

Subject: October 2006 ALERT Data Analysis

I. ALERT Data Source

Raw ALERT data records extracted from the Urban Drainage and Flood Control District's Nova Star 4.0 base station (ALERT 2) were analyzed for the period October 1 through October 31, 2006.

II. General System Analysis Summary

A total of 193,871 individual data records were analyzed. Meteorological sensors account for 71 percent, water level sensors 12 percent, and rain sensors 7 percent of the total monthly transmissions.

Ninety-eight percent of the received data reports were flagged as "good" by the Nova Star validation process. Roughly 4,742 reports were flagged as "bad". Of these "bad" reports, 3,808 originated from the wind sensor (ID 2189 and 2187) at Squaw Mountain. The reception of "bad" data reports from the Squaw Mountain sensor ID's 2189 and 2187 has been a consistent theme throughout this year.

The system-wide radio traffic loading this month was 6,254 reports per day with an average hourly loading of 261 reports. The peak hourly traffic loading was 567 reports, which occurred on October 29th between one and two in the morning. A plot of monthly average and peak hourly traffic loading is provided.

A new radio repeater was installed by Douglas County to relay the Hayman Burn precipitation gages on the District's primary base receiving frequency of 171.875 MHz. The new Douglas County repeater was activated on July 21, 2006 and configured to re-broadcast only those gages with IDs between 5700 through 6000. A total of 1,408 rain reports were received from the Hayman gages this month. The Hayman gages were winterized toward the end of October which will skew their reporting statistics this month.

The sensors reporting most frequently this month include:

- 1. Boulder Creek at Broadway (ID 4583) with 2,926 reports,
- 2. Squaw Mountain (ID 2189) with 2,891 reports,
- 3. Marston Lake North (ID 1526) reported 2,826 reports, and
- 4. Urban Farm (IDs 1464, 1465, 1466, 1467) reported every 15 minutes.

The reports from the above sensors are distributed evenly throughout the month.

III. Rain Sensor Timer Reporting Summary

A total of 171 rain sensors reported during the month. The following analysis assumes that all rain sensors have a 12-hour timer reporting interval. System-wide the ALERT 2 base station received only 80 percent of the non-incrementing timer reports. Those rain sensors with the worst timer reporting statistics are summarized (Table 1).

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Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1010	1460	1460	2340	1460	1460	1460	1440	1540/320	330		
1460	1660	4820	1460	1330	4820	1440	1460	1460	1720		
1640	4240	4570	1330	540	4830	110	2340	4820	430		
			1610	1600	1600	4820	4820	1440	2270		
			1600	4820	2350	4220		110	2340		

Van Bibber @ Hwy 93 (ID 330), Cherry Cr @ Steele (ID 1720), Utah Park (ID 430), Cub Cr below Blue (ID 2270), El Rancho (ID 2340)

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. For example, sensor 4820 consistently exhibits a poor timer performance value.

We suspect that sensor 1460 has a 24-hour timer reporting interval so its timer performance value is actually better than reported here (see data analysis report for May, 2006).

Beginning in October, the District conducts winterization maintenance activities which will impact the timer performance values.

1. Van Bibber at Hwy 93 (ID 330)

This sensor has a valid count series extending from October 1 through October 27th. Only incrementing count values are present in the series. For some reason, this sensor did not report a 12-hour, non-incrementing timer count value during the month.

2. Cherry Creek at Steele (ID 1720)

This sensor has a valid count series extending from October 1 through October 17th. No reports were received from the sensor after October 17th. It may be that this sensor was winterized on October 17th.

3. Utah Park (ID 430)

This sensor has a valid count series extending from October 1 through October 12th. No reports were received from the sensor after October 12 and it is assumed the station was winterized on October 12th.

4. Cub Creek below Blue (ID 2270)

This sensor has a valid count series extending from October 1 through October 16th. No reports were received from the sensor after October 16 and it is assumed the station was winterized.

5. El Rancho (ID 2340)

This sensor has a valid count series extending from October 1 through October 16th. No reports were received from the sensor after October 16 and it is assumed the station was winterized.

