

Memo

Date: September 9, 2014
To: Kevin Stewart
From: Markus Ritsch
Subject: August 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 August 1 through August 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 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. In August 2014 a new repeater was installed at the Castle Rock weather station to forward legacy ALERT reports from Douglas County on to Diamond Hill.

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				
Concentrator	508,306	370,222	495,874	515,526	537,996	430,118	475,605	453,331				
ALERT2	129,855	86,506	110,086	107,478	113,674	109,244	130,087	354,119				
TOTAL	958,464	671,426	885,742	916,141	1,003,616	857,796	914,467	1,090,048	0	0	0	0
Conc+A2	638,161	456,728	605,960	623,004	651,670	539,362	605,692	807,450				
Conc/Leg	1.59	1.72	1.77	1.76	1.53	1.35	1.54	1.60				
DataChron	498,846	444,211	599,923	630,962	663,576	583,568	654,910	705,565				

The daily ratio of concentrator reports received versus legacy ALERT reports received is shown (Figure 1). The data show an increase in the computed ratio toward the end of the month. The reason for this increase is discussed later in this report.

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)	Aug 24	Aug 25	Aug 26	Aug 27	Aug 28	Aug 29	Aug 30	Aug 31	Sep 1
Legacy	8,636	9,226	11,336	9,686	9,159	9,163	8,247	8,604	8,156
Concentrator	14,637	14,991	17,180	15,911	15,714	15,501	14,640	15,296	13,982
ALERT2	11,342	11,546	11,431	11,437	11,414	11,433	11,638	11,709	11,616
NS5B (Greenhouse)									
Legacy	8,636	9,232	11,334	9,686	9,157	9,164	8,248	8,604	8,156
Concentrator	14,646	15,021	17,087	15,939	15,747	15,538	14,652	15,309	13,987
ALERT2	11,536	11,806	11,562	11,679	11,645	11,608	11,691	11,771	11,733
Diff (NS5a-NS5b)									
Legacy	0.00	-6.00	2.00	0.00	2.00	-1.00	-1.00	0.00	0.00
Concentrator	-9.00	-30.00	93.00	-28.00	-33.00	-37.00	-12.00	-13.00	-5.00
ALERT2	-194.00	-260.00	-131.00	-242.00	-231.00	-175.00	-53.00	-62.00	-117.00

Each day the base station located at Greenhouse Data in Wyoming receives roughly 150 more ALERT2 reports than does the base station at Diamond Hill. The difference shows up primarily in the 6600 series of IDs which is the weather station operated by Don Van Wie. This weather station reports data every 5 minutes which yields a total of 288 reports for a 24 hour period for each sensor. None of the ALERT2 repeaters are pass listed so data is received

at Diamond Hill from four separate repeaters (6502-Smoky Hill, 6503-Blue Mountain, 6505-Lee Hill and 6506-Gold Hill). Each repeater passes 288 reports per day which yields a total of 1,152 reports for each sensor. The successful reception of ALERT2 data reports through each repeater is quantified (Table 3) for each base station. The source of lost ALERT2 reports at Diamond Hill relative to Greenhouse is the Blue Mountain repeater. Both Diamond Hill and Greenhouse run the NovaStar5 base station software. The same version of NovaStar5 runs on both servers. Both servers receive data from the IP output on the ALERT2 decoder located at Diamond Hill. It is unlikely that the IP output of the ALERT2 decoder is the problem. It is also unlikely that the NovaStar5 software is the problem.

Table 3. Successful Reception of ALERT2 Self Reports for the Month (Percent)

	Smoky Hill (6502)	Blue Mt. (6503)	Lee Hill (6505)	Gold Hill (6506)
Diamond Hill (UDFCD)	94.5%	96.4%	99.8%	99.5%
Greenhouse Data (Wyoming)	94.1%	99.4%	99.8%	99.7%
Difference	-0.1%	3.0%	0.0%	0.2%

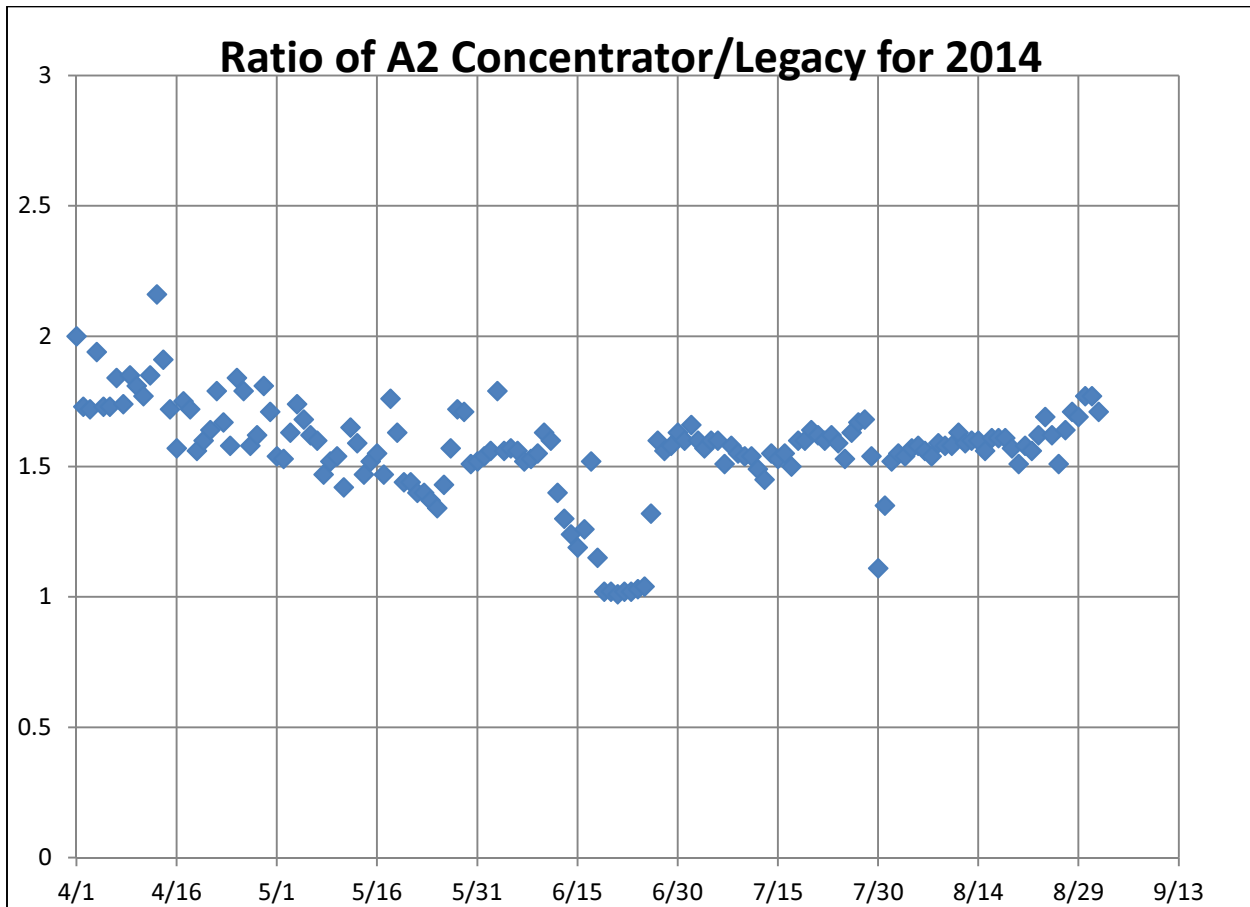


Figure 1. Daily Ratio of Concentrator/Legacy Reports

Beginning on August 18 (approximately) the ratio of concentrator to legacy reports increases and continues to increase throughout the end of the month. The reason for this trend is that the data reception of legacy reports at Diamond Hill is deteriorating. The reception of concentrator and legacy reports for three sensors is shown below (Table 4) that exemplifies the issue.

