*	Apr	May	Jun	Jul	Aug	Sep	Oct*	Nov*	Dec*	Ave
2006	4.62	5.92	18.39	20.47	19.44	13.75	74.03	46.89	24.17	41.13	5.04	16.45	24.19
2007	11.56	5.40	29.75	65.03	68.30	15.87	36.20	46.38	22.13	29.50	6.54	11.29	29.00
2008	4.05	7.38	12.26	20.57	54.82	26.06	16.43	90.20	37.54	19.59	2.82	9.24	25.08
2009	6.33	3.11	11.37	59.26	63.45	68.00	65.00	20.00	27.29	30.24	11.00	5.60	30.89
2010	5.97	11.90	32.54	70.57	39.63	56.04	50.23	31.01	4.18	18.31	8.30	3.31	27.67
2011	6.78	7.45	7.54	33.94	92.68	39.42	90.87	18.25	37.67	25.73	10.41	13.59	32.03
2012	4.89	13.57	2.35	30.17	38.97	19.35	73.03	11.31	48.81	22.32	2.98	4.18	22.66
2013	2.96	14.31	21.86	35.96	45.87	16.39	52.33	50.63	229.74	29.64	5.86	4.00	42.46
2014	6.88	11.86	25.91										

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

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

Several sensors experienced a large jump in the sequential tip count (Table 7).

Table 7. Sensors with a Jump of 6 or More in Sequential Count

Sensor Description	Sensor ID	Comment
WX – Salisbury Park	2730	Looks to be a field maintenance jump during calibration, March 12
Doudy Draw	4820	Looks to be a field maintenance jump during calibration, March 28

D. Sensor-by-Sensor Incrementing Count Summary

The system-wide reception rate of incrementing, 1-mm tip reports for the month was approximately 97 percent. A total of 1,730 incrementing reports were received and a total of 1,788 reports were expected. The total loss of incrementing reports for the month was approximately 3 percent. Those sensors with the worst event transmission performance are summarized (Table 8).

Table 8. Monthly Summary of Sensors with the Worst Performance

Jan*	Feb*	Mar*	Apr	May	Jun	Jul	Aug	Sep	Oct*	Nov*	Dec*
4520	2730	2790									
4010	4330	4790									
4170	4200	4530									
3030	4240	4510									
1460	4870	4240									
1700	4470	4870									

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

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

IV. Heavy Radio Traffic Analysis

Periods exceeding 1,000 messages per hour are analyzed independently in an attempt to quantify data loss rates from rain sensors using their sequential tip count series.

A. The Heaviest Hourly Traffic Periods This Month

The hourly periods of highest radio traffic this month are shown (Table 9). The five heaviest hours of radio traffic are analyzed to quantify the number of missing rain reports for that hour.

Table 9. Periods of Heavy Radio Traffic (total load includes legacy and A2 reports)

Day	Hour	Expected	Received	Total Load	Loss
9	1	0	0	1,384	0.00%
15	12	0	0	1,266	0.00%
18	12	0	0	1,247	0.00%
18	13	0	0	1,245	0.00%
18	11	0	0	1,230	0.00%

V. 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 10).

Table 10. Summary of Unknown IDs

Description	Conc & A2	Legacy
Total number of unknown IDs (IDs without a device definition)	n/a	n/a
Total reports from unknown IDs	2,399	2,116
Unknown IDs with only a single received report (potential noise)	n/a	n/a
Total reports from all IDs – RecData Log entire month	605,960	279,782
Unknown reports as a fraction of total reports	0.40%	0.76%

The total number of reports from unknown sensors is very small relative to the total reports received for the month. Shown below (Table 11) are the total reports received from unknown sensor IDs for each month of the year.

Table 11. Monthly Summary of Total Reports from Unknown IDs (Conc & A2)

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2010	1,220	1,474	1,276	1,174	721	5,707	610	1,738	442	533	2,857	6,396
2011	1,231	2,165	3,065	1,254	2,051	439	489	456	191	683	747	861
2012	692	750	1,575	977	5,469	11,016	453	683	774	2,657	3,854	5,466
2013	4,265	994	1,100	2,589	3,623	6,973	5,230	1,070	4,429	781	13,459	1,213
2014	870	4,284	2,399									

The fraction of reports from unknown sensors relative to the total number of reports is shown below (Table 12).

Table 12. Monthly Percent of Unknown Sensor Reports (Conc & A2)

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2010	0.42%	0.56%	0.38%	0.32%	0.20%	1.61%	0.17%	0.49%	0.13%	0.16%	0.93%	1.88%
2011	0.39%	0.73%	0.90%	0.37%	0.58%	0.12%	0.12%	0.05%	0.12%	0.18%	0.22%	0.26%
2012	0.30%	0.25%	0.43%	0.26%	1.37%	2.74%	0.11%	0.18%	0.20%	0.72%	1.15%	1.62%
2013	1.40%	0.31%	0.29%	0.60%	0.37%	0.61%	0.82%	0.21%	0.96%	0.31%	5.37%	0.23%
2014	0.14%	0.94%	0.40%									

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

A number of “unknown” sensors had multiple reports, which may indicate the existence of a transmitter that is sending information on an ID that is not currently defined within NovaStar. The unknown IDs with multiple reports including the number of reports received by each are shown (Table 13).

