South Fork Palouse River Bacteria TMDL

May 2007 Stormwater Monitoring & Analysis

Presented by Jim Carroll
December 10, 2008

Note: All data included in this presentation should be considered preliminary.

The EPA Letter

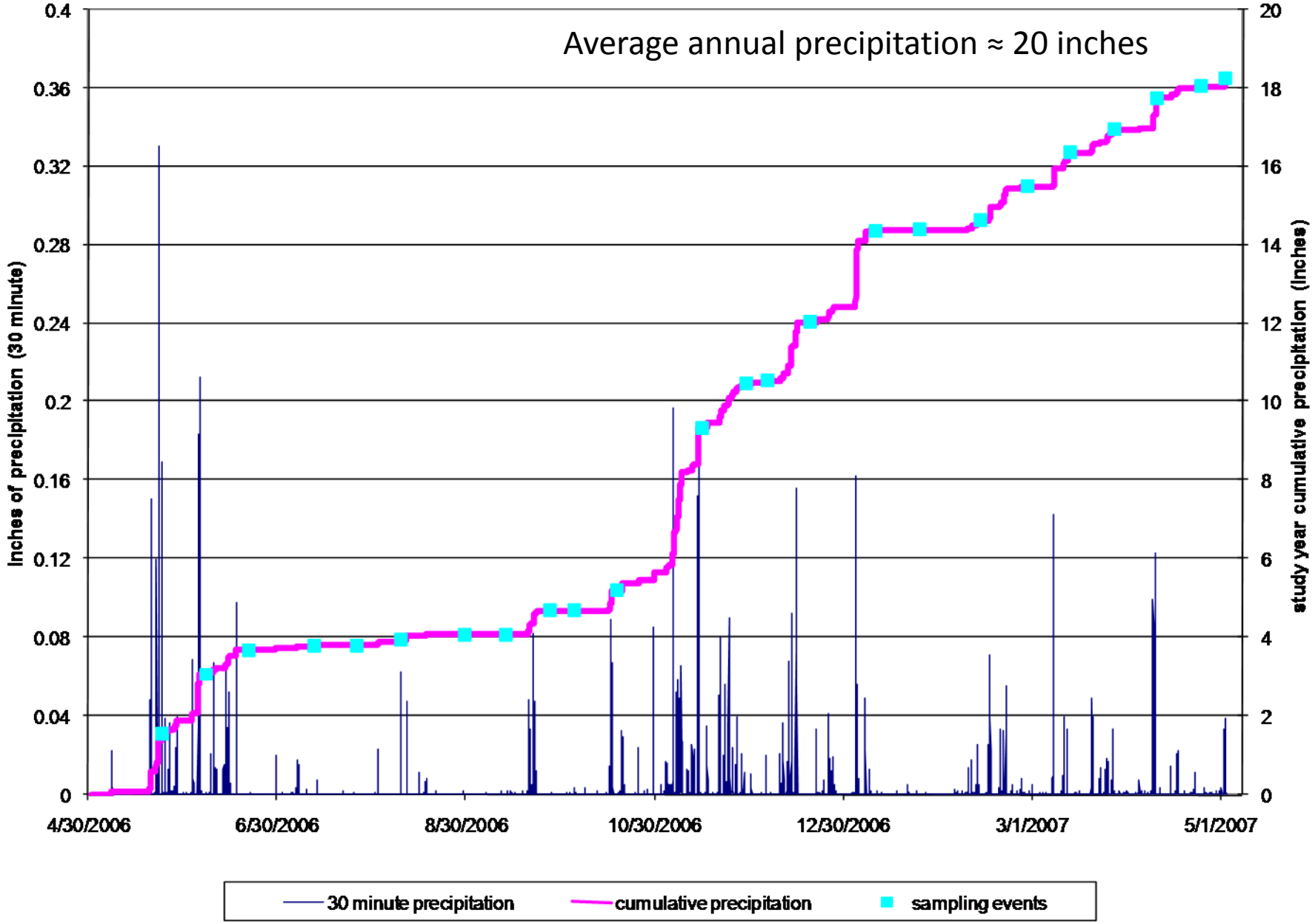
November 2002 memo from the Directors of Office of Wetlands, Oceans and Watersheds and of Wastewater Management to EPA Regions:

> " Establishing Total Maximum Daily Load (TMDL) Wasteload Allocations (WLAs) for Storm Water Sources and NPDES Permit Requirements Based on those WLAs "

http://www.epa.gov/npdes/pubs/final-wwtmdl.pdf

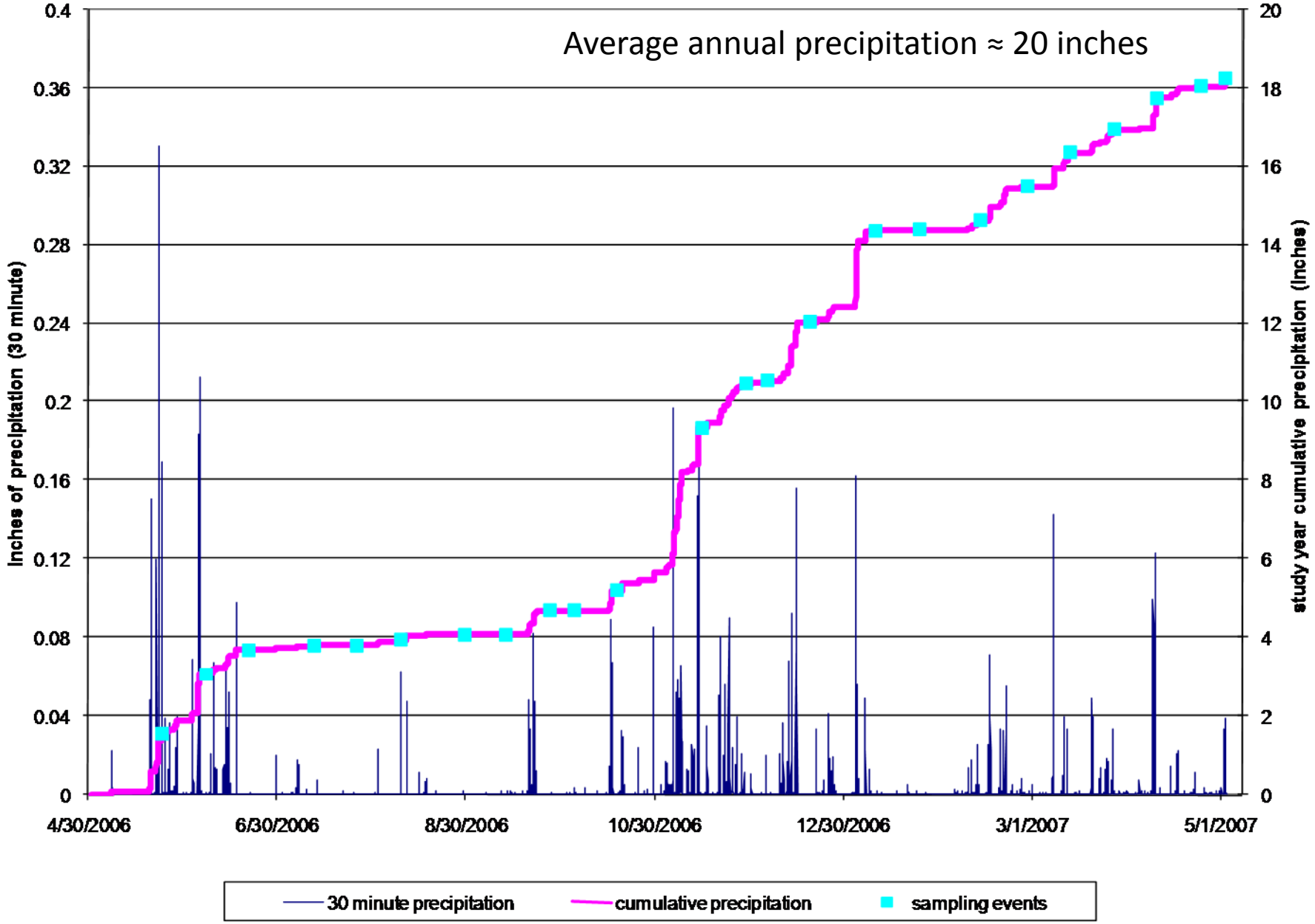
Key Points of the Memo:

- NPDES-regulated storm water discharges ***must*** be addressed as WLAs, not as load allocations (LAs)
- Storm water discharges from sources not currently under permit ***may*** be addressed as LAs
- NPDES-regulated storm water discharges with multiple outfall points ***may*** be given a single categorical WLA when data are insufficient to assign individual WLAs
- Stormwater WLAs and LAs are to be expressed in numeric form – although rough estimates are expected when data are limited


Average annual precipitation ≈ 20 inches
Inches of precipitation (30 minute)
study year cumulative precipitation (inches)
0.4
0.36
0.32
0.28
0.24
0.2
0.16
0.12
0.08
0.04
0
20
18
16
14
12
10
8
6
4
2
0
4/30/2006
6/30/2006
8/30/2006
10/30/2006
12/30/2006
3/1/2007
5/1/2007
30 minute precipitation
cumulative precipitation
sampling events