Table 4. Daily Ratio of Concentrator vs Legacy Reports at Diamond Hill

August	Sensor 921			Sensor 1525			Sensor 4713		
Day	Legacy	Concentrator	Ratio	Legacy	Concentrator	Ratio	Legacy	Concentrator	Ratio
1	22	22	1.00	94	95	1.01	142	142	1.00
2	23	23	1.00	93	94	1.01	146	150	1.03
3	24	24	1.00	95	95	1.00	162	164	1.01
4	23	23	1.00	93	93	1.00	159	160	1.01
5	23	24	1.04	93	94	1.01	161	164	1.02
6	24	24	1.00	93	93	1.00	157	158	1.01
7	22	25	1.14	91	91	1.00	158	169	1.07
8	22	22	1.00	95	96	1.01	163	164	1.01
9	23	24	1.04	91	93	1.02	167	168	1.01
10	19	20	1.05	94	92	0.98	158	158	1.00
11	24	24	1.00	90	91	1.01	72	155	2.15
12	21	24	1.14	90	94	1.04	144	157	1.09
13	22	23	1.05	91	94	1.03	150	152	1.01
14	21	24	1.14	91	95	1.04	153	160	1.05
15	21	24	1.14	89	94	1.06	145	154	1.06
16	22	23	1.05	91	94	1.03	141	170	1.21
17	20	24	1.20	83	88	1.06	158	169	1.07
18	18	23	1.28	43	46	1.07	137	162	1.18
19	14	24	1.71	81	93	1.15	131	161	1.23
20	18	23	1.28	89	95	1.07	160	161	1.01
21	19	24	1.26	85	92	1.08	131	156	1.19
22	17	24	1.41	88	96	1.09	138	141	1.02
23	17	24	1.41	90	96	1.07	121	159	1.31
24	17	22	1.29	85	93	1.09	125	164	1.31
25	11	23	2.09	83	95	1.14	128	145	1.13
26	11	22	2.00	80	91	1.14	122	154	1.26
27	4	23	5.75	77	95	1.23	74	131	1.77
28	9	24	2.67	76	95	1.25	72	149	2.07
29	11	24	2.18	72	94	1.31	97	158	1.63
30	3	24	8.00	73	94	1.29	98	158	1.61
31	3	23	7.67	73	95	1.30	107	164	1.53

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 August 26, 2014 at 15:46 in the afternoon. Incidentally heavy rain was observed on this day. The intermittent data is assumed to be linked to a problem with the A2 decoder and the network IP feed to both District base stations as well as the OneRain base station in Longmont.

As of August 13, 2014 the problem has not been exactly determined. According to OneRain, the source of the problem is likely one of the following:

- The linux board on the A2 decoder has latency
- The cat5 cable from the A2 decoder on the roof to the server room is damaged
- The network at Diamond Hill has latency issues

Both OneRain and WET have implemented alarm criteria to notify when the latency issues are again observed. Another rain event is likely needed to reproduce the latency issue to pin-point the problem.

On August 22 data reception issues were also identified on the legacy ALERT feed to only the ns5b base station at Greenhouse Data. The legacy ALERT feed to the ns5a base was not interrupted. The legacy ALERT feed also employs an IP routing device but it is completely separate from the A2 IP routing mechanism. Since only the ns5b base station experienced interruption it is assumed that Greenhouse Data may have had network problems.

B. Specific Issues Identified this Month

Performance of the following sensors (Table 5) was questionable this month.

Table 5. Sensors with Poor Performance Characteristics

Sensor ID	Description	Timer	Event	Comments
4330	Hansen Rain	44%	86%	Poor timer and event reporting
2360	Indian Hills	61%	69%	Poor timer and event reporting
1660	SPR at Henderson	63%	89%	Poor timer and event reporting
3090	A2-Highland Heritage Park	65%	62%	Marginal radio path.....WET to investigate
2980	Dakan Road	94%	70%	Poor timer and event reporting

An issue was identified this month regarding the processing of A2 self-reports on NovaStar5. Data from sensor 100110 (Table 6), East Toll Gate at Hampden shows the tip count of 307 is temporally out of place causing an erroneous rain total. The tip count of 307 was filed exactly 12 hours later than it occurred in the field. HydroLynx was made aware of this “bug” on September 5, 2014. The HydroLynx response from Dave Leader is as follows:

You are correct. I do have a problem with decoding ALERT2 reports that are logged at 05:58-06:00 MDT and received 06:00-06:02 and also 17:58-18:00 received at 18:00-18:02. My time stamp for data filed is 12 hours in the future!

This is an interesting problem in processing the ALERT2 data with its TDMA latency. Data reports do not get full time stamps in seconds since 01/01/1970. To save space in transmitting time, time stamps are offsets from the nearest 12:00 AM or 12:00 PM UTC. For example when a data report is transmitted at 01:00:00 UTC its time stamp is 3600 seconds from midnight. When the report is received within the 2 minute time frame for example at 01:00:15, the receive data looks back to the most recent 12 hour time, midnight and adds 3600 to compute the data report time: 01:00:00 UTC.

The problem I have in my logic is when a report is time stamped within 2 seconds of the 00:00:00 UTC (18:00:00 MDT). For example a report logged at 23:58:11 UTC (17:58:11 MDT) has the time stamp offset 43151 from 12:00:00 UTC. When I receive it at 00:00:46 UTC (18:00:46 MDT) my logic adds 43151 to 00:00:00 to get 11:58:11 UTC (05:59:00 MDT) the next day instead of 23:58:11 the previous day (17:58:11 MDT). This is what happened to the 100110 report on 08/06/2014 at 17:58:11 MDT. The 307 report got filed 12 hours later on 08/07/2014 05:58:11 MDT. If you look back 12 hours to 08/06/2014 17:58:11, the report count fits perfectly.

When I first saw this in the receive data log I thought the remote transmitter must be computing the time stamp incorrectly. I was wrong. It was time stamped correctly at 17:58:11 from its perspective. But when I received it at 18:00:42 I did not take the 12 hour UTC rollover into account. I computed the report time forward 12 hours.

I need to fix the ALERT2 receive data logic but I must take some time to test it completely. I will have a fix by next Tuesday.

Fortunately, this error only affected event reports transmitted between 05:58-06:00 MDT and 17:58-18:00 MDT. Unfortunately, that is why it took so long so see the problem.

HydroLynx provided a program update to NovaStar5 on September 10, 2014 to fix the problem.

Table 6. NovaStar5 Data Processing "bug" for A2 Self Reports (Sensor 100110 - ETG at Hampden)

Date/Time	Tip Count	Validation Flag	Increment (in)	Total (in)
08/07/2014 12:58:20	312	4V	0.04	12.05
08/07/2014 12:57:35	311	4V	0.16	12.01
08/07/2014 05:58:11	307	4V	0.00	11.85
08/07/2014 02:54:50	310	4V	0.00	11.85
08/06/2014 18:05:16	310	4V	0.04	11.85
08/06/2014 18:02:23	309	4V	0.04	11.81
08/06/2014 18:00:03	308	4V	0.08	11.77
08/06/2014 14:54:48	306	4V	0.00	11.69

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 7).

Table 7. 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				
ETG @ Hampden	100110	05/01/2013	n/a	n/a	83	97	100	100	96	92				
Blackstone	100100	05/03/2013	n/a	n/a	100	100	100	100	94	100				
Newlin Gulch	3070	05/24/2013	100	83	100	100	100	74	99	98				
Carr Street	100	05/31/2013	n/a	n/a	100	100	100	100	96	100				
Maple Grove	1000	05/20/2013	100	90	97	100	100	100	89	96				
Upper Sellers	100140	05/22/2014	n/a	n/a	n/a	n/a	75	93	97	100				
Haystack Road	100150	02/26/2014	n/a	n/a	100	79	79	94	91	100				
Sand Cr at Colfax	100160	05/01/2014	n/a	n/a	n/a	n/a	n/a	100	91	96				
Murphy Creek	870	06/30/2014	n/a	n/a	n/a	n/a	n/a	n/a	97	100				
Arvada/Blunn	100220	Sep 2014	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a				

The poor event performance at 3090 is a result of a large jump in count between August 27 and August 28, which was a period of heavy rainfall.

