BMP Retrofit Pilot Project

Quarterly Status Report No. 13

BMP Retrofit Pilot Project — District 7 and District 11

CTSW-RT-01-077 May 23, 2001

Caltrans

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INTRODUCTION

Background and Purpose

Periodic status reports and meetings are specified in the District 7 and District 11 Scoping Study as a means of updating NRDC, EPA, San Diego Baykeeper, and Santa Monica Baykeeper on the progress of the BMP Retrofit Pilot Program. The bi-weekly and quarterly status meetings have been scheduled on a regular basis to coincide with general project milestones and periods of significant activity. Approximate scheduled dates for the periodic status meetings are given in the *Scoping Study*. This report provides background documentation for the thirteenth status meeting which will be held on June 13, 2001.

The scope of the status reports includes a general program-level overview of the activities that precede the status meetings. This Quarterly Report includes the following information: (1) 3rd Year Monitoring reports (Appendices E and F), (2) Operation and Maintenance activities, (3) vector and biological survey updates, and (4) other items pertaining to the pilot study.

The preceding Status Meeting (No. 12) was held March 14, 2001. The meeting minutes are included as Appendix A. The main subjects discussed at Status Meeting No. 12 included the following:

- Vector Update: including an update on larval monitoring/abatement , an update on DHS survey, and a comparison with Portland's Vector Monitoring/Abatement of BMPs
- A discussion of empirical observations data
- Storm sampling and operation and maintenance activities for the past quarter for the District 11 and District 7 sites
- Device-specific updates: MCTT covers, maintenance of sand filters, and status report on the schedule for the Metro MCTT and Paxton media filter sites
- Development of the final report
- Operation and Maintenance Cost Development Update/MID Analysis

The project calendar listing meetings and submittals scheduled for the next few months is included as Appendix J.

ACTIVITY DESCRIBED IN THIS QUARTERLY REPORT COVERS THE PERIOD FROM FEBRUARY 23, 2001 THROUGH MAY 18,2001

District 7 BMP Pilot Sites

The teams mobilized for four storm events during this quarterly period: February 24-28, March 6, April 7, and April 20, 2001. A marginal storm was forecast for February 23, 2001, but since it was predicted to be a 50% chance of scattered showers in the range of 0.10 to 0.40 inches of rainfall, the decision was made not to mobilize. The actual rainfall received ranged from 0.03 to 0.32 inches, depending on the location of the site. Only the CDS sites were sampled during the February 24-28, 2001 storm event, since they were the only sites to receive less than 0.10 inches of rainfall on February 23, 2001. Additionally, hydraulic residence time (HRT) testing was completed at the I-605/SR-91 and I-605/Del Amo swales. Three successful runs were achieved at each site. Other sites were not monitored because there was too much rainfall on February 23, 2001, and the antecedent dry period was not met. Finally, on March 9-10, 2001, an event was forecast as a 50% chance of less than 0.25 inches of precipitation. Since it was deemed to be unlikely, the decision was made not to mobilize. The actual rainfall received ranged from 0.00 to 0.35 inches, depending on the location of the site.

Summaries of the events are provided in Tables 1 through 4.

Table 1: District 7, February 24 through 28, 2001, Event									
Site	**BMP Type**	**Date of Sample Event**	**Rainfall Total**	**Mobilized**	**Sampled**		**% Storm Capture**	**Number of Aliquots**	**Empirical Observations**
					Comp	**Grab**			
I-605/SR-91	IB	2/24-28/01	2.94	N	NA	NA	NA	NA	NA
I-210 East of Orcas	CDS	2/24-28/01	2.13	Y	Y	Y	>75,>75	>12,>12	Y
I-210 East of Filmore	CDS	2/24-28/01	2.22	Y	Y	Y	>75,>75	>12,>12	Y
I-5/I-605	EDB	2/24-28/01	3.83	N	NA	NA	NA	NA	NA
I-605/SR-91	EDB	2/24-28/01	2.94	N	NA	NA	NA	NA	NA
Alameda MS	OWS	2/24-28/01	3.19	N	NA	NA	NA	NA	NA
Eastern MS	MF	2/24-28/01	3.80	N	NA	NA	NA	NA	NA
Foothill MS	MF	2/24-28/01	3.23	N	NA	NA	NA	NA	NA
Termination P & R	MF	2/24-28/01	3.86	N	NA	NA	NA	NA	NA
Via Verde P & R	MCTT	2/24-28/01	2.02	NA[1]	NA	NA	NA	NA	NA
Lakewood P & R	MCTT	2/24-28/01	3.65	N	NA	NA	NA	NA	NA
Altadena	Bio Strip	2/24-28/01	3.19	N	NA	NA	NA	NA	NA
	Infiltration Trench	2/24-28/01	3.19	N	NA	NA	NA	NA	NA
Foothill MS	DII north- SG Insert	2/24-28/01	3.23	Y	NA	NA	NA	NA	Y
	DII south- FF Insert	2/24-28/01	3.23	Y	NA	NA	NA	NA	Y
Las Flores MS	DII north-SG Insert	2/24-28/01	2.91	Y	NA	NA	NA	NA	Y
	DII south-FF Insert	2/24-28/01	2.91	Y	NA	NA	NA	NA	Y
Rosemead MS	DII north-FF Insert	2/24-28/01	3.49	Y	NA	NA	NA	NA	Y
	DII south-SG Insert	2/24-28/01	3.49	Y	NA	NA	NA	NA	Y
I-605/SR-91	Bio Strip	2/24-28/01	2.94	N	NA	NA	NA	NA	NA
	Bio Swale	2/24-28/01	2.94	Y[2]	NA	NA	NA	NA	Y
Cerritos MS	Bio Swale	2/24-28/01	2.94	N	NA	NA	NA	NA	NA
I-5/I-605	Bioswale	2/24-28/01	3.83	N	NA	NA	NA	NA	NA
I-605/ Del Amo	Bioswale	2/24-28/01	2.94	Y[2]	NA	NA	NA	NA	Y

[1] Site offline due to leak fix
[2] HRT tests performed only – no sampling.

Table2: District 7, March 5 through March 7, 2001, Event									
Site	**BMP Type**	**Date of Sample Event**	**Rainfall Total**	**Mobilized**	**Sampled**		**% Storm Capture**	**Number of Aliquots**	**Empirical Observations**
					Comp	**Grab**			
I-605/SR-91	IB	3/5-7/01	0.57	N	NA	NA	NA	NA	NA
I-210 East of Orcas	CDS	3/5-7/01	2.08	Y	Y	Y	>75,>75	>12,>12	Y
I-210 East of Filmore	CDS	3/5-7/01	1.49	Y	Y	Y	>75,>75	>12,>12	Y
I-5/I-605	EDB	3/5-7/01	0.67	Y	Y	NA	>75,>75	>12,>12	Y
I-605/SR-91	EDB	3/5-7/01	0.57	Y	Y	NA	>75,>75	>12,>12	Y
Alameda MS	OWS	3/5-7/01	0.85	N	NA	NA	NA	NA	NA
Eastern MS	MF	3/5-7/01	0.42	Y	Y	NA	>75,>75	>12,>12	Y
Foothill MS	MF	3/5-7/01	0.71	Y	Y	Y	>75,>75	>12,>12	Y
Termination P & R	MF	3/5-7/01	0.57	Y	Y	NA	>75,>75	>12,>12	Y
Via Verde P & R	MCTT	3/5-7/01	0.51	NA[1]	NA	NA	NA	NA	NA
Lakewood P & R	MCTT	3/5-7/01	0.58	N	NA	NA	NA	NA	NA
Altadena	Bio Strip	3/5-7/01	1.25	N	NA	NA	NA	NA	NA
	Infiltration Trench	3/5-7/01	1.25	N	NA	NA	NA	NA	NA
Foothill MS	DII north- SG Insert	3/5-7/01	0.76	Y	N	NA	NA	NA	Y
	DII south- FF Insert	3/5-7/01	0.76	Y	N	NA	NA	NA	Y
Las Flores MS	DII north-SG Insert	3/5-7/01	3.30	Y	N	NA	NA	NA	Y
	DII south-FF Insert	3/5-7/01	3.30	Y	N	NA	NA	NA	Y
Rosemead MS	DII north-FF Insert	3/5-7/01	0.42	Y	N	NA	NA	NA	Y
	DII south-SG Insert	3/5-7/01	0.42	Y	N	NA	NA	NA	Y
I-605/SR-91	Bio Strip	3/5-7/01	0.57	N	NA	NA	NA	NA	NA
	Bio Swale	3/5-7/01	0.57	N	NA	NA	NA	NA	NA
Cerritos MS	Bio Swale	3/5-7/01	0.57	N	NA	NA	NA	NA	NA
I-5/I-605	Bioswale	3/5-7/01	0.67	N	NA	NA	NA	NA	NA
I-605/ Del Amo	Bioswale	3/5-7/01	0.57	N	NA	NA	NA	NA	NA

[1] Site offline due to leak fix

Table 3: District 7, April 7, 2001, Event									
Site	**BMP Type**	**Date of Sample Event**	**Rainfall Total**	**Mobilized**	**Sampled**		**% Storm Capture**	**Number of Aliquots**	**Empirical Observations**
					Comp	**Grab**			
I-605/SR-91	IB	4/7/01	0.58	Y	NA	NA	NA	NA	Y
I-210 East of Orcas	CDS	4/7/01	1.11	Y	Y	Y	>75,>75	>12,>12	Y
I-210 East of Filmore	CDS	4/7/01	0.62	Y	N[1]	Y	NA	NA	Y
I-5/I-605	EDB	4/7/01	0.79	Y	Y	NA	>75,>75	>12,>12	Y
I-605/SR-91	EDB	4/7/01	0.58	Y	Y	NA	>75,>75	>12,>12	Y
Alameda MS	OWS	4/7/01	0.89	N	NA	NA	NA	NA	NA
Eastern MS	MF	4/7/01	0.84	Y	Y	NA	>75,>75	>12,>12	Y
Foothill MS	MF	4/7/01	1.12	Y	Y	NA	>75,>75	>12,>12	Y
Termination P & R	MF	4/7/01	0.75	Y	Y	NA	>75,>75	>12,>12	Y
Via Verde P & R	MCTT	4/7/01	0.85	Y	Y	NA	>75,>75	>12,>12	Y
Lakewood P & R	MCTT	4/7/01	0.46	N	NA	NA	NA	NA	NA
Altadena	Bio Strip	4/7/01	1.40	Y	Y	NA	>75,>75	>12,>12	Y
	Infiltration Trench	4/7/01	1.40	Y	NA	NA	NA	NA	Y
Foothill MS	DII north- SG Insert	4/7/01	1.12	Y	NA	NA	NA	NA	Y
	DII south- FF Insert	4/7/01	1.12	Y	NA	NA	NA	NA	Y
Las Flores MS	DII north-SG Insert	4/7/01	1.09	Y	NA	NA	NA	NA	Y
	DII south-FF Insert	4/7/01	1.09	Y	NA	NA	NA	NA	Y
Rosemead MS	DII north-FF Insert	4/7/01	1.10	Y	NA	NA	NA	NA	Y
	DII south-SG Insert	4/7/01	1.10	Y	NA	NA	NA	NA	Y
I-605/SR-91	Bio Strip	4/7/01	0.58	Y	Y	NA	>75,>75	11,5	Y
	Bio Swale	4/7/01	0.58	Y	Y[2]	NA	>75,NA	>12,NA	Y
Cerritos MS	Bio Swale	4/7/01	0.58	Y	Y	NA	>75,>75	>12,>12	Y
I-5/I-605	Bioswale	4/7/01	0.79	Y	Y	NA	>75,>75	>12,11	Y
I-605/ Del Amo	Bioswale	4/7/01	0.58	Y	Y[3]	NA	>75,NA	>12,NA	Y

[1]The effluent sampler failed part way through the storm, and thus the effluent sample was not representative. Consequently, neither the effluent nor the influent samples were sent to the laboratory.
[2]No effluent sample was collected.
[3]The effluent sampler failed and no effluent sample was collected. The influent sample was successfully collected and sent to the laboratory.

Table 4: District 7, April 20, 2001 , Event									
Site	**BMP Type**	**Date of Sample Event**	**Rainfall Total**	**Mobilized**	**Sampled**		**% Storm Capture**	**Number of Aliquots**	**Empirical Observations**
					Comp	**Grab**			
I-605/SR-91	IB	4/20/01	0.41	N	NA	NA	NA	NA	NA
I-210 East of Orcas	CDS	4/20/01	0.75	Y	N[1]	Y	NA	NA	Y
I-210 East of Filmore	CDS	4/20/01	0.60	Y	Y	Y	>75,>75	>12,>12	Y
I-5/I-605	EDB	4/20/01	0.25	N	NA	NA	NA	NA	NA
I-605/SR-91	EDB	4/20/01	0.41	N	NA	NA	NA	NA	NA
Alameda MS	OWS	4/20/01	0.32	N	NA	NA	NA	NA	NA
Eastern MS	MF	4/20/01	0.53	N	NA	NA	NA	NA	NA
Foothill MS	MF	4/20/01	0.77	Y	Y	NA	>75,>75	>12,>12	Y
Termination P & R	MF	4/20/01	0.40	N	NA	NA	NA	NA	NA
Via Verde P & R	MCTT	4/20/01	0.84	Y	Y	NA	>75,>75	>12,>12	Y
Lakewood P & R	MCTT	4/20/01	0.26	N	NA	NA	NA	NA	NA
Altadena	Bio Strip	4/20/01	0.80	Y	Y	NA	>75,>75	>12,>12	Y
	Infiltration Trench	4/20/01	0.80	Y	NA	NA	NA	NA	Y
Foothill MS	DII north- SG Insert	4/20/01	0.78	Y	NA	NA	NA	NA	Y
	DII south- FF Insert	4/20/01	0.78	Y	NA	NA	NA	NA	Y
Las Flores MS	DII north-SG Insert	4/20/01	0.43	Y	NA	NA	NA	NA	Y
	DII south-FF Insert	4/20/01	0.43	Y	NA	NA	NA	NA	Y
Rosemead MS	DII north-FF Insert	4/20/01	0.80	Y	NA	NA	NA	NA	Y
	DII south-SG Insert	4/20/01	0.80	Y	NA	NA	NA	NA	Y
I-605/SR-91	Bio Strip	4/20/01	0.41	N	NA	NA	NA	NA	NA
	Bio Swale	4/20/01	0.41	N	NA	NA	NA	NA	NA
Cerritos MS	Bio Swale	4/20/01	0.41	N	NA	NA	NA	NA	NA
I-5/I-605	Bioswale	4/20/01	0.25	N	NA	NA	NA	NA	NA
I-605/ Del Amo	Bioswale	4/20/01	0.41	N	NA	NA	NA	NA	NA

[1]There was insufficient flow to collect a composite sample.

The following is a discussion of activities during the quarter for each BMP site.

I-605/SR-91 Interchange Infiltration Basin (Site ID 73101)

Monitoring/Sampling Activities

2/24-28/01: Forecast predicted rain to produce 1.5 – 2.5 inch of rainfall, with a 100% probability of occurrence. Storm event produced 2.94 inches of rainfall. No team was mobilized to the infiltration basin. Only the CDS sites were sampled during the February 24-28, 2001 storm event, since they were the only sites to receive less than 0.10 inches of rainfall on February 23, 2001.

3/5-7/01: Forecast predicted rain to produce 4 – 8 inches of rainfall, with a 100% probability of occurrence. Storm event produced 0.57 inches of rainfall. No team was mobilized to the infiltration basin.

4/7/01: Forecast predicted rain to produce 0.25 – 1 inch of rainfall, with a 70% probability of occurrence. Storm event produced 0.58 inch of rainfall. A team was mobilized to make empirical observations of the infiltration basin.

4/20/01: Forecast predicted rain to produce up to 0.50 inch of rainfall, with a 70% probability of occurrence. Storm event produced 0.41 inch of rainfall. No team was mobilized to the infiltration basin.

5/1/01: Core soil samples were collected, following the end of the 2000/2001 wet season. Nine cores were collected from locations on an equilateral basin grid (superimposed over the basin). Each of the nine cores was collected using a hand-held, stainless steel soil probe. The probe was driven 1 meter [3.28 ft] below the ground surface and the core was recovered. Each core was then subdivided into three sections as follows:

Section 1 from the ground surface to 0.2 m [0.66 ft] below the ground surface.

Section 2 was from 0.3 m [0.98 ft] to 0.5 m [1.64 ft] below the ground surface.

Section 3 was from 0.6 m [1.97 ft] to 0.8 m [2.62 ft] below the ground surface.

Similar depth intervals of each core were combined to prepare three samples: one from the 0.0 m to 0.2m [0.66 ft] below ground surface interval, one from 0.3 m [0.98 ft] to 0.5 m [1.64 ft] below ground surface interval and one from the 0.6 m [1.97 ft] to 0.8 m [2.62 ft] below the ground surface. Samples were sent to the laboratory for total metal, TRPH analyses, and grain size distribution testing.

Operations and Maintenance

2/27/01: Backfilled and compacted gopher holes.

3/1/01: Conducted monthly/post-storm site inspection following the storm event on February 24-28, 2001.

3/8/01: Conducted post-storm site inspection following the storm event on March 5-7, 2001.

3/20/01: Repaired handle on the wooden cover to the overflow junction box.

4/12/01 Conducted monthly/post-storm site inspection following the storm event on April 7, 2001.

4/25/01: Removed woody vegetation.

5/1/01: Conducted monthly/post storm site inspection following the storm event on April 20, 2001.

Vector Activities

None this period.

Issues / Solutions

None this period.

I-210/East Orcas Avenue Continuous Deflection Separators (Site ID 73102)

Monitoring/Sampling Activities

2/24-28/0: Forecast predicted rain to produce 1.5 – 2.5 inch of rainfall, with a 100% probability of occurrence. Storm event produced 2.13 inches of rainfall. A team was mobilized and composite and grab samples were collected at both the influent and the effluent locations and sent to the laboratory for analysis. Influent and effluent samples met minimum percent storm capture and minimum number of aliquots, and enough volume was collected to run the entire analytical suite. Empirical observations were made.

3/1/01: Trouble shooting equipment.

3/5-7/01: Forecast predicted rain to produce 4 – 8 inches of rainfall, with a 100% probability of occurrence. Storm event produced 2.08 inches of rainfall. A team was mobilized and composite and grab samples were collected at both the influent and the effluent locations and sent to the laboratory for analysis. Influent and effluent samples met minimum percent storm capture and

minimum number of aliquots, and enough volume was collected to run the entire analytical suite. Empirical observations were made.

3/30/01: Collected an aqueous sample from the sump and delivered the sample to the laboratory.

4/7/01: Forecast predicted rain to produce 0.25 – 1 inch of rainfall, with a 70% probability of occurrence. Storm event produced 1.11 inch of rainfall. A team was mobilized and composite and grab samples were collected at both the influent and the effluent locations and sent to the laboratory for analysis. Influent and effluent samples met minimum percent storm capture and minimum number of aliquots, and enough volume was collected to run the entire analytical suite. Empirical observations were made.

4/20/01: Forecast predicted rain to produce up to 0.50 inch of rainfall, with a 70% probability of occurrence. Storm event produced 0.75 inch of rainfall. A team was mobilized to make empirical observations of the CDS unit. There was insufficient flow to collect a composite sample, but grab samples were collected and sent to the laboratory for analysis.

Operations and Maintenance

2/28/01: Met with Jim Settles of the Collins Company to discuss options for materials, and to measure the discharge pipe diameter for the installation of mosquito proof by-pass bags. Also measured the dimensions of the H-Flume to make a debris cover.

3/2/01: Conducted monthly/post-storm site inspection following the storm event on February 24-28, 2001.

3/8/01: Conducted post-storm site inspection following the storm event on March 5-7, 2001. The depth of accumulated litter and debris was measured and found to be up to 19.5 inches or 81% full, i.e., below maintenance threshold limits.

3/8/01: Personnel from CDS, Law Crandall and Caltrans met to discuss the maintenance thresholds of the CDS units. It was decided to wait until after a predicted storm event on March 10, 2001 to conduct any maintenance. CDS subsequently reviewed the maintenance thresholds and sent out a memo suggesting operational changes to the two CDS units. Mosquito screens were also discussed at this meeting. CDS acknowledged that the original litter bypass/mosquito proofing bag without the end cut off had impeded flow during storms. Options for new mosquito screen materials were discussed.

3/12/01: The CDS unit was found to exceed maintenance threshold limits, hence litter and debris captured and bypassed by the CDS unit and weir box were removed for segregation, characterization, and to calculate mass and volume of material.

3/15/01: New mosquito screens were installed at the two CDS units. The new screen material is flexible and UV protected, and is woven with holes smaller in size

than typical mosquito screens. A tube was made by sewing (double-stitching) the screen with monofilament i.e., fishing line. A peripheral pocket was also sewn on the outlet to encase a chain, which is used to help close the end.

4/11/01 Conducted monthly/post-storm site inspection following the storm event on April 7, 2001.

5/2/01: The gross pollutants were removed and sent to the laboratory for characterization, in accordance with the MID. The sump water was sampled and sent to the laboratory for analysis. The water was then pumped out of the units and into drums, and the screen was inspected for structural integrity. The screen was brushed clean.

Vector Activities

None this period.

Issues / Solutions

None this period.

I-210/East of Filmore Street Continuous Deflection Separators (Site ID 73103)

Monitoring/Sampling Activities

2/24-28/01: Forecast predicted rain to produce 1.5 – 2.5 inch of rainfall, with a 100% probability of occurrence. Storm event produced 2.22 inches of rainfall. A team was mobilized and composite and grab samples were collected at both the influent and the effluent locations and sent to the laboratory for analysis. Influent and effluent samples met minimum percent storm capture and minimum number of aliquots, and enough volume was collected to run the entire analytical suite. Empirical observations were made.

3/5-7/01: Forecast predicted rain to produce 4 – 8 inches of rainfall, with a 100% probability of occurrence. Storm event produced 1.49 inches of rainfall. A team was mobilized and composite and grab samples were collected at both the influent and the effluent locations and sent to the laboratory for analysis. Influent and effluent samples met minimum percent storm capture and minimum number of aliquots, and enough volume was collected to run the entire analytical suite. Empirical observations were made.

