

Memo

Date: December 20, 2014
To: Kevin Stewart
From: Markus Ritsch
Subject: November 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 November 1 through November 30, 2014.

II. General System Analysis Summary

In 2014 data will be received at the District through both the legacy ALERT channel and through the ALERT2 (concentrator plus A2 self-reports) channel. The following (Table 1) quantifies the data reception through each telemetry source. The West Creek repeater in Douglas County processes both incoming legacy and ALERT2 but passes on only concentrator ALERT2 format messages to Diamond Hill. All other repeaters in the system send data on both legacy and ALERT2 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	293,137	351,946	318,434	308,775	282,598	271,188	276,732	246,901	
Concentrator	508,306	370,222	495,874	515,526	537,996	430,118	475,605	453,331	440,796	431,441	415,746	
ALERT2	129,855	86,506	110,086	107,478	113,674	109,244	130,087	354,119	354,822	218,687	210,943	
TOTAL	958,464	671,426	885,742	916,141	1,003,616	857,796	914,467	1,090,048	1,066,806	926,860	873,590	0
Conc+A2	638,161	456,728	605,960	623,004	651,670	539,362	605,692	807,450	795,618	650,120	626,689	
Conc/Leg	1.59	1.72	1.77	1.76	1.53	1.35	1.54	1.60	1.63	1.56	1.68	
DataChron	498,846	444,211	599,923	630,962	663,576	583,568	654,910	705,565	694,923	610,674	589,452	

The District operates two redundant NovaStar5 base stations: a primary base station (ns5a) at Diamond Hill and a redundant base (ns5b) at Greenhouse Data. Additional analyses are conducted on the data received by these two base stations (Table 2). The data received by both base stations for short periods this month are shown below.

Table 2. Comparison of Data Reception by ns5a and ns5b

NS5A (DiamondHill)	Nov 26	Nov 27	Nov 28	Nov 29	Nov 30
Legacy	8,951	9,571	9,666	9,903	8,143
Concentrator	13,482	14,056	14,137	15,058	13,671
ALERT2	7,590	7,440	7,019	7,075	7,322
NS5B (Greenhouse)					
Legacy	8,952	9,504	9,585	9,906	8,146
Concentrator	13,677	14,215	14,240	15,198	13,787
ALERT2	7,568	7,447	6,992	7,104	7,346
Diff (NS5a-NS5b)					
Legacy	-1.00	67.00	81.00	-3.00	-3.00
Concentrator	-195.00	-159.00	-103.00	-140.00	-116.00
ALERT2	22.00	-7.00	27.00	-29.00	-24.00

Again in November the number of total legacy, concentrator and ALERT2 reports received by ns5a and ns5b is not consistent. The only consistency seems to be the fact that ns5b receives more concentrator reports.

The daily ratio of total concentrator reports received versus total legacy ALERT reports received is shown (Figure 1).