Line: 4 SA: 3090,6001 Time: 08/28/2014 15:27:56 ID: 3090 Data: 20 Scaled: 0.79 Action: insert
 Line: 4 SA: 3090,6001 Time: 08/28/2014 15:24:49 ID: 3090 Data: 18 Scaled: 0.71 Action: insert
 Line: 4 SA: 3090,6001 Time: 08/28/2014 15:23:24 ID: 3090 Data: 17 Scaled: 0.67 Action: insert
 Line: 4 SA: 3090,6001 Time: 08/27/2014 18:00:00 ID: 3090 Data: 7 Scaled: 0.28 Action: insert
 Line: 4 SA: 3090,6001 Time: 08/27/2014 06:00:00 ID: 3090 Data: 7 Scaled: 0.28 Action: insert
 Line: 4 SA: 3090,6001 Time: 08/26/2014 03:19:28 ID: 3090 Data: 7 Scaled: 0.28 Action: insert
 Line: 4 SA: 3090,6001 Time: 08/22/2014 06:00:00 ID: 3090 Data: 4 Scaled: 0.16 Action: insert

Nothing in the NovaStar5 receive data log file is evident that would explain the jump in the rain counter, no decode errors were identified. The station was transmitting stage readings during this time but no rain data. Maybe the counter jumped at the site. WET is to investigate the transmitter on site to determine if it is working correctly.

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 8).

Table 8. 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				
2710	4470	2710	2330	4330	100150	2360	2360				
2330	2730	4470	2360	2330	100140	1660	1660				
4870	4550	4870	420	1710	2750	2330	3090				
920	3010	3010	1700	940	4330	2280	540				
3010	4330	4330	1710	100150	2330	100150	2330				

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

Statistical Parameter	Value	Comments
Mean	43.59	Only the 1-mm rain sensors were included in the analysis
Median	39	Only the 1-mm rain sensors were included in the analysis
Standard deviation	19.02	Only the 1-mm rain sensors were included in the analysis
Mean plus three standard deviations	100.64	Only the 1-mm rain sensors were included in the analysis
Mean minus two standard deviations	5.55	Only the 1-mm rain sensors were included in the analysis
Minimum total count	5	Powers Park (1500)
Maximum total count	140	W. Cherry Creek – Wx (2790)
Sensors showing NO rain for the month		None this month
Sensors greater than 3 SD (over reporting)		W. Cherry Creek (2790) and CC at Russellville Rd (3040)
Sensors less than 2 SD (under reporting)		Powers Park (1500)

B. Monthly Average Tip/Count Summary

A monthly summary of the District-wide mean total tip/count is presented (Table 10).

Table 10. 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					

*- 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 11).

Table 11. Sensors with a Jump of 6 or More in Sequential Count

Sensor Description	Sensor ID	Comment
Highland Heritage Regional Park	3090	Large jump of 10 counts between 8/27 and 8/28....WET to investigate
Quincy Reservoir	750	Three large jumps all occurred on 8/01 – presumed to be maintenance related

D. Sensor-by-Sensor Incrementing Count Summary

The system-wide reception rate of incrementing, 1-mm tip reports for the month was approximately 95 percent. A total of 7,562 incrementing reports were received and a total of 7,977 reports were expected. The total loss of incrementing reports for the month was approximately 5 percent. Those sensors with the worst event transmission performance are summarized (Table 12).

Table 12. 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				
4010	4330	4790	2230	100150	310	4470	2360				
4170	4200	4530	4510	4470	2980	2320	2980				
3030	4240	4510	3050	2980	1620	2970	2800				
1460	4870	4240	2330	2330	2790	2360	310				
1700	4470	4870	100150	5900	4470	2980	2330				

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

Table 13. Periods of Heavy Radio Traffic (total load includes Concentrator and A2 and Legacy reports)

Day	Hour	Expected	Received	Total Load	Loss
7	13	240	234	2,848	2.50%
7	12	273	271	2,391	0.73%
26	0	276	264	2,228	4.35%
29	15	122	122	2,202	0.00%
26	14	200	189	2,148	5.50%

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 14).

Table 14. Summary of Unknown IDs

Description	Conc & A2	Legacy
Total number of unknown IDs (IDs without a device definition)	156	190
Total reports from unknown IDs	268	265
Unknown IDs with only a single received report (potential noise)	109	154
Total reports from all IDs – RecData Log entire month	807,450	282,598
Unknown reports as a fraction of total reports	0.03%	0.09%

The total number of reports from unknown sensors is very small relative to the total reports received for the month. Shown below (Table 15) are the total reports received from unknown sensor IDs for each month of the year.

Table 15. 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	2,104	25,746	1,832	3,983	268				

The fraction of reports from unknown sensors relative to the total number of reports is shown below (Table 16).

Table 16. 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%	0.34%	3.95%	0.34%	0.66%	0.03%				

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 17).

Table 17. Reports Received by Unknown IDs

Conc + A2		Legacy ALERT		Comment
Unknown ID	Reports	Unknown ID	Reports	
1950	14	1950	14	
2239	12	2239	12	
719	6	719	6	
1661	6	4399	5	
3052	5	1661	4	
3053	5	4836	4	
4399	5	2222	3	
4836	5	4601	3	
2839	4	4809	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
2810	Pine Cliff Road	8	Random bad decodes
750	Quincy Res	6	Maintenance on 8/1/2014
410	Kelly Dam	3	Random bad decodes
3050	East/West Trailhead	8	Random bad decoes
1383	Ferril Lake	740	Bubbler that has failed....OneRain to address with Denver
2813	Pine Cliff Road	103	Negative PT offset
953	Piney at Liverpool	156	Failed PT on June 13
853	Flying J	61	Out of service

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	Name	Trigger Name	Alarm Time	Trigger	Alarm Value
2940	Willow Creek Precipitation-DG	Douglas County 1 hour-1 Inch rainfall	8/5/2014 14:54	1	1.0236226
2790	West Cherry Creek Precipitation-DG	Douglas County 10 minute rainfall	8/5/2014 15:14	0.5	0.5511814
3040	East Cherry Creek at Russellville Road Precip-DG	Douglas County 10 minute rainfall	8/5/2014 15:18	0.5	0.5118113
2790	West Cherry Creek Precipitation-DG	Douglas County 1 hour-1 Inch rainfall	8/5/2014 15:21	1	1.0629927
2790	West Cherry Creek Precipitation-DG	Douglas County 10 minute rainfall	8/5/2014 15:25	0.5	0.5118113
3040	East Cherry Creek at Russellville Road Precip-DG	Douglas County 1 hour-1 Inch rainfall	8/5/2014 15:33	1	1.0629927
1350	Chatfield COE Precipitation-JF	Jefferson County 10 minute rainfall	8/7/2014 12:29	0.5	0.5118113
840	Aurora Fire Station 12 Precipitation-AD	Plains 10 minute rainfall	8/7/2014 12:49	0.5	0.5118113
830	Side Creek Park Precipitation-AR	Plains 10 minute rainfall	8/7/2014 13:01	0.5	0.5118113
750	Quincy Reservoir Precipitation	Plains 10 minute rainfall	8/7/2014 13:02	0.5	0.5118113