4/7/01: Forecast predicted rain to produce 0.25 – 1 inch of rainfall, with a 70% probability of occurrence. Storm event produced 0.62 inch of rainfall. A team was mobilized to make empirical observations of the CDS unit. The effluent sampler failed part way through the storm, and thus the effluent sample was not representative. Consequently, neither the effluent nor the influent samples were sent to the laboratory.

4/20/01: Forecast predicted rain to produce up to 0.50 inch of rainfall, with a 70% probability of occurrence. Storm event produced 0.60 inch of rainfall. A team was mobilized and composite and grab samples were collected at both the influent and the effluent locations and sent to the laboratory for analysis. Influent and effluent samples met minimum percent storm capture and minimum number of aliquots, and enough volume was collected to run the entire analytical suite. Empirical observations were made.

Operations and Maintenance

2/28/01: Met with Jim Settles of the Collins Company to discuss options for materials, and to measure the discharge pipe diameter for the installation of mosquito proof by-pass bags.

3/2/01: Conducted monthly/post-storm site inspection following the storm event on February 24-28, 2001.

3/8/01: Conducted post-storm site inspection following the storm event on March 5-7, 2001. The depth of accumulated litter and debris was measured and found to be up to 8 inches or 33% full i.e., below maintenance threshold limits.

3/8/01: Personnel from CDS, Law Crandall and Caltrans met to discuss the maintenance thresholds of the CDS units. It was decided to wait until after a predicted storm event on March 10, 2001 to conduct any maintenance. CDS subsequently reviewed the maintenance thresholds and sent out a memo suggesting operational changes to the two CDS units. Mosquito screens were also discussed at this meeting. CDS acknowledged that the original litter bypass/mosquito proofing bag without the end cut off had impeded flow during storms. Options for new mosquito screen materials were discussed.

3/12/01: The depth of accumulated litter and debris was measured and found to be below maintenance threshold limits, hence no maintenance was required.

3/13/01: Installed a debris fence to prevent surface water runoff from carrying debris into the energy dissipater and mixing with the material that may have bypassed the CDS unit.

3/15/01 New mosquito screens were installed at the two CDS units. The new screen material is flexible and UV protected, and is woven with holes smaller in size than typical mosquito screens. A tube was made by sewing (double-stitching) the screen with monofilament i.e., fishing line. A peripheral pocket was also sewn on the outlet to encase a chain, which is used to help close the end.

4/11/01 Conducted monthly/post-storm site inspection following the storm event on April 7, 2001.

5/2/01: The gross pollutants were removed and sent to the laboratory for characterization, in accordance with the MID. The sump water was sampled and sent to the laboratory for analysis. The water was then pumped out of the

units and into drums, and the screen was inspected for structural integrity. The screen was brushed clean.

Vector Activities

None this period.

Issues / Solutions

None this period.

I-5/I-605 Extended Detention Basin (Site ID 74101)

Monitoring/Sampling Activities

2/24-28/01: Forecast predicted rain to produce 1.5 – 2.5 inch of rainfall, with a 100% probability of occurrence. Storm event produced 3.83 inches of rainfall. No team was mobilized to the extended detention basin. Only the CDS sites were sampled during the February 24-28, 2001 storm event, since they were the only sites to receive less than 0.10 inches of rainfall on February 23, 2001.

3/5-7/01: Forecast predicted rain to produce 4 – 8 inches of rainfall, with a 100% probability of occurrence. Storm event produced 0.67 inches of rainfall. A team was mobilized and composite samples were collected at both the influent and the effluent locations and sent to the laboratory for analysis. Influent and effluent samples met minimum percent storm capture and minimum number of aliquots, and enough volume was collected to run the entire analytical suite. Empirical observations were made, but no grab samples were collected.

4/7/01: Forecast predicted rain to produce 0.25 – 1 inch of rainfall, with a 70% probability of occurrence. Storm event produced 0.79 inch of rainfall. A team was mobilized and composite samples were collected at both the influent and the effluent locations and sent to the laboratory for analysis. Influent and effluent samples met minimum percent storm capture and minimum number of aliquots, and enough volume was collected to run the entire analytical suite. Empirical observations were made, but no grab samples were collected.

4/20/01: Forecast predicted rain to produce up to 0.50 inch of rainfall, with a 70% probability of occurrence. Storm event produced 0.25 inch of rainfall. No team was mobilized to the extended detention basin.

Operation and Maintenance

2/27/01: Removed trash and debris, and backfilled and compacted gopher holes.

3/2/01: Conducted monthly/post-storm site inspection following the storm event on February 24-28, 2001.

3/5/01: Removed woody vegetation and trash and debris.

3/9/01: Conducted post-storm site inspection following the storm event on March 5-7, 2001.

4/11/01 Conducted monthly/post-storm site inspection following the storm event on April 7, 2001. Removed trash and debris.

4/18-19/01: Removed woody vegetation, backfilled and compacted gopher burrows, and removed trash and debris.

5/1/01: Conducted monthly/post-storm site inspection following the storm event on April 20, 2001. The BMP was inspected for sediment accumulation in the basin, as per the MID, and the sampling protocols. The area of deposited sediments in the BMP was determined by superimposing a square meter grid over the basin floor. Using a x-y origin, the floor was separated into square meter cells and the sampling area was determined. No square meter cell required sampling, however, as none contained 50% or more of deposited sediments with an average depth of at least 1 inch.

5/15/01: Removed debris in the basin near the inlet pipe.

Vector Activities

None this period.

Issues/Solutions

None this period.

I-605/SR-91 Extended Detention Basin (Site ID 74102)

Monitoring/Sampling Activities

2/24-28/01: Forecast predicted rain to produce 1.5 – 2.5 inch of rainfall, with a 100% probability of occurrence. Storm event produced 2.94 inches of rainfall. No team was mobilized to the extended detention basin. Only the CDS sites were sampled during the February 24-28, 2001 storm event, since they were the only sites to receive less than 0.10 inches of rainfall on February 23, 2001.

3/5-7/01: Forecast predicted rain to produce 4 – 8 inches of rainfall, with a 100% probability of occurrence. Storm event produced 0.57 inches of rainfall. A team was mobilized and composite samples were collected at both the influent and the effluent locations and sent to the laboratory for analysis. Influent and effluent samples met minimum percent storm capture and minimum number of aliquots, and enough volume was collected to run the entire analytical suite. Empirical observations were made, but no grab samples were collected.

4/7/01: Forecast predicted rain to produce 0.25 – 1 inch of rainfall, with a 70% probability of occurrence. Storm event produced 0.58 inch of rainfall. A team

was mobilized and composite samples were collected at both the influent and the effluent locations and sent to the laboratory for analysis. Influent and effluent samples met minimum percent storm capture and minimum number of aliquots, and enough volume was collected to run the entire analytical suite. Empirical observations were made, but no grab samples were collected.

4/20/01: Forecast predicted rain to produce up to 0.50 inch of rainfall, with a 70% probability of occurrence. Storm event produced 0.41 inch of rainfall. No team was mobilized to the extended detention basin.

Operation and Maintenance

2/27/01: Backfilled and compacted gopher holes.

3/2/01: Conducted monthly/post-storm site inspection following the storm event on February 24-28, 2001.

3/9/01: Conducted post-storm site inspection following the storm event on March 5-7, 2001.

4/11/01 Conducted monthly/post-storm site inspection following the storm event on April 7, 2001.

4/17-18/01: Removed woody vegetation, backfilled and compacted gopher burrows, and removed trash and debris.

5/1/01: Conducted monthly/post-storm site inspection following the storm event on April 20, 2001. The BMP was inspected for sediment accumulation in the basin, as per the MID, and the sampling protocols. The area of deposited sediments in the BMP was determined by superimposing a square meter grid over the basin floor. Using a x-y origin, the floor was separated into square meter cells and the sampling area was determined. No square meter cell required sampling, however, as none contained 50% or more of deposited sediments with an average depth of at least 1 inch.

5/15/01: Removed debris in the basin, from the rip rap next to the outlet structure.

Vector Activities

None this period.

Issues/Solutions

None this period.

Paxton Maintenance Station Media Filter (Site ID 74103)

Metro Maintenance Station Multi-Chamber Treatment Train (Site ID 74104)

Paxton: Contract was awarded to the lowest bidder on April 9, 2001. Lowest bidder was O'Donnell Construction Inc. The lowest bidder cost was $206,386 (44% lower than the engineer's estimate of $ 370,132). Contract time is 100 working days, which began on May 7, 2001. Completion is therefore anticipated on September 27, 2001.

Paxton Bids

Bidder	Bid Amount
1st	**$206,386**
2nd	$219,909
5th	$302,217
9th	$335,639
13th	$391,598
15th	$450,593

Metro: Project was awarded to the lowest bidder on April 18, 2001. The lowest bidder was Oberg Contracting Corp. The engineer's estimate was $716,229. Contract time is 80 working days, which began on May 16, 2001. Completion is therefore anticipated on September 10, 2001.

Metro Bids

Bidder	Bid Amount
1st	**$612,500**
2nd	$658,000
3rd	$663,000
11th	$774,334
13th	$813,101
14th	$908,667

The project schedule is as follows:

Action	Duration (weeks	Milestone	Estimated Completion Date	
			Paxton	Metro
Incorporate preliminary Structures and D7OE review comments		Submit entire PS&E package	03/08/00 (actual)	03/08/00 (actual)
Structures and D7OE Review	4			
		Receive comments from Structures and D7OE	04/06/00 (actual)	04/06/00 (actual)
Consultant revise PS&E	17.4			
		Submit to D7	08/07/00 (actual)	08/07/00 (actual)
Structures final review and Final Revisions	2			
		Submit final to D7	08/21/00 (actual)	08/21/00 (actual)
D7 process and format PS&E	12.3			
		D7 submit to HQ	11/15/00 (actual)	11/15/00 (actual)
HQ review and processing; advertise contract	13			
		Advertise contract	01/29/01(actual)	03/05/01 (actual)
Bid Period, evaluate bids, Award and Approval of Contract	12			
		Notice to Proceed	05/7/01	05/16/01
Construction	16 to 21			
		Construction complete	09/27/01	09/10/01

Alameda Maintenance Station (Site ID 74201)

Monitoring/Sampling Activities

2/24-28/01: Forecast predicted rain to produce 1.5 – 2.5 inch of rainfall, with a 100% probability of occurrence. Storm event produced 3.19 inches of rainfall. No team was mobilized to the oil/water separator. Only the CDS sites were sampled during the February 24-28, 2001 storm event, since they were the only sites to receive less than 0.10 inches of rainfall on February 23, 2001.

3/5-7/01: Forecast predicted rain to produce 4 – 8 inches of rainfall, with a 100% probability of occurrence. Storm event produced 0.85 inches of rainfall. No team was mobilized to the oil/water separator.

4/7/01: Forecast predicted rain to produce 0.25 – 1 inch of rainfall, with a 70% probability of occurrence. Storm event produced 0.89 inch of rainfall. No team was mobilized to the oil/water separator.

4/20/01: Forecast predicted rain to produce up to 0.50 inch of rainfall, with a 70% probability of occurrence. Storm event produced 0.32 inch of rainfall. No team was mobilized to the oil/water separator.

Operation and Maintenance

3/1/01: Conducted monthly/post-storm site inspection following the storm event on February 24-28, 2001.

3/8/01: Conducted post-storm site inspection following the storm event on March 5-7, 2001.

4/10/01: Conducted monthly/post-storm site inspection following the storm event on April 7, 2001. Removed trash and debris.

4/26/01: Conducted quarterly inspection. There was about 1/8 to ¼ inch of oil on the water. There was greater than ½ inch of sediment in the OWS. Removed trash and debris.

Vector Activities

None this period.

Issues/Solutions

None this period.

Eastern Regional Maintenance Station (Site ID 74202)

Monitoring/Sampling Activities

2/24-28/01: Forecast predicted rain to produce 1.5 – 2.5 inch of rainfall, with a 100% probability of occurrence. Storm event produced 3.80 inches of rainfall. No team was mobilized to the sand filter. Only the CDS sites were sampled during the February 24-28, 2001 storm event, since they were the only sites to receive less than 0.10 inches of rainfall on February 23, 2001.3/5-7/01: Forecast predicted rain to produce 4 – 8 inches of rainfall, with a 100% probability of occurrence. Storm event produced 0.42 inches of rainfall. A team was mobilized and composite samples were collected at both the influent and the effluent locations and sent to the laboratory for analysis. Influent and effluent samples met minimum percent storm capture and minimum number of aliquots, and enough volume was collected to run the entire analytical suite. Empirical observations were made, but no grab samples were collected. Although the sand filter took 42 hours 41 minutes to drain, the loading rate was below the 9ft per day threshold specified in the *Maintenance Indicator Document* (MID). Drain time is based on the difference between the end of effluent to end of influent. Loading rate is estimated based on discharge volume over the entire sand filter surface area over the drain time. Also, the MID thresholds are for 1 inch storms, hence with higher rainfall, the sand filter was likely to take more than 48 hours to drain. Thus, maintenance of the sand filter was required in accordance with the MID.

4/7/01: Forecast predicted rain to produce 0.25 – 1 inch of rainfall, with a 70% probability of occurrence. Storm event produced 0.84 inch of rainfall. A team was mobilized and composite samples were collected at both the influent and the effluent locations and sent to the laboratory for analysis. Influent and effluent samples met minimum percent storm capture and minimum number of aliquots, and enough volume was collected to run the entire analytical suite.

Empirical observations were made, but no grab samples were collected. The drain time improved during this storm, to 23 hours, following the maintenance conducted on April 2-3, 2001, when the top 2 inches of sediment were removed from the sand filter. The rainfall amount was higher, yet the drainage time was faster than the March 5-7, 2001 storm event. Additionally, empirical observations recorded that standing water was not observed on the sand filter during this storm.

4/20/01: Forecast predicted rain to produce up to 0.50 inch of rainfall, with a 70% probability of occurrence. Storm event produced 0.53 inch of rainfall. No team was mobilized to the sand filter.

Operation and Maintenance

3/1/01: Conducted monthly/post-storm site inspection following the storm event on February 24-28, 2001.

3/8/01: Conducted post-storm site inspection following the storm event on March 5-7, 2001.

3/20/01: Repaired wooden cover.

4/3/01: Conducted monthly site inspection. Maintenance was performed to improve drainage times. The first step was to sample the surface sediment and filter bed materials from within the Sand Filter. Nine cores were collected from locations on an equilateral grid, superimposed over the sand filter, to quantify sediment accumulation and quality data. The cores were driven 15 inches below the sediment surface and recovered. A log was used to document depth of penetration and recovery, location, and lithological characteristics. Each core was then subdivided into four sections as follows:

Section 1: 0-2 inches (i.e., mostly sediment crust)

Section 2: 2 to 5 inches

Section 3: 5 to 10 inches

Section 4: 10 to 15 inches

Each Section of the nine cores was homogenized to create four samples to represent the four different depths. The four samples were separated according to the analyses required, deposited into wide-mouth glass jars, and sent to the appropriate laboratory for analyses, accompanied by the chain-of-custody forms. Each sample was analyzed for disposal purposes.

After the sampling was completed, the top 2 inches i.e., the sediment crust, was removed and drummed at each site. The sand in the filter was then raked to flatten the surface. The drums will remain on site until the analytical results indicate the type of disposal required.

4/9/01: Conducted post-storm site inspection following the storm event on April 7, 2001.

5/1/01: Conducted monthly/post-storm site inspection following the storm event on April 20, 2001. The sand filter was inspected for sediment accumulation in the sedimentation chamber, as per the MID, and the sampling protocols. The area of deposited sediments in the BMP was determined by superimposing a square meter grid over the floor of the sedimentation chamber. Using a x-y origin, the floor was separated into square meter cells and the sampling area was determined. No square meter cell required sampling, however, as none contained 50% or more of deposited sediments with an average depth of at least 1 inch.

Vector Activities

None this period.

Issues/Solutions

None this period.

Foothill Maintenance Station (Site ID 74203)

Monitoring/Sampling Activities

2/24-28/01: Forecast predicted rain to produce 1.5 – 2.5 inch of rainfall, with a 100% probability of occurrence. Storm event produced 3.23 inches of rainfall. No team was mobilized to the sand filter. Only the CDS sites were sampled during the February 24-28, 2001 storm event, since they were the only sites to receive less than 0.10 inches of rainfall on February 23, 2001.

3/2/01: Removed block of wood and fixed handle on lid of sampling chamber. Repaired latch on door of the influent enclosure.

3/5-7/01: Forecast predicted rain to produce 4 – 8 inches of rainfall, with a 100% probability of occurrence. Storm event produced 0.71 inches of rainfall. A team was mobilized and composite and grab samples were collected at both the influent and the effluent locations and sent to the laboratory for analysis. Influent and effluent samples met minimum percent storm capture and minimum number of aliquots, and enough volume was collected to run the entire analytical suite. Empirical observations were made. The sand filter took 75 hours 25 minutes to drain, and the loading rate was below the 9ft per day threshold specified in the *Maintenance Indicator Document* (MID). Drain time is based on the difference between the end of effluent to end of influent. Loading rate is estimated based on discharge volume over the entire sand filter surface area over the drain time. Thus, maintenance of the sand filter was required in accordance with the MID.

4/7/01: Forecast predicted rain to produce 0.25 – 1 inch of rainfall, with a 70% probability of occurrence. Storm event produced 1.12 inch of rainfall. A team was mobilized and composite samples were collected at both the influent and the effluent locations and sent to the laboratory for analysis. Influent and effluent samples met minimum percent storm capture and minimum number of aliquots, and enough volume was collected to run the entire analytical suite. Empirical observations were made, but no grab samples were collected. The drain time improved during this storm, to 65 hours 20 minutes, following the maintenance conducted on April 2-3, 2001, when the top 2 inches of sediment were removed from the sand filter. The rainfall amount was higher, yet the drainage time was faster than the March 5-7, 2001 storm event. Additionally, empirical observations recorded that standing water was not observed on the sand filter during this storm. However, following the storm, the standpipe orifices were found to be blocked, and were cleared while the site was still draining. This visibly improved the drainage rate.

4/16/01: Trouble shot phone equipment.

4/20/01: Forecast predicted rain to produce up to 0.50 inch of rainfall, with a 70% probability of occurrence. Storm event produced 0.77 inch of rainfall A team was mobilized and composite samples were collected at both the influent and the effluent locations and sent to the laboratory for analysis. Influent and effluent samples met minimum percent storm capture and minimum number of aliquots, and enough volume was collected to run the entire analytical suite. Empirical observations were made, but no grab samples were collected. One inch depth of standing water was observed on top of approximately one quarter of the sand filter area. Drainage from the sedimentation chamber was observed to be slow, but was improved by clearing the orifices in the standpipes.

Operation and Maintenance

3/1/01: Conducted monthly/post-storm site inspection following the storm event on February 24-28, 2001. Removed debris that was blocking the upper three orifices of the standpipe located in the sedimentation basin.

3/9/01: Conducted post-storm site inspection following the storm event on March 5-7, 2001.

4/3/01: Conducted monthly site inspection. Maintenance was performed to improve drainage times. The first step was to sample the surface sediment and filter bed materials from within the Sand Filter. Nine cores were collected from locations on an equilateral grid, superimposed over the sand filter, to quantify sediment accumulation and quality data. The cores were driven 15 inches below the sediment surface and recovered. A log was used to document depth of penetration and recovery, location, and lithological characteristics. Each core was then subdivided into four sections as follows:

Section 1: 0-2 inches (i.e., mostly sediment crust)

Section 2: 2 to 5 inches

Section 3: 5 to 10 inches

Section 4: 10 to 15 inches

Each Section of the nine cores was homogenized to create four samples to represent the four different depths. The four samples were separated according to the analyses required, deposited into wide-mouth glass jars, and sent to the appropriate laboratory for analyses, accompanied by the chain-of-custody forms. Each sample was analyzed for disposal purposes.

After the sampling was completed, the top 2 inches i.e., the sediment crust, was removed and drummed at each site. The sand in the filter was then raked to flatten the surface. The drums will remain on site until the analytical results indicate the type of disposal required.

4/9/01: Conducted post-storm site inspection following the storm event on April 7, 2001. Cleared the standpipe orifices to improve drainage.

5/1/01: Conducted monthly/post-storm site inspection following the storm event on April 20, 2001. The sand filter was inspected for sediment accumulation in the sedimentation chamber, as per the MID, and the sampling protocols. The area of deposited sediments in the BMP was determined by superimposing a square meter grid over the floor of the sedimentation chamber. Using a x-y origin, the floor was separated into square meter cells and the sampling area was determined. No square meter cell required sampling, however, as none contained 50% or more of deposited sediments with an average depth of at least 1 inch.

Vector Activities

None this period.

Issues/Solutions

None this period.

Termination Park and Ride (Site ID 74204)

Monitoring/Sampling Activities

2/24-28/01: Forecast predicted rain to produce 1.5 – 2.5 inch of rainfall, with a 100% probability of occurrence. Storm event produced 3.86 inches of rainfall. No team was mobilized to the sand filter. Only the CDS sites were sampled during the February 24-28, 2001 storm event, since they were the only sites to receive less than 0.10 inches of rainfall on February 23, 2001.

3/5-7/01: Forecast predicted rain to produce 4 – 8 inches of rainfall, with a 100% probability of occurrence. Storm event produced 0.57 inches of rainfall. A team was mobilized and composite samples were collected at both the influent and the effluent locations and sent to the laboratory for analysis. Influent and

effluent samples met minimum percent storm capture and minimum number of aliquots, and enough volume was collected to run the entire analytical suite. Empirical observations were made, but no grab samples were collected. Although the sand filter took 41 hours 16 minutes to drain, the loading rate was below the 9ft per day threshold specified in the *Maintenance Indicator Document* (MID). Drain time is based on the difference between the end of effluent to end of influent. Loading rate is estimated based on discharge volume over the entire sand filter surface area over the drain time. Also, the MID thresholds are for 1 inch storms, hence with higher rainfall, the sand filter was likely to take more than 48 hours to drain. Thus, maintenance of the sand filter was required in accordance with the MID.