IV. Rain Sensor Event Reporting Summary

A. District-Wide Total Tip/Count Statistics

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

Statistical Parameter	Value	Comments
Mean	41.13	Only the 1-mm rain sensors were included in the analysis
Median	42	Only the 1-mm rain sensors were included in the analysis
Standard deviation	22.27	Only the 1-mm rain sensors were included in the analysis
Mean plus three standard deviations	108	Several sensors for the month are outside the Mean +/- 3 Std Dev
Minimum total count	5	Sand Creek Park (ID 1800)
Maximum total count	102	Chatfield COE (ID 1350)

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

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

Table 3. Monthly Summary of District-Wide Mean Total 1-mm Tip/Count

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Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
4.62	5.92	18.39	20.47	19.44	13.75	74.03	46.89	24.17	41.13		

The average rainfall experienced district-wide was increased from the prior month of September. The month of October experienced the third highest, district-wide, monthly rainfall total. There were no sensors that experienced a tip count exceeding the system-wide mean plus three standard deviations for the month. The largest sensor accumulation occurred for the rain gage at Chatfield COE (1350). The data record for this sensor was further inspected.

1. Chatfield COE (ID 1350)

Overall the series looks reasonable as several periods of rainfall are evident throughout the month (Figure 1). A second graph is prepared that compares the cumulative count series to that of another gage that also experienced a large accumulation of rainfall, Sensor 4810, Shanahan Ridge (Figure 2).

The count series for both sensors compares favorably. Both sensors respond to the same precipitation events throughout the month. The series for both sensors looks reasonable.

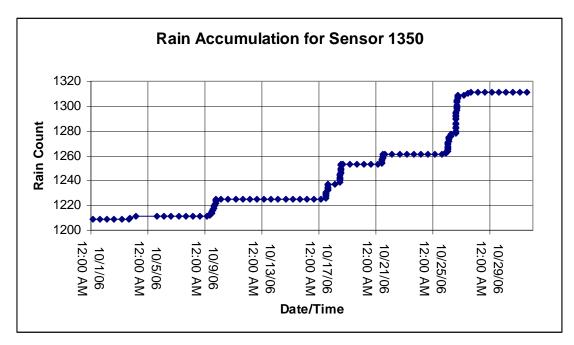


Figure 1. Tip Count Series for Chatfield COE (ID 1350)

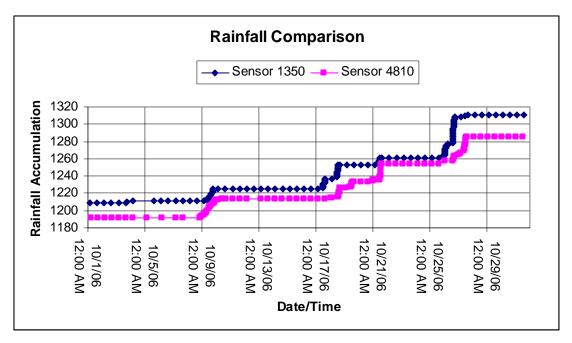


Figure 2. Comparison of Rain Tip Count for Chatfield COE (ID 1350) and Shanahan Ridge (4810)

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

Three rain sensors experienced a jump in their sequential tip count of more than 6. The tip count series for these sensors is explored in the paragraphs below.

1. Diamond Hill (ID 1420)

On October 4th, 5th and 6th, the count series for sensor 1420 was erratic (see below) with several large jumps in count value. It looks like the station was visited on the afternoon of October 6th because it begins to behave normally after 1:30 PM on the 6th.

Sensor ID	Date/Time	Count	Data Type
1420	10/5/2006 1:24:00 PM	2	0
1420	10/5/2006 1:24:54 PM	2	0
1420	10/5/2006 1:27:16 PM	2	0
1420	10/5/2006 1:28:34 PM	2	0
1420	10/5/2006 1:33:57 PM	2	0
1420	10/5/2006 1:54:34 PM	17	0
1420	10/5/2006 1:55:33 PM	17	0
1420	10/5/2006 2:43:24 PM	19	0
1420	10/5/2006 2:44:49 PM	19	0
1420	10/5/2006 3:02:54 PM	19	0
1420	10/5/2006 3:45:59 PM	61	0
1420	10/5/2006 3:48:14 PM	61	0
1420	10/5/2006 3:54:13 PM	61	0

2. Lakeshore (ID 4060)

On October 5th, the rain count jumped from 182 to 192 (see below). This jump was validated by NovaStar. This jump is most likely erroneous because it occurs over a 20 second period. It is possible that field maintenance took place at this time and the field maintenance records should be consulted to see if this was the case.