720	Confluence Pond Precipitation-AR	Plains 10 minute rainfall	8/7/2014 13:05	0.5	0.5118113
870	Murphy Creek Golf Course Precipitation-AR	Plains 10 minute rainfall	8/7/2014 13:07	0.5	0.5118113
870	Murphy Creek Golf Course Precipitation-AR	Plains 1 hour rainfall	8/7/2014 13:15	1	1.0236226
830	Side Creek Park Precipitation-AR	Plains 1 hour rainfall	8/7/2014 13:17	1	1.0236226
870	Murphy Creek Golf Course Precipitation-AR	Plains 10 minute rainfall	8/7/2014 13:19	0.5	0.7086618
2970	Rampart Range Road Precipitation-DG	2970 Rampart Range Road 0.2" in 30 Minutes Rainfall	8/9/2014 13:30	0.2	0.2755907
5740	Trail Creek Precipitation-TL	Hayman 30 minute rainfall	8/10/2014 16:39	0.5	0.5118113
5740	Trail Creek Precipitation-TL	Hayman 30 minute rainfall	8/10/2014 16:57	0.5	0.7480319
5730	West Creek Precipitation-TL	Hayman 30 minute rainfall	8/13/2014 18:03	0.5	0.5118113
2260	Brook Forest Precipitation-JF	Jefferson County 10 minute rainfall	8/14/2014 13:35	0.5	0.5118113
4130	Swiss Peaks Precipitation-BO	Boulder County 10 minute rainfall	8/14/2014 14:29	0.5	0.5118113
4130	Swiss Peaks Precipitation-BO	FMC-BA 0.50" in 30 Min Rainfall	8/14/2014 14:29	0.5	0.5118113
4130	Swiss Peaks Precipitation-BO	FMC-BA 0.75" in 1 Hour Rainfall	8/14/2014 14:39	0.75	0.787402
4730	Sugarloaf Precipitation-BO	FMC-BA 0.50" in 30 Min Rainfall	8/14/2014 14:39	0.5	0.5118113
4730	Sugarloaf Precipitation-BO	FMC-BA 0.75" in 1 Hour Rainfall	8/14/2014 14:48	0.75	0.787402
4160	Sunshine Precipitation-BO	FMC-BA 0.25" in 10 Min Rainfall	8/14/2014 14:56	0.25	0.2755907
4880	Whispering Pines Precipitation-BO	FMC-BA 0.25" in 10 Min Rainfall	8/14/2014 15:00	0.25	0.2755907
2920	West Cherry Head Precipitation-DG	Douglas County 1 hour-1 Inch rainfall	8/14/2014 16:14	1	1.0236226
2970	Rampart Range Road Precipitation-DG	2970 Rampart Range Road 0.2" in 30 Minutes Rainfall	8/19/2014 15:45	0.2	0.2755907
4150	Gold Hill Precipitation-BO	FMC-BA 0.25" in 10 Min Rainfall	8/23/2014 0:32	0.25	0.2755907
1570	Brighton ETO Precipitation-WE	Plains 10 minute rainfall	8/23/2014 14:47	0.5	0.5118113
1570	Brighton ETO Precipitation-WE	Plains 1 hour rainfall	8/23/2014 14:59	1	1.0236226
2860	Cherry Creek at Stroh Precipitation-DG	Douglas County 10 minute rainfall	8/25/2014 16:58	0.5	0.5118113
2840	Sulphur Gulch Precipitation-DG	Douglas County 10 minute rainfall	8/25/2014 17:09	0.5	0.5118113
3080	Tallman Gulch at Tallman Park Precipitation-DG	Douglas County 10 minute rainfall	8/25/2014 17:09	0.5	0.5118113
1660	SPR at Henderson Precipitation	Plains 10 minute rainfall	8/25/2014 17:11	0.5	0.5118113
420	Expo Park Precipitation-AR	Plains 10 minute rainfall	8/26/2014 0:46	0.5	0.5118113
1800	Sand Creek Park Precipitation-AD	Plains 10 minute rainfall	8/26/2014 0:48	0.5	0.5118113
1800	Sand Creek Park Precipitation-AD	Plains 1 hour rainfall	8/26/2014 0:51	1	1.0236226
850	Flying J Truck Plaza Precipitation-AD	Plains 1 hour rainfall	8/26/2014 0:54	1	1.0236226
420	Expo Park Precipitation-AR	Plains 1 hour rainfall	8/26/2014 0:55	1	1.0236226
850	Flying J Truck Plaza Precipitation-AD	Plains 10 minute rainfall	8/26/2014 0:56	0.5	0.5118113
840	Aurora Fire Station 12 Precipitation-AD	Plains 1 hour rainfall	8/26/2014 1:15	1	1.0236226
2360	Indian Hills Precipitation-JF	Jefferson County 10 minute rainfall	8/26/2014 14:13	0.5	0.5118113
1720	Cherry Creek @ Steele Precipitation-DN	Plains 10 minute rainfall	8/26/2014 14:57	0.5	0.5118113
3090	Big Dry Creek at Heritage Regional Park Precipitation-DG	Douglas County 10 minute rainfall	8/28/2014 15:29	0.5	0.5118113
4190	Slaughterhouse Precipitation-BO	FMC-BA 0.50" in 30 Min Rainfall	8/29/2014 14:13	0.5	0.5118113
4850	Porphyry Mountain Precipitation-BO	FMC-BA 0.50" in 30 Min Rainfall	8/29/2014 14:15	0.5	0.5
4320	Lee Hill Rain Precipitation-BO	FMC-BA 0.25" in 10 Min Rainfall	8/29/2014 15:46	0.25	0.2755907

General System Analysis

Database Name P:\A207-UDFCD-Data-Analysis\2014\8-2014\Novastar_extract_2014Aug.mdb

First Date in Database	8/1/14 12:00 AM
Last Date in Database	8/31/14 11:59 PM

Total Days	31.0
Total Hours	744.0

Summarize

Total Records Analyzed 807,450

Records by Group	Conc + A2 Self Reports	Reports	Legacy	Reports	Percent
Wind Data	265,021	32.8%	Wind Data	95,270	33.7%
Temperature	110,825	13.7%	Temperature	40,520	14.3%
Relative Humidity	103,095	12.8%	Relative Humidity	40,165	14.2%
Battery Voltage	76,711	9.5%	Battery Voltage	14,153	5.0%
Water Level	45,449	5.6%	Water Level	26,723	9.5%
Barometric Pressure	37,032	4.6%	Barometric Pressure	20,953	7.4%
Dew Point Temperature	34,972	4.3%	Dew Point Temperature	0	0.0%
Wind Chill	34,940	4.3%	Wind Chill	0	0.0%
Peak Wind	34,719	4.3%	Peak Wind	0	0.0%
Precipitation	30,599	3.8%	Precipitation	14,685	5.2%
Solar Radiation	10,855	1.3%	Solar Radiation	10,606	3.8%
Fuel Temperature	5,951	0.7%	Fuel Temperature	5,918	2.1%
Fuel Moisture	5,940	0.7%	Fuel Moisture	5,894	2.1%
Wind Direction	3,490	0.4%	Wind Direction	0	0.0%
Soil Moisture	2,958	0.4%	Soil Moisture	2,922	1.0%
Repeater Status Report	1,795	0.2%	Repeater Status Report	2,471	0.9%
ET-Hourly	720	0.1%	ET-Hourly	715	0.3%
Status	421	0.1%	Status	0	0.0%
Hayman Battery	416	0.1%	Hayman Battery	0	0.0%
12Hr Status Report	415	0.1%	12Hr Status Report	412	0.1%
Not Used	309	0.0%	Not Used	290	0.1%
Unknown	268	0.0%	Unknown	265	0.1%
Flasher Status	264	0.0%	Flasher Status	0	0.0%
GPS Lock	133	0.0%	GPS Lock	0	0.0%
Handar 585 ALARM Status	64	0.0%	Handar 585 ALARM Status	64	0.0%
Repeater Pass List	62	0.0%	Repeater Pass List	541	0.2%
ET-Daily	26	0.0%	ET-Daily	31	0.0%
Total	807,450	100.0%	Total	282,598	100.0%

Traffic Loading Summary

Alert Reports	807,450		Alert Reports	282,598	
Average Daily Traffic	26,047		Average Daily Traffic	9,116	
Average Hourly Traffic	1,085		Average Hourly Traffic	380	
Median Hourly Traffic	1,066		Median Hourly Traffic	375	hour beginning
Peak Hourly Traffic	1,974		Peak Hourly Traffic	874	Aug 7, 1:00 PM
2nd Max	1,671	Aug 7, 12:00 PM	2nd Max	769	Aug 26, 12:00 AM
3rd Max	1,529	Aug 29, 3:00 PM	3rd Max	720	Aug 7, 12:00 PM
4th Max	1,481	Aug 15, 4:00 PM	4th Max	698	Aug 26, 1:00 AM
5th Max	1,475	Aug 26, 2:00 PM	5th Max	673	Aug 26, 2:00 PM