Ratio of A2 Concentrator/Legacy for 2014

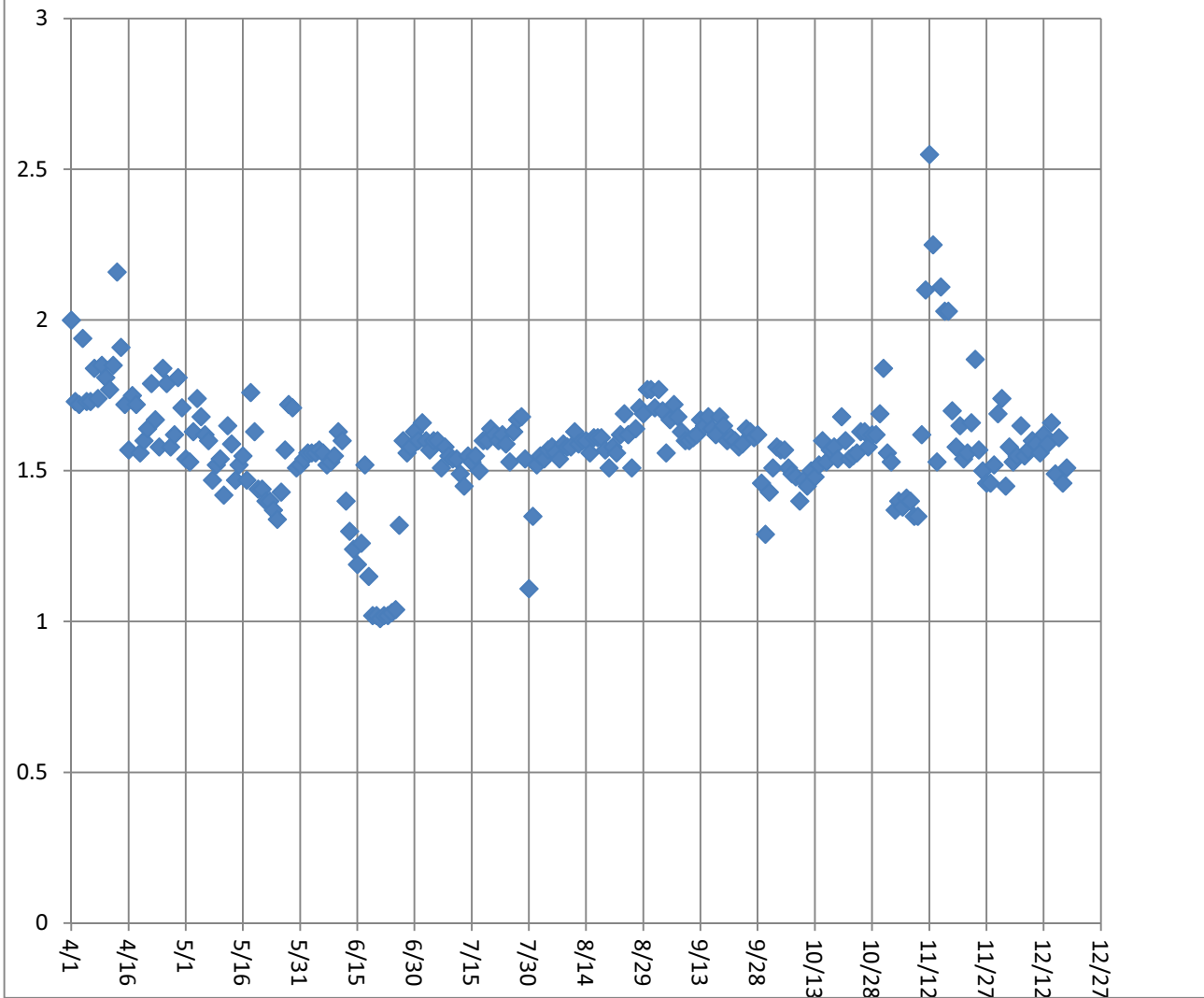


Figure 1. Daily Ratio of Concentrator Reports to Legacy Reports

On July 30th, September 30th and in early November the ratio of concentrator to legacy reports decreases significantly below the “baseline” value of 1.5. Intermittent latency from the ALERT2 decoder was identified as the problem. On October 1, the following statement was received from OneRain. *“We have isolated the problem to the B2010 receiver/decoder. The B2010 is getting hung up with writing logs to the internal SD card and outputting data to our servers. We have been in contact with BWD and they will be further looking into the situation and possibly applying diagnostic tools.”* As of December 19, 2014, this issue has not been resolved and OneRain has since involved Blue Water Design to investigate. *“BWD has been taking lead on this. They implemented some monitoring software in the B2010. We have not heard back of what they have discovered or the next course of action.”*

Several days in November experienced ratios exceeding 2.0. These are typically very cold days when the legacy feed from the Blue Mountain repeater is impaired which increases the ratio.

A. Continuous Operation of Base Receiver/Decoder

The NS5 base stations were NOT in continuous operation for the entire month. Intermittent reception of concentrator and A2 reports was identified on November 11, 2014. The intermittent data is linked to an issue with the A2 decoder and the network IP feed to both District base stations as well as the OneRain base station in Longmont. According to OneRain, the source of the problem is likely the linux board on the A2 decoder. Both OneRain and WET have implemented alarm criteria to notify when latency issues occur.

B. Specific Issues Identified this Month

Performance of the following sensors (Table 3) was questionable this month.

Table 3. Sensors with Poor Performance Characteristics

Sensor ID	Description	Timer	Event	Comments
2750	Wx-Castle Rock	27%	100%	Intermittent data.....WET to investigate
2330	Morrison	63%	93%	Poor performance for entire month
4470	Little Narrows	67%	94%	Poor performance for entire month
4330	Hansen	68%	86%	Poor performance for entire month

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 below (Table 4).