4/7/01: Forecast predicted rain to produce 0.25 – 1 inch of rainfall, with a 70% probability of occurrence. Storm event produced 0.75 inch of rainfall. A team was mobilized and composite samples were collected at both the influent and the effluent locations and sent to the laboratory for analysis. Influent and effluent samples met minimum percent storm capture and minimum number of aliquots, and enough volume was collected to run the entire analytical suite. Empirical observations were made, but no grab samples were collected. The drain time improved during this storm, to 40 hours 30 minutes, following the maintenance conducted on April 2-3, 2001, when the top 2 inches of sediment were removed from the sand filter. The rainfall amount was higher, yet the drainage time was faster than the March 5-7, 2001 storm event. Additionally, empirical observations recorded that standing water was not observed on the sand filter during this storm. The sand filter bypassed during this event

4/16/01: Trouble shot phone equipment.

4/20/01: Forecast predicted rain to produce up to 0.50 inch of rainfall, with a 70% probability of occurrence. Storm event produced 0.40 inch of rainfall. No team was mobilized to the sand filter.

Operation and Maintenance

3/1/01: Conducted monthly/post-storm site inspection following the storm event on February 24-28, 2001.

3/8/01: Conducted post-storm site inspection following the storm event on March 5-7, 2001.

4/2/01: Conducted monthly site inspection. Maintenance was performed to improve drainage times. The first step was to sample the surface sediment and filter bed materials from within the Sand Filter. Nine cores were collected from locations on an equilateral grid, superimposed over the sand filter, to quantify sediment accumulation and quality data. The cores were driven 15 inches below the sediment surface and recovered. A log was used to document depth of penetration and recovery, location, and lithological characteristics. Each core was then subdivided into four sections as follows:

Section 1: 0-2 inches (i.e., mostly sediment crust)

Section 2: 2 to 5 inches

Section 3: 5 to 10 inches

Section 4: 10 to 15 inches

Each Section of the nine cores was homogenized to create four samples to represent the four different depths. The four samples were separated according to the analyses required, deposited into wide-mouth glass jars, and sent to the appropriate laboratory for analyses, accompanied by the chain-of-custody forms. Each sample was analyzed for disposal purposes.

After the sampling was completed, the top 2 inches i.e., the sediment crust, was removed and drummed at each site. The sand in the filter was then raked to flatten the surface. The drums will remain on site until the analytical results indicate the type of disposal required.

4/9/01: Conducted post-storm site inspection following the storm event on April 7, 2001.

4/26/01: The pump was observed not to be functioning properly following the April 20, 2001 storm event, hence the pump was inspected and the breaker was found to be tripped. The breaker was reset and the pump started functioning properly again.

5/1/01: Conducted monthly/post-storm site inspection following the storm event on April 20, 2001. The sand filter was inspected for sediment accumulation in the sedimentation chamber, as per the MID, and the sampling protocols. The area of deposited sediments in the BMP was determined by superimposing a square meter grid over the floor of the sedimentation chamber. Using a x-y origin, the floor was separated into square meter cells and the sampling area was determined. No square meter cell required sampling, however, as none contained 50% or more of deposited sediments with an average depth of at least 1 inch.

Vector Activities

None this period.

Issues/Solutions

None this period.

Via Verde Park and Ride (Site ID 74206)

Monitoring/Sampling Activities

2/24-28/01: Forecast predicted rain to produce 1.5 – 2.5 inch of rainfall, with a 100% probability of occurrence. Storm event produced 2.02 inches of rainfall. No team was mobilized to the MCTT as it was offline due to the leak fix.

3/5-7/01: Forecast predicted rain to produce 4 – 8 inches of rainfall, with a 100% probability of occurrence. Storm event produced 0.51 inches of rainfall. No team was mobilized to the MCTT as it was offline due to the leak fix.

3/20/01: Reinstalled bubbler tubing to monitor the water level in the sedimentation basin, following the leak fix.

4/5/01: Troubleshot phone equipment.

4/7/01: Forecast predicted rain to produce 0.25 – 1 inch of rainfall, with a 70% probability of occurrence. Storm event produced 0.85 inch of rainfall. A team was mobilized and composite samples were collected at both the influent and the effluent locations and sent to the laboratory for analysis. Influent and effluent samples met minimum percent storm capture and minimum number of aliquots, and enough volume was collected to run the entire analytical suite. Empirical observations were made, but no grab samples were collected. The site did not visibly appear to be leaking during this storm event, which was the first one sampled at this site since the leak fix.

4/20/01: Forecast predicted rain to produce up to 0.50 inch of rainfall, with a 70% probability of occurrence. Storm event produced 0.84 inch of rainfall. A team was mobilized and composite samples were collected at both the influent and the effluent locations and sent to the laboratory for analysis. Influent and effluent samples met minimum percent storm capture and minimum number of aliquots, and enough volume was collected to run the entire analytical suite. Empirical observations were made, but no grab samples were collected.

Operation and Maintenance

2/26-27/01: Installed pump, discharge pipe and wiring for the transfer pump through the penetrations of the new MCTT cover. Assembled and installed new overflow pipe through the new hole cut between the sedimentation and filter basins. Picked up trash and construction debris from the installation of the MCTT cover.

3/1/01: Conducted monthly/post-storm site inspection following the storm event on February 24-28, 2001. Trouble shot transfer pump. Determined that the black colored sandblasting sand was fouling the transfer pump. The transfer pump was operational after the sand was removed and drummed.

3/6/01: Sampled the plastic packing balls previously removed from the grit chamber, the sludge removed from the sedimentation chamber prior to the leak fix, and the sandblast material, all of which were stored onsite in 55-gallon drums.

3/8/01: Conducted post-storm site inspection following the storm event on March 5-7, 2001.

3/15/01: Pumped water out of grit chamber in preparation for leak fix in pipe to sedimentation chamber.

3/17/01: SanCon Technologies slip-lined the pipe between the grit chamber and the sedimentation chamber to repair the leak.

3/19-20/01: The settling tubes were reinstalled, removal of the sandblast material from the top of the filter fabric in the filter basin was completed, vertical cable guides for the absorbent socks were installed and litter and debris was swept up within the BMP area. Finally, the plug was removed and returned to the vendor and the site was put back online.

3/26/01: Checked the site for tires and open control box which had been reported to Caltrans. No tires were observed. The control box was closed.

4/10/01: Conducted monthly/post-storm site inspection following the storm event on April 7, 2001. Picked up trash and debris.

5/9-11/01: Conducted monthly site inspection. Drained the sedimentation chamber dry following the end of the 2000/2001 wet season. Removed trash and debris.

Vector Activities

None this period.

Issues/Solutions

None this period.

Lakewood Park and Ride (Site ID 74206)

Monitoring/Sampling Activities

2/24-28/01: Forecast predicted rain to produce 1.5 – 2.5 inch of rainfall, with a 100% probability of occurrence. Storm event produced 3.65 inches of rainfall. No team was mobilized to the MCTT. Only the CDS sites were sampled during the February 24-28, 2001 storm event, since they were the only sites to receive less than 0.10 inches of rainfall on February 23, 2001.

3/5-7/01: Forecast predicted rain to produce 4 – 8 inches of rainfall, with a 100% probability of occurrence. Storm event produced 0.58 inches of rainfall. No team was mobilized to the MCTT.

4/7/01: Forecast predicted rain to produce 0.25 – 1 inch of rainfall, with a 70% probability of occurrence. Storm event produced 0.46 inch of rainfall. No team was mobilized to the MCTT.

4/20/01: Forecast predicted rain to produce up to 0.50 inch of rainfall, with a 70% probability of occurrence. Storm event produced 0.26 inch of rainfall. No team was mobilized to the MCTT.

Operation and Maintenance

2/26/01: Installed wiring for the transfer pump through the penetrations of the new MCTT cover. Picked up trash and construction debris from the installation of the MCTT cover.

3/1/01: Conducted monthly/post-storm site inspection following the storm event on February 24-28, 2001.

3/2/01: Transferred water from the sedimentation basin to the filter basin, following the storm event on February 24-28, 2001.

3/6/01: Sampled the plastic packing balls previously removed from the grit chamber and stored onsite in 55-gallon drums.

3/8/01: Conducted post-storm site inspection following the storm event on March 5-7, 2001. Transferred water from the sedimentation basin to the filter basin, following the storm event on March 5-7, 2001.

3/16/01: Picked up trash and debris. Removed rocks from the top of the MCTT cover that someone had thrown onto it. Removed weeds from absorbent socks.

3/22/01: Replaced the mosquito netting covering the sump. Added some additional discharge pipe in the filter basin from the transfer pump. Tightened grommets for the electrical wires that perforate the MCTT cover.

4/12/01 Conducted monthly/post-storm site inspection following the storm event on April 7, 2001. Transferred water from the sedimentation basin to the filter basin.

4/23/01: Transferred water from the sedimentation basin to the filter basin, following the storm event on April 20, 2001.

5/14/01: Conducted monthly site inspection. Drained the sedimentation chamber dry following the end of the 2000/2001 wet season.

Vector Activities

None this period.

Issues/Solutions

None this period.

Altadena Maintenance Station Bio Strip and Infiltration Trench (Site ID 73211 a, b)

Monitoring/Sampling Activities

2/24-28/01: Forecast predicted rain to produce 1.5 – 2.5 inch of rainfall, with a 100% probability of occurrence. Storm event produced 3.19 inches of rainfall. No team was mobilized to the strip/trench. Only the CDS sites were sampled during the February 24-28, 2001 storm event, since they were the only sites to receive less than 0.10 inches of rainfall on February 23, 2001.

3/5-7/01: Forecast predicted rain to produce 4 – 8 inches of rainfall, with a 100% probability of occurrence. Storm event produced 1.25 inches of rainfall. No team was mobilized to the strip/trench.

4/7/01: Forecast predicted rain to produce 0.25 – 1 inch of rainfall, with a 70% probability of occurrence. Storm event produced 1.40 inch of rainfall. A team was mobilized and composite samples were collected at both the influent and the effluent locations and sent to the laboratory for analysis. Influent and effluent samples met minimum percent storm capture and minimum number of aliquots, and enough volume was collected to run the entire analytical suite. Empirical observations were made, but no grab samples were collected.

4/20/01: Forecast predicted rain to produce up to 0.50 inch of rainfall, with a 70% probability of occurrence. Storm event produced 0.80 inch of rainfall A team was mobilized and composite samples were collected at both the influent and the effluent locations and sent to the laboratory for analysis. Influent and effluent samples met minimum percent storm capture and minimum number of aliquots, and enough volume was collected to run the entire analytical suite. Empirical observations were made, but no grab samples were collected.

Operations and Maintenance

3/2/01: Conducted monthly/post-storm site inspection. Drained influent spreader ditch of standing water following the storm event on February 24-28, 2001. Water was drained through a StreamGuard.

3/8/01: Conducted post-storm site inspection. Drained influent spreader ditch of standing water following the storm event on March 5-7, 2001. Water was drained through a StreamGuard.

4/12/01 Conducted monthly/post-storm site inspection following the storm event on April 7, 2001. Drained influent spreader ditch of standing water. Water was drained through a StreamGuard.

4/23/01: Removed weeds greater than 12 inches tall and trash and debris.

4/24/01: Conducted post-storm inspection. Drained influent spreader ditch of standing water following the storm event on April 20, 2001. Water was drained through a StreamGuard. Removed trash and debris from the strip. Removed sediment from the area in the trench immediately below the influent spreader ditch drain of the strip.

5/2/01: Removed spreader ditch plug following the end of the 2000/2001 wet season, to allow drainage for summer storms.

5/9/01: Conducted monthly site inspection.

Vector Activities

None this period.

Issues / Solutions

None this period.

Foothill Maintenance Station Drain Inlet Insert (StreamGuard and Fossil Filter Inserts) (Site ID 73216 a, b)

Monitoring/Sampling Activities

2/24-28/01: Forecast predicted rain to produce 1.5 – 2.5 inch of rainfall, with a 100% probability of occurrence. Storm event produced 3.23 inches of rainfall. A team was mobilized to make empirical observations of the DIIs.

3/5-7/01: Forecast predicted rain to produce 4 – 8 inches of rainfall, with a 100% probability of occurrence. Storm event produced 0.76 inches of rainfall. A team was mobilized to make empirical observations of the DIIs.

4/7/01: Forecast predicted rain to produce 0.25 – 1 inch of rainfall, with a 70% probability of occurrence. Storm event produced 1.12 inch of rainfall. A team was mobilized to make empirical observations of the DIIs. Flow bypass occurred at the Fossil Filter site.

4/20/01: Forecast predicted rain to produce up to 0.50 inch of rainfall, with a 70% probability of occurrence. Storm event produced 0.78 inch of rainfall A team was mobilized to make empirical observations of the DIIs. Flow bypass occurred at the Fossil Filter and StreamGuard sites.

Operations and Maintenance

3/1/01: Conducted monthly/post-storm/pre-storm site inspection of DIIs following the storm event on February 24-28, 2001 and prior to the event on March 5-7, 2001. Trash and debris were removed from the Fossil Filter DII.

3/6/01: Conducted post-storm site inspection of DIIs following the storm event on March 5-7, 2001.

4/3/01: Conducted monthly/pre-storm site inspection of DIIs prior to the storm event on April 7, 2001. Trash and debris were removed from the Fossil Filter DII.

4/9/01: Conducted post-storm site inspection of DIIs following the storm event on April 7, 2001. Trash and debris were removed from the Fossil Filter DII.

4/20/01: Conducted pre-storm site inspection of DIIs prior to the storm event on April 20, 2001. Trash and debris were removed from the Fossil Filter DII.

5/1/01: Conducted monthly site inspection. All drain inlet insert materials were removed and sent to the laboratory for TRPH and total metals analyses, following the end of the 2000/2001 wet season.

Vector Activities

None this period.

Issues / Solutions

None this period.

Las Flores Maintenance Station Drain Inlet Insert (StreamGuard and Fossil Filter Inserts) (Site ID 73217 a, b)

Monitoring/Sampling Activities

2/24-28/01: Forecast predicted rain to produce 1.5 – 2.5 inch of rainfall, with a 100% probability of occurrence. Storm event produced 2.91 inches of rainfall. A team was mobilized to make empirical observations of the DIIs.

3/2/01: Repaired rubber berm around the sampling vault at the StreamGuard location.

3/5-7/01: Forecast predicted rain to produce 4 – 8 inches of rainfall, with a 100% probability of occurrence. Storm event produced 3.30 inches of rainfall. A team was mobilized to make empirical observations of the DIIs.

4/7/01: Forecast predicted rain to produce 0.25 – 1 inch of rainfall, with a 70% probability of occurrence. Storm event produced 1.09 inch of rainfall. A team was mobilized to make empirical observations of the DIIs. Flow bypass occurred at the Fossil Filter site.

4/20/01: Forecast predicted rain to produce up to 0.50 inch of rainfall, with a 70% probability of occurrence. Storm event produced 0.43 inch of rainfall A team was mobilized to make empirical observations of the DIIs. Flow bypass occurred at the Fossil Filter and StreamGuard sites.

Operations and Maintenance

3/2/01: Conducted monthly/post-storm/pre-storm site inspection of DIIs following the storm event on February 24-28, 2001 and prior to the event on March 5-7, 2001.

3/12/01: Conducted post-storm site inspection of DIIs following the storm event on March 5-7, 2001. Trash, sediment and debris were removed from the Fossil Filter DII.

4/6/01: Conducted monthly/pre-storm site inspection of DIIs prior to the storm event on April 7, 2001.

4/11/01: Conducted post-storm site inspection of DIIs following the storm event on April 7, 2001. Trash, sediment and debris were removed from the Fossil Filter DII.

4/20/01: Conducted pre-storm site inspection of DIIs prior to the storm event on April 20, 2001.

5/1/01: Conducted monthly site inspection. All drain inlet insert materials were removed and sent to the laboratory for TRPH and total metals analyses, following the end of the 2000/2001 wet season.

Vector Activities

None this period.

Issues / Solutions

None this period

Rosemead Maintenance Station Drain Inlet Insert (StreamGuard and Fossil Filter Inserts) (Site ID 73218 a, b)

Monitoring/Sampling Activities

2/24-28/01: Forecast predicted rain to produce 1.5 – 2.5 inch of rainfall, with a 100% probability of occurrence. Storm event produced 3.49 inches of rainfall. A team was mobilized to make empirical observations of the DIIs.

3/5-7/01: Forecast predicted rain to produce 4 – 8 inches of rainfall, with a 100% probability of occurrence. Storm event produced 0.42 inches of rainfall. A team was mobilized to make empirical observations of the DIIs.

4/7/01: Forecast predicted rain to produce 0.25 – 1 inch of rainfall, with a 70% probability of occurrence. Storm event produced 1.10 inch of rainfall. A team was mobilized to make empirical observations of the DIIs. Flow bypass occurred at the Fossil Filter site.

4/20/01: Forecast predicted rain to produce up to 0.50 inch of rainfall, with a 70% probability of occurrence. Storm event produced 0.80 inch of rainfall A team was mobilized to make empirical observations of the DIIs. Flow bypass occurred at the StreamGuard site.

Operations and Maintenance

3/1/01: Conducted monthly/post-storm/pre-storm site inspection of DIIs following the storm event on February 24-28, 2001 and prior to the event on March 5-7, 2001. Trash and debris were removed from the Fossil Filter DII.

3/8/01: Conducted post-storm site inspection of DIIs following the storm event on March 5-7, 2001. Trash, sediment and debris were removed from the Fossil Filter DII.

4/3/01: Conducted monthly/pre-storm site inspection of DIIs prior to the storm event on April 7, 2001. Trash, sediment and debris were removed from the Fossil Filter DII.

4/11/01: Conducted post-storm site inspection of DIIs following the storm event on April 7, 2001.. Sediment was removed from the Fossil Filter DII.

4/20/01: Conducted pre-storm site inspection of DIIs prior to the storm event on April 20, 2001. Trash and debris were removed from the Fossil Filter DII.

5/1/01: Conducted monthly site inspection. All drain inlet insert materials were removed and sent to the laboratory for TRPH and total metals analyses, following the end of the 2000/2001 wet season.

Vector Activities

None this period.

Issues / Solutions

None this period.

I-605/SR-91 Interchange Bio Strip and Swale (Site ID 73222 a, b)

Monitoring/Sampling Activities

Strip:

2/24-28/01: Forecast predicted rain to produce 1.5 – 2.5 inch of rainfall, with a 100% probability of occurrence. Storm event produced 2.94 inches of rainfall. No team was mobilized to the strip. Only the CDS sites were sampled during the February 24-28, 2001 storm event, since they were the only sites to receive less than 0.10 inches of rainfall on February 23, 2001.

3/5-7/01: Forecast predicted rain to produce 4 – 8 inches of rainfall, with a 100% probability of occurrence. Storm event produced 0.69 inches of rainfall. No team was mobilized to the strip.

4/7/01: Forecast predicted rain to produce 0.25 – 1 inch of rainfall, with a 70% probability of occurrence. Storm event produced 0.58 inch of rainfall. A team was mobilized and composite samples were collected at both the influent and the effluent locations and sent to the laboratory for analysis. Influent and effluent samples met minimum percent storm capture but did not meet minimum number of aliquots. However, enough volume was collected to run the entire analytical suite. Empirical observations were made, but no grab samples were collected.

4/20/01: Forecast predicted rain to produce up to 0.50 inch of rainfall, with a 70% probability of occurrence. Storm event produced 0.41 inch of rainfall. No team was mobilized to the strip.

Swale:

2/24-28/01: Forecast predicted rain to produce 1.5 – 2.5 inch of rainfall, with a 100% probability of occurrence. Storm event produced 2.94 inches of rainfall. A

team was mobilized to make empirical observations of the swale. Hydraulic residence time testing was completed, with three successful runs achieved.

3/5-7/01: Forecast predicted rain to produce 4 – 8 inches of rainfall, with a 100% probability of occurrence. Storm event produced 0.69 inches of rainfall. No team was mobilized to the swale.

4/7/01: Forecast predicted rain to produce 0.25 – 1 inch of rainfall, with a 70% probability of occurrence. Storm event produced 0.58 inch of rainfall. A team was mobilized and an influent sample was collected and submitted to the laboratory. Not enough effluent sample was collected due to low flow. Influent sample met minimum percent storm capture and minimum number of aliquots, and enough volume was collected to run the entire analytical suite. Empirical observations were made, but no grab samples were collected.

4/20/01: Forecast predicted rain to produce up to 0.50 inch of rainfall, with a 70% probability of occurrence. Storm event produced 0.41 inch of rainfall. No team was mobilized to the swale.

Operations and Maintenance

Strip:

2/27/01: Removed trash and debris, and backfilled and compacted gopher holes.

3/1/01: Conducted monthly/post-storm site inspection following the storm event on February 24-28, 2001.

4/12/01 Conducted monthly/post-storm site inspection following the storm event on April 7, 2001.

4/19-20/01: Removed weeds greater than 12 inches tall, backfilled and compacted gopher burrows, and removed trash and debris.
4/25/01: Completed removal of weeds.
5/8/01: Conducted monthly site inspection.

Swale:

2/27/01: Backfilled and compacted gopher holes.

3/1/01: Conducted monthly/post-storm site inspection following the storm event on February 24-28, 2001.

4/12/01 Conducted monthly/post-storm site inspection following the storm event on April 7, 2001.

4/17/01: Removed weeds greater than 12 inches tall and woody vegetation, backfilled and compacted gopher burrows, and removed trash and debris.
5/8/01: Conducted monthly site inspection.

Vector Activities

None this period.

Issues / Solutions

None this period.

Cerritos Maintenance Station Bio Swale (Site ID 73223)

Monitoring/Sampling Activities

2/24-28/01: Forecast predicted rain to produce 1.5 – 2.5 inch of rainfall, with an 100% probability of occurrence. Storm event produced 2.94 inches of rainfall. No team was mobilized to the swale. Only the CDS sites were sampled during the February 24-28, 2001 storm event, since they were the only sites to receive less than 0.10 inches of rainfall on February 23, 2001.

3/5-7/01: Forecast predicted rain to produce 4 – 8 inches of rainfall, with a 100% probability of occurrence. Storm event produced 0.69 inches of rainfall. No team was mobilized to the swale.

4/7/01: Forecast predicted rain to produce 0.25 – 1 inch of rainfall, with a 70% probability of occurrence. Storm event produced 0.58 inch of rainfall A team was mobilized and composite samples were collected at both the influent and the effluent locations and sent to the laboratory for analysis. Influent and effluent samples met minimum percent storm capture and minimum number of aliquots, and enough volume was collected to run the entire analytical suite. Empirical observations were made, but no grab samples were collected. Flow bypass occurred through gopher holes.