<u>storm event</u>

defined as a minimum 0.1 inches of rainfall in a 24-hour period preceded by no more than trace rainfall in the previous 24 hours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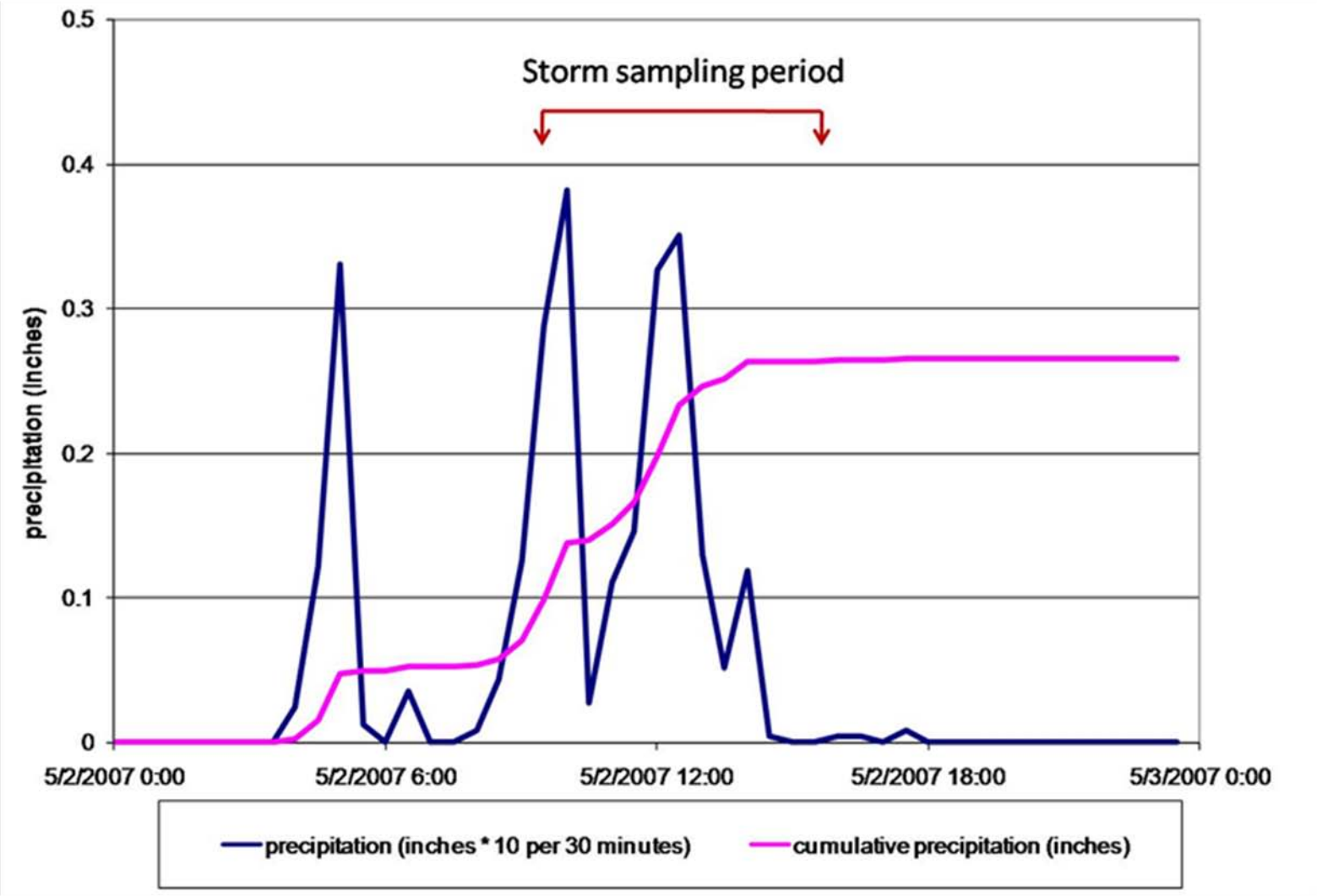
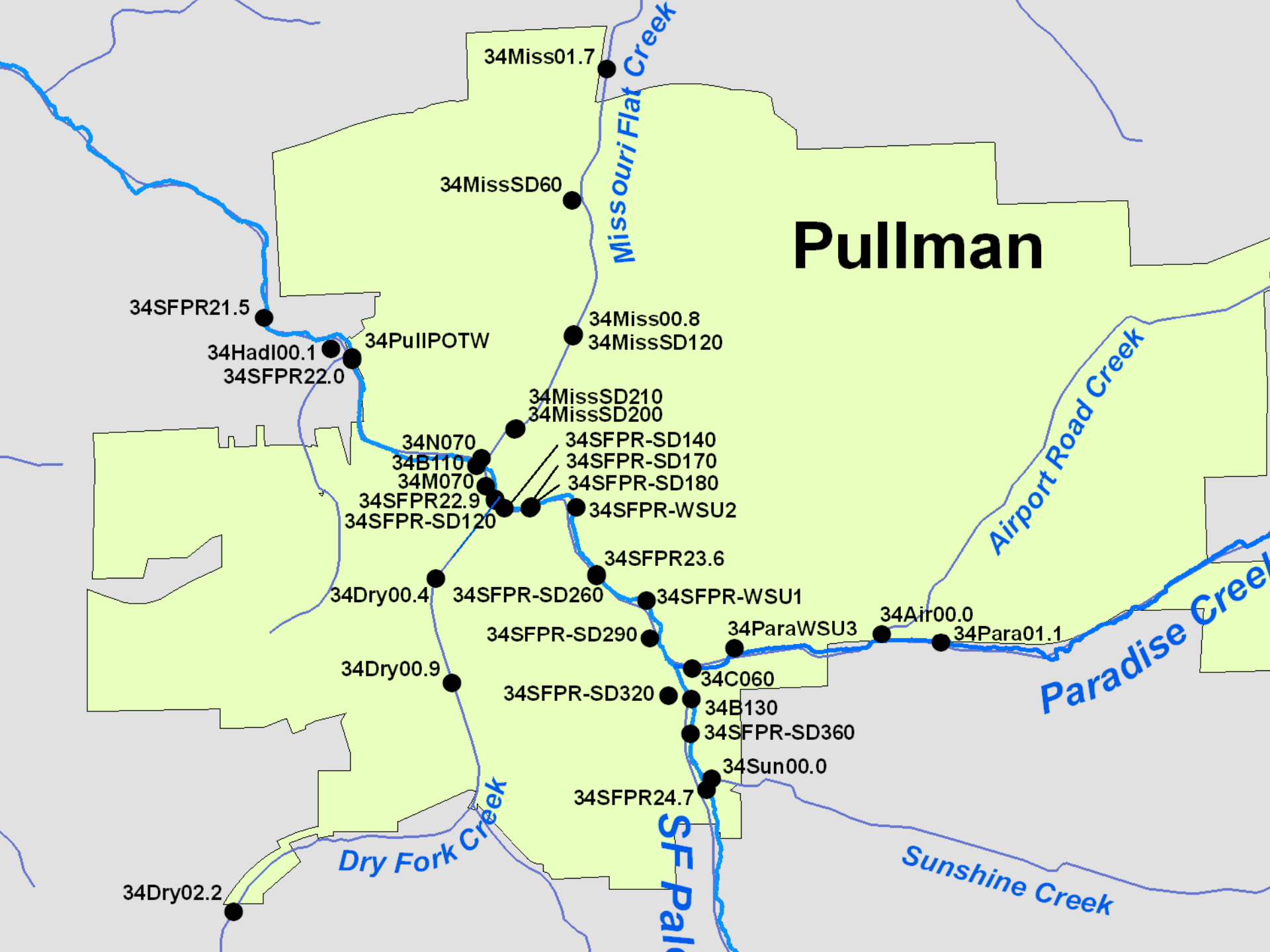
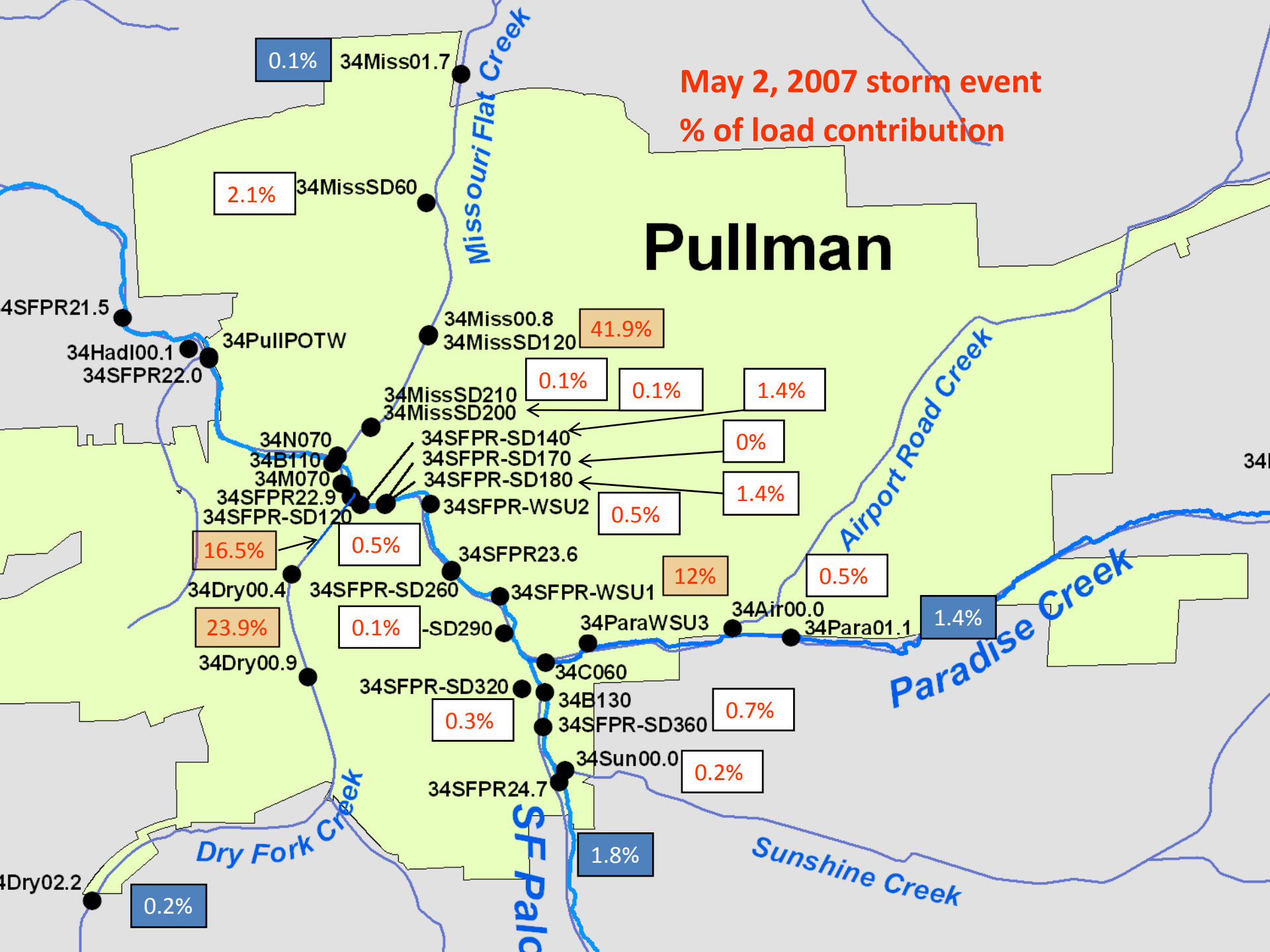
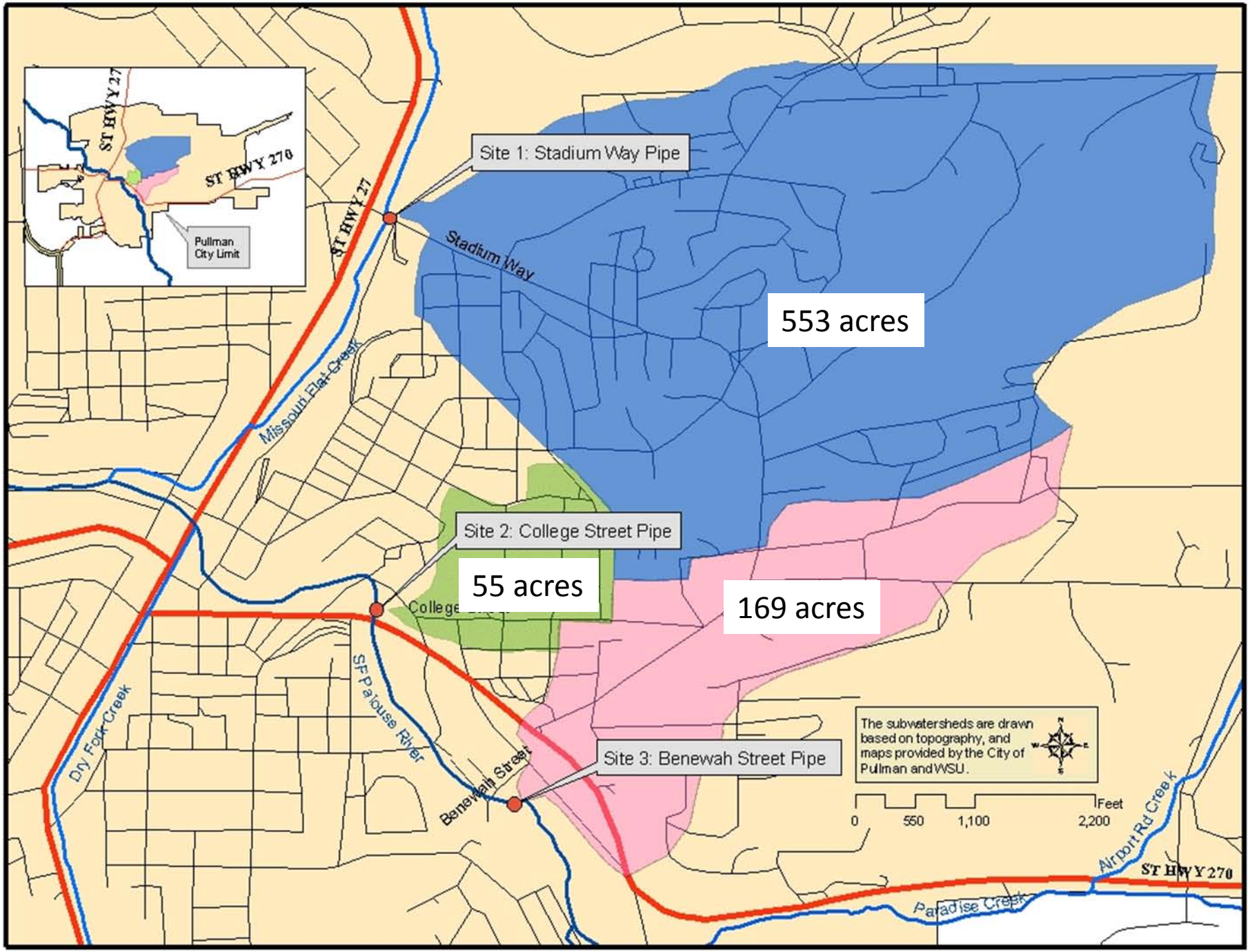
6
4
2
0
4/30/2006
6/30/2006
8/30/2006
10/30/2006
12/30/2006
3/1/2007
5/1/2007
30 minute precipitation
cumulative precipitation
sampling events