Table 13. Reports Received by Unknown IDs

Conc + A2		Legacy ALERT		Comment
Unknown ID	Reports	Unknown ID	Reports	
0	2,288	0	1,993	NS5 was logging unknown IDs and tagging them with a sensor ID of 0 for the period March 10 through march 28
2841	7	1502	5	
1502	5	1504	3	
1501	3	1506	3	
1504	3	1508	3	
1506	3	1929	3	
		1933	3	

VI. Sensors with Invalid Reports

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

Sensor ID	Description	Invalid Reports	Comments
730	No Name @ Quincy	70	Was marked as "out-of-service" placed back into service on April 4, 2014
100110	A2-ETG @ Hampden	3	Erroneous reports received on March 8, 14 and 20 all of value 66 source of four repeaters (6502, 6503, 6505, 6506)
1383	Ferril Lake	389	All negative stage report for the month of March. OneRain: not a reliable site using a bubbler that is failing...trying to replace this spring.
2793	Wx-W. Cherry Creek	172	All invalid reports prior to March 10, problem was fixed in March
2813	Pine Cliff Road	42	WET to investigate in April
113	Ralston Res	19	Maintenance activity

VII. Rainfall Alarms and Intensity Analysis

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

No rainfall alarms recorded this month.

General System Analysis

Database Name P:\A207-UDFCD-Data-Analysis\2014\3-2014\Novastar_extract_2014Mar.mdb

First Date in Database	3/1/14 12:00 AM	Total Days	31.0
Last Date in Database	3/31/14 11:59 PM	Total Hours	744.0

Total Records Analyzed **605,960**

Records by Group	(Conc + A2 self reports)		Legacy	
Wind Data	273,910	45%	Wind Data	114,817
Temperature	83,350	14%	Relative Humidity	39,300
Relative Humidity	75,815	13%	Temperature	38,564
Battery Voltage	40,470	7%	Barometric Pressure	21,727
Barometric Pressure	35,645	6%	Water Level	13,930
Water Level	17,797	3%	Battery Voltage	12,861
Precipitation	14,248	2%	Precipitation	10,400
Dew Point Temperature	11,690	2%	Solar Radiation	10,384
Wind Chill	11,678	2%	Fuel Temperature	5,613
Peak Wind	11,612	2%	Fuel Moisture	5,612
Solar Radiation	10,959	2%	Soil Moisture	2,680
Fuel Moisture	6,135	1%	Unknown	2,104
Fuel Temperature	6,030	1%	Repeater Status Report	744
Unknown	2,399	0%	Repeater Pass List	545
Soil Moisture	3,017	0%	12Hr Status Report	311
12Hr Status Report	335	0%	Not Used	107
Flasher Status	314	0%	Handar 585 ALARM Status	66
Repeater Status Report	290	0%	Solar Power	17
Not Used	108	0%	Total	279,782
Repeater Pass List	74	0%		
Handar 585 ALARM Status	68	0%		
Solar Power	16	0%		
Total	605,960			

Traffic Loading Summary	(Conc + A2 self reports)		Legacy	
Alert Reports	605,960		279,782	
Average Daily Traffic	19,547		9,025	
Average Hourly Traffic	814		376	
Median Hourly Traffic	784	hour beginning	381	hour beginning
Peak Hourly Traffic	1,384	Mar 9, 1:00 AM	631	Mar 5, 10:00 AM
2nd Max	1,266	Mar 15, 12:00 PM	583	Mar 15, 12:00 PM
3rd Max	1,247	Mar 18, 12:00 PM	578	Mar 18, 12:00 PM
4th Max	1,246	Mar 18, 1:00 PM	544	Mar 14, 12:00 PM
5th Max	1,230	Mar 18, 11:00 AM	543	Mar 8, 10:00 AM