Rain Timer Performance

Analyze Rain Sensors

Rain Sensors	Description	Rcv	Timer	Exp	Performance
4330	Hansen Rain	27	22:13	62	44%
2360	Indian Hills	38	14:42	62	61%
1660	SPR at Henderson	39	15:29	62	63%
3090	A2-Highland Heritage Park	40	12:45	62	65%
540	Parker/Mississippi	45	12:18	62	73%
2280	Kinney Peak	45	12:23	62	73%
2330	Morrison	46	13:42	62	74%
4870	SBC @ SB Road	48	14:09	62	77%
4770	Wx-Cal-Wood Ranch	49	12:36	62	79%
100150	A2-Sellers Gulch at Haystack Precip	49	13:15	62	79%
310	Guy Hill Ranch	50	12:19	62	81%
2230	Bear Cr below Cub	51	12:39	62	82%
2790	Wx-W. Cherry Creek	51	12:19	62	82%
1620	Slaughterhouse Glch	52	13:17	62	84%
4470	Little Narrows	52	13:37	62	84%
2900	Russelville Gulch-Douglas	54	12:36	62	87%
2970	Rampart Range Rd-Satellite	216		248	87%
4570	St. Antons	54	12:31	62	87%
2370	Red Rocks Park	55	12:14	62	89%
2800	Columbine Open Space	55	12:00	62	89%
2890	Spruce Mt - Douglas	55	12:54	62	89%
4510	Pinewood Springs	55	12:29	62	89%
4790	Wx-Button Rock	55	12:00	62	89%
940	Aurora Regional Pond	56	12:46	62	90%
1030	NREL/S. Table Mtn.	56	12:14	62	90%
1340	Sanderson at Xavier	56	12:15	62	90%
1710	Shop Creek	56	13:05	62	90%
2270	Cub Cr below Blue	56	12:34	62	90%
2320	Choke Cherry Resvr	56	12:34	62	90%
4180	Gold Lake	56	12:30	62	90%
210	Leyden Confluence	57	12:28	62	92%
650	Iliff Pond	57	12:31	62	92%
1720	Cherry Cr @ Steele	57	12:14	62	92%
3010	WX-EPC at Hwy 105	57	12:50	62	92%
4040	Martin Gulch	57	12:14	62	92%
4050	Walker Ranch	57	12:14	62	92%
4060	Lakeshore	57	13:04	62	92%
4070	Bear Peak	57	11:57	62	92%
4850	Porphory Mtn	57	12:36	62	92%
100140	A2-Upper Sellers Gulch Precip	57	12:49	62	92%
120	West Woods	58	11:58	62	94%
400	Montview Park	58	12:42	62	94%
410	Kelly Dam	58	12:12	62	94%
520	Jewell Detention	58	12:26	62	94%
620	Quincy/Highline	58	11:57	62	94%
1310	LDC at 64th	58	12:13	62	94%
1350	Chatfield COE	58	12:31	62	94%
1530	Bear Creek @ Lowell	58	12:13	62	94%
2240	Cold Sprg Glch conf	58	12:15	62	94%
2250	Rosedale	58	11:57	62	94%
2310	Genesee Village	58	12:15	62	94%
2980	Dakan Rd	58	12:30	62	94%
3060	Fire Sta 47	58	12:31	62	94%
4010	Crescent	58	12:15	62	94%

4190	Slaughterhouse	58	12:29	62	94%
4260	Taylor Mountain	58	12:41	62	94%
4290	Red Hill	58	11:57	62	94%
4340	Riverside	58	12:12	62	94%
150	Nott Creek	59	12:15	62	95%
220	Upper Leyden	59	12:00	62	95%
530	Fire Station #19	59	12:12	62	95%
710	Horseshoe Park Drop	59	11:58	62	95%
920	Wx-Aurora Town Hall	59	12:01	62	95%
1010	Denver West	59	12:44	62	95%
1400	Upper Sloan Det.	59	12:30	62	95%
1480	Third Creek at DIA	59	12:26	62	95%
1700	Cherry Cr @ Champa	59	11:59	62	95%
1800	Sand Creek Park	59	12:26	62	95%
1900	Niver Detention	59	12:11	62	95%
2710	Wx-Highlands Ranch WTP	59	12:29	62	95%
2750	Wx-Castle Rock	59	11:44	62	95%
2810	Pine Cliff Road	59	11:42	62	95%
2820	Haskins Gulch Conf	59	12:14	62	95%
2850	Cherry Cr bl Bayou Glch	59	12:19	62	95%
2920	West Cherry Head-Douglas Cnty	59	12:32	62	95%
3080	Tallman Gulch	59	12:32	62	95%
4160	Sunshine	59	12:15	62	95%
4250	Geer Canyon	59	12:13	62	95%
4320	Lee Hill Rain 2012	59	12:14	62	95%
4360	Justice Center	59	12:13	62	95%
4490	Apple Valley	59	12:12	62	95%
4520	Eagle Ridge	59	12:14	62	95%
4530	Winiger Ridge	59	11:58	62	95%
4820	Doudy Draw	59	12:29	62	95%
200	Leyden Reservoir	60	12:12	62	97%
300	Van Bibber Park	60	12:11	62	97%
640	Goldsmith @ Eastman	60	11:58	62	97%
730	No Name @ Quincy	60	12:12	62	97%
800	Sable Ditch @ 18th	60	12:11	62	97%
810	Granby Ditch @ 6th	60	11:57	62	97%
840	Fire Station 12	60	12:14	62	97%
850	Flying J	60	12:00	62	97%
970	Pump Sta 3	60	11:45	62	97%
1040	Lena @ U.S. Hwy 6	60	11:59	62	97%
1050	Jeffco Fairgrounds	60	12:11	62	97%
1100	Louisville Rec Ctr	60	11:59	62	97%
1300	Hidden Lake	60	12:13	62	97%
1360	Denver Zoo	60	12:00	62	97%
1370	West Metro FS13	60	11:57	62	97%
1440	Wx-Elbert	60	12:00	62	97%
1460	Wx-Urban Farm	60	12:13	62	97%
1520	Wx-Marston Lake North	60	12:00	62	97%
1570	Wx-Brighton Ditch	60	12:00	62	97%
1920	Wx-Brighton	60	12:00	62	97%
2860	CC at Stroh Rd	60	12:15	62	97%
2910	East Cherry Cr-Douglas	60	12:00	62	97%
2940	Willow Creek - DougCnty	60	12:00	62	97%
3040	CC @ Prairie Canyon Ranch	60	11:51	62	97%
4080	Twin Sisters	60	11:58	62	97%
4130	Swiss Peaks	60	11:58	62	97%
4220	Fling's	60	11:58	62	97%
4240	Sunset	60	12:12	62	97%
4300	Big Elk Park	60	12:11	62	97%

4310	Johnny Park	60	11:58	62	97%
4840	SBC@S Boulder Ditch	60	12:11	62	97%
110	Ralston Reservoir	61	11:57	62	98%
140	Wx-Blue Mountain	61	12:00	62	98%
420	Expo Park	61	11:40	62	98%
430	Utah Park	61	12:18	62	98%
440	Fire Station #7	61	11:57	62	98%
500	Havana Park	61	11:57	62	98%
610	Harvard @ Jackson	61	11:57	62	98%
630	Temple Pond at DTC	61	11:56	62	98%
700	Toll Gate @ 6th	61	12:00	62	98%
760	Mission Viejo Park	61	12:12	62	98%
1060	Heritage Square	61	11:57	62	98%
1110	Gunbarrel	61	12:12	62	98%
1200	Broomfield 3207	61	11:59	62	98%
1320	SPR at 3rd Ave	61	11:58	62	98%
1420	Wx-Diamond Hill	61	12:00	62	98%
1550	Lakewood CC	61	11:56	62	98%
1640	SPR at Union Ave.	61	11:57	62	98%
2210	Wx-Hiwan G.C.	61	12:00	62	98%
2260	Brook Forest	61	11:56	62	98%
2340	El Rancho	61	12:13	62	98%
2350	Idledale	61	11:57	62	98%
2730	Wx-Salisbury Park	61	12:08	62	98%
2840	Sulphur Gulch	61	11:43	62	98%
2950	DC Public Works	61	12:00	62	98%
2960	Indian Creek	61	12:00	62	98%
2990	Wx-Tomah Rd-DougCnty	61	11:59	62	98%
3020	Wx-West Creek WX	61	12:00	62	98%
3050	East/West Trailhead	61	12:00	62	98%
3070	A2-Newlin Gulch Precip	122	6:00	124	98%
4020	Rio Grande	61	11:57	62	98%
4030	Red Garden	61	11:57	62	98%
4090	Magnolia	61	11:57	62	98%
4110	Betasso	61	11:57	62	98%
4140	Logan Mill	61	11:57	62	98%
4150	Gold Hill	61	11:57	62	98%
4170	Pine Brook	61	11:57	62	98%
4200	Lazy Acres	61	11:48	62	98%
4230	Golden Age	61	12:12	62	98%
4270	Cannon Mountain	61	11:57	62	98%
4550	Boulder Jail	61	11:56	62	98%
4710	Wx-Ward C-1	61	12:00	62	98%
4750	Wx-Louisville Lake	61	11:50	62	98%
4810	Shanahan Ridge	61	11:57	62	98%
4830	SBC @ San Souci	61	11:57	62	98%
4880	Whispering Pines	61	11:57	62	98%
100100	A2-Blackstone Precip	61	12:00	62	98%
100110	A2-ETG @ Hampden Precip	61	12:00	62	98%
100160	A2-Sand Creek at Colfax Precip	61	12:00	62	98%
870	A2-Murphy Creek GC	742		744	100%
100	A2-Carr Street	743		744	100%
1000	A2-Maple Grove Resv.	743		744	100%
330	Van Bibber @ Hwy 93	62	11:44	62	100%
510	Virginia Court	62	11:56	62	100%
600	Harvard Gulch Park	62	11:57	62	100%
750	Wx-Quincy Reservoir	62	11:56	62	100%
820	ETG @ Buckley	62	11:57	62	100%
830	Side Creek Park	62	11:57	62	100%