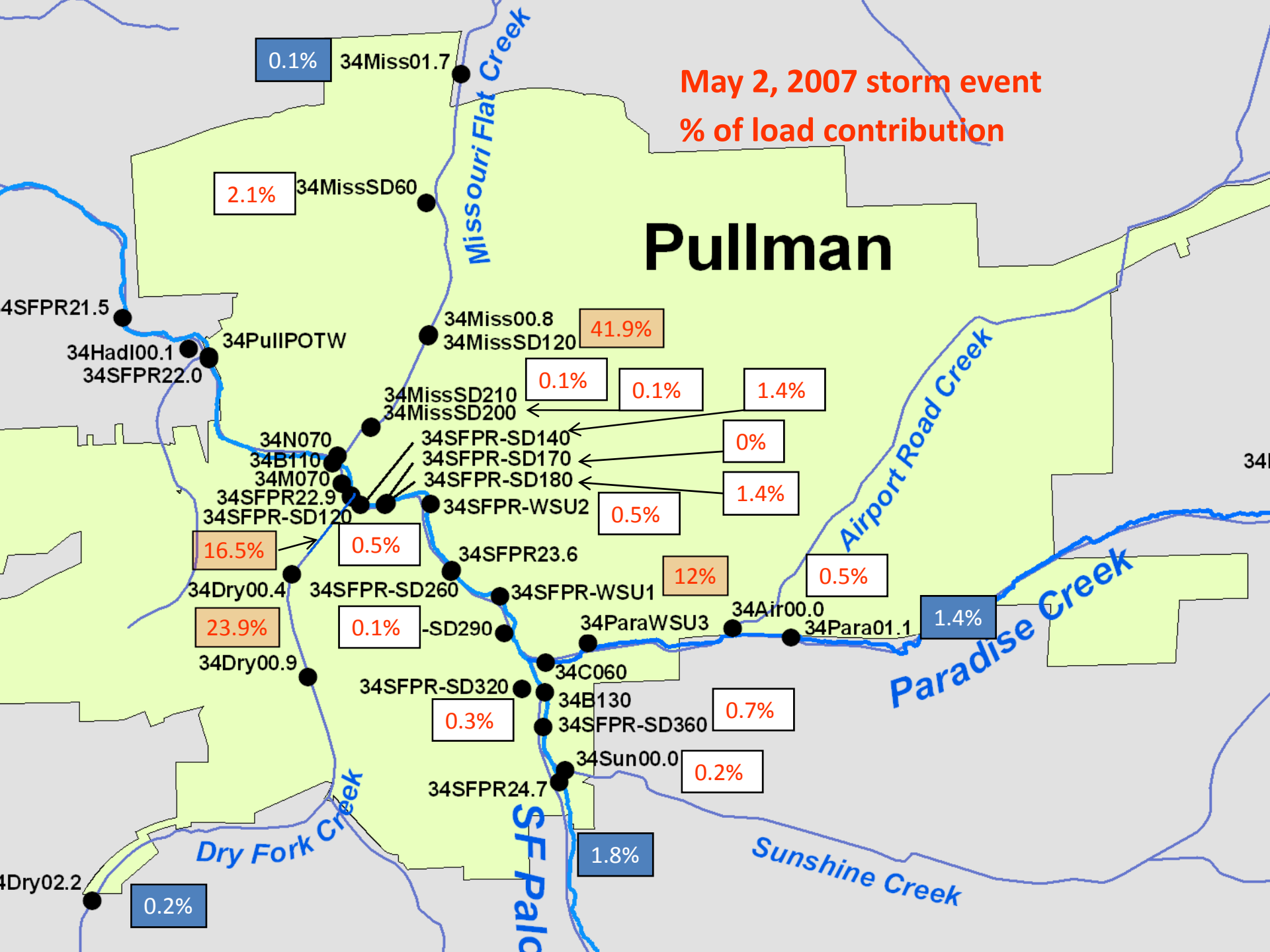

Storm sampling period
0.5
0.4
0.3
0.2
0.1
0
precipitation (inches)
5/2/2007 0:00
5/2/2007 6:00
5/2/2007 12:00
5/2/2007 18:00
5/3/2007 0:00
precipitation (inches * 10 per 30 minutes)
cumulative precipitation (inches)


Pullman
Missouri Flat Creek
Airport Road Creek
Paradise Creek
Dry Fork Creek
SF Palouse
Sunshine Creek
34Miss01.7
34MissSD60
34SFPR21.5
34HadI00.1
34SFPR22.0
34PullPOTW
34Miss00.8
34MissSD120
34MissSD210
34MissSD200
34N070
34B110
34M070
34SFPR22.9
34SFPR-SD120
34SFPR-SD140
34SFPR-SD170
34SFPR-SD180
34SFPR-WSU2
34SFPR23.6
34Dry00.4
34SFPR-SD260
34SFPR-WSU1
34SFPR-SD290
34ParaWSU3
34Air00.0
34Para01.1
34Dry00.9
34C060
34SFPR-SD320
34B130
34SFPR-SD360
34Sun00.0
34SFPR24.7
34Dry02.2