Rain Timer Performance

Analyze Rain Sensors

Rain Sensors	Description	Rcv	Timer	Exp	Performance
2790	Wx-W. Cherry Creek	22	15:35	62	35%
100100	A2-Blackstone Precip	40	12:00	62	65%
2710	Wx-Highlands Ranch WTP	41	15:03	62	66%
4470	Little Narrows	42	14:17	62	68%
4870	SBC @ SB Road	48	13:17	62	77%
100110	A2-ETG @ Hampden Precip	50	12:32	62	81%
3010	WX-EPC at Hwy 105	52	12:00	62	84%
4330	Hansen Rain	53	12:58	62	85%
4510	Pinewood Springs	54	13:00	62	87%
100150	A2-Sellers Gulch at Haystack Precip	55	13:28	62	89%
4570	St. Antons	55	13:13	62	89%
4490	Apple Valley	56	12:51	62	90%
4550	Boulder Jail	57	12:48	62	92%
4270	Cannon Mountain	57	12:41	62	92%
4190	Slaughterhouse	57	13:11	62	92%
4710	Wx-Ward C-1	58	12:13	62	94%
4860	Fairview Peak	58	12:01	62	94%
4340	Riverside	58	12:27	62	94%
4290	Red Hill	58	12:41	62	94%
1420	Wx-Diamond Hill	59	12:15	62	95%
4790	Wx-Button Rock	59	12:01	62	95%
920	Wx-Aurora Town Hall	59	12:01	62	95%
900	Wx-Aurora Reservoir	59	12:27	62	95%
4850	Porphyry Mtn	59	12:01	62	95%
4350	Conifer Hill	59	12:26	62	95%
4320	Lee Hill Rain 2012	59	12:12	62	95%
4240	Sunset	59	12:28	62	95%
4220	Fling's	59	12:14	62	95%
4070	Bear Peak	59	11:58	62	95%
4040	Martin Gulch	59	12:29	62	95%
4020	Rio Grande	59	12:26	62	95%
4010	Crescent	59	12:13	62	95%
1440	Wx-Elbert	60	12:13	62	97%
4770	Wx-Cal-Wood Ranch	60	12:14	62	97%
1570	Wx-Brighton Ditch	60	12:01	62	97%
4830	SBC @ San Souci	60	11:59	62	97%
4810	Shanahan Ridge	60	12:13	62	97%
4520	Eagle Ridge	60	12:01	62	97%
4360	Justice Center	60	11:59	62	97%
4310	Johnny Park	60	12:11	62	97%
4230	Golden Age	60	12:11	62	97%
4160	Sunshine	60	11:59	62	97%
4100	Filter Plant	60	12:00	62	97%
4030	Red Garden	60	12:16	62	97%
3020	Wx-West Creek WX	61	12:01	62	98%
1460	Wx-Urban Farm	61	12:01	62	98%
2730	Wx-Salisbury Park	61	12:01	62	98%
750	Wx-Quincy Reservoir	61	11:59	62	98%
1520	Wx-Marston Lake North	61	12:14	62	98%
2210	Wx-Hiwan G.C.	61	12:01	62	98%
2750	Wx-Castle Rock	61	12:01	62	98%
1920	Wx-Brighton	61	12:01	62	98%
140	Wx-Blue Mountain	61	12:01	62	98%
4820	Doudy Draw	61	11:59	62	98%

4300	Big Elk Park	61	11:58	62	98%
4260	Taylor Mountain	61	11:59	62	98%
4180	Gold Lake	61	11:59	62	98%
4170	Pine Brook	61	12:12	62	98%
4130	Swiss Peaks	61	12:00	62	98%
4110	Betasso	61	12:01	62	98%
4090	Magnolia	61	11:59	62	98%
4080	Twin Sisters	61	11:45	62	98%
4050	Walker Ranch	61	12:00	62	98%
2990	Wx-Tomah Rd-DougCnty	62	11:57	62	100%
2930	Wx-Spring Valley Rd-DougCnty	62	11:48	62	100%
4530	Winiger Ridge	62	11:46	62	100%
4880	Whispering Pines	62	11:45	62	100%
4840	SBC@S Boulder Ditch	62	11:59	62	100%
4250	Geer Canyon	62	11:44	62	100%
4200	Lazy Acres	62	11:45	62	100%
4140	Logan Mill	62	11:46	62	100%
4060	Lakeshore	62	11:45	62	100%
4730	Wx-Sugarloaf	63	11:47	62	102%
3030	WX-Bingham Lake Park	63	11:35	62	102%
4150	Gold Hill	64	11:46	62	103%
4750	Wx-Louisville Lake	65	11:08	62	105%

3090	A2-Highland Heritage Park	36	12:00	62	58%
3080	Tallman Gulch	42	12:00	62	68%
3070	A2-Newlin Gulch	121	6:00	62	195%
3060	Fire Sta 47	43	12:00	62	69%
3050	East/West Trailhead	32	13:45	62	52%
3040	CC @ Prairie Canyon Ranch	37	12:00	62	60%
2980	Dakan Rd	32	13:39	62	52%
2970	Rampart Range Rd-Satellite	121	3:35	62	195%
2960	Indian Creek	36	12:00	62	58%
2950	DC Public Works	16	10:17	62	26%
2940	Willow Creek - DougCnty	36	12:42	62	58%
2920	West Cherry Head-Douglas Cnty	37	12:00	62	60%
2910	East Cherry Cr-Douglas	37	12:20	62	60%
2900	Russelville Gulch-Douglas	40	12:38	62	65%
2890	Spruce Mt - Douglas	15	12:00	62	24%
2880	Happy Canyon at N Surrey Dr	34	12:22	62	55%
2870	Cottonwood (Apache)	38	13:01	62	61%
2860	CC at Stroh Rd	41	12:34	62	66%
2850	Cherry Cr bl Bayou Glch	41	12:18	62	66%
2840	Sulphur Gulch	41	11:59	62	66%
2820	Haskins Gulch Conf	36	12:00	62	58%
2810	Pine Cliff Road	32	12:47	62	52%
2800	Columbine Open Space	37	11:59	62	60%
2370	Red Rocks Park	12	14:08	62	19%
2360	Indian Hills	22	13:45	62	35%
2350	Idledale	14	11:57	62	23%
2340	El Rancho	25	13:31	62	40%
2330	Morrison	22	4:29	62	35%
2320	Choke Cherry Resvr	46	12:55	62	74%
2310	Genesee Village	29	11:58	62	47%
2280	Kinney Peak	25	13:00	62	40%
2270	Cub Cr below Blue	24	13:35	62	39%
2260	Brook Forest	27	11:58	62	44%
2250	Rosedale	48	6:36	62	77%
2240	Cold Sprg Glch conf	13	12:57	62	21%