950	Piney at Liverpool	62	11:57	62	100%
1500	Powers Park	62	11:57	62	100%
1600	Englewood Dam	62	11:57	62	100%
2870	Cottonwood (Apache)	62	11:39	62	100%
3030	WX-Bingham Lake Park	62	12:00	62	100%
4100	Filter Plant	62	11:59	62	100%
4350	Conifer Hill	62	11:57	62	100%
4730	Wx-Sugarloaf	62	12:00	62	100%
320	Sports Complex	63	11:58	62	102%
900	Wx-Aurora Reservoir	63	11:38	62	102%
2880	Happy Canyon at N Surrey Dr	63	11:49	62	102%
2930	Wx-Spring Valley Rd-DougCnty	63	11:32	62	102%
4860	Fairview Peak	63	12:00	62	102%
720	Confluence Pond	65	11:17	62	105%

5720	Four Mile Creek	44	14:15	62	71%
5730	West Creek	60	12:00	62	97%
5740	Trail Creek	60	12:00	62	97%
5810	Stump Bump	57	12:00	62	92%
5860	Cedar Mountain	59	12:16	62	95%
5880	Hackett Mountain	61	12:00	62	98%
5900	Horse Creek-Satellite	1115		62	
5940	Log Jumper	57	12:16	62	92%

Rain Event Performance																				
		Reports Received	7,562				Analyze Rain Sensors													
	Systemwide Avg	Total Tips	7,977																	
	94.80%	Data Loss	5.20%																	
Description	Sensor	Performance	1-tips	2-tips	3-tips	4-tips	5-tips	6-tips	>6-tips	Rcv	Exp	Miss	Hold	Bucket						
A2-Highland Heritage Park	3090	62%	23	4	2	0	0	0	1	29	47	8	0	0.03937						
Rampart Range Rd-Satellite	2970	68%	19	4	2	0	1	0	0	26	38	12	0	0.03937	Mean					43.59
Indian Hills	2360	69%	34	3	1	1	0	2	0	41	59	18	0	0.03937	Median					39
Dakan Rd	2980	70%	12	9	0	0	0	0	0	21	30	9	0	0.03937	St. Dev					19.018
Columbine Open Space	2800	71%	21	9	2	0	0	0	0	32	45	13	0	0.03937	Mean plus 3 SD					100.64
Guy Hill Ranch	310	75%	36	6	1	1	1	0	0	45	60	15	0	0.03937	Min					5
Morrison	2330	79%	31	11	0	0	0	0	0	42	53	11	0	0.03937	Max					140
Little Narrows	4470	81%	28	4	2	0	0	0	0	34	42	8	0	0.03937						
Quincy/Highline	620	84%	36	4	2	0	0	0	0	42	50	8	0	0.03937						
Cub Cr below Blue	2270	84%	37	5	0	1	0	0	0	43	51	8	0	0.03937						
Kinney Peak	2280	85%	65	10	2	0	0	0	0	77	91	14	0	0.03937						
Side Creek Park	830	85%	34	7	0	0	0	0	0	41	48	7	0	0.03937						
Bear Creek @ Lowell	1530	86%	35	7	0	0	0	0	0	42	49	7	0	0.03937						
Wx-Button Rock	4790	86%	28	0	1	1	0	0	0	30	35	5	0	0.03937						
Hansen Rain	4330	86%	34	2	2	0	0	0	0	38	44	6	0	0.03937						
Mission Viejo Park	760	86%	30	1	0	0	1	0	0	32	37	5	0	0.03937						
Wx-W. Cherry Creek	2790	87%	105	16	1	0	0	0	0	122	140	18	0	0.03937						
Indian Creek	2960	87%	29	5	0	0	0	0	0	34	39	5	0	0.03937						
Geer Canyon	4250	88%	25	2	1	0	0	0	0	28	32	4	1	0.03937						
Wx-Quincy Reservoir	750	88%	40	2	0	0	1	0	3	43	49	6	0	0.03937						
Cherry Cr bl Bayou Glch	2850	88%	40	4	1	0	0	0	0	45	51	6	0	0.03937						
SBC @ SB Road	4870	88%	26	4	0	0	0	0	0	30	34	4	0	0.03937						
SPR at Henderson	1660	89%	34	5	0	0	0	0	0	39	44	5	0	0.03937						
Tallman Gulch	3080	89%	44	4	1	0	0	0	0	49	55	6	0	0.03937						
Cottonwood (Apache)	2870	89%	37	5	0	0	0	0	0	42	47	5	0	0.03937						
Slaughterhouse Glch	1620	90%	40	1	2	0	0	0	0	43	48	5	0	0.03937						
WX-Bingham Lake Park	3030	90%	49	3	0	1	0	0	0	53	59	6	0	0.03937						
Happy Canyon at N Surrey Dr	2880	90%	55	7	0	0	0	0	0	62	69	7	0	0.03937						
CC at Stroh Rd	2860	90%	57	5	1	0	0	0	0	63	70	7	0	0.03937						
Haskins Gulch Conf	2820	90%	25	1	1	0	0	0	0	27	30	3	0	0.03937						
Gunbarrel	1110	90%	17	0	1	0	0	0	0	18	20	2	0	0.03937						
Pinewood Springs	4510	90%	50	6	0	0	0	0	0	56	62	6	0	0.03937						
St. Antons	4570	91%	26	3	0	0	0	0	0	29	32	3	0	0.03937						
Fire Station 12	840	91%	57	4	1	0	0	0	0	62	68	6	0	0.03937						
CC @ Prairie Canyon Ranch	3040	91%	105	11	0	0	0	0	0	116	127	11	0	0.03937						
Choke Cherry Resvr	2320	92%	51	3	1	0	0	0	0	55	60	5	0	0.03937						
Sulphur Gulch	2840	92%	52	3	1	0	0	0	0	56	61	5	0	0.03937						
A2-ETG @ Hampden Precip	100110	92%	45	1	0	1	0	0	0	47	51	4	0	0.03937						
Granby Ditch @ 6th	810	92%	33	3	0	0	0	0	0	36	39	3	0	0.03937						
Wx-Salisbury Park	2730	92%	33	3	0	0	0	0	0	36	39	3	0	0.03937						
Wx-Highlands Ranch WTP	2710	92%	22	2	0	0	0	0	0	24	26	2	0	0.03937						
Toll Gate @ 6th	700	93%	36	3	0	0	0	0	0	39	42	3	0	0.03937						
Cold Sprg Glch conf	2240	93%	65	5	0	0	0	0	0	70	75	5	0	0.03937						
Cherry Cr @ Champa	1700	93%	26	2	0	0	0	0	0	28	30	2	0	0.03937						
East Cherry Cr-Douglas	2910	94%	42	3	0	0	0	0	0	45	48	3	0	0.03937						
Bear Cr below Cub	2230	94%	57	4	0	0	0	0	0	61	65	4	0	0.03937						
Iliff Pond	650	94%	43	3	0	0	0	0	0	46	49	3	0	0.03937						
Russelville Gulch-Douglas	2900	94%	43	3	0	0	0	0	0	46	49	3	0	0.03937						
Conifer Hill	4350	94%	30	2	0	0	0	0	0	32	34	2	0	0.03937						
Fire Sta 47	3060	94%	46	3	0	0	0	0	0	49	52	3	0	0.03937						
Sand Creek Park	1800	94%	48	3	0	0	0	0	0	51	54	3	0	0.03937						
Wx-Cal-Wood Ranch	4770	94%	32	2	0	0	0	0	0	34	36	2	0	0.03937						
Confluence Pond	720	95%	34	2	0	0	0	0	0	36	38	2	2	0.03937						