Table 4. 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	100	100	100	80	62	94	100	---	
ETG @ Hampden	100110	05/01/2013	n/a	n/a	83	97	100	100	96	92	100	100	---	
Blackstone	100100	05/03/2013	n/a	n/a	100	100	100	100	94	100	100	100	100	
Newlin Gulch	3070	05/24/2013	100	83	100	100	100	74	99	98	98	97	---	
Carr Street	100	05/31/2013	n/a	n/a	100	100	100	100	96	100	100	100	---	
Maple Grove	1000	05/20/2013	100	90	97	100	100	100	89	96	100	95	100	
Upper Sellers	100140	05/22/2014	n/a	n/a	n/a	n/a	75	93	97	100	97	100	---	
Haystack Road	100150	02/26/2014	n/a	n/a	100	79	79	94	91	100	97	100	---	
Sand Cr at Colfax	100160	05/01/2014	n/a	n/a	n/a	n/a	n/a	100	91	96	100	100	100	
Murphy Creek	870	06/30/2014	n/a	n/a	n/a	n/a	n/a	n/a	97	100	100	100	100	

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 5).

Table 5. 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	2810	1700	2810	4330	4330	4770	4220	2750	
2710	4470	2710	2330	4330	100150	2360	2360	2360	4850	2330	
2330	2730	4470	2360	2330	100140	1660	1660	4330	2710	4470	
4870	4550	4870	420	1710	2750	2330	3090	2330	2750	4330	
920	3010	3010	1700	940	4330	2280	540	2790	4330	4870	
3010	4330	4330	1710	100150	2330	100150	2330	1710	2790	4220	

*- 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 6). 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 6. District-Wide Total Tip/Count Statistical Summary

Statistical Parameter	Value	Comments
Mean	13.36	Only the 1-mm rain sensors were included in the analysis
Median	12	Only the 1-mm rain sensors were included in the analysis
Standard deviation	6.40	Only the 1-mm rain sensors were included in the analysis
Mean plus three standard deviations	32.54	Only the 1-mm rain sensors were included in the analysis
Mean minus two standard deviations	0.60	Only the 1-mm rain sensors were included in the analysis
Minimum total count	2	WX-Castle Rock (2750)
Maximum total count	28	Pinewood Springs (4510)
Sensors showing NO rain for the month		Several
Sensors greater than 3 SD (over reporting)		None
Sensors less than 2 SD (under reporting)		None

B. Monthly Average Tip/Count Summary

A monthly summary of the District-wide mean total tip/count is presented (Table 7).

Table 7. 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	29.30	77.30	29.16	99.73	43.59	50.96	29.26	13.36		

*- 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 8).

Table 8. Sensors with a Jump of 6 or More in Sequential Count

Sensor Description	Sensor ID	Comment
None		None this month

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 959 incrementing reports were received and a total of 989 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 9).

Table 9. Monthly Summary of Sensors with the Worst Performance

Jan*	Feb*	Mar*	Apr	May	Jun	Jul	Aug	Sep	Oct*	Nov*	Dec*
4520	2730	2790	2980	4330	5940	650	3090	2330	4470	4490	
4010	4330	4790	2230	100150	310	4470	2360	2360	4520	140	
4170	4200	4530	4510	4470	2980	2320	2980	4470	4570	4510	
3030	4240	4510	3050	2980	1620	2970	2800	2970	4840	4330	
1460	4870	4240	2330	2330	2790	2360	310	1660	4870	4080	
1700	4470	4870	100150	5900	4470	2980	2330	4330	4490	2730	

*-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 10). The five heaviest hours of radio traffic are analyzed to quantify the number of missing rain reports for that hour.

Table 10. Periods of Heavy Radio Traffic (total load includes Concentrator and A2 and Legacy reports)

Day	Hour	Expected	Received	Total Load	Loss
2	1	7	7	1,208	0.00%
10	11	4	4	786	0.00%
24	14	1	1	779	0.00%
10	10	7	7	777	0.00%
25	12	2	2	759	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 11).

Table 11. Summary of Unknown IDs

Description	Concentrator	Legacy
Total number of unknown IDs (IDs without a device definition)	213	277
Total reports from unknown IDs	470	492
Unknown IDs with only a single received report (potential noise)	115	187
Total reports from all IDs – RecData Log entire month	415,746	246,901
Unknown reports as a fraction of total reports	0.11%	0.20%

The total number of reports from unknown sensors is very small relative to the total reports received for the month. Shown below (Table 12) are the total reports received from unknown sensor IDs for each month of the year.