2230	Bear Cr below Cub	20	15:29	62	32%
1900	Niver Detention	54	7:58	62	87%
1800	Sand Creek Park	40	11:38	62	65%
1720	Cherry Cr @ Steele	32	12:44	62	52%
1710	Shop Creek	44	15:04	62	71%
1700	Cherry Cr @ Champa	62	11:48	62	100%
1660	SPR at Henderson	52	12:47	62	84%
1640	SPR at Union Ave.	61	11:59	62	98%
1620	Slaughterhouse Glch	39	11:58	62	63%
1600	Englewood Dam	50	10:13	62	81%
1550	Lakewood CC	60	12:12	62	97%
1530	Bear Creek @ Lowell	37	12:17	62	60%
1500	Powers Park	37	12:17	62	60%
1480	Third Creek at DIA	34	7:12	62	55%
1400	Upper Sloan Det.	60	12:26	62	97%
1370	West Metro FS13	56	12:57	62	90%
1360	Denver Zoo	53	12:32	62	85%
1350	Chatfield COE	60	11:33	62	97%
1340	Sanderson at Xavier	52	8:22	62	84%
1320	SPR at 3rd Ave	40	11:39	62	65%
1310	LDC at 64th	60	12:12	62	97%
1300	Hidden Lake	58	12:55	62	94%
1200	Broomfield 3207	16	15:03	62	26%
1110	Gunbarrel	22	11:57	62	35%
1100	Louisville Rec Ctr	19	13:42	62	31%
1060	Heritage Square	59	12:12	62	95%
1050	Jeffco Fairgrounds	58	12:38	62	94%
1040	Lena @ U.S. Hwy 6	56	12:45	62	90%
1030	NREL/S. Table Mtn.	60	12:12	62	97%
1010	Denver West	59	12:12	62	95%
1000	A2-Maple Grove Resv.	61	12:01	62	98%
970	Pump Sta 3	54	13:29	62	87%
950	Piney at Liverpool	44	10:49	62	71%
940	Aurora Regional Pond	60	7:21	62	97%
870	Murphy Creek GC	39	12:00	62	63%
850	Flying J	34	18:02	62	55%
840	Fire Station 12	57	12:44	62	92%
830	Side Creek Park	59	12:12	62	95%
820	ETG @ Buckley	53	12:13	62	85%
810	Granby Ditch @ 6th	58	11:30	62	94%
800	Sable Ditch @ 18th	57	11:59	62	92%
760	Mission Viejo Park	60	11:59	62	97%
720	Confluence Pond	25	10:24	62	40%
710	Horseshoe Park Drop	54	11:59	62	87%
700	Toll Gate @ 6th	55	13:33	62	89%
650	Iloff Pond	59	8:40	62	95%
640	Goldsmith @ Eastman	43	11:57	62	69%
630	Temple Pond at DTC	49	10:20	62	79%
620	Quincy/Highline	38	13:20	62	61%
610	Harvard @ Jackson	43	12:15	62	69%
600	Harvard Gulch Park	36	12:18	62	58%
540	Parker/Mississippi	56	13:12	62	90%
530	Fire Station #19	61	11:59	62	98%
520	Jewell Detention	59	12:26	62	95%
510	Virginia Court	61	12:12	62	98%
500	Havana Park	49	12:15	62	79%
440	Fire Station #7	56	12:59	62	90%
430	Utah Park	44	12:15	62	71%
420	Expo Park	46	11:25	62	74%

410	Kelly Dam	67	8:50	62	108%
400	Montview Park	47	13:06	62	76%
330	Van Bibber @ Hwy 93	25	11:57	62	40%
320	Sports Complex	54	7:35	62	87%
310	Guy Hill Ranch	23	12:32	62	37%
300	Van Bibber Park	59	12:26	62	95%
220	Upper Leyden	59	12:25	62	95%
210	Leyden Confluence	35	11:58	62	56%
200	Leyden Reservoir	46	6:48	62	74%
150	Nott Creek	60	11:59	62	97%
120	West Woods	25	12:29	62	40%
110	Ralston Reservoir	63	9:09	62	102%
100	A2-Carr Street	26	12:00	62	42%