Apple Valley	4490	95%	18	1	0	0	0	0	0	0	19	20	1	0	0.03937
Niver Detention	1900	95%	18	1	0	0	0	0	0	0	19	20	1	0	0.03937
DC Public Works	2950	95%	19	1	0	0	0	0	0	0	20	21	1	0	0.03937
Montview Park	400	95%	19	1	0	0	0	0	0	0	20	21	1	0	0.03937
Taylor Mountain	4260	95%	19	1	0	0	0	0	0	0	20	21	1	0	0.03937
A2-Maple Grove Resv.	1000	96%	42	0	1	0	0	0	0	0	43	45	2	2	0.03937
Cherry Cr @ Steele	1720	96%	42	2	0	0	0	0	0	0	44	46	2	0	0.03937
Sanderson at Xavier	1340	96%	43	2	0	0	0	0	0	0	45	47	2	0	0.03937
Sable Ditch @ 18th	800	96%	45	0	1	0	0	0	0	0	46	48	2	0	0.03937
Virginia Court	510	96%	44	2	0	0	0	0	0	0	46	48	2	0	0.03937
West Cherry Head-Douglas Cnty	2920	96%	67	3	0	0	0	0	0	0	70	73	3	0	0.03937
Red Rocks Park	2370	96%	46	2	0	0	0	0	0	0	48	50	2	0	0.03937
Harvard @ Jackson	610	96%	23	1	0	0	0	0	0	0	24	25	1	0	0.03937
Temple Pond at DTC	630	96%	70	3	0	0	0	0	0	0	73	76	3	0	0.03937
Wx-Louisville Lake	4750	96%	24	1	0	0	0	0	0	0	25	26	1	0	0.03937
A2-Sand Creek at Colfax Precip	100160	96%	50	0	1	0	0	0	0	0	51	53	2	0	0.03937
Red Hill	4290	96%	25	1	0	0	0	0	0	0	26	27	1	0	0.03937
Havana Park	500	96%	77	1	1	0	0	0	0	0	79	82	3	0	0.03937
Eagle Ridge	4520	96%	26	1	0	0	0	0	0	0	27	28	1	0	0.03937
Lazy Acres	4200	96%	26	1	0	0	0	0	0	0	27	28	1	0	0.03937
Upper Sloan Det.	1400	96%	26	1	0	0	0	0	0	0	27	28	1	0	0.03937
Expo Park	420	97%	83	3	0	0	0	0	0	0	86	89	3	1	0.03937
Slaughterhouse	4190	97%	56	2	0	0	0	0	0	0	58	60	2	0	0.03937
SBC @ San Souci	4830	97%	28	1	0	0	0	0	0	0	29	30	1	0	0.03937
Denver Zoo	1360	97%	29	1	0	0	0	0	0	0	30	31	1	0	0.03937
Horseshoe Park Drop	710	97%	29	1	0	0	0	0	0	0	30	31	1	0	0.03937
Lakeshore	4060	97%	29	1	0	0	0	0	0	0	30	31	1	0	0.03937
ETG @ Buckley	820	97%	30	1	0	0	0	0	0	0	31	32	1	0	0.03937
Fling's	4220	97%	30	1	0	0	0	0	0	0	31	32	1	0	0.03937
Hidden Lake	1300	97%	30	1	0	0	0	0	0	0	31	32	1	0	0.03937
No Name @ Quincy	730	97%	30	1	0	0	0	0	0	0	31	32	1	0	0.03937
Idledale	2350	97%	31	1	0	0	0	0	0	0	32	33	1	0	0.03937
Golden Age	4230	97%	33	1	0	0	0	0	0	0	34	35	1	0	0.03937
Jeffco Fairgrounds	1050	97%	33	1	0	0	0	0	0	0	34	35	1	0	0.03937
Willow Creek - DougCnty	2940	97%	67	2	0	0	0	0	0	0	69	71	2	0	0.03937
Wx-Aurora Town Hall	920	97%	68	2	0	0	0	0	0	0	70	72	2	0	0.03937
Riverside	4340	97%	34	1	0	0	0	0	0	0	35	36	1	0	0.03937
Parker/Mississippi	540	97%	35	1	0	0	0	0	0	0	36	37	1	0	0.03937
Martin Gulch	4040	97%	37	1	0	0	0	0	0	0	38	39	1	0	0.03937
Aurora Regional Pond	940	98%	38	1	0	0	0	0	0	0	39	40	1	0	0.03937
Harvard Gulch Park	600	98%	38	1	0	0	0	0	0	0	39	40	1	0	0.03937
Lakewood CC	1550	98%	38	1	0	0	0	0	0	0	39	40	1	0	0.03937
Betasso	4110	98%	39	1	0	0	0	0	0	0	40	41	1	0	0.03937
Justice Center	4360	98%	39	1	0	0	0	0	0	0	40	41	1	0	0.03937
Red Garden	4030	98%	39	1	0	0	0	0	0	0	40	41	1	0	0.03937
NREL/S. Table Mtn.	1030	98%	41	1	0	0	0	0	0	0	42	43	1	0	0.03937
El Rancho	2340	98%	43	1	0	0	0	0	0	0	44	45	1	0	0.03937
West Metro FS13	1370	98%	44	1	0	0	0	0	0	0	45	46	1	0	0.03937
Wx-Marston Lake North	1520	98%	44	1	0	0	0	0	0	0	45	46	1	1	0.03937
Wx-Spring Valley Rd-DougCnty	2930	98%	47	1	0	0	0	0	0	0	48	49	1	0	0.03937
Wx-Tomah Rd-DougCnty	2990	98%	47	1	0	0	0	0	0	0	48	49	1	0	0.03937
Lena @ U.S. Hwy 6	1040	98%	49	1	0	0	0	0	0	0	50	51	1	0	0.03937
Wx-Sugarloaf	4730	98%	52	1	0	0	0	0	0	0	53	54	1	1	0.03937
Wx-West Creek WX	3020	98%	53	1	0	0	0	0	0	0	54	55	1	0	0.03937
Heritage Square	1060	98%	55	1	0	0	0	0	0	0	56	57	1	0	0.03937
A2-Newlin Gulch Precip	3070	98%	59	1	0	0	0	0	0	0	60	61	1	1	0.03937
Goldsmith @ Eastman	640	98%	60	1	0	0	0	0	0	0	61	62	1	0	0.03937
Flying J	850	98%	62	1	0	0	0	0	0	0	63	64	1	2	0.03937
Genesee Village	2310	98%	62	1	0	0	0	0	0	0	63	64	1	0	0.03937