4/20/01: Forecast predicted rain to produce up to 0.50 inch of rainfall, with a 70% probability of occurrence. Storm event produced 0.41 inch of rainfall. No team was mobilized to the swale.

Operations and Maintenance

3/1/01: Conducted monthly/post-storm site inspection following the storm event on February 24-28, 2001.

4/12/01 Conducted monthly/post-storm site inspection following the storm event on April 7, 2001.

4/17/01: Removed weeds greater than 12 inches tall and woody vegetation, backfilled and compacted gopher burrows, and removed trash and debris.

5/8/01: Conducted monthly site inspection.

Vector Activities

None this period.

Issues / Solutions

None this period.

I-5/I-605 Bio Swale (Site ID 73224)

Monitoring/Sampling Activities

2/24-28/01: Forecast predicted rain to produce 1.5 – 2.5 inch of rainfall, with an 100% probability of occurrence. Storm event produced 3.83 inches of rainfall. No team was mobilized to the swale. Only the CDS sites were sampled during the February 24-28, 2001 storm event, since they were the only sites to receive less than 0.10 inches of rainfall on February 23, 2001.

3/5-7/01: Forecast predicted rain to produce 4 – 8 inches of rainfall, with a 100% probability of occurrence. Storm event produced 0.67 inches of rainfall. No team was mobilized to the swale.

4/7/01: Forecast predicted rain to produce 0.25 – 1 inch of rainfall, with a 70% probability of occurrence. Storm event produced 0.79 inch of rainfall. A team was mobilized and composite samples were collected at both the influent and the effluent locations and sent to the laboratory for analysis. Influent and effluent samples met minimum percent storm capture but only the influent met minimum number of aliquots. However, enough volume was collected at both locations to run the entire analytical suite. Empirical observations were made, but no grab samples were collected.

4/20/01: Forecast predicted rain to produce up to 0.50 inch of rainfall, with a 70% probability of occurrence. Storm event produced 0.25 inch of rainfall. No team was mobilized to the swale.

Operations and Maintenance

3/2/01: Conducted monthly/post-storm site inspection following the storm event on February 24-28, 2001.

4/11/01 Conducted monthly/post-storm site inspection following the storm event on April 7, 2001. Removed trash and debris.

4/18-19/01: Removed weeds greater than 12 inches tall, backfilled and compacted gopher burrows, and removed trash and debris.

5/8/01: Conducted monthly site inspection.

Vector Activities

None this period.

Issues / Solutions

None this period.

I-605/Carson & Del Amo Bio Swale (Site ID 73225)

Monitoring/Sampling Activities

2/24-28/01: Forecast predicted rain to produce 1.5 – 2.5 inch of rainfall, with an 100% probability of occurrence. Storm event produced 2.94 inches of rainfall. A team was mobilized to make empirical observations of the swale. Hydraulic residence time testing was completed, with three successful runs achieved.

3/5-7/01: Forecast predicted rain to produce 4 – 8 inches of rainfall, with a 100% probability of occurrence. Storm event produced 0.69 inches of rainfall. No team was mobilized to the swale.

4/7/01: Forecast predicted rain to produce 0.25 – 1 inch of rainfall, with a 70% probability of occurrence. Storm event produced 0.58 inch of rainfall. A team was mobilized and an influent sample was collected and submitted to the laboratory. The effluent sampler failed and no effluent sample was collected. Influent sample met minimum percent storm capture and minimum number of aliquots, and enough volume was collected to run the entire analytical suite. Empirical observations were made, but no grab samples were collected.

4/20/01: Forecast predicted rain to produce up to 0.50 inch of rainfall, with a 70% probability of occurrence. Storm event produced 0.41 inch of rainfall. No team was mobilized to the swale.

Operations and Maintenance

3/1/01: Conducted monthly/post-storm site inspection following the storm event on February 24-28, 2001.

4/12/01 Conducted monthly/post-storm site inspection following the storm event on April 7, 2001.

4/18/01: Removed weeds greater than 12 inches tall and removed trash and debris.
5/8/01: Conducted monthly site inspection.

Vector Activities

None this period.

Issues / Solutions

None this period.

Summary of Target and Successfully Sampled Storms Per Site

Location	BMP Type	Monitoring Consultant	Operational (yes/no)	Operational Date	Target Number of Storms	Successfully Sampled Storms (PRELIMINARY)			
						1998-1999	1999-2000	2000-2001	Total[11]
District 7									
I-605/SR-91	IB	MW/Law	Yes	4/9/99	**4**	0	8[1]	7[1]	**15[1]**
I-210 East of Orcas	CDS	MW/Law	Yes	8/10/00	**8**	0	0	4	**4**
I-210 East of Filmore	CDS	MW/Law	Yes	8/10/00	**8**	0	0	7	**7**
I-5/I-605	EDB	MW/Law	Yes	2/26/99	**10**	2	4	7	**13**
I-605/SR-91	EDB	MW/Law	Yes	2/22/99	**10**	3	3[3]	6[4]	**12**
Paxton P & R	MF	MW/Law	No	Fall 2001	**0**	0	0	0	**0**
Metro MS	MCTT	MW/Law	No	Fall 2001	**0**	0	0	0	**0**
Alameda MS	OWS	MW/Law	Yes	5/17/99	**8**	0	4	5	**9**
Eastern MS	MF	MW/Law	Yes	2/15/99	**8**	1	4	5	**10**
Foothill MS	MF	MW/Law	Yes	3/8/99	**8**	2	4	6	**12**
Termination P & R	MF	MW/Law	Yes	5/17/99	**8**	0	4	4	**8**
Via Verde P & R	MCTT	MW/Law	Yes	5/17/99	**8**	0	4[5]	4	**8**
Lakewood P & R	MCTT	MW/Law	Yes	5/17/99	**8**	0	4[5]	6	**10**
Altadena	Bio Strip	MW/Law	Yes	10/1/99	**8**	0	6[3]	6	**12**
	Infiltration Trench	MW/Law	Yes	10/1/99	**8**	0	6[1]	7[1]	**13[1]**
Foothill MS	DII north- SG Insert	MW/Law	Yes	1/22/99	**8**	0[2]	7	4	**11**
	DII south- FF Insert	MW/Law	Yes	1/22/99	**8**	0[2]	7	4	**11**
Las Flores MS	DII north-SG Insert	MW/Law	Yes	1/22/99	**8**	0[2]	5	4	**9**
	DII south-FF Insert	MW/Law	Yes	1/22/99	**8**	0[2]	5	5	**10**
Rosemead MS	DII north-FF Insert	MW/Law	Yes	1/22/99	**8**	0[2]	5	5[3]	**10**
	DII south-SG Insert	MW/Law	Yes	1/22/99	**8**	0[2]	5	5	**10**
I-605/SR-91	Bio Strip	MW/Law	Yes	10/1/99	**8**	0	3[4]	5[4]	**8**
	Bio Swale	MW/Law	Yes	10/1/99	**8**	0	3[4]	6[6]	**9**
Cerritos MS	Bio Swale	MW/Law	Yes	10/1/99	**8**	0	4	6[7]	**10**
I-5/I-605	Bio Swale	MW/Law	Yes	10/1/99	**8**	0	4	5[7]	**9**
I-605/ Del Amo	Bio Swale	MW/Law	Yes	10/1/99	**8**	0	2	6[3,4,8]	**8**
District 11									
I-5/SR-56	EDB	KLI	Yes	1/24/99	**12**	4	5	7[3]	**16**
I-15/SR-78	EDB	KLI	Yes	1/24/99	**12**	4	5	10	**19**
I-5/La Costa (West)	IB	KLI	Yes	1/24/99	**12**	8[1]	13[1]	9[1]	**30[1]**
I-5/La Costa (East)	WB	KLI	Yes	10/1/99	**8**	0	5[3]	8[3]	**13**
I-5/Manchester (East)	EDB	KLI	Yes	10/1/99	**8**	0	4	10	**14**
Kearney Mesa MS	StormFilter	KLI	Yes	10/1/99	**12**	3	6[3]	9	**18**
Escondido MS	MF	KLI	Yes	2/16/99	**12**	3	5	8[3]	**16**
La Costa P & R	MF	KLI	Yes	2/16/99	**12**	3	5[3]	8[3]	**16**
SR-78/I-5 P& R	MF	KLI	Yes	2/26/99	**12**	2	6[9]	11[3]	**19**
Melrose Ave/SR-78	Bio Swale	KLI	Yes	3/1/99	**12**	0	2[7]	8[10,3]	**10**
I-5 Palomar Airport Rd	Bio Swale	KLI	Yes	10/1/99	**12**	0	3	6	**9**
Carlsbad MS	Bio Strip	KLI	Yes	10/1/99	**12**	0	3	7	**10**
	Infiltration Trench	KLI	Yes	10/1/99	**12**	8[1]	11[1]	10[1]	**29[1]**

[1] Empirical Observations and runoff testing from influent only. No runoff effluent; groundwater or vadose zone samples only.
[2] 1998/1999 DII data was disqualified.
[3] One storm did not meet minimum number of aliquots but did meet percent storm capture.
[4] During one storm, influent sample collected; no effluent flow, thus no effluent sampled.
[5] One storm did not meet percent storm capture but did not meet minimum number of aliquots.
[6] During four storms, influent samples collected; no or insufficient effluent flow, thus no effluent sampled.
[7] During two storms, influent samples collected; no or insufficient effluent flow, thus no effluent sampled.
[8] During one storm, effluent sampler failed, hence no effluent sample collected.
[9] Two storms did not meet minimum number of aliquots but did meet percent storm capture.
[10] During three storms, influent samples collected; no or insufficient effluent flow, thus no effluent sampled.
[11] Total monitoring storms include events where : (1) minimum number of aliquots were not met but did meet percent storm capture; and (2) minimum storm capture not met, but did meet minimum number of aliquots.

District 11 BMP Pilot Sites

Monitoring Activities Applicable to all Sites

This reporting period covers the period February 12 - May 17, 2001. During the reporting period, five storm events were monitored in District 11 – numbers 8, 9, 10, 11, and 12 for the 2000/2001 storm season. Rainfall, percent capture, and sample aliquot numbers are provided in the tables below for each monitored storm event.

During Event 8 (Table 1), the February 23 storm, all sites were successfully sampled except La Costa Wet Basin and Escondido Maintenance Station. The flow meter failed at the La Costa Wet Basin Effluent, and at Escondido there was a significant difference in the number of samples collected at the influent and effluent. Equipment problems were suspected; consequently; the samples were not submitted for analysis.

Table 1: Event #8, February 23 through 24

Site	BMP Type	Date of Sampling Event	Rainfall Total	Mobilized	Sampled		% Storm Capture	Number of Aliquots	Empirical Observations
					Comp	Grab			
I-5/SR-56	EDB	2/23/01	0.52	Y	Y	NA	>75	>12	Y
I-15/SR-78	EDB	2/23/01	0.59	Y	Y	NA	>75	>12	Y
I-5/La Costa (West)	IB	2/23/01	0.21	Y	NA	NA	NA	NA	Y
I-5/La Costa (East)	WB	2/23/01	0.31	Y	(2)	NA	NA	NA	Y
I-5/Manchester	EDB	2/23/01	(1)	Y	(1)	NA	>75	>12	Y
Kearney Mesa MS	StormFilter	2/23/01	0.40	Y	Y	NA	>75	>12	Y
Escondido MS	MF	2/23/01	0.67	Y	(3)	NA	NA	NA	Y
La Costa P & R	MF	2/23/01	(1)	Y	(1)	NA	>75	>12	Y
SR-78/I-5 P& R	MF	2/23/01	0.35	Y	Y	NA	>75	>12	Y
Melrose Ave/SR-78	Bio Swale	2/23/01	0.58	Y	Y	NA	>75	>12	Y
I-5 Palomar Airport Rd	Bio Swale	2/23/01	0.38	Y	Y	NA	>75	>12	Y
Carlsbad MS	Bio Strip	2/23/01	0.45	Y	Y	NA	>75	>12	Y
	Infiltration Trench	2/23/01	0.45	Y	Y	NA	>75	>12	Y

(1) The effluent was still flowing on 2/25 when a second storm began. The storms were combined. Manchester had 0.30" and La Costa P&R 0.21" in the storm of 2/23.
(2) The flow meter at the effluent failed. It was replaced before the storm on 3/25.
(3) The samples were discarded due to significant differences between the measured flow and samples collected at the influent and effluent. Equipment problems were suspected, but the showery nature of the storm may have been the cause.

Event 9 was the second storm that occurred on February 25. Since there had not been 48 hours since the storm of February 23, and most sites had been sampled successfully during the February 23 event, only four sites were sampled during this storm: Manchester EDB, La Costa Park and Ride, La Costa Wet Basin, and Escondido Maintenance Station. Manchester and La Costa P&R effluents had not stopped flowing from the event of February 23, thus the two storms were combined at these sites. The La Costa Wet Basin and Escondido were sampled because they had not been successfully sampled in the previous storm. The flow meter at the La Costa Wet Basin effluent was replaced before the

February 25 storm. All four sites were successfully sampled. Table 2 shows the rainfall recorded at all stations. The four stations that were operating are bolded.

Table 2: Event #9, February 25 through 28

Site	BMP Type	Date of Sampling Event	Rainfall Total	Mobilized	Sampled		% Storm Capture	Number of Aliquots	Empirical Observations
					Comp	Grab			
I-5/SR-56	EDB	2/25/01	1.57	N	NA	NA	NA	NA	NA
I-15/SR-78	EDB	2/25/01	1.99	N	NA	NA	NA	NA	NA
I-5/La Costa (West)	IB	2/25/01	1.80	N	NA	NA	NA	NA	NA
I-5/La Costa (East)	**WB**	**2/25/01**	**1.80**	**Y**	**Y**	**NA**	**>75**	**>12**	**Y**
I-5/Manchester	**EDB**	**2/25/01**	**(1)**	**Y**	**Y**	**NA**	**>75**	**>12**	**Y**
Kearney Mesa MS	StormFilter	2/25/01	1.32	N	NA	NA	NA	NA	NA
Escondido MS	**MF**	**2/25/01**	**2.00**	**Y**	**Y**	**NA**	**>75**	**>12**	**Y**
La Costa P & R	**MF**	**2/25/01**	**(2)**	**Y**	**Y**	**NA**	**>75**	**>12**	**Y**
SR-78/I-5 P& R	MF	2/25/01	2.13	N	NA	NA	NA	NA	NA
Melrose Ave/SR-78	Bio Swale	2/25/01	1.79	N	NA	NA	NA	NA	NA
I-5 Palomar Airport Rd	Bio Swale	2/25/01	1.90	N	NA	NA	NA	NA	NA
Carlsbad MS	Bio Strip	2/25/01	1.89	N	NA	NA	NA	NA	NA
	Infiltration Trench	2/25/01	1.89	N	NA	NA	NA	NA	NA

(1) Total rainfall for storms of 2/23 and 2/25 was 2.26": 0.30" + 1.96".
(2) Total rainfall for storms of 2/23 and 2/25 was 2.00": 0.21" + 1.78".

During Event 10 (Table 3), which occurred on March 6 and 7, all sites except Melrose biofiltration swale were successfully sampled and submitted for analysis. Only six samples were collected at the Melrose influent due to the showery nature of the rainfall, and the effluent did not flow. The Melrose influent samples were not submitted for analysis.

Table 3: Event #10, March 6 through 7

Site	BMP Type	Date of Sampling Event	Rainfall Total	Mobilized	Sampled		% Storm Capture	Number of Aliquots	Empirical Observations
					Comp	Grab			
I-5/SR-56	EDB	3/6/01	0.52	Y	Y	NA	>75	>12	Y
I-15/SR-78	EDB	3/6/01	0.53	Y	Y	NA	>75	>12	Y
I-5/La Costa (West)	IB	3/6/01	0.42	Y	NA	NA	NA	NA	Y
I-5/La Costa (East)	WB	3/6/01	0.42	Y	Y	NA	>75	9/13	Y
I-5/Manchester	EDB	3/6/01	0.43	Y	Y	NA	>75	>12	Y
Kearney Mesa MS	StormFilter	3/6/01	0.59	Y	Y	NA	>75	>12	Y
Escondido MS	MF	3/6/01	0.58	Y	Y	NA	>75	>12	Y
La Costa P & R	MF	3/6/01	0.42	Y	Y	NA	>75	>12	Y
SR-78/I-5 P& R	MF	3/6/01	0.53	Y	Y	NA	>75	>12	Y
Melrose Ave/SR-78	Bio Swale	3/6/01	0.30	Y	N (1)	NA	>75	(1)	Y
I-5 Palomar Airport Rd	Bio Swale	3/6/01	0.58	Y	Y	NA	>75	>12	Y
Carlsbad MS	Bio Strip	3/6/01	0.49	Y	Y	NA	>75	>12	Y
	Infiltration Trench	3/6/01	0.49	Y	Y	NA	>75	>12	Y

(1). Only six samples were collected at the Melrose influent and the effluent did not flow. The influent samples were not analyzed.

Event 11 (Table 4a) consisted of two storms, one on April 7 and a second on April 9. During the April 7 storm all BMPs were sampled. Melrose effluent flowed but had only 7 samples but were submitted for analysis. The effluent at the La Costa Park and Ride sand filter had not stopped flowing by the time a second storm began on April 9. The two storms were combined at this site.

Table 4a: Event #11a, April 7 and 9, All Sites

Site	BMP Type	Date of Sampling Event	Rainfall Total	Mobilized	Sampled		% Storm Capture	Number of Aliquots	Empirical Observations
					Comp	Grab			
District 11									
I-5/SR-56	EDB	**4/7**	**0.45**	**Y**	**Y**	**NA**	**>75**	**>12**	**Y**
I-15/SR-78	EDB	**4/7**	**0.74**	**Y**	**Y**	**NA**	**>75**	**>12**	**Y**
I-5/La Costa (West)	IB	**4/7**	**0.34**	**Y**	**NA**	**NA**	**NA**	**NA**	**Y**
I-5/La Costa (East)	WB	**4/7**	**0.43**	**Y**	**Y**	**NA**	**>75**	**>12**	**Y**
I-5/Manchester	EDB	**4/7**	**0.35**	**Y**	**Y**	**NA**	**>75**	**>12**	**Y**
Kearny Mesa MS	StormFilter	**4/7**	**0.62**	**Y**	**Y**	**NA**	**>75**	**>12**	**Y**
Escondido MS	MF	**4/7**	**0.68**	**Y**	**Y**	**NA**	**>75**	**>12**	**Y**
La Costa P & R	MF	**4/7-4/12**	**0.44**	**Y**	**(1)**	**NA**	**>75**	**>12**	**Y**
SR-78/I-5 P& R	MF	**4/7**	**0.49**	**Y**	**Y**	**NA**	**>75**	**>12**	**Y**
Melrose Ave/SR-78	Bio Swale	**4/7**	**0.75**	**Y**	**Y**	**NA**	**>75**	**(2)**	**Y**
I-5 Palomar Airport Rd	Bio Swale	**4/7**	**0.43**	**Y**	**Y**	**NA**	**>75**	**>12**	**Y**
Carlsbad MS	Bio Strip	**4/7**	**0.42**	**Y**	**Y**	**NA**	**>75**	**>12**	**Y**
	Infiltration Trench	4/7	0.42	Y	Y	NA	>75	>12	Y

(1) The effluent had not stopped running before the start of the storm on 4/9, therefore; the two storms were combined.
(2) The influent took more than 12 samples. The effluent took 7 samples. They were submitted for analysis.

Table 4b: Event #11b, April 7 and 9 La Costa Park and Ride Continued

Site	BMP Type	Date of Sample Event	Rainfall Total	Mobilized	Sampled		% Storm Capture	Number of Aliquots	Empirical Observations
					Comp	Grab			
I-5/SR-56	EDB	**NA**	**0.34**	**N**	**NA**	**NA**	**NA**	**NA**	**NA**
I-15/SR-78	EDB	**NA**	**0.23**	**N**	**NA**	**NA**	**NA**	**NA**	**NA**
I-5/La Costa (West)	IB	**NA**	**0.18**	**N**	**NA**	**NA**	**NA**	**NA**	**NA**
I-5/La Costa (East)	WB	**NA**	**0.18**	**N**	**NA**	**NA**	**NA**	**NA**	**NA**
I-5/Manchester	EDB	**NA**	**0.48**	**N**	**NA**	**NA**	**NA**	**NA**	**NA**
Kearney Mesa MS	StormFilter	**NA**	**0.29**	**N**	**NA**	**NA**	**NA**	**NA**	**NA**
Escondido MS	MF	**NA**	**0.20**	**N**	**NA**	**NA**	**NA**	**NA**	**NA**
La Costa P & R	**MF**	4/7-4/12	0.18	Y	Y(1)	NA	NA	NA	NA
SR-78/I-5 P& R	MF	**NA**	**0.19**	**N**	**NA**	**NA**	**NA**	**NA**	**NA**
Melrose Ave/SR-78	Bio Swale	**NA**	**0.29**	**N**	**NA**	**NA**	**NA**	**NA**	**NA**
I-5 Palomar Airport Rd	Bio Swale	**NA**	**0.14**	**N**	**NA**	**NA**	**NA**	**NA**	**NA**
Carlsbad MS	Bio Strip	**NA**	**0.10**	**N**	**NA**	**NA**	**NA**	**NA**	**NA**
	Infiltration Trench	NA	0.10	N	NA	NA	NA	NA	NA

(1) The effluent was still flowing on 4/9 when a second storm began. The samples from the two storms were combined. La Costa P&R had 0.44" of rain in the storm of 4/7 and 0.13" in the storm of 4/9 for a total of 0.57".

Event 12 occurred on April 21. Samples were obtained at all influents. The Melrose effluent did not flow, and the bio-strip at Carlsbad Maintenance station took only one sample. Samples from all other effluents were submitted for analysis, although the Extended Detention Basin at I-5/SR-56 had taken only 8 sample aliquots. The influent had 28 sample aliquots.