Rain Event Performance			Analyze Rain Sensors																	
		Reports Received	1,730																	
	Systemwide Avg	Total Tips	1,788																	
	96.76%	Data Loss	3.24%																	
Description	Sensor	Performance	1-tips	2-tips	3-tips	4-tips	5-tips	6-tips	>6-tips	Rcv	Exp	Miss	Hold	Bucket						
Wx-W. Cherry Creek	2790	75%	5	0	1	0	0	0	0	6	8	2	0	0.03937						
Wx-Button Rock	4790	78%	15	2	0	1	0	0	0	18	23	5	0	0.03937	Mean				25.913	
Winiger Ridge	4530	82%	15	2	1	0	0	0	0	18	22	4	0	0.03937	Median				27	
Pinewood Springs	4510	85%	18	4	0	0	0	0	0	22	26	4	0	0.03937	St. Dev				10.898	
Sunset	4240	88%	28	0	0	0	1	0	0	29	33	4	0	0.03937	Mean plus 3 SD				58.606	
SBC @ SB Road	4870	89%	27	4	0	0	0	0	0	31	35	4	0	0.03937	Min				1	
Betasso	4110	90%	37	0	0	0	1	0	0	38	42	4	0	0.03937	Max				56	
Lakeshore	4060	91%	26	3	0	0	0	0	0	29	32	3	0	0.03937						
Shanahan Ridge	4810	91%	48	1	2	0	0	0	0	51	56	5	1	0.03937						
Little Narrows	4470	92%	22	2	0	0	0	0	0	24	26	2	0	0.03937						
Wx-Ward C-1	4710	93%	24	2	0	0	0	0	0	26	28	2	0	0.03937						
Eagle Ridge	4520	93%	12	1	0	0	0	0	0	13	14	1	0	0.03937						
Hansen Rain	4330	93%	25	2	0	0	0	0	0	27	29	2	0	0.03937						
Bear Peak	4070	94%	30	2	0	0	0	0	0	32	34	2	1	0.03937						
Wx-West Creek WX	3020	95%	18	1	0	0	0	0	0	19	20	1	0	0.03937						
Riverside	4340	95%	19	1	0	0	0	0	0	20	21	1	0	0.03937						
Wx-Highlands Ranch WTP	2710	95%	20	1	0	0	0	0	0	21	22	1	0	0.03937						
Taylor Mountain	4260	96%	22	1	0	0	0	0	0	23	24	1	0	0.03937						
Twin Sisters	4080	96%	24	1	0	0	0	0	0	25	26	1	0	0.03937						
Conifer Hill	4350	96%	26	1	0	0	0	0	0	27	28	1	0	0.03937						
Slaughterhouse	4190	96%	26	1	0	0	0	0	0	27	28	1	0	0.03937						
Wx-Louisville Lake	4750	97%	27	1	0	0	0	0	0	28	29	1	0	0.03937						
Wx-Diamond Hill	1420	97%	31	1	0	0	0	0	0	32	33	1	0	0.03937						
Sunshine	4160	97%	31	1	0	0	0	0	0	32	33	1	0	0.03937						
Rio Grande	4020	97%	34	1	0	0	0	0	0	35	36	1	0	0.03937						
Doudy Draw	4820	97%	37	1	0	0	0	0	1	38	39	1	0	0.03937						
SBC @ San Souci	4830	98%	41	1	0	0	0	0	0	42	43	1	0	0.03937						
Martin Gulch	4040	98%	47	1	0	0	0	0	0	48	49	1	0	0.03937						
Wx-Urban Farm	1460	100%	19	0	0	0	0	0	0	19	19	0	0	0.03937						
Wx-Tomah Rd-DougCnty	2990	100%	31	0	0	0	0	0	0	31	31	0	0	0.03937						
Wx-Sugarloaf	4730	100%	33	0	0	0	0	0	0	33	33	0	0	0.03937						
Wx-Spring Valley Rd-DougCnty	2930	100%	7	0	0	0	0	0	0	7	7	0	0	0.03937						
Wx-Salisbury Park	2730	100%	9	0	0	0	0	0	1	9	9	0	0	0.03937						
Wx-Quincy Reservoir	750	100%	13	0	0	0	0	0	0	13	13	0	0	0.03937						
Wx-Marston Lake North	1520	100%	29	0	0	0	0	0	0	29	29	0	1	0.03937						
Wx-Hiwan G.C.	2210	100%	24	0	0	0	0	0	0	24	24	0	1	0.03937						
Wx-Elbert	1440	100%	1	0	0	0	0	0	0	1	1	0	0	0.03937						
Wx-Castle Rock	2750	100%	6	0	0	0	0	0	0	6	6	0	0	0.03937						
Wx-Cal-Wood Ranch	4770	100%	14	0	0	0	0	0	0	14	14	0	0	0.03937						
Wx-Brighton Ditch	1570	100%	5	0	0	0	0	0	0	5	5	0	0	0.03937						
Wx-Brighton	1920	100%	17	0	0	0	0	0	0	17	17	0	0	0.03937						
Wx-Blue Mountain	140	100%	20	0	0	0	0	0	0	20	20	0	0	0.03937						
WX-Bingham Lake Park	3030	100%	25	0	0	0	0	0	0	25	25	0	0	0.03937						
Wx-Aurora Town Hall	920	100%	3	0	0	0	0	0	0	3	3	0	0	0.03937						
Wx-Aurora Reservoir	900	100%	9	0	0	0	0	0	0	9	9	0	0	0.03937						
Whispering Pines	4880	100%	25	0	0	0	0	0	0	25	25	0	0	0.03937						
SBC@S Boulder Ditch	4840	100%	42	0	0	0	0	0	0	42	42	0	0	0.03937						
St. Antons	4570	100%	29	0	0	0	0	0	0	29	29	0	0	0.03937						
Boulder Jail	4550	100%	31	0	0	0	0	0	0	31	31	0	0	0.03937						
Justice Center	4360	100%	36	0	0	0	0	0	0	36	36	0	0	0.03937						
Lee Hill Rain 2012	4320	100%	26	0	0	0	0	0	0	26	26	0	0	0.03937						
Johnny Park	4310	100%	30	0	0	0	0	0	0	30	30	0	0	0.03937						