Sensor ID	Date/Time	Count	Data Type
4060	10/5/2006 1:22:45 AM	181	0
4060	10/5/2006 1:20:47 PM	181	0
4060	10/5/2006 1:56:23 PM	182	0
4060	10/5/2006 1:56:44 PM	192	0
4060	10/5/2006 2:47:53 PM	192	0
4060	10/5/2006 3:07:35 PM	1	0
4060	10/5/2006 3:07:56 PM	2	0

3. Doudy Draw (ID 4820)

A non-incrementing timer transmission was received at 1:09:38 PM on 10/24/06 with a count of 260. The following day, the timer transmission was received at 1:03:46 PM, with a value of 260. The internal clock of this transmitter is drifting considerably and is falling behind by about 6 minutes each day. The timer transmission was received at 12:57:46 PM on 10/26/06 with a count of 264 which was invalidated by NovaStar (see below). The afternoon of October 26th, a number of incrementing rain tip reports are missed by the base station thus causing the large jump of

more than 6 counts at 4:51:51 PM (see below). The tip count series was validated by NovaStar and the rain total at this station looks to be accurate.

Sensor ID	Date/Time	Count	Data Type
4820	10/24/2006 1:09:38 PM	260	0
4820	10/25/2006 1:06:40 AM	260	0
4820	10/25/2006 1:03:46 PM	260	0
4820	10/26/2006 12:57:56 PM	264	1
4820	10/26/2006 1:47:53 PM	262	0
4820	10/26/2006 4:51:51 PM	276	0
4820	10/26/2006 5:06:58 PM	277	0
4820	10/26/2006 5:21:46 PM	278	0
4820	10/26/2006 5:58:20 PM	280	0
4820	10/26/2006 7:10:16 PM	282	0
4820	10/26/2006 8:52:18 PM	283	0
4820	10/26/2006 11:21:52 PM	284	0

C. Sensor-by-Sensor Incrementing Count Summary

The system-wide reception rate of incrementing rain tip reports for the month was approximately 93 percent. A total of 5,691 incrementing reports were received and a total of 6,151 were expected. The total loss of incrementing reports for the month was approximately 7.48 percent. Those sensors with the worst rain event transmission characteristics are summarized (Table 4).

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Table 4	Table 4. Monthly Summary of Sensors with the Most Missed Tips										
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct		
640	4010	4530	2190	540	4820	4820	2370	1200	1720		

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
640	4010	4530	2190	540	4820	4820	2370	1200	1720		
1640	4080	4170	310	1400	1350	2350	2310	4820	330		
4490	4170	4820	4820	1100	4790	2310	220	2340	2340		
				4820	2340	750	4060	1530	4820		
				1420	2350	150	4180	110	4270		
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* Van Bibber @ Hwy 93 (330), Doudy Draw (4820), El Rancho (2340), Cherry Cr @ Steele (1720), Cannon Mountain (4270).

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.

Doudy Draw and El Rancho exhibit poor rain event transmission performance for multiple months.

D. Peak Traffic Hour Analysis

The peak hour of radio traffic occurred on 10/29/2006 between 1:00 AM and 2:00 AM. The data for this period was examined more closely to characterize the distribution of sensor transmissions during times of heavy loading (Table 5). During this hour the radio traffic was dominated by wind reports.

Sensor Group	Total Reports	Percent
Wind Gust	114	20%
Wind Speed Average & Azimuth	93	16%
Temperature	73	13%
Relative Humidity	72	13%
Wind Direction	49	9%
Water Level PT-HSE	46	8%
Wind Speed Average	34	6%

Table 5. Peak Traffic Hour Sensor Report Distribution

Precipitation	19	3%
Battery Voltage Digital	12	2%
Battery Voltage HSE	12	2%
Barometric Pressure	9	2%
Solar Radiation	8	1%
Water Level Float	7	1%
Fuel Moisture	4	1%
Fuel Temperature	4	1%
Repeater Pass List	4	1%
Battery Voltage Analog	2	0%
Water Level PT	2	0%
Soil Moisture	2	0%
Precipitation - Test	1	0%
Total	567	100%

The accuracy of rain data for the peak hour was further analyzed (Table 6) for the District's 1-mm rain sensors. The Hayman gages are not included in the following analysis. No single incrementing tip reports were lost during this peak hour. The rainfall accumulation totals as tracked by NovaStar for the peak hour were accurate. There were no sensors that under-reported rainfall due to the loss of sequential tip counts.