		Measured Load	Net Load	% contribution	Totals
Paradise Creek					
upstream boundary	34PARA01.1	490	490	1.4%	
tributary	34AIR00.0	169	169	0.5%	
stormdrain	34PARAWSU3	0	0	0.0%	
mouth	34PARA00.1	522	-137		1.4%
Dry Fork Creek					
upstream boundary	34Dry02.2	88	88	0.2%	
instream boundary	34Dry00.4	8752	8664	23.9%	
mouth	34Dry00.0	14721	5969	16.5%	40.6%
Missouri Flat Creek					
upstream boundary	34Miss01.7	52	52	0.1%	
stormdrain	34MissSD120	15181	15181	41.9%	
stormdrain	34MissSD200	54	54	0.1%	
stormdrain	34MissSD210	54	54	0.1%	
stormdrain	34MissSD60	764	764	2.1%	
mouth	34Miss00.1	14974	-1132	-3.1%	41.3%
SF Palouse River					
upstream boundary	34SFPR24.7	662	662	1.8%	
stormdrain	34SFPR-SD120	175	175	0.5%	
stormdrain	34SFPR-SD140	524	524	1.4%	
stormdrain	34SFPR-SD170	3	3	0.0%	
stormdrain	34SFPR-SD180	491	491	1.4%	
stormdrain	34SFPR-SD260	29	29	0.1%	
stormdrain	34SFPR-SD320	124	124	0.3%	
stormdrain	34SFPR-SD360	243	243	0.7%	
stormdrain	34SFPRWSU1	4354	4354	12.0%	
stormdrain	34SFPRWSU2	173	173	0.5%	
tributary	34SUN00.0	69	69	0.2%	18.9%
tributary	34PARA00.1	522	522	1.4%	
tributary	34Dry00.0	14721	14721	40.6%	
tributary	34Miss00.1	14974	14974	41.3%	
Downstream boundary	34SFPR21.5	36265	-796		


May 2, 2007 storm event
% of load contribution
Pullman
Missouri Flat Creek
Airport Road Creek
Paradise Creek
Dry Fork Creek
SF Palo
Sunshine Creek
0.1%
34Miss01.7
2.1%
34MissSD60
4SFPR21.5
34HadI00.1
34SFPR22.0
34PullPOTW
34Miss00.8
34MissSD120
41.9%
0.1%
0.1%
1.4%
34MissSD210
34MissSD200
34N070
34B110
34M070
34SFPR22.9
34SFPR-SD120
34SFPR-SD140
34SFPR-SD170
34SFPR-SD180
0%
1.4%
34SFPR-WSU2
0.5%
16.5%
0.5%
34SFPR23.6
12%
0.5%
34Dry00.4
34SFPR-SD260
34SFPR-WSU1
23.9%
0.1%
-SD290
34ParaWSU3
34Air00.0
34Para01.1
1.4%
34Dry00.9
34C060
34SFPR-SD320
34B130
0.3%
34SFPR-SD360
0.7%
34Sun00.0
0.2%
34SFPR24.7
1.8%
4Dry02.2
0.2%


Site 1: Stadium Way Pipe
553 acres
Site 2: College Street Pipe
55 acres
169 acres
Site 3: Benewah Street Pipe
Stadium Way
ST HWY 27
ST HWY 270
Missouri Flat Creek
SF Palouse River
Dry Fork Creek
Benewah Street
Airport Rd Creek
Paradise Creek
Pullman City Limit
The subwatersheds are drawn based on topography, and maps provided by the City of Pullman and WSU.
0
550
1,100
2,200
Feet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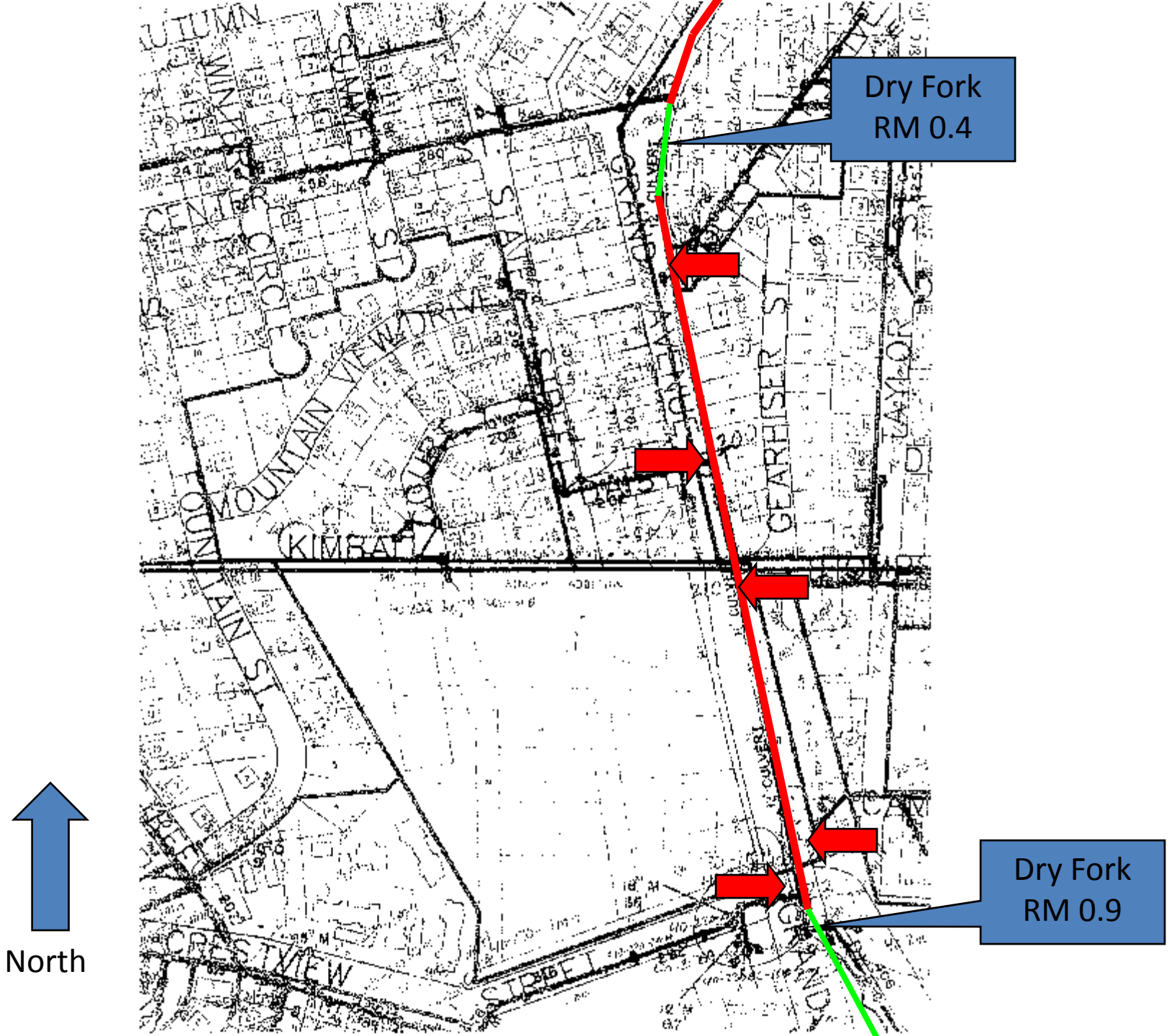
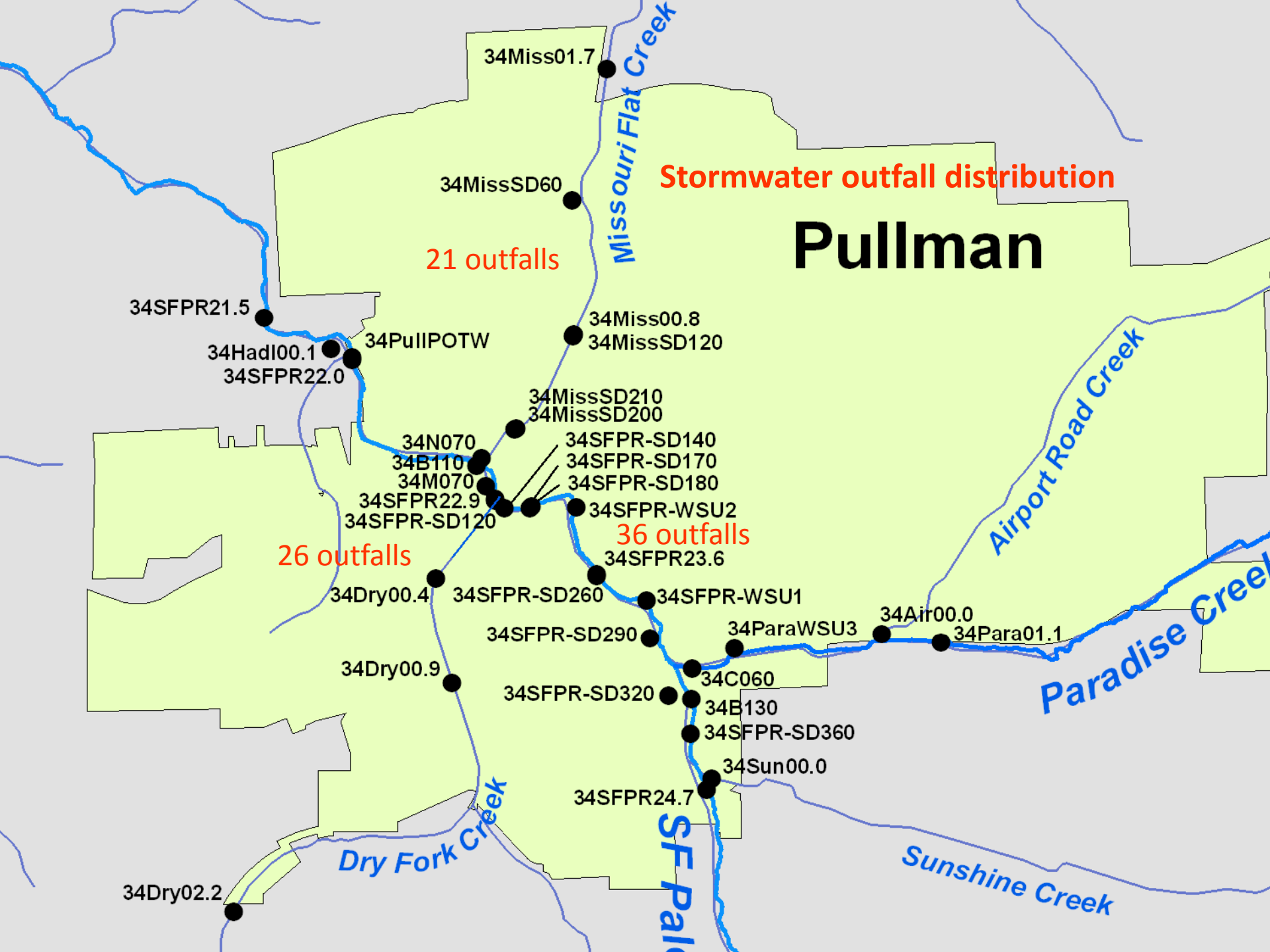