Table 12. Monthly Summary of Total Reports from Unknown IDs (Conc)

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	2,104	25,746	1,832	3,983	268	369	448	470	

The fraction of reports from unknown sensors relative to the total number of reports is shown below (Table 13).

Table 13. Monthly Percent of Unknown Sensor Reports (Conc)

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%	0.34%	3.95%	0.34%	0.66%	0.03%	0.03%	0.07%	0.11%	

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 14).

Table 14. Reports Received by Unknown IDs

Concentrator		Legacy ALERT		Comment
Unknown ID	Reports	Unknown ID	Reports	
1495	20	1495	13	
1470	12	1919	13	
1919	10	1470	12	Possibly coming from Brighton
1534	8	1534	8	Possibly coming from Bear Creek at Lowell
1929	8	1929	8	Possibly coming from Brighton
1930	7	1528	7	
1949	7	1930	7	

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
2810	Pine Cliff Road	4	Random decodes
1520	Wx-Marston Lake North	4	Random decodes
1530	Bear Creek at Lowell	4	Random decodes
1440	Wx-Elbert	3	Random decodes
2210	Wx-Hiwan G.C.	3	Random decodes
2360	Indian Hills	3	Random decodes
4830	SBC@San Souci	3	Random decodes

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.

ID	Description	Alarm Description	Date/Time	Threshold (in)	Total Rain (in)
410	Kelly Dam Precipitation-DN	Plains 10 minute rainfall	11/04/2014 13:07:25	0.5	0.551

General System Analysis

Database Name

P:\A207-UDFCD-Data-Analysis\2014\11-2014\Novastar_extract_2014Nov.mdb

First Date in Database

11/1/14 12:00 AM

Total Days

30.0

Last Date in Database

11/30/14 11:59 PM

Total Hours

720.0

Total Records Analyzed

415,746

Records by Group	Concentrator	Percent	Legacy	Percent
Wind Data	181,005	44%	102,537	42%
Temperature	68,887	17%	35,713	14%
Relative Humidity	60,986	15%	36,032	15%
Barometric Pressure	35,148	8%	21,011	9%
Battery Voltage	18,334	4%	9,087	4%
Water Level	12,869	3%	10,662	4%
Solar Radiation	10,492	3%	9,627	4%
Precipitation	6,313	2%	5,498	2%
Fuel Moisture	5,637	1%	5,170	2%
Fuel Temperature	5,636	1%	5,180	2%
Wind Direction	4,285	1%	0	0%
Soil Moisture	2,741	1%	2,315	1%
Repeater Status Report	1,854	0%	2,369	1%
ET-Hourly	711	0%	410	0%
Unknown	470	0%	492	0%
12Hr Status Report	194	0%	173	0%
Repeater Pass List	67	0%	530	0%
Not Used	54	0%	53	0%
ET-Daily	28	0%	29	0%
GPS Lock	21	0%	0	0%
Solar Power	10	0%	11	0%
Handar 585 ALARM Status	2	0%	2	0%
ALERT/A2 Testing	2	0%	0	0%
Total	415,746	100%	246,901	100%

Traffic Loading Summary

	Concentrator		Legacy	
Alert Reports	415,746		246,901	
Average Daily Traffic	13,858		8,230	
Average Hourly Traffic	577		343	
Median Hourly Traffic	576	hour beginning	360	hour beginning
Peak Hourly Traffic	1,208	Nov 2, 1:00 AM	672	Nov 2, 1:00 AM
2nd Max	786	Nov 10, 11:00 AM	515	Nov 3, 6:00 AM
3rd Max	779	Nov 24, 2:00 PM	509	Nov 25, 11:00 AM
4th Max	777	Nov 10, 10:00 AM	502	Nov 25, 12:00 PM
5th Max	759	Nov 25, 12:00 PM	496	Nov 25, 2:00 PM