Table 5: Event #12, April 20 through 21

Site	BMP Type	Date of Sample Event	Rainfall Total	Mobilized	Sampled		% Storm Capture	Number of Aliquots	Empirical Observations
					Comp	Grab			
I-5/SR-56	EDB	4/21	0.22	Y	Y	NA	>75	(1)	Y
I-15/SR-78	EDB	4/21	0.83	Y	Y	NA	>75	>12	Y
I-5/La Costa (West)	IB	4/21	0.24	Y	NA	NA	NA	NA	Y
I-5/La Costa (East)	WB	4/21	0.23	Y	Y	NA	>75	>12	Y
I-5/Manchester	EDB	4/21	0.25	Y	Y	NA	>75	>12	Y
Kearny Mesa MS	StormFilter	4/21	0.28	Y	Y	NA	>75	>12	Y
Escondido MS	MF	4/21	0.60	Y	Y	NA	>75	>12	Y
La Costa P & R	MF	4/21	0.28	Y	Y	NA	>75	(2)	Y
SR-78/I-5 P& R	MF	4/21	0.31	Y	Y	NA	>75	>12	Y
Melrose Ave/SR-78	Bio Swale	4/21	0.39	Y	(3)	NA	>75	(3)	Y
I-5 Palomar Airport Rd	Bio Swale	4/21	0.33	Y	Y	NA	>75	>12	Y
Carlsbad MS	Bio Strip	4/21	0.19	Y	(4)	NA	>75	(4)	Y
	Infiltration Trench	4/21	0.19	Y	Y	NA	>75	>12	Y

(1) At I-5/SR56 only 8 samples were collected at the effluent. They were submitted for analysis.
(2) 11 samples were collected at both the influent and effluent at La Costa Park & Ride. Samples were submitted for analysis.
(3) The effluent did not flow at Melrose. The influent took more than 12 samples.
(4) The bio-strip at the Carlsbad Maintenance Station took only one sample.

Maintenance Activities Applicable to all Sites

Trash and debris were picked up at sites by crews during all site visits other than during storm events. Otherwise, no general maintenance was conducted at all sites during this period.

Vector Activities Applicable to all Sites

The County of San Diego Department of Environmental Health performed inspections for vectors at all sites weekly. Inspections were conducted on the following dates: 2/20/01, 2/26/01, 3/5/01, 3/12/01, 3/20/01, 3/26/01, 4/2/01, 4/9/01, 4/16/01, 4/23/01, 4/30/01, 5/8/01, and 5/14/01. Site-specific information is included in the following summary.

I-5/SR-56 Extended Detention Basin (Site ID 111101)

Monitoring/Sampling Activities

2/23/01: The National Weather Service forecast an 80% chance of up to 0.33 inches of rain. Crews and stations mobilized for the storm. The storm produced 0.52 inches of rain at the site. Samples from both the influent and effluent were submitted for analysis. Empirical observations were made.

3/6/01: The National Weather Service forecast an 80% chance of from 0.25 to 0.75 inches of rain. Stations and crews mobilized for the storm. Again, 0.52 inches of rain fell at the EDB. Samples from both the influent and effluent were submitted for analysis. Empirical observations were made.

4/7/01: The National Weather Service forecast an 80% probability of showers. One-quarter to one-half inch of rain was forecast. The storm produced 0.45 inches of rain. Samples from both the influent and effluent were submitted for analysis. Empirical observations were made.

4/21/01: The National Weather Service forecast a 70 percent chance of rain with amounts of from 0.2 to 0.5 inches. Crews and all stations were mobilized for the storm. The rainfall was showery. The storm produced 0.22 inches of rain at the site. The influent took 28 samples, but the effluent only took 8 samples. Samples from both the influent and effluent were submitted for analysis. Empirical observations were made.

Operations and Maintenance

3/1/01 and 5/3/01: Conducted monthly site inspections. Removed trash and debris.

3/7/01,4/8/01, 4/21/01: Conducted post-storm inspections

3/29/01: A broken lock was replaced. There was no indication of vandalism.

3/30/01: Native Landscape cut the vegetation per the MID.

Vector Activities

3/20/01, 3/26/01, 4/2/01, 4/16/01, 4/23/01, and 4/30/01: Mosquito breeding was found in one or more places. No abatement was performed at any time.

Issues / Solutions

None this period.

SR-78/I-15 Extended Detention Basin (Site ID 111102)

Monitoring/Sampling Activities

2/23/01: The National Weather Service forecast an 80% chance of up to 0.33 inches of rain. Crews and stations mobilized for the storm and 0.59 inches of rain fell at the site. Samples from both the influent and effluent were submitted for analysis. Empirical observations were made.

3/1/01: Sediment was removed from the influent pipe upstream of the velocity transducer. The transducer was buried during the storm on 1/23.

3/6/01: The National Weather Service forecast an 80% chance of from 0.25 to 0.75 inches of rain. Stations and crews mobilized for the storm. The storm produced 0.53 inches of rain at the site. Both influent and effluent samples were submitted for analysis. Empirical observations were made.

4/7/01: The National Weather Service forecast an 80% probability of showers. One-quarter to one-half inch of rain was forecast. There was 0.74 inches of rain at the site. Both influent and effluent samples were submitted for analysis. Empirical observations were made.

4/21/01: The National Weather Service forecast a 70 percent chance of rain with amounts of from 0.2 to 0.5 inches. Crews and stations were mobilized for the storm. The storm produced 0.83 inches of rain. Both influent and effluent samples were submitted for analysis. Empirical observations were made.

Operations and Maintenance

2/24/01, 3/7/01, 4/8/01, and 4/23/01: Post storm site inspections were conducted.

5/3/01: Monthly site inspection was conducted.

Vector Activities

Breeding was observed on 4/16, 5/8, and 5/14. No abatement was performed.

Issues / Solutions

None this period.

I-5/La Costa Avenue Infiltration Basin (Site ID 111103)

Monitoring/Sampling Activities

2/23/01: The ground water well depth was measured.

2/23/01: The National Weather Service forecast an 80% chance of up to 0.33 inches of rain. Crews and stations mobilized for the storm. The site received 0.21 inches of rain and empirical observations were taken.

3/6.01: The National Weather Service forecast an 80% probability of from 0.25 to 0.75 inches of rain. Stations and crews mobilized for the storm. The site received 0.42 inches of rain and empirical observations were taken.

3/8/01: The ground water well depth was measured.

3/21/01: The ground water well depth was measured.

4/6/01: The ground water well depth was measured.

4/7/01: The National Weather Service forecast an 80% probability of showers. Forecast rain was 0.25 to 0.50 inches and 0.34 was received at the site. Empirical observations were performed.

4/19/01: The ground water well was sampled for the second time in the storm season. The ground water well depth was measured.

4/21/01: The National Weather Service forecast a 70 percent chance of rain with amounts of from 0.2 to 0.5 inches. Crews and all stations were mobilized for the storm. The site received 0.24 inches of rain and empirical observations were taken.

5/4/01: The ground water well depth was measured.

Operations and Maintenance

2/16/01, 3/01/01, 4/16/01, and 5/2/01: Monthly site inspections were conducted.

3/9/01 and 4/23/01: Post storm site inspections were conducted.

3/12/01: One support pole for the bird netting was reset in concrete.

3/30/01: The hinges on the gate to the facility were replaced. They were stolen earlier.

5/4/01: Several of the guy cables for the support poles were stolen along with their fittings. In addition, a length of the cable that runs between the support poles was taken. The site had been intact during the site inspection two days earlier.

5/8/01: The stolen elements from the support system were replaced.

Vector Activities

4/2/01, 4/23/01,4/30/01, 5/8/01, and 5/14/01: Mosquito breeding was observed. No abatement was performed.

Issues / Solutions

None this period.

I-5/La Costa Wet Basin (Site ID 111104)

Monitoring/Sampling Activities

2/25/01: The National Weather Service forecast a 100% chance of from 1 to 2 inches of rain. Rain began at approximately midnight on February 25 and continued in waves until the afternoon of February 28. The wet basin received 1.80 inches of rain.

This was the second of two storms within 48 hours of each other. Samples from the first storm were not submitted for analysis due to the failure of the flow meter at the effluent. The flow meter was replaced, and the second storm was successfully sampled. Empirical observations were made.

3/6/01: The National Weather Service forecast an 80% chance of from 0.25 to 0.75 inches of rain. Stations and crews mobilized for the storm. The storm produced 0.42 inches of rain at the site. The influent took 9 samples and the effluent took 13 samples. All samples were submitted for analysis.

3/15/01: The monthly baseline samples were collected.

4/4/01: The monthly baseline samples were collected.

4/7/01: The National Weather Service forecast an 80% probability of showers. One-quarter to one-half inch of rain was forecast. Rainfall actually totaled 0.43 inches. Both influent and effluent samples were collected and submitted for analysis. Empirical observations were made.

4/21/01: The National Weather Service forecast a 70 percent chance of rain with amounts of from 0.2 to 0.5 inches. Crews and stations were mobilized for the storm. Rainfall was 0.23 inches. Samples from both the influent and effluent were submitted for analysis. Empirical observations were made.

5/9/01: The monthly baseline samples were collected.

Operations and Maintenance

2/6/01 and 4/23/01: Post storm site inspections were performed.

3/8/01: Trash and debris were removed from near the influent pipe in the basin.

3/30/01, 4/16/01, and 5/12/01: Monthly site inspections were performed.
5/1/01: Martha Blane performed the annual vegetation assessment.

Vector Activities

3/12/01, 3/20/01, 3/26/01, and 4/23/01: Mosquitoes were found to be breeding. no abatement was applied.

Issues / Solutions

None this period.

I-5/Manchester Avenue Extended Detention Basin (Site ID 111105)

Monitoring/Sampling Activities

2/23/01: The National Weather Service forecast an 80% chance of up to 0.33 inches of rain. Crews and stations mobilized for the storm. There was 0.30 inches of rain at the BMP. A second storm began before the effluent quit flowing. The sampling equipment was left active, and the two storms were combined.

2/25/01: This was the second of the two storms. The National Weather Service forecast a 100% chance of from 1 to 2 inches of rain. Rain began at approximately midnight on February 25 and continued in waves until the afternoon of February 28. There was 1.96 inches of rain during the second storm giving a total of 2.26 inches. The combined storms were successfully sampled. Empirical observations were made.

3/6/01: The National Weather Service forecast an 80% chance of from 0.25 to 0.75 inches of rain. Stations and crews mobilized for the storm and 0.43 inches of rain fell at the site. Both the influent and effluent were successfully sampled. Empirical observations were made.

4/7/01: The National Weather Service forecast an 80% probability of showers. One-quarter to one-half inch of rain was forecast. Rainfall at the site totaled 0.35 inches. Both the influent and effluent were successfully sampled. Empirical observations were made.

4/21/01: The National Weather Service forecast a 70 percent chance of rain with amounts of from 0.2 to 0.5 inches. Crews and stations were mobilized for the storm. Rainfall totaled 0.25 inches. Both the influent and effluent were successfully sampled, and empirical observations were made.

Operations and Maintenance

2/14/01, 3/08/01, 4/9/01, and 4/23/01: Post storm site inspections were performed.

3/4/01 and 5/2/01: Monthly site inspections were performed.

3/29/01: The padlock was replaced on the gate to the site.

3/30/01: Native landscape cut the vegetation per the MID.

Vector Activities

No mosquito breeding was found.

Issues/Solutions

None this period.

Kearny Mesa Maintenance Station StormFilter - Perlite/Zeolite (Site ID 112201)

Monitoring/Sampling Activities

2/23/01: The National Weather Service forecast an 80% chance of up to 0.33 inches of rain. Crews and stations mobilized for the storm. The storm produced 0.40 inches of rain at the site. Both the influent and effluent samples were submitted for analysis. Empirical observations were made.

3/6/01: The National Weather Service forecast an 80% chance of from 0.25 to 0.75 inches of rain. Stations and crews mobilized for the storm. There was 0.59 inches of rain at the site. Samples were collected at both influent and effluent and were submitted for analysis. Empirical observations were made.

4/7/01: The National Weather Service forecast an 80% probability of showers. One-quarter to one-half inch of rain was forecast. Rainfall totaled 0.62 inches. Samples from both the influent and effluent were submitted for analysis. Empirical observations were made.

4/21/01: The National Weather Service forecast a 70 percent chance of rain with amounts of from 0.2 to 0.5 inches. Crews and stations were mobilized for the storm. Rainfall was 0.28 inches. Samples from both the influent and effluent were submitted for analysis. Empirical observations were made.

Operations and Maintenance

2/14/01, 2/24/01, 3/7/01, 4/8/01, and 4/21/01: Post storm site inspections were performed.

5/2/01: The monthly site inspection was performed.

5/2/01: The annual major inspection of the facility was performed.

Vector Activities

5/8/01 and 5/14/01: Mosquitoes were breeding. No abatement was applied.

Issues / Solutions

None this period.

Escondido Maintenance Station Media Filter - Sand (Site ID 112202)

Monitoring/Sampling Activities

2/25/01: The National Weather Service forecast a 100% chance of from 1 to 2 inches of rain. Rain began at approximately midnight on February 25 and continued in waves until the afternoon of February 28. Two inches of rain fell during this storm.

This was the second of two storms to begin in 48 hours. During the first storm, there was a significant difference in measured flow at the influent and effluent. Flow meter malfunction was suspected. The samples from the first storm were discarded. The second storm was then successfully sampled. Empirical observations were made.

3/6/01: The National Weather Service forecast an 80% chance of from 0.25 to 0.75 inches of rain. Stations and crews mobilized for the storm. Rainfall totaled 0.58 inches. Influent and effluent samples were successfully collected and submitted for analysis. Empirical observations were made.

4/7/01: The National Weather Service forecast an 80% probability of showers. One-quarter to one-half inch of rain was forecast. There was 0.68 inches of rain at the site. Both influent and effluent samples were submitted for analysis. Empirical observations were made.

4/21/01: The National Weather Service forecast a 70 percent chance of rain with amounts of from 0.2 to 0.5 inches. Crews and stations were mobilized for the storm. Rainfall at the site was 0.60 inches. Both the influent and effluent were successfully sampled. Empirical observations were made.

Operations and Maintenance

2/14/01, 2/24/01, 3/7/01, 4/9/01, and 4/23/01: Post storm site inspections were performed.

3/1/01 and 5/3/01: Monthly site inspections were performed.

4/4/01: The seat and face of the gate valve that drains the sediment chamber were cleaned as the gate valve had been leaking.

4/26/01: The barrels of sand that had been removed in January from the top two inches of the sand filter were sampled in preparation for disposing of the sand.

Vector Activities

No mosquito breeding was observed during this reporting period.

Issues / Solutions

None this period.

La Costa Park and Ride Media Filter - Sand (Site ID 112203)

Monitoring/Sampling Activities

2/23/01: Sediment was removed from the influent flume.

2/23/01: The National Weather Service forecast an 80% chance of up to 0.33 inches of rain. Crews and stations mobilized for the storm. Rainfall totaled 0.21 inches at the site during this storm. Empirical observations were made. Before the effluent stopped flowing, a second storm began. The two storms were combined.

2/25/01: The National Weather Service forecast a 100% chance of from 1 to 2 inches of rain. Rain began at approximately midnight on February 25 and continued in waves until the afternoon of February 28. During this storm 1.78 inches of rain fell at the site for a total of 1.99 inches in the combined storms. Samples from both the influent and effluent were submitted for analysis.

3/6/01: The National Weather Service forecast an 80% chance of from 0.25 to 0.75 inches of rain. Stations and crews mobilized for the storm. A total of 0.42 inches of rain fell at the site. Both the influent and effluent were successfully sampled. Empirical observations were made.

4/7/01: The National Weather Service forecast an 80% probability of showers. Rain of 0.25 to 0.50 inches was forecast. A second storm was also forecast for April 9th with a 70% chance of scattered thunderstorms. Rainfall amounts were forecast to be highly variable in coverage. The effluent at the La Costa Sand Filter had not stopped flowing after the storm of April 7th by the time rain started on April 9th. The two events were combined at that site. Rainfall totaled 0.57 inches for the two storms: 0.44 inches in the first storm and 0.13 inches in the second storm. Empirical observations were made throughout the two storms.

4/21/01: The National Weather Service forecast a 70 percent chance of rain with amounts of from 0.2 to 0.5 inches. Crews and stations were mobilized for the storm. Rainfall totaled 0.28 inches. Eleven samples each were collected at the influent and effluent and were submitted for analysis. Empirical observations were made.

Operations and Maintenance

2/20/01, 4/16/01, and 5/2/01: Monthly site inspections were performed.

2/22/01: Sediment was removed from the spreader trough after the drain plugs had been reinstalled after draining the sediment basin.

3/1/01: The bird netting was installed over the sand filter.

3/9/01, and 4/23/01: Post storm site inspections were performed.

3/9/01: Wetland vegetation was removed from the sand filter. Trash and debris were removed from the sediment basin.

4/23/01: Trash and debris were removed from the sediment basin.

Vector Activities

3/20/01, 3/26/01, 4/2/01, 4/16/01, 4/23/01, 4/30/01, 5/8/01, and 5/14/01: Mosquito breeding was observed. No abatement was performed.

Issues / Solutions

None this period.

SR-78/I-5 Park and Ride Media Filter - Sand (Site ID 112204)

Monitoring/Sampling Activities

2/23/01: The National Weather Service forecast an 80% chance of up to 0.33 inches of rain. Crews and stations mobilized for the storm. Rainfall was 0.35 inches. Both the influent and effluent were successfully samples. Empirical observations were made.

3/6/01: The National Weather Service forecast an 80% chance of from 0.25 to 0.75 inches of rain. Stations and crews mobilized for the storm. Rainfall totaled 0.53 inches. Both influent and effluent samples were submitted for analysis. Empirical observations were made.

4/7/01: The National Weather Service forecast an 80% probability of showers. One-quarter to one-half inch of rain was forecast. Rainfall at the site was 0.49 inches. Sample from both the influent and effluent were submitted for analysis. Empirical observations were made.

4/21/01: The National Weather Service forecast a 70 percent chance of rain with amounts of from 0.2 to 0.5 inches. Crews and stations were mobilized for the storm. There was 0.31 inches of rain at the station. Empirical observations were made. Samples from both the influent and effluent were submitted for analysis.

Operations and Maintenance

2/14/01, 2/26/01, 3/8/01, 4/8/01, and 4/23/01: Post storm site inspections were performed.

2/22/01: Sediment was removed from the spreader trough after the drain caps were replaced. The sediment basin had been previously been drained.

3/1/01: The bird netting was placed over the sand filter.

3/8/01: Trash and debris were removed from the sediment basin and around the outside of the BMP.

3/27/01: Graffiti was painted over on the east wall of the BMP.

5/4/01: A monthly site inspection was performed. Trash and debris were removed.

Vector Activities

Standing water was present during every weekly inspection, either in the sediment basin, the spreader trough or both.

4/16/01, 5/8/01, and 5/14/01: Mosquito breeding was found. No abatement was performed.

Issues / Solutions

None this period.

Melrose Ave/SR-78 Bio Swale (Site ID 112205)

Monitoring/Sampling Activities

2/23/01: The National Weather Service forecast an 80% chance of up to 0.33 inches of rain. Crews and stations were mobilized for the storm. The site had 0.58 inches of rain. Both influent and effluent samples were collected and submitted for analysis. Empirical observations were made.

3/6/01: The National Weather Service forecast an 80% chance of from 0.25 to 0.75 inches of rain. Stations and crews mobilized for the storm. Rainfall at this site was 0.30 inches. The effluent did not flow and only six samples were collected at the influent. The samples were not submitted for analysis. Empirical observations were made.

4/7/01: The National Weather Service forecast an 80% probability of showers. One-quarter to one-half inch of rain was forecast. Rainfall totaled 0.75 inches at the site. Influent and effluent samples were collected. Only seven samples were collected. Both influent and effluent samples were submitted for analysis. Empirical observations were made.

4/21/01: The National Weather Service forecast a 70 percent chance of rain with amounts of from 0.2 to 0.5 inches. Crews and stations were mobilized for the storm. There was 0.39 inches of rain at the site. Twenty samples were collected at the influent, but the effluent did not flow. The influent samples were submitted for analysis. Empirical observations were made.

Operations and Maintenance

2/14/01, 2/24/01, 3/7/01, 4/8/01, and 4/21/01: Post storm site inspections were performed.

3/28/01: Native Landscape pulled tall weeds and cut the salt grass per the MID.

5/1/01: Martha Blane performed the annual vegetation assessment inspection.

5/3/01: A monthly site inspection was performed.

5/7/01: Trash and debris were collected.

5/10/01: Gopher burrows were collapsed and filled.

Vector Activities

None this period.

Issues / Solutions

None this period.

I-5 Palomar Airport Biofiltration Swale (Site ID 112206)

Monitoring/Sampling Activities

2/23/01: The National Weather Service forecast an 80% chance of up to 0.33 inches of rain. Crews and stations mobilized for the storm. Rainfall at the site was 0.38 inches. Samples from both the influent and effluent were submitted for analysis. Empirical observations were made.

3/6/01: The National Weather Service forecast an 80% chance of from 0.25 to 0.75 inches of rain. Stations and crews mobilized for the storm. Rainfall was 0.58 inches. Both influent and effluent samples were collected and submitted for analysis. Empirical observations were made.

4/7/01: The National Weather Service forecast an 80% probability of showers. One-quarter to one-half inch of rain was forecast. There was 0.43 inches of rain at the site. Both influent and effluent samples were collected. Empirical observations were made.

4/21/01: The National Weather Service forecast a 70 percent chance of rain with amounts of from 0.2 to 0.5 inches. Crews and stations were mobilized for the storm. Rainfall totaled 0.33 inches. Samples from both the influent and effluent were submitted for analysis. Empirical observations were made.

Operation and Maintenance

2/14/01, 2/24/01, 4/8/01, and 4/23/01: Post storm site inspections were performed.

3/3/0/01 and 5/04/01: Monthly site inspections were performed.

3/9/01: Trash and debris were removed from the site.

3/28/01: Native Landscape removed weeds from throughout the swale. Weeds had overgrown the swale after the salt grass had been mowed to two inches by Adopt –A-Highway last fall.

4/3/01: It was noted that herbicide had recently been sprayed under the guardrail along the shoulder of the highway. Some spray had drifted down the slope into the salt grass.

4/11/01: A van caught on fire and stopped on the shoulder of the highway alongside the north segment of the swale. Water and chemicals that were used to fight the fire flowed into the swale.

4/9/01, Sand bags were place at selected sites along the highway to channel water away from eroded locations on the side slope.

4/27/01: Eroded locations on the side slope were filled with topsoil and compacted.

5/1/01: Martha Blane performed the annual vegetation assessment inspection.