Heavy Traffic Period	Traffic Msgs/hr	Rain reports expected	Rain reports received	Loss of reports	Accurate rain totals
10/29/06 1:00 AM - 2:00 AM	567	19	19	0.00%	Yes
9/21/06 3:00 AM - 4:00 AM	620	117	114	2.56%	Yes
8/13/06 9:00 PM - 10:00 PM	1,107	346	286	17.34%	Yes

 Table 6. Peak Traffic Hour Rain Reporting Summary – Annual Reporting

The table above will be used to track the peak hour summary for each month so that over a period of time a correlation can be developed between peak hour loading and loss of single increment reports.

V. Issues Continued from Previous Month

The following issues were identified last month.

1. Doudy Draw (ID 4820) and El Rancho (ID 2340) exhibit poor timer and event transmission performance.

VI. Issues Identified this Month

Further investigation into the following issues is recommended:

- Van Bibber @ Hwy 93 (ID 330) had both poor timer and event performance characteristics for the month of October. This sensor has an incrementing rain count series extending from October 1 through October 30. Only incrementing count values are present in the series. For some reason, this sensor did not report a 12-hour, non-incrementing timer count value.
- 2. Diamond Hill Complex rain sensor (ID 1420) had erratic raw count values on October 4th, 5th, and 6th. The tip series included values that were erroneously validated. Quality control should be performed on the historic/archival data series for this sensor to ensure accurate rain totals are available for future analyses.
- 3. Lakeshore rain sensor (ID 4060) had a jump in raw count from 182 to 192 on October 5th. The tip series included values that were erroneously validated. Quality control should be performed on the historic/archival series for this sensor to ensure accurate rain totals are available for use of the data in further analyses.
- 4. Doudy Draw and El Rancho exhibit poor rain event transmission performance for multiple months.

General System Analysis

First Date in Database 01/06 12:00 Ad 103:06 11:09 PM Total Baye 010 2440 Total Records Analyzed 193371 1 Records by Group Wind Gust 34482 195 Wind Gust 34482 195 Records by Group Wind Gust 34482 195 Wind Level P1 1456 1766 195 Precipitation 10033 75 Wind Speed Average 11319 65 Battery Value Digital 4495 25 Wind Speed Average 11319 65 Battery Value Digital 4495 25 Battery Value Digital 1037 10 Battery Value Digital
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Description Sensor Reports Fraction of
Boulder Cr at Broadway 4583 2926 2%
Squaw Mountain 2189 2891 1%
Marston Lake North 1526 2826 1%
Urban Farm 1466 2821 1% Crore Dirbh 4502 2820 1%
Green Ditch 4593 2809 1% Urban Farm 1465 2800 1%
Marston Lake North 1521 2799 1%
Urban Farm 1464 2786 1%
Urban Farm 1467 2757 1%
Ward C-1 4707 2723 1%
Salisbury Park 2727 2717 19%
Castle Rock 274 2694 1%
Salisbury Park 2724 2588 1%
Salisbury Park 2724 2588 1% Elbert 1439 2582 1% Hiwan G.C. 2208 2574 1%