Dry Fork
RM 0.4
Dry Fork
RM 0.9
North
MOUNTAIN VIEW DRIVE
KIMBALL
GEARHISER ST
CRESTVIEW
STREET

Audio


Stormwater outfall distribution
Pullman
21 outfalls
26 outfalls
36 outfalls
34Miss01.7
34MissSD60
34SFPR21.5
34HadI00.1
34SFPR22.0
34PullPOTW
34Miss00.8
34MissSD120
34MissSD210
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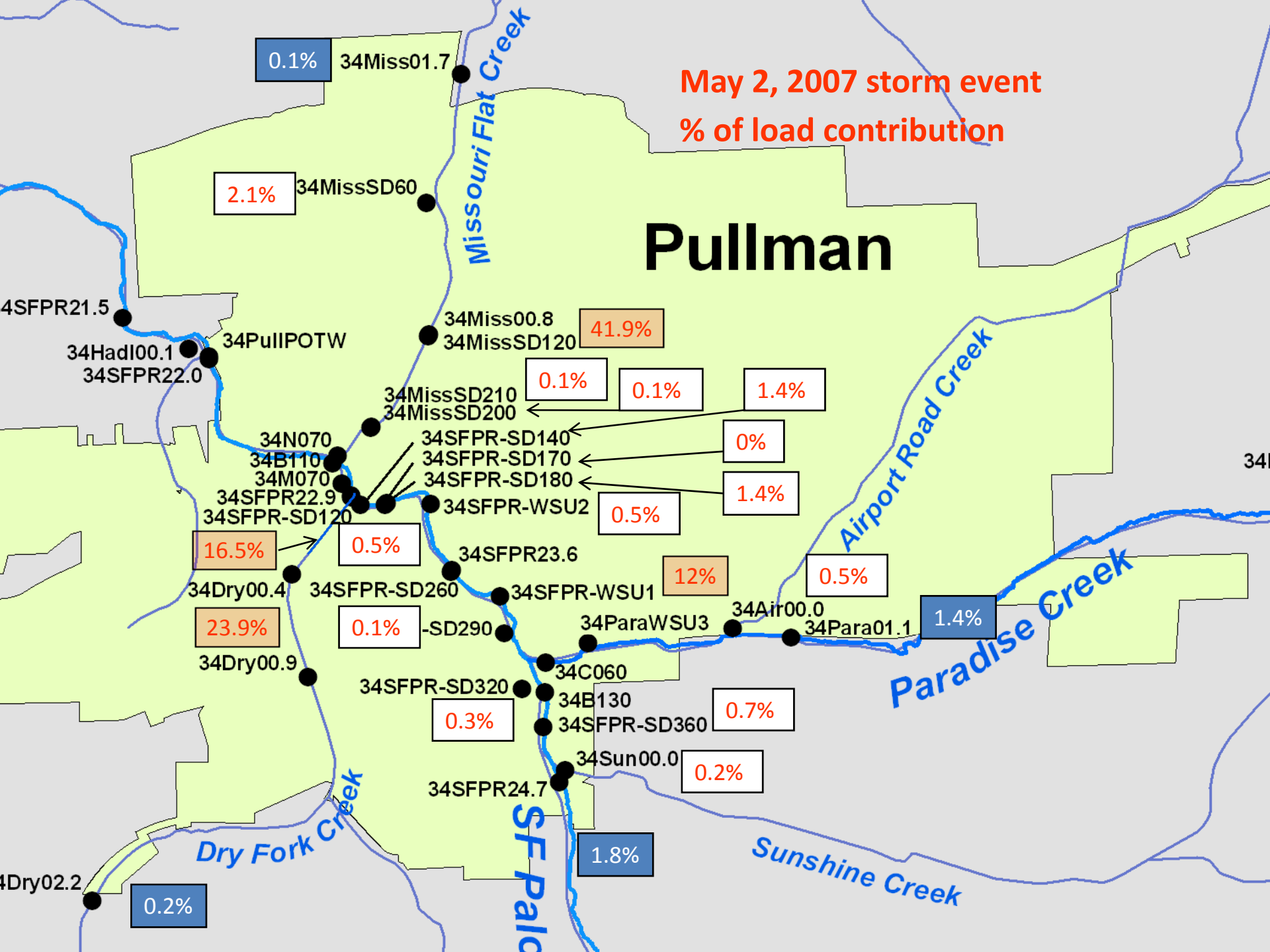
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0.7%
34Sun00.0
0.2%
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1.8%
4Dry02.2
0.2%

Conclusions from the May 2, 2007 storm event sampling

- During the May 2, 2007 event less than 5% of the FC bacteria load originated from outside of the Pullman city limits.
- Within the city, almost 90% came from 3 different sources:

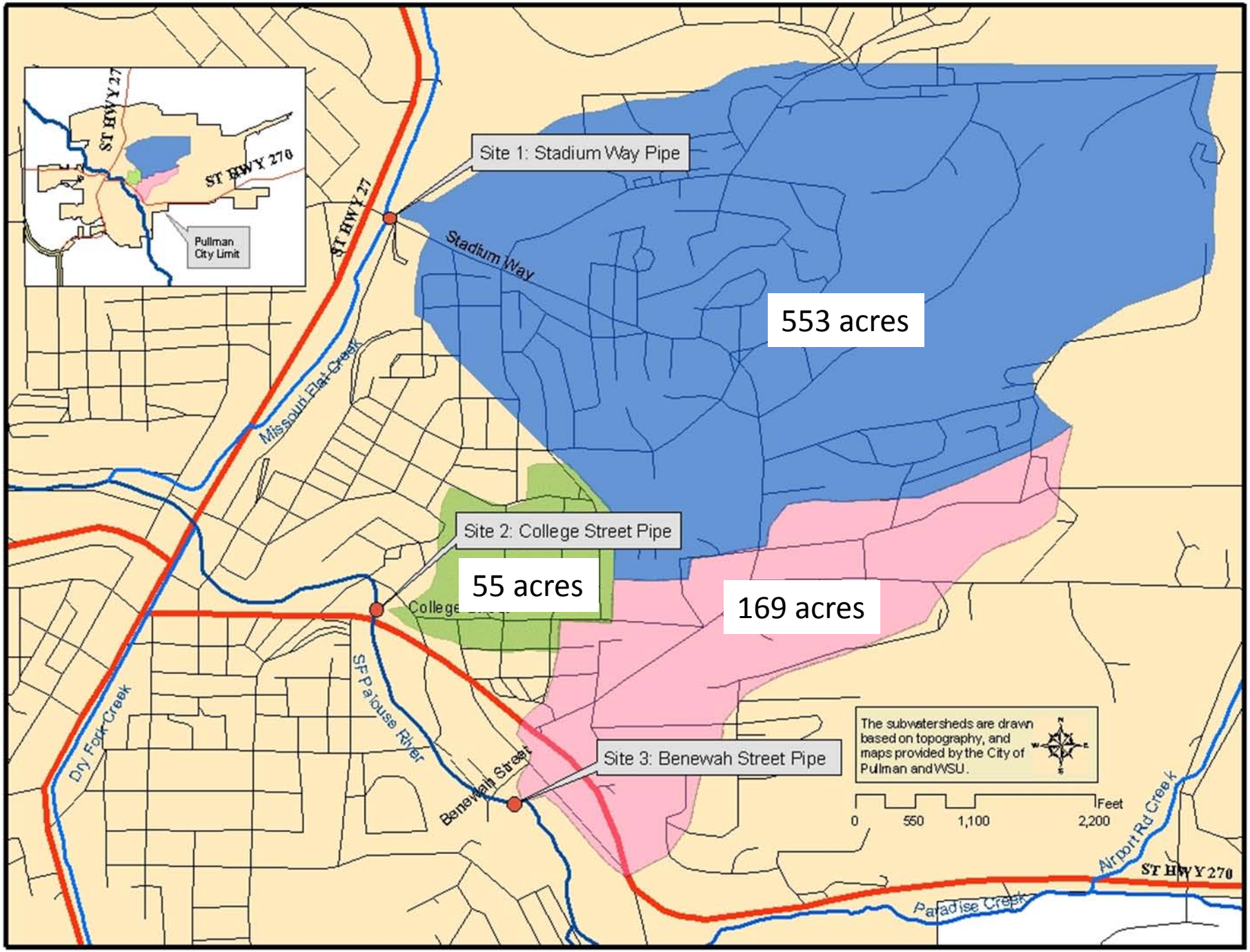
1. More than 40% came from the stormwater outfall to Missouri Flat Creek at Stadium Way (34MissSD120).
2. Almost 12% came from the stormwater outfall to the SF Palouse River at Benewah St. (34SFPRWSU1).
3. Almost 40% came from Dry Fork Creek between the mouth and RM 2.2.