Rain Timer Performance

Analyze Rain Sensors

Rain Sensors	Description	Rcv	Timer	Exp	Performance	Comment
2750	Wx-Castle Rock	16	12:00	60	27%	
2330	Morrison	38	17:24	60	63%	
4470	Little Narrows	40	16:22	60	67%	
4330	Hansen Rain	41	14:08	60	68%	
4870	SBC @ SB Road	43	14:11	60	72%	
4220	Fling's	44	12:56	60	73%	
1660	SPR at Henderson	47	15:00	60	78%	
150	Nott Creek	49	8:35	60	82%	
2790	Wx-W. Cherry Creek	50	14:31	60	83%	
4790	Wx-Button Rock	50	12:46	60	83%	
4510	Pinewood Springs	50	12:51	60	83%	
4240	Sunset	50	14:07	60	83%	
870	A2-Murphy Creek GC	617	0:00	720	86%	
1480	Third Creek at DIA	52	8:25	60	87%	
3030	WX-Bingham Lake Park	53	13:34	60	88%	
4300	Big Elk Park	55	12:27	60	92%	
4250	Geer Canyon	55	12:40	60	92%	
4490	Apple Valley	56	12:40	60	93%	
4360	Justice Center	56	12:39	60	93%	
4270	Cannon Mountain	56	12:24	60	93%	
4030	Red Garden	56	12:40	60	93%	
4820	Doudy Draw	57	12:24	60	95%	
4340	Riverside	57	12:25	60	95%	
4320	Lee Hill Rain 2012	57	12:11	60	95%	
4310	Johnny Park	57	12:12	60	95%	
4090	Magnolia	57	12:25	60	95%	
4060	Lakeshore	57	12:10	60	95%	
4010	Crescent	57	12:24	60	95%	
2320	Choke Cherry Resvr	57	12:33	60	95%	
2990	Wx-Tomah Rd-DougCnty	58	12:12	60	97%	
4750	Wx-Louisville Lake	58	12:12	60	97%	
1440	Wx-Elbert	58	12:25	60	97%	
140	Wx-Blue Mountain	58	12:33	60	97%	
4530	Winiger Ridge	58	12:10	60	97%	
4810	Shanahan Ridge	58	11:56	60	97%	
4570	St. Antons	58	11:58	60	97%	
4550	Boulder Jail	58	12:10	60	97%	
4350	Conifer Hill	58	12:10	60	97%	
4290	Red Hill	58	12:10	60	97%	
4260	Taylor Mountain	58	12:10	60	97%	
4180	Gold Lake	58	12:10	60	97%	
4130	Swiss Peaks	58	12:12	60	97%	
4100	Filter Plant	58	11:58	60	97%	
4080	Twin Sisters	58	11:56	60	97%	
4070	Bear Peak	58	12:09	60	97%	
4050	Walker Ranch	58	12:10	60	97%	
4020	Rio Grande	58	12:09	60	97%	
2980	Dakan Rd	58	12:11	60	97%	
3020	Wx-West Creek WX	59	11:58	60	98%	
4710	Wx-Ward C-1	59	11:58	60	98%	
4730	Wx-Sugarloaf	59	11:58	60	98%	
2930	Wx-Spring Valley Rd-DougCnty	59	11:58	60	98%	