Wx-Ward C-1	4710	98%	63	1	0	0	0	0	0	0	64	65	1	0	0.03937
Wx-Brighton Ditch	1570	99%	67	1	0	0	0	0	0	0	68	69	1	2	0.03937
Pump Sta 3	970	100%	101	0	0	0	0	0	0	0	101	101	0	0	0.03937
Utah Park	430	100%	83	0	0	0	0	0	0	0	83	83	0	0	0.03937
Brook Forest	2260	100%	79	0	0	0	0	0	0	0	79	79	0	0	0.03937
A2-Murphy Creek GC	870	100%	67	0	0	0	0	0	0	0	67	67	0	2	0.03937
Swiss Peaks	4130	100%	64	0	0	0	0	0	0	0	64	64	0	0	0.03937
Wx-Brighton	1920	100%	63	0	0	0	0	0	0	0	63	63	0	0	0.03937
Nott Creek	150	100%	60	0	0	0	0	0	0	0	60	60	0	0	0.03937
Rosedale	2250	100%	60	0	0	0	0	0	0	0	60	60	0	0	0.03937
Lee Hill Rain 2012	4320	100%	58	0	0	0	0	0	0	0	58	58	0	0	0.03937
Wx-Elbert	1440	100%	58	0	0	0	0	0	0	0	58	58	0	0	0.03937
Gold Hill	4150	100%	53	0	0	0	0	0	0	0	53	53	0	0	0.03937
Englewood Dam	1600	100%	51	0	0	0	0	0	0	0	51	51	0	0	0.03937
Sunshine	4160	100%	51	0	0	0	0	0	0	0	51	51	0	0	0.03937
Whispering Pines	4880	100%	51	0	0	0	0	0	0	0	51	51	0	0	0.03937
A2-Blackstone Precip	100100	100%	48	0	0	0	0	0	0	0	48	48	0	0	0.03937
Wx-Hiwan G.C.	2210	100%	46	0	0	0	0	0	0	0	46	46	0	0	0.03937
Filter Plant	4100	100%	44	0	0	0	0	0	0	0	44	44	0	0	0.03937
Wx-Blue Mountain	140	100%	44	0	0	0	0	0	0	0	44	44	0	1	0.03937
Third Creek at DIA	1480	100%	43	0	0	0	0	0	0	0	43	43	0	0	0.03937
Denver West	1010	100%	39	0	0	0	0	0	0	0	39	39	0	0	0.03937
Doudy Draw	4820	100%	39	0	0	0	0	0	0	0	39	39	0	0	0.03937
Piney at Liverpool	950	100%	38	0	0	0	0	0	0	0	38	38	0	0	0.03937
Big Elk Park	4300	100%	37	0	0	0	0	0	0	0	37	37	0	0	0.03937
Chatfield COE	1350	100%	37	0	0	0	0	0	0	0	37	37	0	0	0.03937
Logan Mill	4140	100%	37	0	0	0	0	0	0	0	37	37	0	0	0.03937
Rio Grande	4020	100%	36	0	0	0	0	0	0	0	36	36	0	0	0.03937
Twin Sisters	4080	100%	36	0	0	0	0	0	0	0	36	36	0	0	0.03937
A2-Sellers Gulch at Haystack Precip	100150	100%	35	0	0	0	0	0	0	0	35	35	0	1	0.03937
Crescent	4010	100%	35	0	0	0	0	0	0	0	35	35	0	0	0.03937
Shop Creek	1710	100%	35	0	0	0	0	0	0	0	35	35	0	0	0.03937
SPR at Union Ave.	1640	100%	35	0	0	0	0	0	0	0	35	35	0	0	0.03937
Wx-Diamond Hill	1420	100%	35	0	0	0	0	0	0	0	35	35	0	0	0.03937
Gold Lake	4180	100%	34	0	0	0	0	0	0	0	34	34	0	0	0.03937
Magnolia	4090	100%	34	0	0	0	0	0	0	0	34	34	0	0	0.03937
Pine Cliff Road	2810	100%	34	0	0	0	0	0	0	0	34	34	0	0	0.03937
Van Bibber @ Hwy 93	330	100%	34	0	0	0	0	0	0	0	34	34	0	0	0.03937
Pine Brook	4170	100%	33	0	0	0	0	0	0	0	33	33	0	0	0.03937
Spruce Mt - Douglas	2890	100%	33	0	0	0	0	0	0	0	33	33	0	0	0.03937
A2-Carr Street	100	100%	32	0	0	0	0	0	0	0	32	32	0	0	0.03937
Bear Peak	4070	100%	32	0	0	0	0	0	0	0	32	32	0	0	0.03937
Louisville Rec Ctr	1100	100%	32	0	0	0	0	0	0	0	32	32	0	1	0.03937
A2-Upper Sellers Gulch Precip	100140	100%	31	0	0	0	0	0	0	0	31	31	0	0	0.03937
Fire Station #19	530	100%	31	0	0	0	0	0	0	0	31	31	0	0	0.03937
Ralston Reservoir	110	100%	31	0	0	0	0	0	0	0	31	31	0	0	0.03937
Van Bibber Park	300	100%	31	0	0	0	0	0	0	0	31	31	0	0	0.03937
SPR at 3rd Ave	1320	100%	30	0	0	0	0	0	0	0	30	30	0	0	0.03937
Winiger Ridge	4530	100%	30	0	0	0	0	0	0	0	30	30	0	0	0.03937
Wx-Aurora Reservoir	900	100%	30	0	0	0	0	0	0	0	30	30	0	1	0.03937
Cannon Mountain	4270	100%	29	0	0	0	0	0	0	0	29	29	0	0	0.03937
East/West Trailhead	3050	100%	29	0	0	0	0	0	0	0	29	29	0	0	0.03937
SBC@S Boulder Ditch	4840	100%	28	0	0	0	0	0	0	0	28	28	0	0	0.03937
LDC at 64th	1310	100%	27	0	0	0	0	0	0	0	27	27	0	0	0.03937
Sports Complex	320	100%	26	0	0	0	0	0	0	0	26	26	0	0	0.03937
Sunset	4240	100%	26	0	0	0	0	0	0	0	26	26	0	0	0.03937
Upper Leyden	220	100%	26	0	0	0	0	0	0	0	26	26	0	0	0.03937
Wx-Castle Rock	2750	100%	26	0	0	0	0	0	0	0	26	26	0	0	0.03937
Johnny Park	4310	100%	25	0	0	0	0	0	0	0	25	25	0	0	0.03937

Shanahan Ridge	4810	100%	25	0	0	0	0	0	0	25	25	0	0	0.03937
Kelly Dam	410	100%	24	0	0	0	0	0	0	24	24	0	0	0.03937
Walker Ranch	4050	100%	24	0	0	0	0	0	0	24	24	0	0	0.03937
Fire Station #7	440	100%	23	0	0	0	0	0	0	23	23	0	0	0.03937
West Woods	120	100%	19	0	0	0	0	0	0	19	19	0	1	0.03937
Boulder Jail	4550	100%	17	0	0	0	0	0	0	17	17	0	0	0.03937
Wx-Urban Farm	1460	100%	17	0	0	0	0	0	0	17	17	0	1	0.03937
Leyden Confluence	210	100%	16	0	0	0	0	0	0	16	16	0	0	0.03937
Broomfield 3207	1200	100%	15	0	0	0	0	0	0	15	15	0	0	0.03937
Leyden Reservoir	200	100%	14	0	0	0	0	0	0	14	14	0	0	0.03937
Jewell Detention	520	100%	9	0	0	0	0	0	0	9	9	0	0	0.03937
Powers Park	1500	100%	5	0	0	0	0	0	0	5	5	0	0	0.03937
		Total Tips	7222	295	33	6	4	2	4	7562	7977	405	21	
WX-EPC at Hwy 105	3010	92%	153	9	3	0	0	0	0	165	180	15	0	0.01
Porphory Mtn	4850	80%	143	22	7	0	2	0	0	174	218	44	26	0.01
Fairview Peak	4860	95%	178	7	1	0	0	0	0	186	195	9	25	0.01
Four Mile Creek	5720	88%	32	3	1	0	0	0	0	36	41	5	0	0.03937
West Creek	5730	99%	71	1	0	0	0	0	0	72	73	1	0	0.03937
Trail Creek	5740	98%	63	1	0	0	0	0	0	64	65	1	0	0.03937
Stump Bump	5810	97%	74	2	0	0	0	0	0	76	78	2	0	0.03937
Cedar Mountain	5860	98%	38	1	0	0	0	0	0	39	40	1	0	0.03937
Hackett Mountain	5880	95%	38	2	0	0	0	0	0	40	42	2	0	0.03937
Horse Creek-Satellite	5900	100%	35	0	0	0	0	0	0	35	35	0	0	0.03937
Log Jumper	5940	100%	29	0	0	0	0	0	0	29	29	0	0	0.03937

2014 Monthly Peak Hour ALERT Radio Traffic Summary