Pullman Stormwater Pilot Study for Pesticides, PCBs, and Fecal Coliform Bacteria, 2005-2006

October 2006

Publication No. 06-03-034

WASHINGTON STATE DEPARTMENT OF ECOLOGY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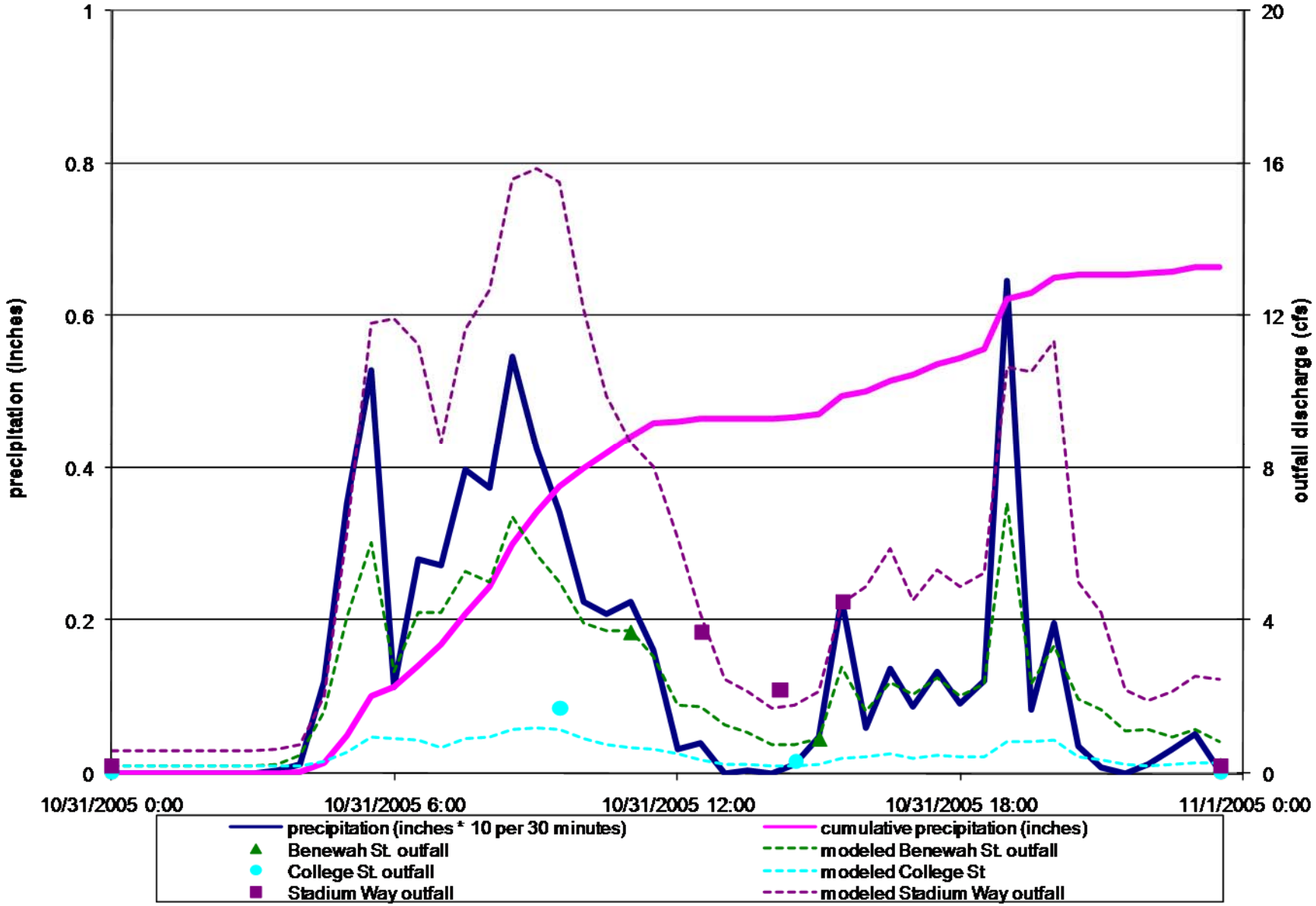
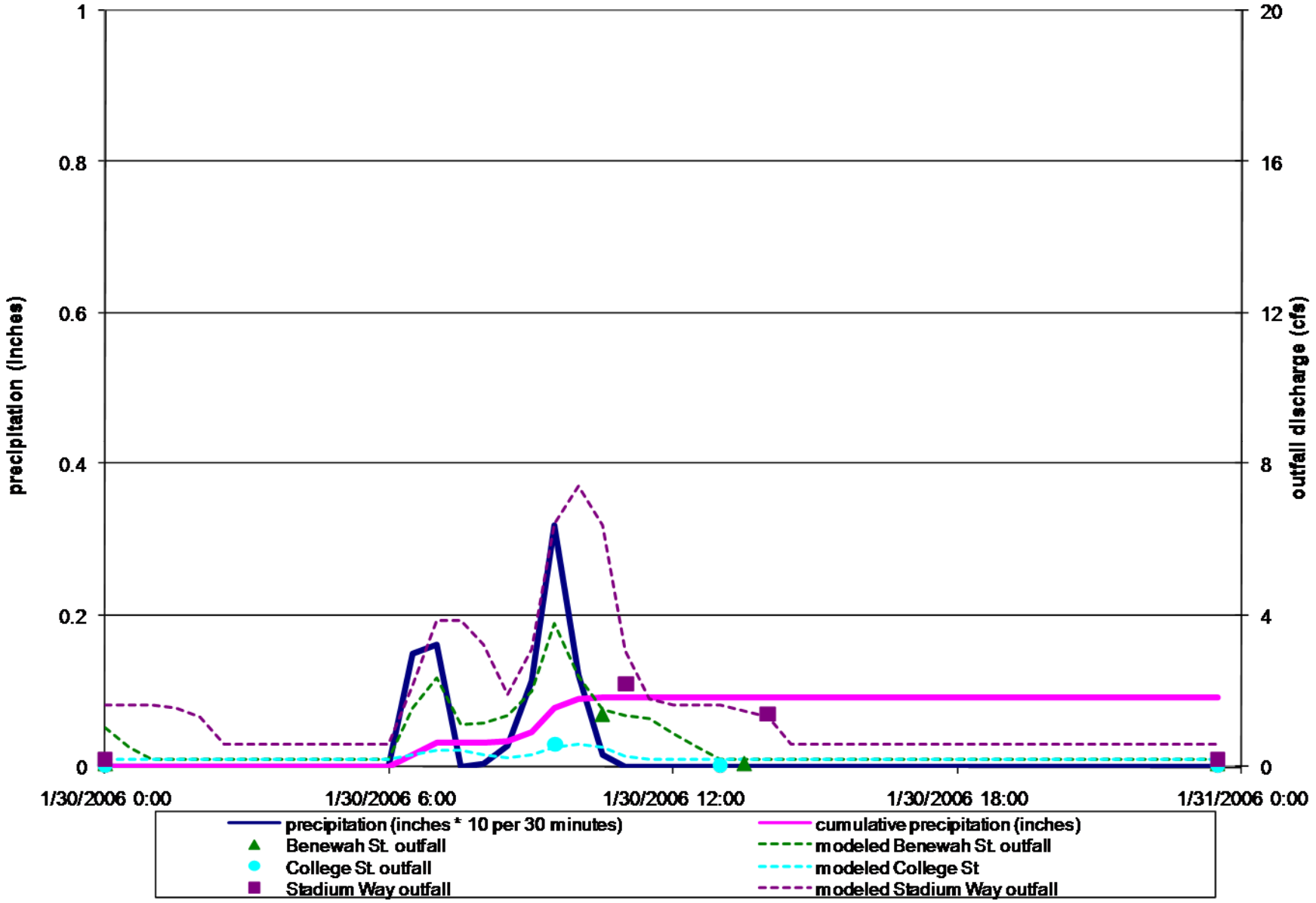
0
550
1,100
2,200
Feet

	Date	First Rotation Concentration (cfu/100 mL)	First Rotation Discharge (cfs)	Second Rotation Concentration (cfu/100 mL)	Second Rotation Discharge (cfs)	Average Daily Bacterial Load
Stadium Way	10/13/2005	1250	3.7	940	4.5	4472
	1/30/2006	1900	3.1	190	2.2	3188
	4/5/2006	1300	7.5	510	2.7	5575
	5/2/2007	3000	9.7	800	1.7	15230
College Street	10/13/2005	1065	1.7	2650	0.3	1265
	1/30/2006	400	0.6	39	0	112
	4/5/2006	2400	0.1	325	0.6	203
	5/2/2007	1100	0.3	550	0.1	171
Benewah Street	10/13/2005	2650	3.7	2100	0.9	5907
	1/30/2006	315	1.4	380	0.1	231
	4/5/2006	2100	2.3	4900	1.4	5727
	5/2/2007	1100	2.4	2200	2.7	4351