Rain Timer Performance

			sustamuida sustanas (deur)	Analyze Rain Sensors	Systemwide Average 80%	
			systemwide average (days) 0.5183			
Rain Sensors	Description	Received Timer Reports	Average Timer Interval	Expected Timer Reports	Performance	
100	Carr Street	36	12:45	62.00	58%	
110	Ralston Reservoir	54	12:29	62.00	87%	
120	West Woods	56	12:12	62.00	90%	
140	Blue Mountain	57	12:42	62.00	92%	
150	Nott Creek	57	12:46	62.00	92%	
200	Leyden Reservoir	56	12:12	62.00	90%	
210	Leyden Confluence	34	13:40	62.00	55%	
220	Upper Leyden	56	12:45	62.00	90%	
300	Van Bibber Park	60	11:56	62.00	97%	
310	Guy Hill Ranch	39	13:05	62.00	63%	
320	Sports Complex	35	12:22	62.00	56%	
330	Van Bibber @ Hwy 93	1		62.00	0070	
400	Montview Park	32	11:58	62.00	52%	
410	Kelly Dam	55	12:43	62.00	89%	
420	Expo Park	32	11:57	62.00	52%	
430	Utah Park	20	12:48	62.00	32%	
440	Fire Station #7	61	12:11	62.00	98%	
500	Havana Park	31	11:57	62.00	50%	
510	Virginia Court	58	12:13	62.00	94%	
520	Jewell Detention	58	12:27	62.00	94%	
530	Fire Station #19	61	11:56	62.00	98%	
540	Parker/Mississippi	43	14:55	62.00	69%	
600	Harvard Gulch Park	55	12:43	62.00	89%	
610	Harvard @ Jackson	32	12:50	62.00	52%	
620	Quincy/Highline	56	12:31	62.00	90%	
630	Temple Pond at DTC	56	12:07	62.00	90%	
640	Goldsmith @ Eastman	58	11:50	62.00	94%	
650	lliff Pond	33	12:22	62.00	53%	
700	Toll Gate @ 6th	59	12:13	62.00	95%	
710	Horseshoe Park Drop	37	11:47	62.00	60%	
720	Confluence Pond	36	12:16	62.00	58%	
730	No Name @ Quincy	36	12:22	62.00	58%	
740	Smoky Hill	60	12:26	62.00	97%	
750	Quincy Reservoir	54	13:18	62.00	87%	
760	Mission Viejo Park	60	11:56	62.00	97%	
800	Sable Ditch @ 18th	36	12:20	62.00	58%	
810	Granby Ditch @ 6th	32	12:49	62.00	52%	
820	ETG @ Buckley	33	12:22	62.00	53%	
830	Side Creek Park	59	12:26	62.00	95%	
840	Fire Station 12	56	12:14	62.00	90%	
850	Flying J	34	12:38	62.00	55%	
860	Sand Cr at Colfax	27	15:30	62.00	44%	
870	Murphy Creek GC	36	12:00	62.00	58%	
900	Aurora Reservoir	59	12:27	62.00	95%	
1000	Maple Grove Resv.	53	13:23	62.00	85%	
1010	Denver West	57	12:45	62.00	92%	
1020	Lena @ Nolte Pond	35	12:43	62.00	56%	
1020	NREL/S. Table Mtn.	56	12:46	62.00	90%	
1040	Lena @ U.S. Hwy 6	34	12:53	62.00	55%	
1050	Jeffco Fairgrounds	57	12:27	62.00	92%	
1060	Heritage Square	59	12:26	62.00	95%	
1100	Louisville Rec Ctr	55	13:28	62.00	89%	
1110	Gunbarrel	50	12:51	62.00	81%	
1200	Broomfield 3207	30	12:22	62.00	55%	
1300	Hidden Lake	54 54	12:44	62.00	87%	
1310	LDC at 64th	55	12:44	62.00	89%	
1320	SPR at 3rd Ave	56	12:36	62.00	90%	
1330	Roslvn	61	11:58	62.00	98%	
1340	Sanderson at Xavier	58	12:14	62.00	94%	
1350	Chatfield COE	55	11:58	62.00	89%	
1360	Denver Zoo	58	12:14	62.00	94%	
1370	West Metro FS13	58	12:13	62.00	94%	
1400	Upper Sloan Det.	33	12:49	62.00	53%	
1400	Diamond Hill	91	7:42	62.00	147%	
1420	Elbert	60	12:12	62.00	97%	
1440	Urban Farm	29	1:05	62.00	97% 47%	
1460	Third Creek at DIA	29 61	12:12		47% 98%	
1480	Powers Park	56	12:12	62.00 62.00	98% 90%	
1520	Marston Lake North Bear Creek @ Lowell	58	12:31	62.00	94%	
1520	Dear Creek @ LOWell	55	13:02	62.00	89%	
1530		60	40.44	60.00	070/	
1530 1540 1600	Sanderson at Xavier Englewood Dam	60 56	12:11 12:57	62.00 62.00	97% 90%	