2730	Wx-Salisbury Park	59	11:58	60	98%	
750	Wx-Quincy Reservoir	59	11:56	60	98%	

2210	Wx-Hiwan G.C.	59	11:58	60	98%
2710	Wx-Highlands Ranch WTP	59	11:58	60	98%
3010	WX-EPC at Hwy 105	59	11:58	60	98%
4770	Wx-Cal-Wood Ranch	59	11:58	60	98%
1920	Wx-Brighton	59	11:49	60	98%
920	Wx-Aurora Town Hall	59	11:58	60	98%
900	Wx-Aurora Reservoir	59	11:45	60	98%
4880	Whispering Pines	59	11:56	60	98%
4840	SBC@S Boulder Ditch	59	11:56	60	98%
4830	SBC @ San Souci	59	11:56	60	98%
4230	Golden Age	59	11:56	60	98%
4200	Lazy Acres	59	11:58	60	98%
4170	Pine Brook	59	11:56	60	98%
4110	Betasso	59	11:58	60	98%
4040	Martin Gulch	59	12:10	60	98%
700	Toll Gate @ 6th	59	11:58	60	98%
1000	A2-Maple Grove Resv.	719	0:00	720	100%
100160	A2-Sand Creek at Colfax Precip	84	1:00	84	100%
100100	A2-Blackstone Precip	10	11:51	10	100%
4860	Fairview Peak	60	11:58	60	100%
4520	Eagle Ridge	60	11:58	60	100%
4190	Slaughterhouse	60	11:55	60	100%
4150	Gold Hill	60	11:56	60	100%
970	Pump Sta 3	60	11:46	60	100%
1520	Wx-Marston Lake North	61	11:51	60	102%
1420	Wx-Diamond Hill	61	12:03	60	102%
1570	Wx-Brighton Ditch	61	11:35	60	102%
4160	Sunshine	61	11:43	60	102%
4140	Logan Mill	61	11:43	60	102%
1460	Wx-Urban Farm	66	11:32	60	110%
1640	SPR at Union Ave.	68	10:28	60	113%
200	Leyden Reservoir	78	9:14	60	130%
1700	Cherry Cr @ Champa	79	9:10	60	132%
2310	Genesee Village	21	5:52	60	35%
2350	Idledale	20	5:50	60	33%
950	Piney at Liverpool	14	8:37	60	23%
2340	El Rancho	10	11:49	60	17%
940	Aurora Regional Pond	10	11:48	60	17%
820	ETG @ Buckley	10	11:49	60	17%
2280	Kinney Peak	9	11:48	60	15%
2260	Brook Forest	8	13:39	60	13%
1720	Cherry Cr @ Steele	8	9:22	60	13%
520	Jewell Detention	7	11:42	60	12%
420	Expo Park	7	11:37	60	12%
800	Sable Ditch @ 18th	6	11:42	60	10%
530	Fire Station #19	6	11:37	60	10%
510	Virginia Court	6	11:41	60	10%
500	Havana Park	6	11:42	60	10%
410	Kelly Dam	6	11:37	60	10%
400	Montview Park	6	11:37	60	10%
540	Parker/Mississippi	5	11:37	60	8%
2360	Indian Hills	17	7:25	60	28%
110	Ralston Reservoir	35	5:56	60	58%