Big Elk Park	4300	100%	17	0	0	0	0	0	0	17	17	0	0	0.03937
Red Hill	4290	100%	29	0	0	0	0	0	0	29	29	0	0	0.03937
Cannon Mountain	4270	100%	18	0	0	0	0	0	0	18	18	0	0	0.03937
Geer Canyon	4250	100%	33	0	0	0	0	0	0	33	33	0	0	0.03937
Golden Age	4230	100%	10	0	0	0	0	0	0	10	10	0	0	0.03937
Fling's	4220	100%	26	0	0	0	0	0	0	26	26	0	0	0.03937
Lazy Acres	4200	100%	33	0	0	0	0	0	0	33	33	0	0	0.03937
Gold Lake	4180	100%	27	0	0	0	0	0	0	27	27	0	0	0.03937
Pine Brook	4170	100%	19	0	0	0	0	0	0	19	19	0	0	0.03937
Gold Hill	4150	100%	31	0	0	0	0	0	0	31	31	0	0	0.03937
Logan Mill	4140	100%	26	0	0	0	0	0	0	26	26	0	0	0.03937
Swiss Peaks	4130	100%	33	0	0	0	0	0	0	33	33	0	0	0.03937
Filter Plant	4100	100%	27	0	0	0	0	0	0	27	27	0	0	0.03937
Magnolia	4090	100%	34	0	0	0	0	0	0	34	34	0	0	0.03937
Walker Ranch	4050	100%	26	0	0	0	0	0	0	26	26	0	0	0.03937
Red Garden	4030	100%	40	0	0	0	0	0	0	40	40	0	0	0.03937
Cresent	4010	100%	36	0	0	0	0	0	0	36	36	0	0	0.03937
TOTAL			1684	39	4	1	2	0	2	1730	1788	58	4	
Tallman Gulch	3080	100%	4	0	0	0	0	0	0	4	4	0	0	0.03937
Fire Sta 47	3060	100%	6	0	0	0	0	0	0	6	6	0	0	0.03937
East/West Trailhead	3050	100%	1	0	0	0	0	0	0	1	1	0	0	0.03937
CC @ Prairie Canyon Ranch	3040	100%	1	0	0	0	0	0	0	1	1	0	0	0.03937
Dakan Rd	2980	50%	0	1	0	0	0	0	0	1	2	1	0	0.03937
Rampart Range Rd-Satellite	2970	100%	6	0	0	0	0	0	0	6	6	0	0	0.03937
Indian Creek	2960	100%	2	0	0	0	0	0	0	2	2	0	0	0.03937
Willow Creek - DougCnty	2940	75%	2	1	0	0	0	0	0	3	4	1	0	0.03937
West Cherry Head-Douglas Cnty	2920	50%	1	0	1	0	0	0	0	2	4	2	0	0.03937
East Cherry Cr-Douglas	2910	100%	2	0	0	0	0	0	0	2	2	0	0	0.03937
Russelville Gulch-Douglas	2900	100%	8	0	0	0	0	0	0	8	8	0	0	0.03937
Happy Canyon at N Surrey Dr	2880	100%	1	0	0	0	0	0	0	1	1	0	0	0.03937
CC at Stroh Rd	2860	100%	2	0	0	0	0	0	0	2	2	0	0	0.03937
Cherry Cr bl Bayou Glch	2850	67%	3	0	1	0	0	0	0	4	6	2	0	0.03937
Sulphur Gulch	2840	75%	2	1	0	0	0	0	0	3	4	1	0	0.03937
Haskins Gulch Conf	2820	100%	1	0	0	0	0	0	0	1	1	0	0	0.03937
Pine Cliff Road	2810	100%	2	0	0	0	0	0	0	2	2	0	0	0.03937
Columbine Open Space	2800	100%	2	0	0	0	0	0	0	2	2	0	0	0.03937
Red Rocks Park	2370	100%	1	0	0	0	0	0	0	1	1	0	0	0.03937
Indian Hills	2360	100%	4	0	0	0	0	0	0	4	4	0	0	0.03937
Idledale	2350	100%	1	0	0	0	0	0	0	1	1	0	0	0.03937
El Rancho	2340	100%	2	0	0	0	0	0	0	2	2	0	0	0.03937
Morrison	2330	73%	16	7	1	0	0	0	0	24	33	9	0	0.03937
Choke Cherry Resvr	2320	86%	24	0	0	0	1	0	0	25	29	4	0	0.03937
Genesee Village	2310	75%	5	0	1	0	0	0	0	6	8	2	0	0.03937
Kinney Peak	2280	100%	4	0	0	0	0	0	0	4	4	0	0	0.03937
Cub Cr below Blue	2270	100%	6	0	0	0	0	0	0	6	6	0	0	0.03937
Brook Forest	2260	90%	8	1	0	0	0	0	0	9	10	1	0	0.03937
Rosedale	2250	100%	9	0	0	0	0	0	0	9	9	0	0	0.03937
Cold Sprg Glch conf	2240	100%	1	0	0	0	0	0	0	1	1	0	0	0.03937
Bear Cr below Cub	2230	50%	7	1	0	0	1	1	1	10	20	10	0	0.03937
Niver Detention	1900	100%	3	0	0	0	0	0	0	3	3	0	0	0.03937
Sand Creek Park	1800	100%	3	0	0	0	0	0	0	3	3	0	0	0.03937
Cherry Cr @ Steele	1720	50%	0	1	0	0	0	0	0	1	2	1	0	0.03937
Shop Creek	1710	89%	15	2	0	0	0	0	0	17	19	2	0	0.03937
Cherry Cr @ Champa	1700	88%	13	2	0	0	0	0	0	15	17	2	0	0.03937
SPR at Henderson	1660	100%	15	0	0	0	0	0	0	15	15	0	0	0.03937
SPR at Union Ave.	1640	100%	22	0	0	0	0	0	0	22	22	0	0	0.03937