5/8/01: Trash and debris were removed from the site.

Vector Activities

No mosquito breeding was observed during this reporting period.

Issues / Solutions

Signs will be placed both at the influent and effluent of the swale to warn maintenance people that this is a study area. They will also be placed on the fence facing the highway.

No other issues this period.

Carlsbad Maintenance Station Bio Strip Infiltration Trench (Site ID 112207)

Monitoring/Sampling Activities

2/20/01: The ground water depth was measured.

2/23/01: The National Weather Service forecast an 80% chance of up to 0.33 inches of rain. Crews and stations mobilized for the storm. Rainfall totaled 0.45 inches. Samples were collected from both the infiltration trench influent and the bio-strip effluent. Empirical observations were made.

3/6/01: The National Weather Service forecast an 80% chance of from 0.25 to 0.75 inches of rain. Stations and crews mobilized for the storm. Rainfall totaled 0.49 inches. Samples from both the influent and effluent were submitted for analysis. Empirical observations were made.

During the storm water overflowed from the infiltration trench via the overflow weir. After the storm, while the overflow was still occurring, it was observed that water from the infiltration trench was flowing into the trough that collects water from the bio-strip. The water was flowing into the trough through cracks in the curb that separates the trough from the trench. It was being sampled as effluent flow from the bio-strip.

3/13/01 A second attempt of the storm season was made to sample vadose zone water with the lysimeter. No water was obtained after applying a suction for 24-hours.

3/21/01: The ground water depth was measured.

4/7/01: The National Weather Service forecast an 80% probability of showers. One-quarter to one-half inch of rain was forecast. Rainfall at the site totaled 0.42 inches of rain. At the infiltration trench influent, 45 samples collected and 9 samples were collected at the bio-strip effluent. Both samples were submitted for analysis. Empirical observations were made.

4/19/01: The ground water depth was measured. The second ground water sample of the storm season was collected.

4/21/01: The National Weather Service forecast a 70 percent chance of rain with amounts of from 0.2 to 0.5 inches. Crews and stations were mobilized for the storm. A total of 0.19 inches of rain fell at the site. Seventeen samples were collected at the infiltration trench influent, but only one sample at the bio-strip effluent. Only the influent samples were submitted for analysis. Empirical observations were made.

Operations and Maintenance

2/14/01, 2/24/01, 4/08/01, and 4/23/01: post storm site inspections were performed.

3/9/01: Kinnetic Laboratories pulled tall weeds from the two bio-strips.

3/29/01: Native Landscape removed tall weeks and cut the salt grass per the MID.

3/30/01 and 5/4/01: Monthly site inspections were performed.

5/1/01: Martha Blaine performed the annual vegetation assessment.

Vector Activities

2/20/01, 3/12/01, and 4/9/01: No mosquito breeding was found.

Issues / Solutions

None this period.

OMM PLAN ACTIVITIES

Maintenance Indicator Document

During the past quarter, a change was made to the CDS Units maintenance threshold. Changes to the MID were discussed during the Biweekly meeting. A revised MID (change only) is included in Appendix B.

Database

The OMM Database is updated monthly and posted on the www.rbf.com/caltrans web site. Data collected during inspections, maintenance, empirical observations, and preliminary analytical data is posted on the web site. The database incorporates data through the month of May 2001.

O&M Cost

Cumulative operation and maintenance cost and hours are tracked as part of the program. Costs from October 1998 through February 2001 are included in Appendix I of this document. Summary sheets are provided with costs sorted by BMP types as well as by Districts.

VECTOR ACTIVITIES

Summary of vector activities from February 26, 2001 through May 17, 2001.

DISTRICT 7

San Gabriel Valley Mosquito & Vector Control District

Monitoring

No breeding was found at this time.

Abatement

No abatement carried out during this period.

Greater Los Angeles County Vector Control District

Monitoring

No breeding was found at this time.

Abatement

No abatement carried out during this period.

Los Angeles County West Vector Control District

Monitoring

No breeding was found at this time.

Abatement

No abatement carried out during this period.

DISTRICT 11

County of San Diego Vector Surveillance and Control

Monitoring

Breeding was observed at the following sites:

3/12/01:	The WB at La Costa (Site #111104)
3/20/01:	The EDB at I-5 / SR-56 (Site #111101)
	Sedimentation chamber and spreader trough of the media filter at La Costa P&R (Site #112203)
	The WB at La Costa (Site #111104)
3/26/01:	The EDB at I-5 / SR-56 (Site #111101)
	Spreader trough of the media filter at La Costa P&R (Site #112203)
	The WB at La Costa (Site #111104)
4/02/01:	The EDB at I-5 / SR-56 (Site #111101)
	The IB at La Costa (Site #111103)
	Spreader trough of the media filter at La Costa P&R (Site #112203)
4/16/01:	The EDB at I-5 / SR-56 (Site #111101)
	Spreader trough of the media filter at La Costa P&R (Site #112203)
	Spreader trough of media filter at I-5 / SR-78 P&R (Site #112204)
4/23/01:	The EDB at I-5 / SR-56 (Site #111101)
	Spreader trough of the media filter at La Costa P&R (Site #112203)
	The WB at La Costa (Site #111104)
	The IB at La Costa (Site #111103)
4/30/01:	The EDB at I-5 / SR-56 (Site #111101)
	Spreader trough of the media filter at La Costa P&R (Site #112203)
	The IB at La Costa (Site #111103)
5/08/01:	The StormFilter at Kearney Mesa
	The IB at La Costa (Site #111103)
	Spreader trough of the media filter at La Costa P&R (Site #112203)
	Spreader trough of media filter at I-5 / SR-78 P&R (Site #112204)
5/14/01:	The StormFilter at Kearney Mesa
	The IB at La Costa (Site #111103)

The WB at La Costa (Site #111104)

Spreader trough of media filter at I-5 / SR-78 P&R (Site #112204)

Abatement

No abatement carried out during this reporting period.

DEPARTMENT OF HEALTH SERVICES

Out-of-State Survey

Caltrans received the Out of State Summary Addendum Report which is included in Appendix C. Due to volume, appendices to this report are available upon request.

DHS made two trips to Portland, Oregon and to Austin, Texas to visit out of state BMPs and to gather as much information as they could relative to vector breeding. Those reports are contained in the appendices of the Out of State Survey Addendum Report.

Appendices to the Out-of-State Survey report include:

(1) Portland, Oregon Trip Report

(2) Austin, Texas Trip Report

(3) List of Contacted Agencies

(4) Returned Questionnaires

(5) *Preliminary Survey of Mosquito Breeding in Stormwater Retention Ponds in Three Maryland Counties*, prepared by Maryland Department of Agriculture Mosquito Control

(6) *Best Management Practices for Mosquito Control and Freshwater Wetland Management*, prepared by New Jersey Wetland Management Protection Agency

Engineering Design Review

Caltrans received the Draft Engineering Review Report on May 1, 2001. It is included in Appendix D.

Vector Database

The DHS vector database reports have been updated for this quarter and are available via the RBF website, www.rbf.com/caltrans.

Sites Monitored by Vector Control District

Location	BMP Type	Monitor Consultant	Vector Control District	Activities
DISTRICT 7				
I-605/SR-91	IB	MW/Law	GLACVCD	None this period.
I-210 East of Orcas	CDS	MW/Law	GLACVCD	None this period.
I-210 East of Filmore	CDS	MW/Law	GLACVCD	None this period.
I-5/I-605	EDB	MW/Law	GLACVCD	None this period.
I-605/SR-91	EDB	MW/Law	GLACVCD	None this period.
Paxton Park & Ride	MF	MW/Law	GLACVCD	N/A
Metro MS	MCTT	MW/Law	GLACVCD	N/A
Alameda MS	OWS	MW/Law	GLACVCD	None this period.
Eastern MS	MF	MW/Law	GLACVCD	None this period.
Foothill MS	MF	MW/Law	SGVVCD	None this period.
Termination Park & Ride	MF	MW/Law	GLACVCD	None this period.
Via Verde Park & Ride	MCTT	MW/Law	SGVVCD	None this period.
Lakewood Park & Ride	MCTT	MW/Law	GLACVCD	None this period.
Altadena	Bio Strip/IT	MW/Law	GLACVCD	None this period.
Foothill	DII	MW/Law	SGVVCD	None this period
Las Flores	DII	MW/Law	LA Co West	None this period.
Rosemead	DII	MW/Law	SGVVCD	None this period.
I-605/SR-91	Bio Strip/Swale	MW/Law	GLACVCD	None this period.
Cerritos MS	BioSwale	MW/Law	GLACVCD	None this period.
I-5/I-605	BioSwale	MW/Law	GLACVCD	None this period.
I-605/ Del Amo	BioSwale	MW/Law	GLACVCD	None this period.
DISTRICT 11				
I-5/SR-56	EDB	KLI	SD Co VC	March 20, 26, 2001: Breeding observed; no treatment applied April 2, 16, 23, 30, 2001: Breeding observed; no treatment applied
I-15/SR-78	EDB	KLI	SD Co VC	April 16, 2001: Breeding observed; no treatment applied May 5, 2001: Breeding observed; no treatment applied May 14, 2001: Breeding observed; no treatment applied
I-5/La Costa (West)	IB	KLI	SD Co VC	April 12, 23, 30, 2001: Breeding observed; no treatment applied May 5, 14, 2001: Breeding observed; no treatment applied
I-5/La Costa (East)	WB	KLI	SD Co VC	March 12: Breeding observed; no treatment applied March 20: Breeding observed; no treatment applied March 26: Breeding observed April 2: Breeding observed; no treatment applied

Location	BMP Type	Monitor Consultant	Vector Control District	Activities
				April 23: Breeding observed; no treatment applied
I-5/Manchester (East)	EDB	KLI	SD Co VC	None this period.
Kearny Mesa MS	StormFilter (Perlite/Zeolite)	KLI	SD Co VC	May 5, 14, 2001: Breeding observed; no treatment applied
Escondido MS	MF	KLI	SD Co VC	None this period.
La Costa Park & Ride	MF	KLI	SD Co VC	March 20, 26: Breeding observed; no treatment applied April 2, 16, 23, 30: Breeding observed; no treatment applied May 5, 14: Breeding observed; no treatment applied
SR-78/I-5 Park & Ride	MF	KLI	SD Co VC	April 16: Breeding observed; no treatment applied May 5, 14: Breeding observed; no treatment applied
Melrose Ave/SR-78	Bio Swale	KLI	SD Co VC	None this period.
I-5 Palomar Airport Road	Bio Swale	KLI	SD Co VC	None this period.
Carlsbad MS	Bio Strip/IT	KLI	SD Co VC	None this period.

ENVIRONMENTAL INFORMATION

During this reporting period, Dudek and Associates, Inc. surveyed the BMPs in February, March, and April 2001. The surveys consisted of reviewing the sites for potential endangered, threatened, or sensitive species issues. Conditions reviewed included presence of water and presence of nesting birds or suitable habitat.

Nesting birds were not detected during the surveys. It is recommended that the net exclusion devices remain installed at the media filters at the La Costa sand filter and the I-5/SR78 sand filter.

No nesting birds or sensitive species were observed in residence at any BMP site during this quarterly that would preclude schedule maintenance. Monthly surveys will continue during the spring and summer.

Monthly Survey reports for the months of February and March are provided in Appendix G.

WEATHER

Precipitation data for Los Angeles and San Diego were obtained from NOAA. Precipitation data since the beginning of the 1999-2000 and 2000-2001 seasons is for two gages in Los Angeles and two gages in San Diego is provided below.

The data presented here is for reference only. The actual rainfall at individual BMP sites will vary from the values given in the table. The data presented above for Los Angeles is as of 4:00 p.m. for the preceding 24 hours on the date indicated. For San Diego, the data is as of 5:00 p.m. for the preceding 24 hours.

December 1999							
Los Angeles – Downtown/USC				**San Diego**			
Day	**Precip. (Inches)**	**Day**	**Precip. (Inches)**	**Day**	**Precip. (Inches)**	**Day**	**Precip. (Inches)**
1	0.00	16	0.00	1	0.00	16	0.00
2	0.00	17	0.00	2	0.00	17	0.00
3	0.00	18	0.00	3	0.00	18	0.00
4	0.00	19	0.00	4	0.00	19	0.00
5	0.00	20	0.00	5	0.00	20	0.00
6	0.00	21	0.00	6	0.00	21	0.00
7	0.00	22	0.00	7	0.00	22	0.00
8	0.00	23	0.00	8	0.00	23	0.00
9	0.00	24	0.00	9	0.00	24	0.00
10	0.03	25	0.00	10	0.03	25	0.00
11	0.00	26	0.00	11	0.00	26	0.00
12	0.00	27	0.00	12	0.00	27	0.00
13	0.00	28	0.00	13	0.00	28	0.00
14	0.00	29	0.00	14	0.00	29	0.00
15	0.00	30	0.00	15	0.00	30	0.00
		31	0.00			31	0.00

January 2000							
Los Angeles – Downtown/USC				**San Diego**			
Day	**Precip. (Inches)**	**Day**	**Precip. (Inches)**	**Day**	**Precip. (Inches)**	**Day**	**Precip. (Inches)**
1	0.12	16	0.00	1	0.28	16	0.03
2	0.00	17	0.02	2	0.04	17	Trace
3	0.00	18	0.01	3	0.00	18	0.00
4	0.00	19	0.00	4	0.00	19	0.00
5	0.00	20	0.00	5	0.00	20	0.00
6	0.00	21	0.00	6	0.00	21	0.00
7	0.00	22	0.00	7	0.00	22	0.00
8	0.00	23	0.02	8	0.00	23	0.00
9	0.00	24	0.00	9	0.00	24	0.00
10	0.00	25	0.42	10	0.00	25	Trace
11	0.00	26	0.14	11	0.00	26	0.03
12	0.00	27	0.00	12	0.00	27	0.00
13	0.00	28	0.00	13	0.00	28	0.00
14	0.00	29	0.00	14	0.00	29	0.00
15	0.00	30	0.03	15	0.00	30	Trace
		31	0.21			31	0.08

February 2000							
Los Angeles – Downtown/USC				**San Diego**			
Day	**Precip. (Inches)**	**Day**	**Precip. (Inches)**	**Day**	**Precip. (Inches)**	**Day**	**Precip. (Inches)**
1	0.00	16	0.58	1	0.00	16	0.07
2	0.00	17	0.08	2	0.00	17	0.14
3	0.00	18	0.00	3	0.00	18	0.00
4	0.00	19	0.00	4	0.00	19	0.00
5	0.00	20	0.29	5	0.02	20	0.33
6	0.00	21	1.63	6	0.00	21	1.19
7	0.00	22	0.00	7	0.00	22	0.58
8	0.00	23	1.09	8	Trace	23	0.08
9	0.00	24	0.00	9	0.00	24	0.63
10	0.41	25	0.00	10	0.03	25	0.00
11	0.12	26	0.00	11	0.09	26	0.00
12	0.62	27	0.24	12	0.39	27	Trace
13	0.26	28	0.00	13	0.06	28	Trace
14	0.44	29	0.00	14	0.06	29	0.00
15	0.00			15	0.00		

March 2000							
Los Angeles – Downtown/USC				**San Diego**			
Day	**Precip. (Inches)**	**Day**	**Precip. (Inches)**	**Day**	**Precip. (Inches)**	**Day**	**Precip. (Inches)**
1	0.00	16	0.00	1	0.04	16	0.00
2	0.00	17	0.00	2	0.00	17	0.00
3	0.01	18	0.00	3	0.01	18	0.00
4	0.27	19	0.00	4	Trace	19	0.00
5	1.78	20	0.00	5	0.65	20	0.10
6	0.04	21	0.00	6	0.08	21	0.00
7	0.00	22	0.00	7	0.05	22	0.00
8	0.71	23	0.00	8	0.06	23	0.00
9	0.01	24	0.00	9	0.00	24	0.00
10	0.00	25	0.00	10	0.00	25	0.00
11	0.00	26	0.00	11	0.00	26	0.00
12	0.00	27	0.00	12	0.00	27	Trace
13	0.00	28	0.00	13	0.00	28	0.00
14	0.00	29	0.00	14	0.00	29	0.00
15	0.00	30	0.00	15	0.00	30	0.00
		31	0.00			31	0.00

April 2000							
Los Angeles – Downtown/USC				**San Diego**			
Day	**Precip. (Inches)**	**Day**	**Precip. (Inches)**	**Day**	**Precip. (Inches)**	**Day**	**Precip. (Inches)**
1	0.00	16	0.00	1	0.00	16	0.00
2	0.00	17	1.03	2	0.00	17	0.02
3	0.00	18	0.46	3	0.00	18	0.46
4	0.00	19	0.00	4	0.00	19	0.01
5	0.00	20	0.00	5	0.00	20	0.00
6	0.00	21	0.00	6	0.00	21	Trace
7	0.00	22	0.00	7	0.00	22	0.01
8	0.00	23	0.00	8	0.00	23	0.00
9	0.00	24	0.00	9	0.00	24	0.00
10	0.00	25	0.00	10	0.00	25	0.00
11	0.00	26	0.00	11	0.00	26	0.00
12	0.00	27	0.00	12	0.00	27	0.00
13	0.00	28	0.00	13	0.00	28	0.00
14	0.00	29	0.00	14	0.00	29	0.00
15	0.00	30	0.00	15	0.04	30	0.00

May 2000							
Los Angeles – Downtown/USC				**San Diego**			
Day	**Precip. (Inches)**	**Day**	**Precip. (Inches)**	**Day**	**Precip. (Inches)**	**Day**	**Precip. (Inches)**
1	0.00	16	0.00	1	0.00	16	0.00
2	0.00	17	0.00	2	0.00	17	0.00
3	0.00	18	0.00	3	0.00	18	0.00
4	0.00	19	0.00	4	0.00	19	0.00
5	0.00	20	0.00	5	0.00	20	0.00
6	0.00	21	0.00	6	0.00	21	0.00
7	0.00	22	0.00	7	0.00	22	0.00
8	0.00	23	0.00	8	Trace	23	Trace
9	0.00	24	0.00	9	0.00	24	0.00
10	0.00	25	0.00	10	0.00	25	Trace
11	0.00	26	0.00	11	0.00	26	0.00
12	0.00	27	0.00	12	0.00	27	0.00
13	0.00	28	0.00	13	0.00	28	0.00
14	0.00	29	0.00	14	0.00	29	0.00
15	0.00	30	0.00	15	0.00	30	0.00
		31	0.00			31	0.00

June 2000							
Los Angeles – Downtown/USC				**San Diego**			
Day	**Precip. (Inches)**	**Day**	**Precip. (Inches)**	**Day**	**Precip. (Inches)**	**Day**	**Precip. (Inches)**
1	0.00	16	0.00	1	0.00	16	0.00
2	0.00	17	0.00	2	0.00	17	0.00
3	0.00	18	0.00	3	0.00	18	0.00
4	0.00	19	0.00	4	0.00	19	0.00
5	0.00	20	0.00	5	0.00	20	0.00
6	0.00	21	0.00	6	0.00	21	Trace
7	0.00	22	0.00	7	0.00	22	0.00
8	0.00	23	0.00	8	0.00	23	0.00
9	0.00	24	0.00	9	0.00	24	0.00
10	0.00	25	0.00	10	0.00	25	Trace
11	0.00	26	0.00	11	0.00	26	0.00
12	0.00	27	0.00	12	0.00	27	0.00
13	0.00	28	0.00	13	0.00	28	0.00
14	0.00	29	0.00	14	0.00	29	0.00
15	0.00	30	0.00	15	0.00	30	0.00

July 2000							
Los Angeles – Downtown/USC				**San Diego**			
Day	**Precip. (Inches)**	**Day**	**Precip. (Inches)**	**Day**	**Precip. (Inches)**	**Day**	**Precip. (Inches)**
1	0.00	16	0.00	1	0.00	16	0.00
2	0.00	17	0.00	2	0.00	17	0.00
3	0.00	18	0.00	3	0.00	18	0.00
4	0.00	19	0.00	4	0.00	19	0.00
5	0.00	20	0.00	5	0.00	20	0.00
6	0.00	21	0.00	6	0.00	21	0.00
7	0.00	22	0.00	7	0.00	22	0.00
8	0.00	23	0.00	8	0.00	23	0.00
9	0.00	24	0.00	9	0.00	24	0.00
10	0.00	25	0.00	10	0.00	25	0.00
11	0.00	26	0.00	11	0.00	26	0.00
12	0.00	27	0.00	12	0.00	27	0.00
13	0.00	28	0.00	13	0.00	28	0.00
14	0.00	29	0.00	14	0.00	29	0.00
15	0.00	30	0.00	15	0.00	30	0.00
		31	0.00			31	0.00

August 2000							
Los Angeles – Downtown/USC				**San Diego**			
Day	**Precip. (Inches)**	**Day**	**Precip. (Inches)**	**Day**	**Precip. (Inches)**	**Day**	**Precip. (Inches)**
1	0.00	16	0.00	1	0.00	16	0.00
2	0.00	17	0.00	2	Trace	17	0.00
3	0.00	18	0.00	3	0.00	18	0.00
4	0.00	19	0.00	4	0.00	19	0.00
5	0.00	20	0.00	5	0.00	20	0.00
6	0.00	21	0.00	6	0.00	21	0.00
7	0.00	22	0.00	7	0.00	22	0.00
8	0.00	23	0.00	8	0.00	23	0.00
9	0.00	24	0.00	9	0.00	24	0.00
10	0.00	25	0.00	10	0.00	25	0.00
11	0.00	26	0.00	11	0.00	26	0.00
12	0.00	27	0.00	12	0.00	27	0.00
13	0.00	28	0.00	13	0.00	28	0.00
14	0.00	29	0.07	14	0.00	29	0.01
15	0.00	30	0.00	15	0.00	30	0.00
		31	0.00			31	0.00