Rain Event Performance		Reports Received	959	Analyze Rain Sensors														
	Systemwide Avg	Total Tips	989															
	96.97%	Data Loss	3.03%															
Description	Sensor	Performance	1-tips	2-tips	3-tips	4-tips	5-tips	6-tips	>6-tips	Rcv	Exp	Miss	Hold	Bucket				
Apple Valley	4490	85%	9	2	0	0	0	0	0	11	13	2	0	0.03937				
Wx-Blue Mountain	140	86%	11	0	1	0	0	0	0	12	14	2	0	0.03937	Mean			13.365
Pinewood Springs	4510	86%	20	4	0	0	0	0	0	24	28	4	0	0.03937	Median			12
Hansen Rain	4330	86%	15	3	0	0	0	0	0	18	21	3	0	0.03937	St. Dev			6.3926
Twin Sisters	4080	86%	5	1	0	0	0	0	0	6	7	1	0	0.03937	Mean plus 3 SD			32.543
Wx-Salisbury Park	2730	88%	6	1	0	0	0	0	0	7	8	1	0	0.03937	Min			2
Wx-Cal-Wood Ranch	4770	89%	14	2	0	0	0	0	0	16	18	2	0	0.03937	Max			28
Eagle Ridge	4520	90%	16	2	0	0	0	0	0	18	20	2	1	0.03937				
Rio Grande	4020	90%	8	1	0	0	0	0	0	9	10	1	0	0.03937				
Lee Hill Rain 2012	4320	92%	22	0	1	0	0	0	0	23	25	2	0	0.03937				
WX-Bingham Lake Park	3030	93%	12	1	0	0	0	0	0	13	14	1	0	0.03937				
Morrison	2330	93%	12	1	0	0	0	0	0	13	14	1	0	0.03937				
Little Narrows	4470	94%	14	1	0	0	0	0	0	15	16	1	0	0.03937				
Sunshine	4160	94%	15	1	0	0	0	0	0	16	17	1	0	0.03937				
Wx-Diamond Hill	1420	95%	18	1	0	0	0	0	0	19	20	1	0	0.03937				
Red Hill	4290	95%	19	1	0	0	0	0	0	20	21	1	0	0.03937				
Wx-Marston Lake North	1520	96%	21	1	0	0	0	0	0	22	23	1	0	0.03937				
WX-EPC at Hwy 105	3010	96%	24	1	0	0	0	0	0	25	26	1	0	0.01				
Johnny Park	4310	96%	24	1	0	0	0	0	0	25	26	1	0	0.03937				
Fairview Peak	4860	96%	25	1	0	0	0	0	0	26	27	1	0	0.01				
Wx-West Creek WX	3020	100%	4	0	0	0	0	0	0	4	4	0	0	0.03937				
Wx-Ward C-1	4710	100%	6	0	0	0	0	0	0	6	6	0	0	0.03937				
Wx-W. Cherry Creek	2790	100%	4	0	0	0	0	0	0	4	4	0	0	0.03937				
Wx-Urban Farm	1460	100%	27	0	0	0	0	0	0	27	27	0	0	0.03937				
Wx-Tomah Rd-DougCnty	2990	100%	8	0	0	0	0	0	0	8	8	0	0	0.03937				
Wx-Sugarloaf	4730	100%	9	0	0	0	0	0	0	9	9	0	0	0.03937				
Wx-Spring Valley Rd-DougCnty	2930	100%	2	0	0	0	0	0	0	2	2	0	0	0.03937				
Wx-Quincy Reservoir	750	100%	12	0	0	0	0	0	0	12	12	0	0	0.03937				
Wx-Louisville Lake	4750	100%	7	0	0	0	0	0	0	7	7	0	0	0.03937				
Wx-Hiwan G.C.	2210	100%	15	0	0	0	0	0	0	15	15	0	1	0.03937				
Wx-Highlands Ranch WTP	2710	100%	12	0	0	0	0	0	0	12	12	0	0	0.03937				
Wx-Elbert	1440	100%	5	0	0	0	0	0	0	5	5	0	1	0.03937				
Wx-Castle Rock	2750	100%	2	0	0	0	0	0	0	2	2	0	0	0.03937				
Wx-Button Rock	4790	100%	16	0	0	0	0	0	0	16	16	0	0	0.03937				
Wx-Brighton	1920	100%	15	0	0	0	0	0	0	15	15	0	0	0.03937				
Wx-Aurora Town Hall	920	100%	10	0	0	0	0	0	0	10	10	0	0	0.03937				
Wx-Aurora Reservoir	900	100%	14	0	0	0	0	0	0	14	14	0	0	0.03937				
Winiger Ridge	4530	100%	8	0	0	0	0	0	0	8	8	0	0	0.03937				
Whispering Pines	4880	100%	24	0	0	0	0	0	0	24	24	0	0	0.03937				
SBC @ SB Road	4870	100%	10	0	0	0	0	0	0	10	10	0	0	0.03937				
SBC@S Boulder Ditch	4840	100%	13	0	0	0	0	0	0	13	13	0	0	0.03937				
SBC @ San Souci	4830	100%	12	0	0	0	0	0	0	12	12	0	0	0.03937				
Doudy Draw	4820	100%	12	0	0	0	0	0	0	12	12	0	0	0.03937				
Shanahan Ridge	4810	100%	12	0	0	0	0	0	0	12	12	0	0	0.03937				
St. Antons	4570	100%	10	0	0	0	0	0	0	10	10	0	0	0.03937				
Boulder Jail	4550	100%	11	0	0	0	0	0	0	11	11	0	0	0.03937				
Justice Center	4360	100%	16	0	0	0	0	0	0	16	16	0	0	0.03937				
Conifer Hill	4350	100%	11	0	0	0	0	0	0	11	11	0	0	0.03937				
Riverside	4340	100%	12	0	0	0	0	0	0	12	12	0	0	0.03937				
Big Elk Park	4300	100%	6	0	0	0	0	0	0	6	6	0	0	0.03937				
Cannon Mountain	4270	100%	5	0	0	0	0	0	0	5	5	0	0	0.03937				
Taylor Mountain	4260	100%	7	0	0	0	0	0	0	7	7	0	0	0.03937				