1
0.8
0.6
0.4
0.2
0
20
16
12
8
4
0
precipitation (inches)
outfall discharge (cfs)
10/31/2005 0:00
10/31/2005 6:00
10/31/2005 12:00
10/31/2005 18:00
11/1/2005 0:00
precipitation (inches * 10 per 30 minutes)
cumulative precipitation (inches)
Benewah St. outfall
modeled Benewah St. outfall
College St. outfall
modeled College St
Stadium Way outfall
modeled Stadium Way outfall


precipitation (inches)
outfall discharge (cfs)
1
0.8
0.6
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20
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12
8
4
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1/30/2006 0:00
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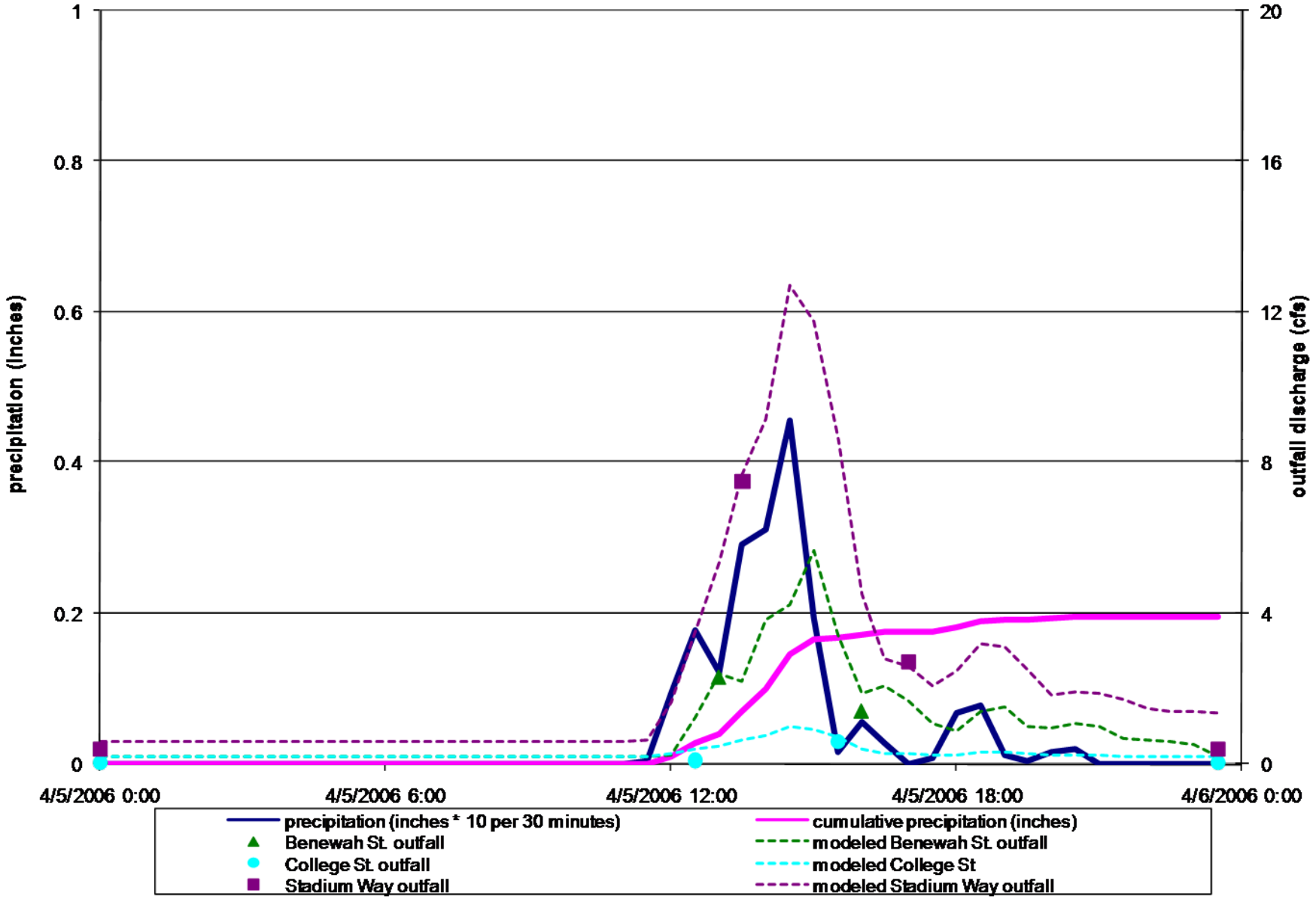
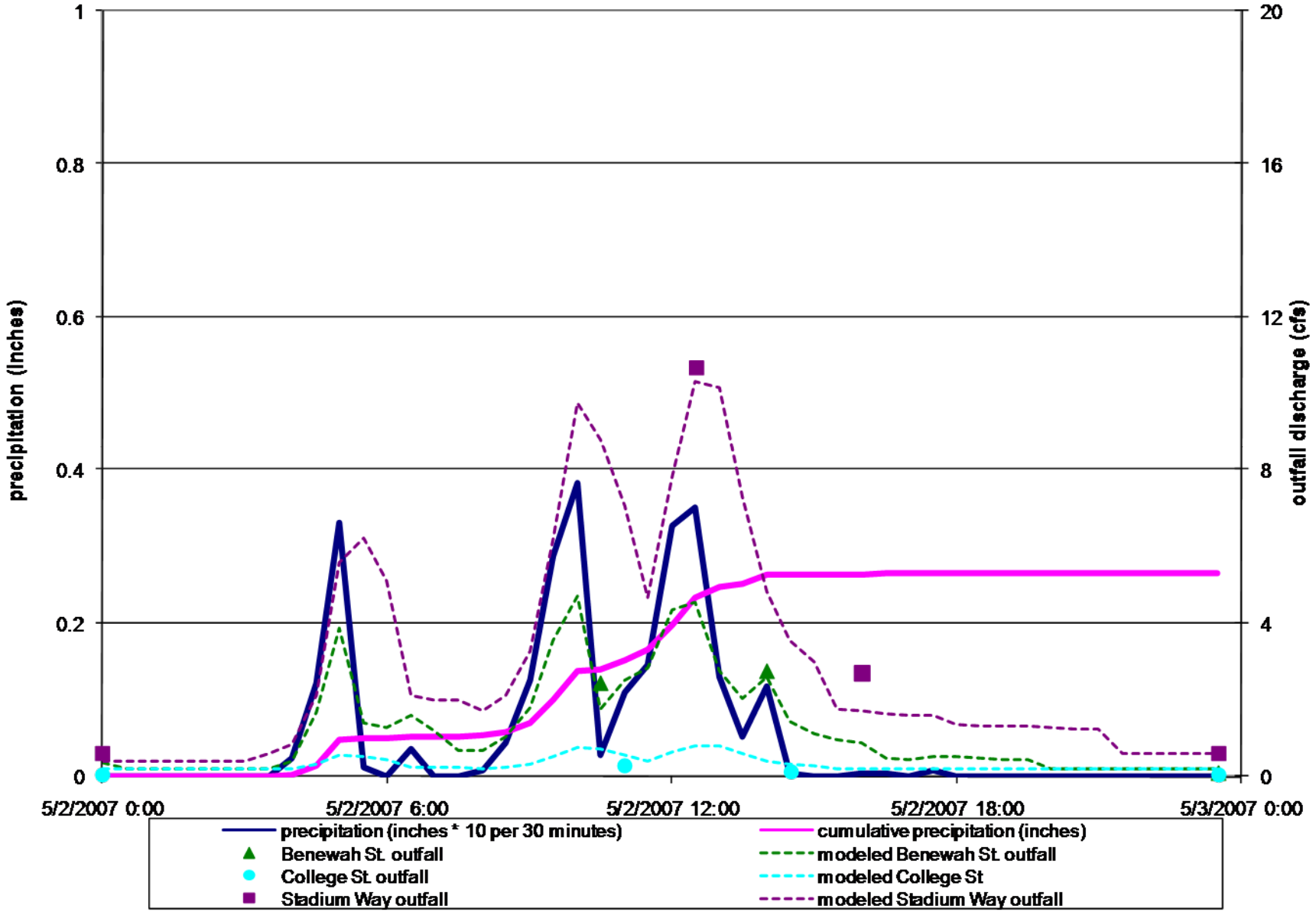
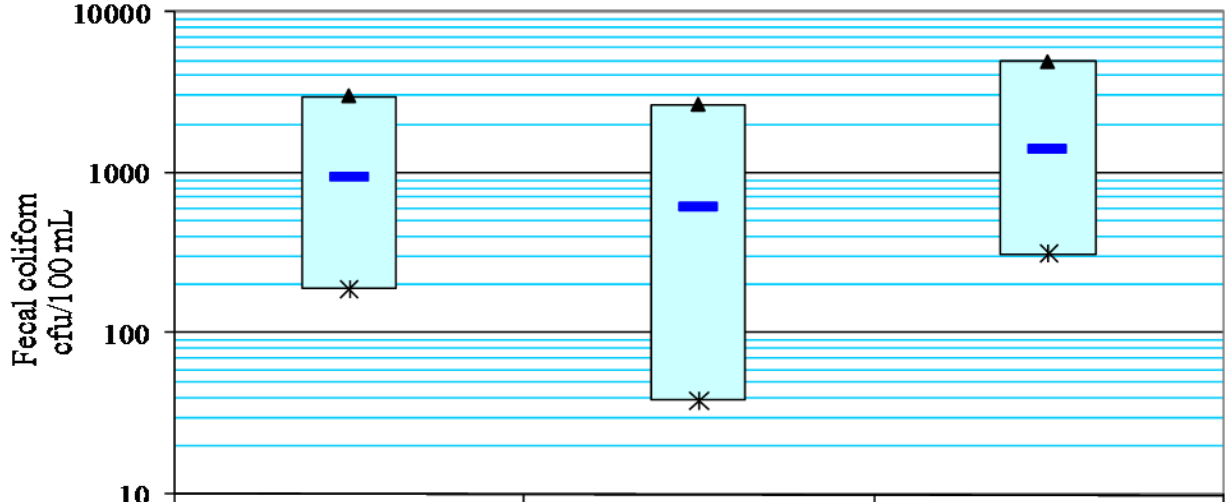
1/30/2006 12:00
1/30/2006 18:00
1/31/2006 0:00
precipitation (inches * 10 per 30 minutes)
cumulative precipitation (inches)
Benewah St. outfall
modeled Benewah St. outfall
College St. outfall
modeled College St
Stadium Way outfall
modeled Stadium Way outfall