1620	Slaughterhouse Glch	56	13:00	62.00	90%
1640	SPR at Union Ave.	52	14:19	62.00	84%
1660	SPR at Henderson	58	12:27	62.00	94%
1700 1710	Cherry Cr @ Champa	55 34	12:46 19:09	62.00	89%
1720	Shop Creek Cherry Cr @ Steele	10	12:00	62.00 62.00	55% 16%
1800	Sand Creek Park	32	11:50	62.00	52%
1810	Sand Creek at mouth	57	11:58	62.00	92%
1900	Niver Detention	60	12:10	62.00	97%
1920	Brighton	59	11:58	62.00	95%
2190	Squaw Mountain	55	12:56	62.00	89%
2210	Hiwan G.C.	66	11:00	62.00	106%
2220	Evergreen Lake	63	11:45	62.00	102%
2230	Bear Cr below Cub	32	11:33	62.00	52%
2240	Cold Sprg Glch conf	36	12:00	62.00	58%
2250	Rosedale	29	10:54	62.00	47%
2260	Brook Forest	31	12:00	62.00	50%
2270	Cub Cr below Blue	26	12:00	62.00	42%
2280	Kinney Peak	32	11:41	62.00	52%
2310	Genesee Village	32	11:32	62.00	52%
2330	Morrison	56	11:56	62.00	90%
2340	El Rancho	27	12:29	62.00	44%
2350	Idledale	35	12:00	62.00	56%
2360	Indian Hills	31	11:36	62.00	50%
2370	Red Rocks Park	33	12:00	62.00	53%
2710	Highlands Ranch WTP	59	11:58	62.00	95%
2730	Salisbury Park	56	12:14	62.00	90%
2750	Castle Rock	58	12:14	62.00	94%
2810	Pine Cliff Road	53	12:52	62.00	85%
2820	Haskins Gulch Conf	56	12:30	62.00	90%
2840	Sulphur Gulch	57	12:40	62.00	92%
4010	Cresent	57	12:14	62.00	92%
4020	Rio Grande	59	11:56	62.00	95%
4030	Red Garden	57	12:43	62.00	92%
4040	Martin Gulch	62	11:57	62.00	100%
4050	Walker Ranch	59	12:45	62.00	95%
4060	Lakeshore	51	13:25	62.00	82%
4070	Bear Peak	62	11:56	62.00	100%
4080	Twin Sisters	44	12:18	62.00	71%
4090	Magnolia	51	13:05	62.00	82%
4100	Filter Plant	55	13:21	62.00	89%
4110	Betasso	57	12:32	62.00	92%
4130	Swiss Peaks	52	13:42	62.00	84%
4140	Logan Mill	55	12:14	62.00	89%
4150	Gold Hill	57	12:22	62.00	92%
4160	Sunshine	62	11:39	62.00	100%
4170	Pine Brook	49	14:01	62.00	79%
4180	Gold Lake	52	12:53	62.00	84%
4190	Slaughterhouse	56	12:35	62.00	90%
4200	Lazy Acres	59	12:28	62.00	95%
4220	Fling's	56	12:46	62.00	90%
4230	Golden Age	57	12:27	62.00	92%
4240	Sunset	56	12:31	62.00	90%
4250	Geer Canyon	57	12:13	62.00	92%
4260	Taylor Mountain	61	11:54	62.00	98%
4270	Cannon Mountain	52	12:13	62.00	84%
4290	Red Hill	60	11:55	62.00	97%
4300	Big Elk Park	60	12:23	62.00	97%
4310	Johnny Park	59	11:57	62.00	95%
4330	Indian Ruins	61	11:40	62.00	98%
4340	Riverside	58	12:30	62.00	94%
4350	Conifer Hill	58	12:00	62.00	94%
4360	Justice Center	58	12:28	62.00	94%
4470	Little Narrows	50	14:08	62.00	81%
4490	Apple Valley	57	12:27	62.00	92%
4510	Pinewood Springs	55	12:49	62.00	89%
4520	Eagle Ridge Winiger Bidge	56	13:01	62.00	90%
4530 4560	Winiger Ridge Lyons Diversion NSV	60 49	12:11 14:28	62.00 62.00	97% 79%
4560 4570	St. Antons	49 54	13:20	62.00	79% 87%
4570 4710	Ward C-1	54 58	13:20	62.00	87% 94%
4710	Sugarloaf	59	12:14	62.00	94% 95%
4750	Louisville Lake	55	13:02	62.00	95% 89%
4750	Cal-Wood Ranch	58	12:14	62.00	94%
4790	Button Rock	57	12:32	62.00	92%
4790	Shanahan Ridge	50	13:08	62.00	92 <i>%</i> 81%
4810	Doudy Draw	46	13:46	62.00	74%
4830	SBC @ San Souci	51	13:06	62.00	82%
4840	SBC@S Boulder Ditch	56	12:27	62.00	90%
			·		0070