Geer Canyon	4250	100%	24	0	0	0	0	0	0	24	24	0	0	0.03937
Sunset	4240	100%	9	0	0	0	0	0	0	9	9	0	0	0.03937
Golden Age	4230	100%	9	0	0	0	0	0	0	9	9	0	0	0.03937
Fling's	4220	100%	12	0	0	0	0	0	0	12	12	0	0	0.03937
Lazy Acres	4200	100%	20	0	0	0	0	0	0	20	20	0	0	0.03937
Slaughterhouse	4190	100%	17	0	0	0	0	0	0	17	17	0	0	0.03937
Gold Lake	4180	100%	9	0	0	0	0	0	0	9	9	0	0	0.03937
Pine Brook	4170	100%	10	0	0	0	0	0	0	10	10	0	0	0.03937
Gold Hill	4150	100%	16	0	0	0	0	0	0	16	16	0	0	0.03937
Logan Mill	4140	100%	14	0	0	0	0	0	0	14	14	0	0	0.03937
Swiss Peaks	4130	100%	12	0	0	0	0	0	0	12	12	0	0	0.03937
Betasso	4110	100%	21	0	0	0	0	0	0	21	21	0	0	0.03937
Filter Plant	4100	100%	15	0	0	0	0	0	0	15	15	0	0	0.03937
Magnolia	4090	100%	14	0	0	0	0	0	0	14	14	0	0	0.03937
Bear Peak	4070	100%	11	0	0	0	0	0	0	11	11	0	0	0.03937
Lakeshore	4060	100%	10	0	0	0	0	0	0	10	10	0	0	0.03937
Walker Ranch	4050	100%	6	0	0	0	0	0	0	6	6	0	0	0.03937
Martin Gulch	4040	100%	13	0	0	0	0	0	0	13	13	0	0	0.03937
Red Garden	4030	100%	14	0	0	0	0	0	0	14	14	0	0	0.03937
Crescent	4010	100%	9	0	0	0	0	0	0	9	9	0	0	0.03937
A2-Maple Grove Resv.	1000	100%	15	0	0	0	0	0	0	15	15	0	0	0.03937
A2-Murphy Creek GC	870	100%	4	0	0	0	0	0	0	4	4	0	0	0.03937
		Total Tips	931	26	2	0	0	0	0	959	989	30	3	
Indian Hills	2360	80%	3	1	0	0	0	0	0	4	5	1	0	0.03937
Idledale	2350	75%	2	1	0	0	0	0	0	3	4	1	0	0.03937
El Rancho	2340	100%	4	0	0	0	0	0	0	4	4	0	0	0.03937
Choke Cherry Resvr	2320	79%	16	2	0	1	0	0	0	19	24	5	0	0.03937
Genesee Village	2310	57%	8	1	1	2	0	0	0	12	21	9	0	0.03937
Kinney Peak	2280	100%	2	0	0	0	0	0	0	2	2	0	0	0.03937
Cherry Cr @ Steele	1720	100%	8	0	0	0	0	0	0	8	8	0	0	0.03937
Cherry Cr @ Champa	1700	93%	13	1	0	0	0	0	0	14	15	1	1	0.03937
SPR at Henderson	1660	64%	5	3	1	0	0	0	0	9	14	5	0	0.03937
SPR at Union Ave.	1640	94%	15	1	0	0	0	0	0	16	17	1	0	0.03937
Third Creek at DIA	1480	100%	19	0	0	0	0	0	1	19	19	0	0	0.03937
Pump Sta 3	970	100%	10	0	0	0	0	0	0	10	10	0	0	0.03937
Piney at Liverpool	950	100%	5	0	0	0	0	0	0	5	5	0	0	0.03937
Aurora Regional Pond	940	100%	7	0	0	0	0	0	0	7	7	0	0	0.03937
ETG @ Buckley	820	100%	4	0	0	0	0	0	0	4	4	0	0	0.03937
Sable Ditch @ 18th	800	100%	6	0	0	0	0	0	0	6	6	0	0	0.03937
Toll Gate @ 6th	700	89%	14	2	0	0	0	0	0	16	18	2	2	0.03937
Parker/Mississippi	540	100%	3	0	0	0	0	0	0	3	3	0	0	0.03937
Fire Station #19	530	93%	12	1	0	0	0	0	0	13	14	1	0	0.03937
Jewell Detention	520	71%	4	0	1	0	0	0	0	5	7	2	0	0.03937
Virginia Court	510	100%	2	0	0	0	0	0	0	2	2	0	0	0.03937
Havana Park	500	100%	11	0	0	0	0	0	0	11	11	0	0	0.03937
Expo Park	420	63%	4	0	0	1	0	0	0	5	8	3	0	0.03937
Kelly Dam	410	88%	14	0	1	0	0	0	1	15	17	2	0	0.03937
Montview Park	400	94%	15	1	0	0	0	0	0	16	17	1	0	0.03937
Leyden Reservoir	200	90%	25	0	0	1	0	0	0	26	29	3	0	0.03937
Nott Creek	150	76%	11	1	0	1	0	0	0	13	17	4	0	0.03937
Ralston Reservoir	110	70%	11	2	0	0	1	0	0	14	20	6	0	0.03937
A2-Sand Creek at Colfax Precip	100160	100%	6	0	0	0	0	0	0	6	6	0	0	0.03937
A2-Blackstone Precip	100100	100%	4	0	0	0	0	0	0	4	4	0	0	0.03937

2014 Monthly Peak Hour ALERT Radio Traffic Summary