Slaughterhouse Glich	1620	100%	2	0	0	0	0	0	0	2	2	0	0	0.03937
Englewood Dam	1600	100%	3	0	0	0	0	0	0	3	3	0	0	0.03937
Lakewood CC	1550	96%	24	1	0	0	0	0	0	25	26	1	0	0.03937
Bear Creek @ Lowell	1530	100%	2	0	0	0	0	0	0	2	2	0	0	0.03937
Powers Park	1500	100%	1	0	0	0	0	0	0	1	1	0	0	0.03937
Third Creek at DIA	1480	100%	4	0	0	0	0	0	0	4	4	0	0	0.03937
Upper Sloan Det.	1400	96%	26	1	0	0	0	0	0	27	28	1	0	0.03937
West Metro FS13	1370	100%	26	0	0	0	0	0	0	26	26	0	0	0.03937
Denver Zoo	1360	82%	20	2	0	1	0	0	0	23	28	5	0	0.03937
Chatfield COE	1350	100%	28	0	0	0	0	0	0	28	28	0	0	0.03937
Sanderson at Xavier	1340	100%	3	0	0	0	0	0	0	3	3	0	1	0.03937
SPR at 3rd Ave	1320	100%	2	0	0	0	0	0	0	2	2	0	0	0.03937
LDC at 64th	1310	100%	21	0	0	0	0	0	0	21	21	0	0	0.03937
Hidden Lake	1300	100%	21	0	0	0	0	0	0	21	21	0	0	0.03937
Broomfield 3207	1200	100%	5	0	0	0	0	0	0	5	5	0	0	0.03937
Gunbarrel	1110	100%	5	0	0	0	0	0	0	5	5	0	0	0.03937
Louisville Rec Ctr	1100	100%	7	0	0	0	0	0	0	7	7	0	0	0.03937
Heritage Square	1060	94%	15	1	0	0	0	0	0	16	17	1	0	0.03937
Jeffco Fairgrounds	1050	100%	20	0	0	0	0	0	0	20	20	0	0	0.03937
Lena @ U.S. Hwy 6	1040	100%	32	0	0	0	0	0	0	32	32	0	0	0.03937
NREL/S. Table Mtn.	1030	100%	20	0	0	0	0	0	0	20	20	0	0	0.03937
Denver West	1010	100%	30	0	0	0	0	0	0	30	30	0	0	0.03937
A2-Maple Grove Resv.	1000	97%	33	1	0	0	0	0	0	34	35	1	1	0.03937
Pump Sta 3	970	100%	3	0	0	0	0	0	0	3	3	0	0	0.03937
Piney at Liverpool	950	100%	2	0	0	0	0	0	0	2	2	0	0	0.03937
Aurora Regional Pond	940	100%	5	0	0	0	0	0	0	5	5	0	0	0.03937
Murphy Creek GC	870	100%	3	0	0	0	0	0	0	3	3	0	0	0.03937
Flying J	850	95%	17	1	0	0	0	0	0	18	19	1	0	0.03937
Fire Station 12	840	95%	19	1	0	0	0	0	0	20	21	1	0	0.03937
Side Creek Park	830	94%	15	1	0	0	0	0	0	16	17	1	0	0.03937
ETG @ Buckley	820	100%	10	0	0	0	0	0	0	10	10	0	1	0.03937
Granby Ditch @ 6th	810	96%	26	1	0	0	0	0	0	27	28	1	0	0.03937
Sable Ditch @ 18th	800	100%	27	0	0	0	0	0	0	27	27	0	0	0.03937
Mission Viejo Park	760	96%	21	1	0	0	0	0	0	22	23	1	0	0.03937
Confluence Pond	720	100%	2	0	0	0	0	0	0	2	2	0	0	0.03937
Horseshoe Park Drop	710	100%	11	0	0	0	0	0	0	11	11	0	0	0.03937
Toll Gate @ 6th	700	95%	18	1	0	0	0	0	0	19	20	1	0	0.03937
Iliff Pond	650	89%	7	1	0	0	0	0	0	8	9	1	0	0.03937
Goldsmith @ Eastman	640	100%	4	0	0	0	0	0	0	4	4	0	0	0.03937
Temple Pond at DTC	630	83%	4	1	0	0	0	0	0	5	6	1	0	0.03937
Quincy/Highline	620	100%	6	0	0	0	0	0	0	6	6	0	0	0.03937
Harvard @ Jackson	610	100%	7	0	0	0	0	0	0	7	7	0	0	0.03937
Harvard Gulch Park	600	100%	1	0	0	0	0	0	0	1	1	0	0	0.03937
Parker/Mississippi	540	96%	22	1	0	0	0	0	0	23	24	1	0	0.03937
Fire Station #19	530	96%	24	1	0	0	0	0	0	25	26	1	0	0.03937
Jewell Detention	520	100%	22	0	0	0	0	0	0	22	22	0	0	0.03937
Virginia Court	510	100%	22	0	0	0	0	0	0	22	22	0	0	0.03937
Havana Park	500	92%	10	1	0	0	0	0	0	11	12	1	0	0.03937
Fire Station #7	440	100%	26	0	0	0	0	0	0	26	26	0	0	0.03937
Utah Park	430	100%	4	0	0	0	0	0	0	4	4	0	0	0.03937
Expo Park	420	100%	2	0	0	0	0	0	0	2	2	0	1	0.03937
Kelly Dam	410	95%	20	1	0	0	0	0	0	21	22	1	0	0.03937
Montview Park	400	100%	10	0	0	0	0	0	0	10	10	0	0	0.03937
Van Bibber @ Hwy 93	330	100%	4	0	0	0	0	0	0	4	4	0	1	0.03937
Sports Complex	320	100%	2	0	0	0	0	0	0	2	2	0	1	0.03937
Guy Hill Ranch	310	100%	3	0	0	0	0	0	0	3	3	0	0	0.03937
Van Bibber Park	300	100%	23	0	0	0	0	0	0	23	23	0	0	0.03937