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810 100% 7 0 0 0 0 0 7 7 0 0 0 0 830 100% 25 0 0 0 0 0 0 25 25 0 0 0.0355 840 04% 25 1 0 <td></td> <td>0</td> <td>0.0393</td>													0	0.0393
820 100% 2 0 0 0 0 0 7 7 0 0 0.0 840 84% 27 4 1 0 0 0 0 32 38 6 0 0.033 840 84% 27 4 1 0 0 0 0 15 15 0 </td <td></td> <td>2070</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>-</td> <td></td> <td></td> <td>0.0393</td>		2070									-			0.0393
830 100% 25 0 0 0 0 25 25 0 0 0 0 840 100% 15 0														
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B60 100% 11 0 0 0 0 0 11 11 0 0 0.033 B70 100% 15 0	840	84%	27	4	1	0	0	0	0	32	38	6	0	0.0393
870 100% 10 0 0 0 0 10 0<														0.0393
900 100% 15 0 0 0 0 15 15 0 0 0.033 1010 91% 48 5 0 0 0 0 53 78 5 0 0.0333 1030 93% 41 1 1 0 0 0 43 46 3 0 0.0333 1040 97% 28 1 0 0 0 0 40 411 1 0 0.0333 1060 100% 33 0 0 0 0 0 333 0 0 0.0333 1100 89% 61 1 0														
1010 91% 48 5 0 0 0 63 58 5 0 0.038 1040 97% 28 1 0 0 0 0 29 30 1 0 0.038 1050 98% 39 1 0 0 0 0 40 41 1 0 0.038 1060 100% 33 0 0 0 0 0 33 3 0 0.038 1100 84% 41 1 1 0 0 0 0 51 54 3 0 0.038 1200 90% 67 2 0 0 0 0 0 64 2 0 0.038 1300 97% 67 7 0 2 0 0 0 60 75 13 0 0.038 1350 98% 51 1														0.0393
1030 93% 41 1 0 0 0 0 28 36 1 0 0.033 1050 98% 39 1 0 0 0 0 441 1 0 0.033 1060 100% 33 0 0 0 0 0 33 33 0 0 0.0333 1100 88% 51 6 1 0 0 0 138 66 8 0 0.0333 1100 96% 49 1 0 0 0 0 141 0 0 0 0 161 0 0.0333 0 <td< td=""><td></td><td></td><td>68</td><td></td><td></td><td>0</td><td></td><td></td><td></td><td></td><td>78</td><td></td><td></td><td>0.0393</td></td<>			68			0					78			0.0393
1040 97% 28 1 0 0 0 0 0 40 41 1 0 0.033 1060 100% 33 0 0 0 0 0 0 33 33 0 0 0.033 1100 88% 51 6 1 0 0 0 55 66 8 0.0333 1100 98% 49 1 0 0 0 0 18 20 2 0 0.0333 1300 98% 44 1 0 0 0 0 46 47 1 0 0.0333 1300 97% 40 4 0 1 0 0 0 46 47 1 0 0.0333 130 86% 45 1 0 0 0 0 0 0 10 0 0.0333 1300 86%														
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2340 75% 4 2 0 0 0 0 6 8 2 0 0.039 2350 89% 14 2 0 0 0 0 0 16 18 2 1 0.039 2360 100% 10 0 0 0 0 0 10 10 0 0 0.039 2360 100% 10 0 0 0 0 10 10 0 0 0.0393 2370 100% 26 0 0 0 0 0 26 26 0 0 0.0393 2710 98% 44 1 0 0 0 0 0 45 46 1 0 0.0393 2730 100% 11 0 0 0 0 0 11 11 0 0 0.0393	2320	93%	40		0	0	0	0	0	43	46		0	0.0393
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2710 98% 44 1 0 0 0 0 45 46 1 0 0.0393 2730 100% 11 0 0 0 0 0 11 11 0 0.0393	2360	100%	10	0	0	0	0	0	0	10	10	0	0	0.0393
2730 100% 11 0 0 0 0 0 0 11 11 0 0 0.0393														0.0393
	2730	100%	18	0	0	0	0	0	0	18	18	0	0	0.0393