September 2000							
Los Angeles – Downtown/USC				**San Diego**			
Day	Precip. (Inches)	Day	Precip. (Inches)	Day	Precip. (Inches)	Day	Precip. (Inches)
1	0.00	16	0.00	1	0.00	16	0.00
2	0.00	17	0.00	2	0.00	17	0.00
3	0.00	18	0.00	3	0.00	18	0.00
4	0.00	19	0.00	4	0.00	19	0.00
5	0.00	20	0.00	5	0.00	20	0.00
6	0.00	21	0.00	6	0.00	21	0.00
7	0.00	22	0.00	7	Trace	22	0.00
8	0.00	23	0.15	8	0.00	23	Trace
9	0.00	24	0.00	9	0.00	24	0.00
10	0.00	25	0.00	10	0.00	25	0.00
11	0.00	26	0.00	11	0.00	26	0.00
12	0.00	27	0.00	12	0.00	27	0.00
13	0.00	28	0.00	13	0.00	28	0.00
14	0.00	29	0.00	14	0.00	29	0.00
15	0.00	30	0.00	15	0.00	30	0.00

October 2000							
Los Angeles – Downtown/USC				**San Diego**			
Day	Precip. (Inches)	Day	Precip. (Inches)	Day	Precip. (Inches)	Day	Precip. (Inches)
1	0.00	16	0.00	1	0.00	16	0.00
2	0.00	17	0.00	2	0.00	17	0.00
3	0.00	18	0.00	3	0.00	18	0.00
4	0.00	19	0.00	4	0.00	19	0.00
5	0.00	20	0.00	5	0.01	20	0.00
6	0.00	21	0.00	6	0.06	21	0.01
7	0.00	22	0.00	7	0.01	22	Trace
8	0.00	23	0.00	8	0.00	23	Trace
9	0.00	24	0.00	9	0.00	24	0.00
10	0.00	25	0.00	10	0.04	25	0.00
11	0.12	26	0.07	11	0.05	26	Trace
12	0.12	27	0.25	12	Trace	27	0.38
13	0.00	28	0.01	13	0.00	28	0.17
14	0.00	29	0.07	14	0.00	29	0.00
15	0.00	30	0.53	15	0.00	30	0.51
		31	0.00			31	0.00

November 2000							
Los Angeles – Downtown/USC				**San Diego**			
Day	**Precip. (Inches)**	**Day**	**Precip. (Inches)**	**Day**	**Precip. (Inches)**	**Day**	**Precip. (Inches)**
1	0.00	16	0.00	1	0.00	16	0.00
2	0.00	17	0.00	2	0.00	17	0.00
3	0.00	18	0.00	3	0.00	18	0.00
4	0.00	19	0.00	4	Trace	19	0.00
5	0.00	20	0.00	5	0.00	20	0.00
6	0.00	21	0.00	6	0.00	21	0.00
7	0.00	22	0.00	7	0.00	22	0.00
8	0.00	23	0.00	8	0.00	23	0.00
9	0.00	24	0.00	9	Trace	24	0.00
10	0.00	25	0.00	10	0.04	25	0.00
11	0.00	26	0.00	11	0.22	26	0.00
12	0.00	27	0.00	12	0.00	27	0.00
13	0.00	28	0.00	13	0.00	28	0.00
14	0.00	29	0.00	14	Trace	29	0.00
15	0.00	30	0.00	15	0.00	30	0.00

December 2000							
Los Angeles – Downtown/USC				**San Diego**			
Day	**Precip. (Inches)**	**Day**	**Precip. (Inches)**	**Day**	**Precip. (Inches)**	**Day**	**Precip. (Inches)**
1	0.00	16	0.00	1	0.00	16	0.00
2	0.00	17	0.00	2	0.00	17	0.00
3	0.00	18	0.00	3	0.00	18	0.00
4	0.00	19	0.00	4	0.00	19	0.00
5	0.00	20	0.00	5	0.00	20	0.00
6	0.00	21	0.00	6	0.00	21	0.00
7	0.00	22	0.00	7	0.00	22	0.00
8	0.00	23	0.00	8	0.00	23	0.00
9	0.00	24	0.00	9	0.00	24	0.00
10	0.00	25	0.00	10	0.00	25	0.00
11	0.00	26	0.00	11	0.00	26	0.00
12	0.00	27	0.00	12	0.00	27	0.00
13	0.00	28	0.00	13	0.00	28	0.00
14	0.00	29	0.00	14	0.00	29	0.00
15	0.00	30	0.00	15	0.00	30	0.00
		31	0.00			31	0.00

January 2001							
Los Angeles – Downtown/USC				**San Diego**			
Day	**Precip. (Inches)**	**Day**	**Precip. (Inches)**	**Day**	**Precip. (Inches)**	**Day**	**Precip. (Inches)**
1	0.00	16	0.00	1	0.00	16	Trace
2	0.00	17	0.00	2	0.00	17	0.00
3	0.00	18	0.00	3	0.00	18	0.00
4	0.00	19	0.00	4	0.00	19	0.00
5	0.00	20	0.00	5	0.01	20	0.00
6	0.00	21	0.00	6	Trace	21	0.00
7	0.00	22	0.00	7	0.00	22	0.00
8	0.00	23	0.00	8	0.29	23	0.00
9	0.01	24	0.30	9	0.36	24	0.06
10	0.21	25	0.00	10	0.00	25	0.00
11	3.61	26	0.52	11	1.11	26	0.26
12	0.59	27	0.00	12	0.84	27	0.34
13	0.00	28	0.00	13	0.00	28	0.00
14	0.00	29	0.00	14	0.00	29	0.00
15	0.00	30	0.00	15	0.00	30	0.00
		31	0.00			31	0.00

February 2001							
Los Angeles – Downtown/USC				**San Diego**			
Day	Precip. (Inches)	Day	Precip. (Inches)	Day	Precip. (Inches)	Day	Precip. (Inches)
1	0.00	16	0.00	1	0.00	16	0.00
2	0.00	17	0.00	2	0.00	17	0.00
3	0.00	18	0.02	3	0.00	18	0.00
4	0.00	19	0.18	4	0.00	19	0.00
5	0.00	20	0.57	5	0.00	20	0.03
6	0.00	21	0.00	6	0.00	21	0.00
7	0.06	22	0.00	7	0.01	22	Trace
8	0.01	23	0.12	8	0.05	23	0.34
9	0.00	24	NA	9	0.00	24	0.02
10	0.36	25	1.07	10	Trace	25	0.26
11	0.02	26	2.86	11	0.04	26	0.39
12	1.00	27	0.22	12	Trace	27	0.44
13	2.94	28	0.31	13	0.41	28	0.23
14	0.92			14	0.17		
15	0.00			15	0.00		

March 2001							
Los Angeles – Downtown/USC				**San Diego**			
Day	Precip. (Inches)	Day	Precip. (Inches)	Day	Precip. (Inches)	Day	Precip. (Inches)
1	0.00	16	0.00	1	0.00	16	0.00
2	0.00	17	0.00	2	0.00	17	0.00
3	0.00	18	0.00	3	Trace	18	0.00
4	0.00	19	0.00	4	0.56	19	0.00
5	0.66	20	0.00	5	Trace	20	0.00
6	1.10	21	0.00	6	0.00	21	0.00
7	0.00	22	0.00	7	0.00	22	0.00
8	0.00	23	0.00	8	0.00	23	0.00
9	0.00	24	0.00	9	0.00	24	0.00
10	0.00	25	0.00	10	0.07	25	0.00
11	0.00	26	0.00	11	0.00	26	0.00
12	0.00	27	0.00	12	0.00	27	0.00
13	0.00	28	0.00	13	0.00	28	0.00
14	0.00	29	0.00	14	0.00	29	0.00
15	0.00	30	0.00	15	0.00	30	0.00
		31	0.00			31	0.00

April 2001							
Los Angeles – Downtown/USC				**San Diego**			
Day	Precip. (Inches)	Day	Precip. (Inches)	Day	Precip. (Inches)	Day	Precip. (Inches)
1	0.00	16	0.00	1	0.00	16	0.00
2	0.00	17	0.00	2	0.04	17	0.00
3	0.00	18	0.00	3	0.00	18	0.00
4	0.00	19	0.00	4	0.00	19	0.00
5	0.00	20	0.00	5	0.00	20	0.00
6	0.00	21	0.34	6	Trace	21	0.19
7	0.64	22	0.00	7	0.17	22	0.00
8	0.04	23	0.00	8	0.00	23	0.00
9	0.00	24	0.00	9	0.03	24	0.00
10	0.00	25	0.00	10	0.25	25	0.00
11	0.00	26	0.00	11	0.00	26	0.00
12	0.00	27	0.00	12	0.00	27	0.00
13	0.00	28	0.00	13	0.00	28	0.00
14	0.00	29	0.00	14	0.00	29	0.00
15	0.00	30	0.00	15	0.00	30	0.00

May 2001							
Los Angeles – Downtown/USC				**San Diego**			
Day	Precip. (Inches)	Day	Precip. (Inches)	Day	Precip. (Inches)	Day	Precip. (Inches)
1	0.00	16	0.00	1	0.00	16	0.00
2	0.00	17	0.00	2	0.00	17	0.00
3	0.00	18	0.00	3	0.00	18	0.00
4	0.00	19	0.00	4	0.00	19	0.00
5	0.00	20	0.00	5	0.00	20	0.00
6	0.00	21	0.00	6	0.00	21	0.00
7	0.00	22	0.00	7	0.00	22	0.00
8	0.00	23	0.00	8	0.00	23	0.00
9	0.00	24		9	0.00	24	
10	0.00	25		10	0.00	25	
11	0.00	26		11	0.00	26	
12	0.00	27		12	0.00	27	
13	0.00	28		13	0.00	28	
14	0.00	29		14	0.00	29	
15	0.00	30		15	0.00	30	

APPENDIX A
QUARTERLY STATUS MEETING NO. 12 MINUTES

JN: 100979,100980

STORMWATER PLANNING SERVICES
CONTRACT NO. 43A0004A
Meeting Minutes

ISSUE VERSION: Final

MEETING NO.: 12
DATE: 3/14/01
TIME: 9:30am
LOCATION: RBF Irvine

SUBJECT: Quarterly Meeting No. 12

Prepared by: S. Taylor

Approved by: (Signature)

Date Prepared: 4/10/01

Attendee Names / Company

E. Delano, NRDC
S. Fleischli, SMBaykeeper
R. Graff, SDBaykeeper
R. Horner, NRDC

S. Borroum, Caltrans
B. Currier, Caltrans
K. Smarkel, Caltrans
W. Evans, Caltrans
D. Failing, Caltrans
S. Ramos, Caltrans
M. Sanchez, Caltrans

Attendee Names / Company

C. Tesoro, Caltrans
J. Smith, Caltrans
P. Thakur, Caltrans
L. Chronert, Caltrans

J. Welch, SWRCB
P. Barksdale, SWRCB

M. Barrett, UT/RBF
L. Hansen, RBF
A. Lantin, RBF
S. Taylor, RBF

Copies To:

File

The following items presented summarize the substantive items discussed or issues resolved at the above meeting to the best of the writer's memory.

ITEM	DESCRIPTION	STATUS	OPENED	DUE	ACTION FOR:
01	**Agenda Item 2.** Opening Remarks. US EPA regarding the La Costa infiltration basin: Laurie Kermish sent a letter that says that the EPA does not see the need to modify the consent decree, and would like to see the work proceed in a collaborative manner. What was the purpose of the meeting at SCCWRP on infiltration? Caltrans responded that the meeting at SCCWRP was a result of the District 7 stipulation, and not to discuss the particulars of the studies in District 11. The objective was to discuss the technical aspect of concerns from the Board if infiltration devices should be deployed. Ther was no intent to exclude interested parties from the pilot team. The EPA noted that it is not really possible to distinguish between infiltration in the Districts, rather it is all one issue. Caltrans had previously noted that it had to hold on consideration of infiltration due to the language in the San Diego municipal permit. NRDC asked if the preliminary siting study (for District 11) was underway? District 11 indicated that a draft report was developed, and now the District (11), wants to move forward based on the letter the district legal staff has put forth. NRDC noted they still have some concerns as to the scope of the District 11 investigation, and those comments have not been shared with Caltrans yet. District 11 noted the December letter was just a mechanism to memorialize the understanding and agreement regarding the La Costa basin settlement.	New	3/14	6/15	Caltrans D 11
02	**Agenda Item 3a.** Vector larval monitoring and abatement update. This quarter in District 7 there were a total of six sites breeding, and 21 abatement actions, in District 11 seven breeding incidents and four abatements. NRDC asked why there were no abatement actions in January or February. Caltrans will follow up on this, but it is probably due to the fact that there was a series of storm events during this period.	New	3/14	4/12	Caltrans HQ
03	**Agenda Item 3b,c.** Update on DHS Survey and Portland field investigation. DHS has been given an extension to complete their report. DHS went to Portland, OR, to assess how this jurisdiction deals with BMP vector issues, they are summarizing what they learned. April 30th is the new deadline for completion of the out of state survey for BMP/Vector activities. NRDC: What are the findings in Portland? Caltrans: They have a more limited BMP palette, mostly EDBs and biofilters. Concerns expressed by the agencies there were O&M driven. A summary of the Portland experience will be in the next bi-weekly report. It was noted that the next bi-weekly call is on the 29th of March.	New	3/14	3/29	Caltrans HQ
04	**Agenda Item 4.** Empirical Observations Data. A brief overview of the findings of the empirical observations was given, and a handout supplied. NRDC indicated the findings were on target with their view of things, and noted that the findings will appear in a subsection of each final report chapter. NRDC would like to get a more a numerical assessment. Look at the observations, and say what the extent (number) of observations were, to give the reader some context as to the extent of the problem. Also, we need to note in the final report that the swales can be constructed on fill, although a swale should not be formed with berms made of fill (the gopher problem at the Cerritos MS was because of a relatively thin berm constructed of fill dirt).	New	3/14	6/14	Caltrans HQ/RBF

ITEM	DESCRIPTION	STATUS	OPENED	DUE	ACTION FOR:
05	**Agenda Item 5.** Storm Sampling Activities in District 7: Had two recent storm events that were successfully sampled. Only CDS sites that are short for the overall program (4 storms). District 11: Five events in the quarterly reporting period. Two events are not in the quarterly report, all sites were successfully monitored during the captured events. All sites meet criteria for target storms except at the swales. USEPA: Flow meters failed at 5/56, why? Caltrans: Had blockage in the sample intake tubes, they were subsequently retested and reinstalled after the event. NRDC: Is there construction at the Escondido MS? Caltrans: No, there is only normal maintenance activity at this station. NRDC also noted that the CDS units may need to be monitored beyond this year. No other sites where this is a problem. CDS Vector prevention fix: Put a bag on the downstream pipe outlet. This fix was a problem for storm flows, and created an unacceptable hydraulic condition (blocked flow and caused a backwater in the unit). The next step was to put in a more pliable fabric at the end of the pipe to get rid of the gaps that may allow mosquitoes in, and cut the end out of the bag to let it collapse on itself, but still allow flow and debris to pass during storms. On the inlet side, it does not appear that mosquitoes are coming through the inlet system. EPA: CDS representatives had some conversations with Caltrans regarding putting in a mixer to agitate the permanent pool in the device. What happened to this plan? Caltrans We want to try to exhaust the passive approaches before resorting to a more complex and maintenance intensive active approach. Caltrans also noted that litter baskets were installed downstream to catch (measure) the trash that bypasses the CDS unit. Caltrans noted that with the smaller design storms being recommended by the Board (0.75 inch as compared to the 1 inch plus the pilot program used for design), the bypasses may be more frequent. Santa Monica BayKeeper noted that Caltrans is not subject to the SUSMPs, or the Municipal permit. They further noted that the SUSMPs are not a mandate, they are a minimum standard, and Caltrans can implement a more conservative design storm. The Baykeeper also reminded Caltrans that complying with the litter TMDL is an issue separate from the design storm. Caltrans recoginized that the basis for specifying BMPs does need further consideration, especially with respect to TMDLs. Caltrans noted that the SUSMPs are the most current thinking and guidance from the Board, and that the design storm issue remains unsettled. Caltrans wants to continue the dialogue on this issue. The State Board representative noted that the Regional Boards are concerned about the costs of the devices if they are designed with too big of a water quality volume or peak discharge rate. The Boards want flexibility, to get the most devices deployed. Caltrans noted they are not locked into any particular design storm because they believe the best solution is location, pollutant and watershed specific, and noted they are currently doing research in this area.	FYI	3/14		
06	**Agenda Item 6.** Device Specific Updates (6a). The vector covers were successfully installed at Via Verde. The units were smoke tested, found no leaks. The installation will be monitored for	New	3/14	6/15	Caltrans

ITEM	DESCRIPTION	STATUS	OPENED	DUE	ACTION FOR:
	effectiveness. It was noted that the covers are also safe for personnel load. Sand Filter Maintenance (6b). Delaware Filter in District 11: Removed and replaced top two inches of filter sand. The unit is now working fine and has drain times comparable to when new. NRDC noted that it looks like other filters in District 7 are now clogging, and that mimics the national experience with respect to filter run time (about 3 – 5 years). It was also noted that they are seeing the crusting of the filter surface in Austin, Texas. Caltrans noted they are looking at alternative media for the SFs, and maybe the research will find a way around the surface crusting problem. NRDC noted that infiltration basin surfaces are known to crust, and this can be somewhat alleviated with the application of gypsum (calcium sulfate). Vegetation also helps mitigate this problem. NRDC requested that some testing of the cores taken at the sand filters. Maybe test for particle size and organic analysis. Caltrans indicated this could be done, but noted that there will be no baseline to compare the results to. It was decided to have this as a discussion item in the next bi-weekly call. Mike Barrett speculated that evaporation and deposition of dissolved solids in the surface layer could be a cause of clogging, which could be assessed by analyzing the crust. Steve Borroum thought that placing filter fabric on the surface and rolling it up when needed could be an easy, cheap solution. Metro and Paxton Update (6c): Bid came in at 40% of engineer's estimate at Paxton park and ride, 15 bids were received. No award yet. Metro maintenance station has been advertised, bids to be opened on April 5th. The plan now is to build the sites but not to monitor/sample them, and have the monitoring money saved to build some biofilters in the District instead. The agreement to accomplish this has yet to be formalized.				
07	**Agenda Item 7.** Final Report Development Update. The report development group held a meeting on 3/13, and talked about structure of the document, where the lessons learned would be placed in the text (integrated in the body and tabulated the end of each section). NRDC: Term the lessons learned as 'criteria/guidelines' as appropriate to help users develop design manuals in the future. NRDC indicated the process is working well, and that Caltrans and the Plaintiffs have exchanged on all the lessons learned for each BMP, and there are no remaining disagreements. The plan is to continue to exchange draft chapters for comment. It appears the report can be finalized by September 2001. There will also be a concluding chapter that compares the sampling results between the different technologies to indicate what technology appears better suited to the removal of the specified constituent. It was agreed that the summary reports previously developed (siting, design and construction) would not be used in the final report. The Plaintiffs requested that Caltrans go back and make sure that there is nothing in the summary reports that should be brought forward to the final report (important points that were left out). All report chapters will be completed in draft by the end of May, with September 1 being the target for a final draft. The District 11 Plaintiffs noted they are OK with final report development being guided and reviewed by the District 7 Plaintiff experts.	New	3/14	9/14	Caltrans HQ/NRDC Consultants

ITEM	DESCRIPTION	STATUS	OPENED	DUE	ACTION FOR:
08	**Agenda Item 8.** O&M Cost Update and MID Analysis. OMM Cost update: The objective of the committee that has been formed is developing O&M costs that would be representative if Caltrans was to perform the work. The committee is going to meet with the Pilot consultants, and develop a questionnaire. The Plaintiffs noted they would like to be involved in this process. NRDC: Are you working to cost or hours? Caltrans: both. Caltrans suggested that this summer would be a good chance to check back on the MID, and go through it and make it reflect with what we have learned over the course of the program, and refine the maintenance intervals to reflect this experience. The Plaintiffs inquired if the pilots will be maintained through next year, including the consent decree only pilot sites. Caltrans indicated the Consent Decree has specified deadlines, and we need to make sure those deadlines are honored. District 11 would like to sit down with the Plaintiffs and determine what (if any) sites would be decommissioned, and how they will be maintained from this point forward. If the sites are functioning, the District will continue to operate them, and if they are not functioning, the District will most likely retrofit or decommission them. District 11 will have a resolution/disposition proposal for each site by June if possible, by September at the latest . NRDC noted they would require a high standard for any decision to decommission a site. District 11 noted we are coming to a point where the legal obligations under the Consent Decree are ending.	New	3/14	9/14	District 11
09	**Agenda Item 9.** Closure and Meeting Summary. Dates to highlight: A field trip will be held on April 24 and 25th. June 13th, Wednesday is the next Quarterly Meeting date. The State Board Representative noted that they were invited and were concerned and wanted to see the process, and how Caltrans will be complying with their permit. The Board staff would like to put together a list of comments for Caltrans to respond to.				

APPENDIX B:
MID CHANGES – CDS UNITS

CONTINUOUS DEFLECTIVE SEPARATION (CDS) UNITS

Preventive Maintenance and Routine Inspections

DESIGN CRITERIA, ROUTINE ACTIONS	MAINTENANCE INDICATOR	FIELD MEASUREMENT	MEASUREMENT FREQUENCY	MAINTENANCE ACTIVITY	SITE-SPECIFIC REQUIREMENTS
Inspect for accumulation of trash and debris	Unit 85 percent full or When the sump is 50% full during two consecutive monthly inspections.	Visual observation using a depth measuring gauge	Monthly during the wet season	Empty unit when the ~~it~~ unit is 85 percent full or 50% full during two consecutive monthly inspections or ~~annually~~ Annually in May, effect cleaning within ~~30~~ 15 days	
Inspect for vector harborage	Standing water for more than 72 hours	Visual observation	Monthly and 72 hours after target storm event	Immediately notify VCD for vector abatement assessment.	None
Inspect the screen for damage and to ensure that it is properly fastened.	Screen becomes clogged, damaged or loose	Visual observation	Annually between September 15 and October 1)	Brush or high pressure wash the screen	None
Inspection for structural integrity	Holes in screen, large debris, damage to housing or weir box	Visual observation	Monthly or prior to a target storm during the wet season, and annually in May	Immediately consult with engineer and manufacturer's representative to develop a course of action, effect repairs within 10 working days	None

APPENDIX C:
DHS OUT-OF-STATE SUMMARY ADDENDUM REPORT

A Preliminary Assessment of Vectors Associated with Stormwater Management Structures in the United States.