Leyden Confluence	210	50%	1	0	1	0	0	0	0	2	4	2	0	0.03937		
Leyden Reservoir	200	100%	2	0	0	0	0	0	0	2	2	0	0	0.03937		
Nott Creek	150	88%	28	1	0	1	0	0	0	30	34	4	0	0.03937		
West Woods	120	100%	2	0	0	0	0	0	0	2	2	0	0	0.03937		
Ralston Reservoir	110	92%	23	0	1	0	0	0	0	24	26	2	0	0.03937		
A2-Newlin Gulch	3070	50%	2	15	2	0	0	0	0	19	38	19	0	0.019685		
WX-EPC at Hwy 105	3010	88%	18	3	0	0	0	0	0	21	24	3	0	0.01		
Porphory Mtn	4850	88%	39	4	1	0	0	0	0	44	50	6	0	0.01		
Fairview Peak	4860	97%	65	2	0	0	0	0	0	67	69	2	0	0.01		
A2-Blackstone Precip	100100	100%	2	0	0	0	0	0	0	2	2	0	1	0.03937		
A2-ETG @ Hampden Precip	100110	83%	9	0	1	0	0	0	0	10	12	2	0	0.03937		
A2-Sellers Gulch at Haystack Precip	100150	100%	16	0	0	0	0	0	0	16	16	0	0	0.03937		

2014 Monthly Peak Hour ALERT Radio Traffic Summary