2820	95%	35	2	0	0	0	0	0	37	39	2	0	0.0393701
2840	96%	24	1	0	0	0	0	0	25	26	1	0	0.0393701
4010	88%	33	3	1	0	0	0	0	37	42	5	0	0.0393701
4010	98%	44	1	0	0	0	0	0	45	42	1	0	0.0393701
4020	98%	55	5	0	0	0	0	0	43 60	40	5	0	0.0393701
4030	92%	65	6	0	0	0	0	0	71	77	6	0	0.0393701
4040	92%	42	1	0	0	0	0	0	43	44	1	0	0.0393701
4050	98%	42	7	1	0	0	0	1	43	44 52	9	0	
4060	94%	35	3	0	0	0	0	0	43	52	3	0	0.0393701
4070	94%	44	3	0	0	0	0	0	47	21	3	0	0.0393701
4080	93%		3						39	42	3		
4090	93%	36 47	3	0	0	0	0	0	48	42	3	0	0.0393701
				-	-	-	0	-	48	49 73		-	0.0393701
4110	96%	67	3	0	0	0	-	0			3	0	0.0393701
4130	93%	40	1	1	0	0	0	0	42	45	3	0	0.0393701
4140	89%	51	5	1	0	0	0	0	57	64	7	0	0.0393701
4150	90%	48	6	0	0	0	0	0	54	60	6	0	0.0393701
4160	100%	65	0	0	0	0	0	0	65	65	0	0	0.0393701
4170	95%	51	3	0	0	0	0	0	54	57	3	0	0.0393701
4180	92%	30	3	0	0	0	0	0	33	36	3	0	0.0393701
4190	97%	56	2	0	0	0	0	0	58	60	2	0	0.0393701
4200	98%	60	1	0	0	0	0	0	61	62	1	0	0.0393701
4220	94%	28	2	0	0	0	0	0	30	32	2	0	0.0393701
4230	100%	30	0	0	0	0	0	0	30	30	0	0	0.0393701
4240	93%	25	2	0	0	0	0	0	27	29	2	0	0.0393701
4250	98%	79	2	0	0	0	0	0	81	83	2	0	0.0393701
4260	100%	29	0	0	0	0	0	0	29	29	0	0	0.0393701
4270	78%	23	5	0	1	0	0	0	29	37	8	0	0.0393701
4290	97%	68	2	0	0	0	0	0	70	72	2	0	0.0393701
4300	98%	39	1	0	0	0	0	0	40	41	1	0	0.0393701
4310	95%	59	3	0	0	0	0	0	62	65	3	0	0.0393701
4330	96%	52	2	0	0	0	0	0	54	56	2	0	0.0393701
4340	100%	47	0	0	0	0	0	0	47	47	0	0	0.0393701
4350	96%	48	2	0	0	0	0	0	50	52	2	0	0.0393701
4360	99%	86	1	0	0	0	0	0	87	88	1	0	0.0393701
4470	89%	56	6	1	0	0	0	0	63	71	8	0	0.0393701
4490	92%	45	4	0	0	0	0	0	49	53	4	0	0.0393701
4510	84%	41	10	0	0	0	0	0	51	61	10	0	0.0393701
4520	98%	45	1	0	0	0	0	0	46	47	1	0	0.0393701
4530	88%	38	6	0	0	0	0	0	44	50	6	0	0.0393701
4570	95%	34	2	0	0	0	0	0	36	38	2	0	0.0393701
4710	93%	25	2	0	0	0	0	0	27	29	2	0	0.0393701
4730	88%	18	3	0	0	0	0	0	21	24	3	0	0.0393701
4750	89%	48	5	1	0	0	0	0	54	61	7	0	0.0393701
4770	93%	39	3	0	0	0	0	0	42	45	3	0	0.0393701
4790	82%	40	3	2	1	0	0	0	46	56	10	0	0.0393701
4810	87%	73	6	3	0	0	0	0	82	94	12	0	0.0393701
4820	77%	35	9	1	1	0	0	1	46	60	14	0	0.0393701
4830	84%	56	7	3	0	0	0	0	66	79	13	0	0.0393701
4840	94%	74	5	0	0	0	0	0	79	84	5	0	0.0393701
	Total Tips	5285	363	35	6	1	1	2	5691	6151			

Bucket Tip Data Analysis	
Mean	41.12667
Median	42
Std Deviation	22.27175
Mean + 3 st dev	107.9419
Mean - 3 st dev	-25.68858
Min	5
Max	102