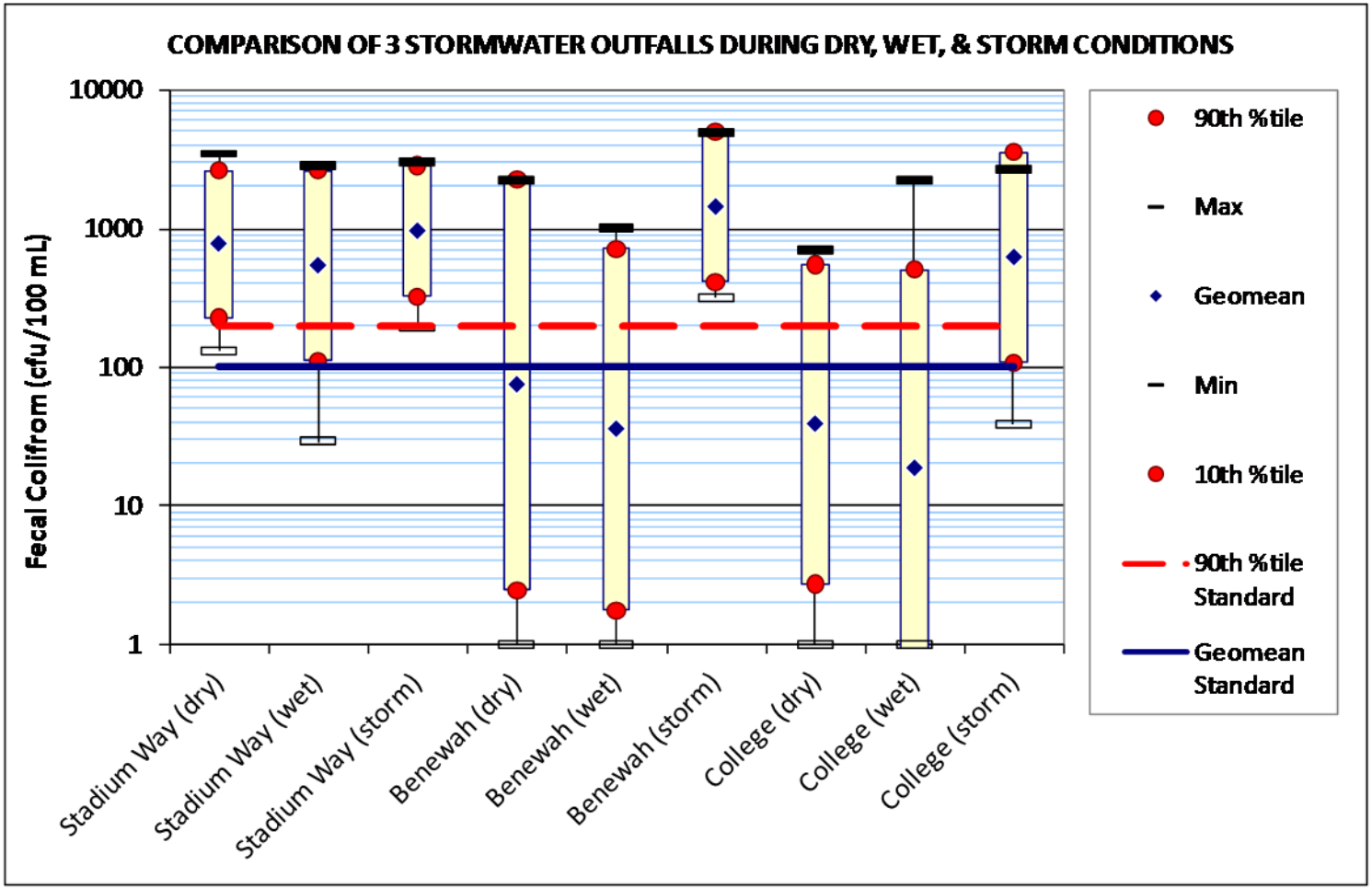

1
0.8
0.6
0.4
0.2
0
20
16
12
8
4
0
precipitation (inches)
outfall discharge (cfs)
4/5/2006 0:00
4/5/2006 6:00
4/5/2006 12:00
4/5/2006 18:00
4/6/2006 0:00
precipitation (inches * 10 per 30 minutes)
cumulative precipitation (inches)
Benewah St. outfall
modeled Benewah St. outfall
College St. outfall
modeled College St
Stadium Way outfall
modeled Stadium Way outfall

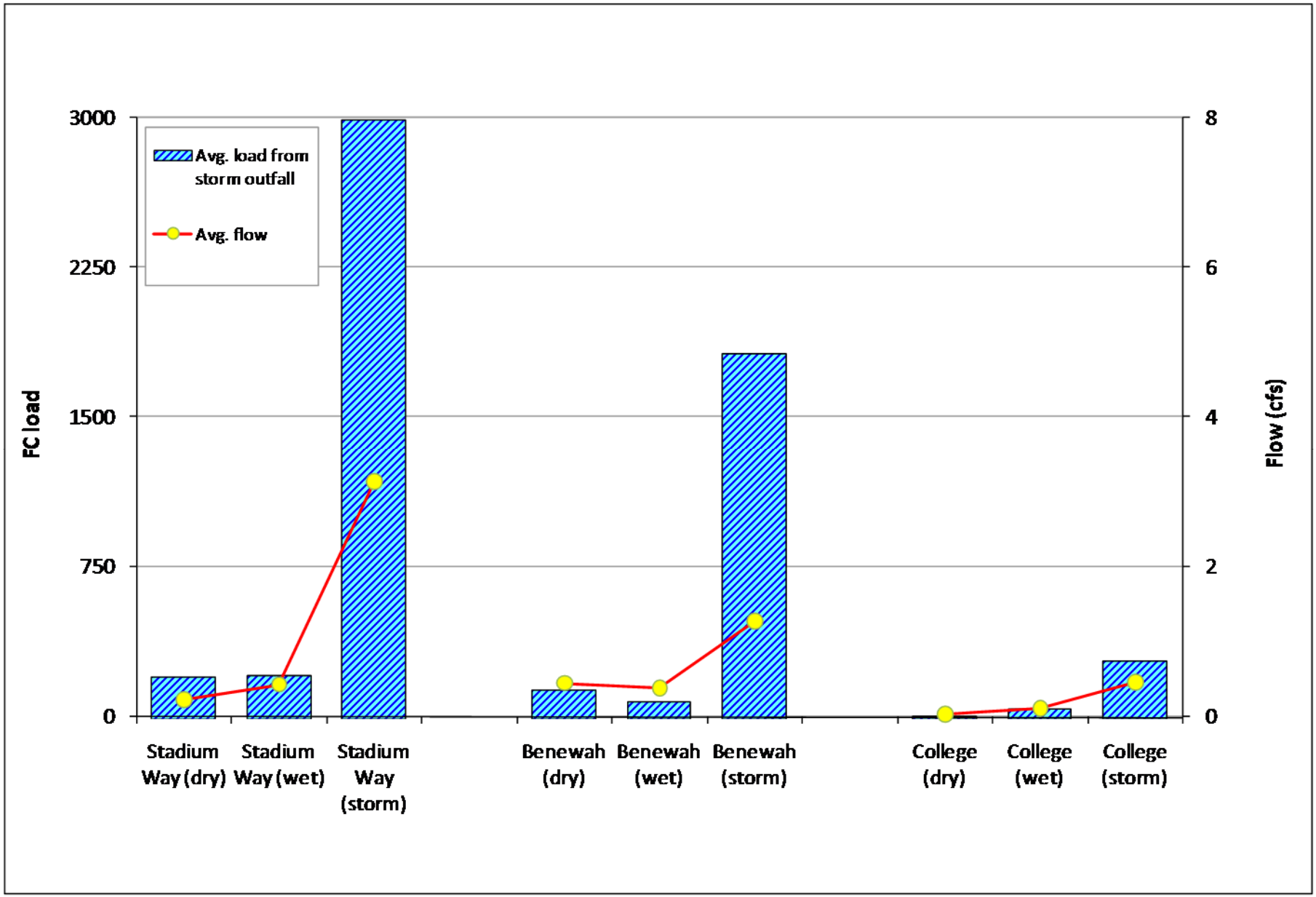

precipitation (inches)
outfall discharge (cfs)
1
0.8
0.6
0.4
0.2
0
20
16
12
8
4
0
5/2/2007 0:00
5/2/2007 6:00
5/2/2007 12:00
5/2/2007 18:00
5/3/2007 0:00
precipitation (inches * 10 per 30 minutes)
cumulative precipitation (inches)
Benewah St. outfall
modeled Benewah St. outfall
College St. outfall
modeled College St
Stadium Way outfall
modeled Stadium Way outfall

2006 Pilot Study and May 2007 TMDL Storm Sampling



	Stadium Way	College Street	Benewah Street
▲ max	3000	2650	4900
– geometric mean	952	615	1421
✳ min	190	39	315


COMPARISON OF 3 STORMWATER OUTFALLS DURING DRY, WET, & STORM CONDITIONS
Fecal Colifrom (cfu/100 mL)
10000
1000
100
10
1
Stadium Way (dry)
Stadium Way (wet)
Stadium Way (storm)
Benewah (dry)
Benewah (wet)
Benewah (storm)
College (dry)
College (wet)
College (storm)
90th %tile
Max
Geomean
Min
10th %tile
90th %tile Standard
Geomean Standard


3000
2250
1500
750
0
FC load
8
6
4
2
0
Flow (cfs)
Avg. load from storm outfall
Avg. flow
Stadium Way (dry)
Stadium Way (wet)
Stadium Way (storm)
Benewah (dry)
Benewah (wet)
Benewah (storm)
College (dry)
College (wet)
College (storm)

Conclusions

- The May 2, 2007 storm event sampling at the three stations monitored the previous year had similar results to the previous year.
- Storm events and storm runoff greatly increased FC bacteria pollution and degraded the water quality in the SF Palouse and its tributaries beyond the levels of dry or wet season pollution.