*Addendum

CALIFORNIA DEPARTMENT OF HEALTH SERVICES

VECTOR-BORNE DISEASE SECTION

Gray Davis
Governor
State of California

June 2001

Grantland Johnson, Secretary
California Health and Human Services Agency

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Background

In 1998, the California Department of Health Services, Vector-Borne Disease Section (VBDS) entered into a Memorandum of Understanding with the California Department of Transportation (Caltrans) to provide technical expertise regarding the production of vectors and vector-borne disease within its stormwater Best Management Practice (BMP) Retrofit Pilot Study. One of the tasks undertaken by VBDS for Caltrans was a study to determine the relative abundance and types of stormwater management structures in selected areas across the United States and assess their impact on local vector production and vector control activities. This study was essential because of the little available information on vector issues associated with these structures, despite the abundance of documentary evidence on the positive attributes of BMPs as stormwater management and water quality devices.

To establish a baseline evaluation, VBDS prepared a detailed questionnaire to solicit information from vector control agencies with regard to their experience with stormwater management structures. The objectives of the survey were to develop a better understanding of the vector issues associated with different structures, factors affecting vector production within structures, and the solutions used to correct them when necessary. On January 11, 2000, 338 surveys were mailed out to vector control agencies nationwide. Exactly 105 agencies participated in the study, of which 72 (69%) provided feedback on vectors associated with local structures. The responses from these agencies provided a preliminary assessment of the potential public health risks involved with the construction of structures such as the Caltrans BMPs, addressed factors that encouraged vector production, and summarized the views of vector control agencies on these issues.

Scope of the Addendum

The report generated by VBDS based on responses to the questionnaire revealed that vectors are associated with stormwater management structures nationwide. This confirmed that vector production noted within Caltrans BMPs is not unique to southern California or to the specific BMP technologies implemented by Caltrans as part of their stormwater Best Management Practice (BMP) Retrofit Pilot Study. Instead, it demonstrates that opportunistic vector species will utilize a variety of habitats that provide them with food and shelter, resulting in increased human health threats.

Stormwater runoff is a relatively new and rapidly growing field of interest in the United States. Most states have begun implementing structural and non-structural BMPs to comply with local, state, and federal regulations regarding stormwater runoff management and water quality. Many states outside of California have years or decades of valuable experience working with BMPs. Unfortunately, there is a general lack of inter-agency communication, particularly between agencies involved with water issues and those involved with vector issues. Information gained from different agencies could be used to improve upon BMP structures planned for use in California and would provide some background useful for establishing or improving upon inter-agency relationships.

Eight states were selected for more detailed investigations into vector / BMP related issues. This addendum study includes a variety of agencies at different levels of government, and with different overall objectives, to provide a more rounded, non-biased view of the vector / BMP relationship. VBDS used a slightly different approach to conducting this addendum study. Rather than mailing out questionnaires and waiting for responses, agencies were first actively searched out using the Internet and local area contacts, then contacted by phone. The biggest challenge was locating the most qualified person(s) within an agency to discuss issues relevant to the scope of this project. Once found, the person(s) was contacted directly by phone. During phone conversations, VBDS staff took detailed notes and solicited that a questionnaire be completed. For consistency, the same questionnaire that was used in the original study

was used in this addendum study. Using this process, VBDS obtained more information from agencies than in the original study, and nearly all questionnaires were completed and returned. Over 45 agencies were contacted and are included in the following addendum report.

Organization

Agencies contacted as part of this addendum study had a variety of different objectives and the contact person's knowledge of BMP / vector issues varied widely. As a result, the following report is divided into 8 sub-sections by state and each contacted agency within a state is treated separately. A general summary is provided for each of the eight states that discusses briefly the responsibilities of the contacted agencies, their involvement with BMPs and/or vectors, and Internet addresses if available. Following the general summary, are details of the phone conversations between VBDS and each contacted agency within the state, beginning with state agencies, followed by successive levels of government. It should be noted that local agencies that actually design and implement BMPs usually had more knowledge of BMP design, function, maintenance, and associated vector issues than did higher level regulatory agencies.

Six reference appendices are included in this report, including: A) as list of contacted agencies, B) a report summarizing VBDS' visit to Portland, Oregon, C) a report summarizing VBDS' visit to Austin, Texas, D) a report prepared by the Maryland Department of Agriculture, Mosquito Control, entitled "A preliminary survey for mosquito breeding in stormwater retention ponds in three Maryland counties" (upon request), E) a manual prepared by the New Jersey Department of Environmental Protection, State Mosquito Control Commission, entitled "Best management practices for mosquito control and freshwater wetlands management" (upon request), and F) copies of questionnaires returned by contacted agencies (upon request). It should also be noted that written information provided on returned questionnaires may contain additional information not discussed during the phone conversations.

COLORADO

Summary. VBDS investigated BMP / vector issues in Colorado, with emphasis in and around the city of Denver. Vector control in the city of Denver is conducted primarily by the City and County of Denver, Department of Environmental Health, Division of Animal Control (http://www.denvergov.org/dephome.asp?depid=42). However, the City and County of Denver, Community Planning and Development Agency, Neighborhood Inspection Services (http://www.denvergov.org/dephome.asp?depid=710) occasionally conducts some vector control on an "as needed" basis. The Denver suburb areas to the north of the city contract out some of their mosquito control to a private organization called *Colorado Mosquito Control, Inc.* (CMC) (http://www.comosquitocontrol.com/). CMC also conducts all of the mosquito control in Jefferson County, to the west of Denver County. Commerce City is part of the Denver-metropolitan area and has a vector control program within the Tri-County Health Department (http://www.tchd.org/) that covers Adams, Arapahoe, and Douglas Counties, to the north, east, and south of Denver County, respectively. The Colorado Department of Public Health and Environment, Disease Control & Environmental Epidemiology Division (http://www.cdphe.state.co.us/dc/dceedhom.asp) is not directly involved with mosquito control in the state, but will act as a consultant to local agencies when requested.

Colorado Department of Public Health and Environment. A state epidemiologist in the Disease Control & Environmental Epidemiology Division, was contacted by phone in October/November of 2000. He was familiar with mosquito problems, but was not the right contact for the interests of VBDS and Caltrans. On January 31, 2001, the Vector Control Program manager for the state was contacted by phone.

Summary of the phone conversation with The Vedctor Control Program manager. The State vector control program is strictly a consulting agency that will assist and advise local agencies as needed. For example, they will conduct field surveys to determine mosquito species present and advise on abatement procedures. However,

the State does not conduct any type of mosquito control. They do however conduct plague surveys in conjunction with the Center for Disease Control, located in Fort Collins. The state of Colorado has a very de-centralized program and municipalities and/or counties will decide whether or not to implement a vector control program. In many cases, mosquito control is contracted out (i.e. Colorado Mosquito Control, Inc.) because it is more economical. In other cases, Parks and Recreation, who conduct mosquito control on a very local basis, sometimes run rural areas. It was suggested that VBDS contact the City and County of Denver, Community Planning and Development Agency, Neighborhood Inspection Services because they are involved with various aspects of pest control in Denver.

Denver Community Planning and Development Agency. The Neighborhood Inspection Services, was contacted by phone on February 16, 2001 and again briefly on February 26, 2001.

Summary of the phone conversation. Our contact occasionally does some vector control on an "as needed" basis in pond / riparian habitats. He suggested that people involved with a committee called Urban Drainage, within his agency, be contacted for more information on stormwater issues.

Denver Department of Environmental Health. The field inspector for the Division of Animal Control, Vector Control, was contacted by phone on January 31, 2001.

Summary of the phone conversation. Vector surveillance and control is only conducted on city owned lands. Some of the typical sites inspected and treated include creek beds, river edges, culverts, detention ponds, and areas of new development. Our contact was aware of water management structures, old and new. She stated that many structures were built in and around the massive urban development areas near the new Denver International Airport. She mentioned that mosquitoes are regularly associated with many of the structures, and that many of the structures do not drain at the rate they were designed to, resulting in additional problems.

Colorado Mosquito Control, Inc. The president of the Colorado Mosquito Control (CMC), was contacted by phone on February 1, 2001. CMC participated in the original VBDS study back in June 2000.

Summary of the phone conversation. CMC is a privately owned municipal contractor that works in different areas of the state. In the Denver area, they have some contracts in the suburban areas, north of Denver, that are not part of the city of Denver; however, CMC will work on both privately owned and city owned lands depending on the contract. CMC will not do maintenance on any of the canals, ponds, etc. that they abate for mosquitoes. Our contact noted that maintenance of these structures has been lacking severely and that in many cases, abatement that is performed for many consecutive months could be avoided if the structures were maintained regularly, allowing the water to drain as intended in the original designs. He also mentioned that thick cattail growth as well as trash and debris accumulation frequently prevents proper drainage of canals. Dense stands of cattails also create mosquito problems in wet ponds.

Tri-County Health Department. The supervisor of the Vector Control Program, was contacted by phone on February 26, 2001.

Summary of phone conversation. Urban stormwater runoff in the Tri-County area is captured mainly by urban or commercial-based ponds. These structures are designed to drain rapidly, in approximately 72 hours. However, our contact mentioned that after the first few storms, structures tend to clog with sediment and trash and form ponds of water. This water then becomes overgrown with thick mats of filamentous algae and duckweed. He has seen larvae along the edges of these ponds, but believes that the water becomes so clogged with vegetation that it may occasionally exclude mosquito larvae.

The aesthetics of urban pond structures are frequently enhanced by building parks around them. Ponds are supposed to be maintained by homeowners associations. Interestingly, our contact's experience, many people don't even know what the purpose of the pond is.

MARYLAND

Summary. VBDS investigated BMP / vector issues in the state of Maryland. The Maryland Department of Agriculture, Office of Plant Industries and Pest Management, Mosquito Control Section (http://www.mda.state.md.us) is responsible for administering and implementing mosquito control throughout the state of Maryland. Frederick County Health Department, Environmental Health Services, Mosquito Program (http://www.frederickhealth.org/environment/community.htm) conducts basic mosquito surveillance and monitoring and is one of many counties that contracts with the State for mosquito control. Calvert County is one of the few Counties in Maryland that have an operational mosquito control program (http://www.co.cal.md.us/services/mosquito.htm).

There is a collaborative plan among three state agencies to respond to West Nile Virus: Maryland Department of Agriculture (MDA), Maryland Department of Health and Mental Hygiene (DHMH), and the Maryland Department of Natural Resources (MDNR). More information on this group can be found on the Internet (http://www.dhmh.state.md.us/publ-rel/html/westnile.htm). The overall head of the cooperative group agreement is the Secretary of Health and Mental Hygiene, Georges Benjamin. Each agency in this group has a role: 1) MDA does mosquito collections and identifications, dead bird pick ups, and sends pools of specimens to DHMH, virology lab, for testing, 2) DHMH screens pools of specimens received from MDA for Eastern Equine Encephalitis, Saint Louis Encephalitis, and West Nile Virus, and operate the West Nile Virus and dead bird hotline for public information, and 3) MDNR coordinates wildlife disease work and takes care of animal trapping for disease monitoring and surveillance when necessary.

The Maryland Department of the Environment (http://www.mde.state.md.us) heads up NPDES related issues and is responsible for preparing the state BMP manual. The 2000 Maryland Stormwater Design Manual that MDE prepared, as well as publications related to non-point source pollution are available on the Internet (http://www.mde.state.md.us/environment/wma/stormwatermanual/).

The Maryland Department of Transportation is divided up into several Administrations. The State Highway Administration (http://www.sha.state.md.us/) is responsible for construction and maintenance of many of the BMP structures throughout the state.

Maryland Department of Agriculture. Cyrus Lesser, the head of the Mosquito Control Section in the Office of Plant Industries and Pest Management, was contacted by phone on April 10, 2001. Later the same day, Mike Cantwell, the Maryland Department of Agriculture (MDA) regional entomologist for western Maryland was also contacted by phone. He handles the contracts with individual counties within the state and is more closely involved with field situations.

Summary of the phone conversation with Cyrus Lesser. The MDA is responsible for surveillance, control, recommendations, and mosquito identifications for almost every county in the state. There are only a few counties with their own operational mosquito control programs; other counties all contract with the State for mosquito control. Cyrus Lesser has been trying repeatedly to get vector issues recognized by the Maryland Department of Environment (MDE), which regulates all state BMP guidelines and is responsible for preparing the State manual. Although MDA had sent numerous written requests to MDE for consideration of mosquito issue "verbage" (for the State manual) within the construction of BMPs, MDA has had no response from MDE. The 2000 BMP guidelines manual produced by MDE mentions mosquitoes briefly and states that they are an insignificant factor within water quality ponds.

Cyrus Lesser mentioned that Maryland Department of Transportation is the primary state agency that builds structural BMPs. He also mentioned that many of the BMP designs are becoming progressively worse in terms of providing more suitable mosquito larval habitat. Many water quality ponds are being built with very shallow sections (swampy) with planted aquatic and semi-aquatic plant species. These structures hold water for weeks, even in summer, and act like natural vernal pools or emergent wetlands and are a very large source of mosquitoes. Dry detention basins and bioswales are also frequent sources of mosquitoes in Maryland, particularly

floodwater species. Permanent wet ponds that are stocked with mosquito fish have been the least problematic in terms of mosquito production.

Developers of new subdivisions in Maryland are required to built stormwater runoff ponds. The developer then is supposed to be responsible for upkeep and maintenance of these structures. However, when MDA finds mosquitoes associated with these ponds, there is often a lot of "finger pointing" when attempting to determine who is responsible for their maintenance. Many ponds have fallen in to disrepair with thick, uncontrolled vegetation (including trees) that makes vector surveillance and control efforts difficult and reduces the ability of the pond to serve its original purpose for water quality.

Cyrus Lesser suggested that VBDS also contact Ken Pensyl, the Environmental Program Manager for MDE, and Wilson Freeland, the supervisor of the Calvert County Mosquito Control Program, for additional information.

One last bit of interesting information that Cyrus Lesser mentioned was that there is a group called the Council of Governments (COG) that includes Washington D.C., northern Virginia, and adjoining areas of Maryland. This group coordinates on issues such as West Nile Virus that are of mutual importance to all three areas.

Summary of the phone conversation with Mike Cantwell. Mike Cantwell is a regional entomologist for MDA and handles individual county contracts within western Maryland. For example, when a county health department or other agency reports a mosquito problem, the appropriate regional section of MDA will respond and assess the severity of the situation.

Ponds in western Maryland are owned by the County they reside in, or by developers. Most permanent ponds appear to be maintained, whereas problems with vector production are most often encountered with dry detention ponds. The majority of pond structures in the State are dry detention, designed to drain quickly (approximately 5-10 days). Unfortunately, many are built into areas with clay soils that do not infiltrate well, and perform worse as sediments accumulate. These structures mainly produce floodwater mosquitoes including species of *Aedes* and *Psorophora*, but can also provide habitat for *Culex* and *Anopheles* mosquitoes in those that hold water for longer

periods of time. Problem sites are inspected every other week, or monthly, and treated with Altosid when necessary.

BMP structures are frequently built in the center of community developments and most are relatively new, less than 20 years old. Many are constructed with steep sides with no access for equipment, and in many cases, trees, shrubs, and other plants will grow freely impairing access to the site and making mosquito control efforts extremely difficult.

Calvert County Mosquito Control Program. Wilson Freeland, the supervisor of the Mosquito Control Program, was contacted by phone on April 10, 2001.

Summary of the phone conversation with Wilson Freeland. Calvert County is one of the only counties in the State with their own mosquito control program. There are several different types of BMPs in Calvert County including artificial/mitigated wetlands, dry ponds, wet ponds, and infiltration basins. Many BMP structures are built in "open space" areas of subdivisions. The entire community is laid out so that stormwater ends up in the BMP, usually in a "recreational area". Unfortunately, most of these ponds have no provisions for maintenance.

Wetlands are most apt to produce large numbers of mosquitoes because they are built with very shallow water and are planted heavily with native grasses and plants. *Anopheles* mosquitoes capable of transmitting malaria are abundant in these wetland habitats. There have been several cases of malaria in Maryland that appear to have been contracted locally (Information on these cases may be available in the AMCA archives).

Maryland has a native mosquito fish species, *Gambusia holbroki*. State regulations dictate that it can only be introduced into stormwater structures for mosquito control, not into natural waterways. These fish are stocked into most permanent ponds providing excellent mosquito control year-round (winters in Maryland are usually not cold enough to kill off fish populations). Wilson Freeland would like to have shallow wetland "swamps" constructed with a deep area or zone where mosquito fish could survive when water levels drop. One of his main concerns is that the wetlands dry up periodically preventing the survival of mosquitofish with their current design. Wilson

Freeland has been unsuccessful in convincing developers, the County, or the State involved in BMP construction to include a deep area within the constructed wetlands that would support mosquito fish.

Frederick County Health Department. Tom Mohler, the manager of the Environmental Health Services, Mosquito Program, was contacted by phone on April 10, 2001.

Summary of the phone conversation with Tom Mohler. The Frederick County Health Department does not run its own independent mosquito control program. Like most county programs in the state of Maryland, Frederic County contracts with the Maryland Department of Agriculture (MDA) for mosquito control. The County is only responsible for vector monitoring, surveillance, and collection of samples for identification. When problem sites are discovered, MDA is contacted to identify collected samples, evaluate the severity of the vector problem, and determine if treatment is necessary.

In Frederick County "bio-retention" ponds are most apt to produce mosquitoes in large numbers. These are permanent water structures that are planted heavily and serve as sedimentation and water quality ponds. Tom Mohler has investigated different types of ponds and has found that dry detention ponds that drain approximately within a week do not produce mosquitoes. He did mention however, that the mosquito problems in the inland counties of Maryland such as his are small compared to those encountered along the coastal regions. Tom Mohler suggested that VBDS contact Mike Cantwell, the Maryland Department of Agriculture regional entomologist for western Maryland who would be able to provide me with more information on MDA fieldwork.

Maryland Department of Environment. Stewart Comstock, with the Water Management Administration, Non-Point Source Program, was contacted by phone on April 16, 2001.

Summary of the phone conversation with Stewart Comstock. Stewart Comstock is one of the key people responsible for writing the Maryland Stormwater Design Manual. Maryland is moving away from stormwater ponds and structural practices in

general. Instead, the Maryland Department of Environment (MDE) is encouraging pollution prevention, particularly through the use and implementation of non-structural BMPs: open section roadways (with no curb) that allow even runoff, roof downspouts that direct runoff into vegetated areas of yards rather than to curb drains, small on-lot filtration devices, landscaping and vegetation appropriate for reducing runoff into streets, natural conservation areas that receive and disperse flow are just some of the examples. If structures must be built, then MDE is encouraging them to be designed "smart from the start". Designs should keep maintenance needs to a minimum and should be least conducive to vector production. Dry designs used for volume reduction or water quality should drain down very rapidly (1-3 days).

The governor of Maryland had made a statement recently about BMPs, stating that if designed properly, water quality ponds and wetlands did not pose significant mosquito problems because of natural enemies of mosquito immatures present in the system. Stewart Comstock was aware of mosquito issues, particularly associated with structures that drain slowly and do not support natural predators, especially facilities with vegetated bottoms. However, there has been no active mosquito monitoring within MDE. Stewart did mention that there is a reference on mosquito production in constructed wetlands that MDE had used as a reference written by the Center for Watershed Protection. The article is available on the web through the Stormwater Manager's Resource Center (SMRC), Reference Library at (http://www.stormwatercenter.net/Database_Files/Publications_Database_1Page311.html).

Maryland Department of Transportation. Steve Udzinski, an engineer with the State Highway Administration, Highway Hydraulics Division, was contacted by phone on April 10, 2001.

Summary of the phone conversation with Steve Udzinski. Steve Udzinski mentioned that some Caltrans people had recently been over to visit the Maryland Department of Transportation (MDOT) regarding BMP structures and costs. MDOT has had some complaints regarding mosquito production in BMP structures, but Steve Udzinski was not aware of the extent of the problem. MDOT designs and builds

structures based on the characteristics of the project and on their intended purpose. For example, those used for water volume reduction are structures such as extended detention basins, whereas those used for water quality improvement are structures such as shallow mashes or permanent ponds.

Steve Udzinski mentioned that many BMP designs look good on paper, but once built, do not necessarily work well in the field. MDOT is becoming more sensitive and aware of biological factors within BMP designs. The basic philosophy of MDOT regarding new BMPs is that they should be built to address both water quality and wildlife issues. Because MDOT does not have their own BMP manual, they have adopted the new manual written by the Maryland Department of Environment. MDOT also obtains their NPDES permits through the Maryland Department of Environment.

MINNESOTA

Summary. VBDS investigated BMP / vector issues in Minnesota, with particular interest in the metropolitan area of Minneapolis-St. Paul. Mosquito control for the entire metropolitan area of Minneapolis-St. Paul is conducted by the Metropolitan Mosquito Control District (http://www.mmcd.org).

The state of Minnesota, Department of Natural Resources, Waters Division (http://www.dnr.state.mn.us/waters/), is a regulatory entity that manages the state's water resources. The Minnesota Pollution Control Agency (http://www.pca.state.mn.us/netscape.shtml) is the state agency responsible for protecting Minnesota's air, water and land resources from the effects of pollution. They handle all NPDES permits in the state and are responsible for preparing the BMP manual.

The Minnesota Department of Transportation, Office of Environmental Services (http://www.dot.state.mn.us/environment/) deals with storm water management.

Minnesota Department of Natural Resources. John Stine, of the Waters Division, was contacted by phone on April 23, 2001.

Summary of the phone conversation with John Stine. John Stine is employed by the Minnesota Department of Natural Resources (DNR), Waters, the group within Minnesota DNR that is responsible for implementing the federal EPA Clean Water Act for the state. Minnesota DNR Waters is basically a regulatory agency that does some ecological studies, but is generally not directly involved with BMPs. John Stine suggested that VBDS contact Doug Norris, also with Minnesota DNR, but in the Ecological Services Division. In addition, he suggested VBDS contact either Don Jakes or Mark Gernes (a wetland specialist) of the Minnesota Pollution Control Agency, the agency responsible for handling all state NPDES permits, for more information regarding BMPs.

Minnesota Pollution Control Agency. Don Jakes, the supervisor of Unit 2, Community and Area-wide Programs Section, Policy and Planning Division, was contacted by phone on April 27, 2001.

Summary of the phone conversation with Don Jakes. The Minnesota Pollution Control Agency (PCA) handles all NPDES permits for the state and is responsible for preparing the BMP manual for the state. Don Jakes was not aware of any mosquito issues associated with structural BMPs, but mentioned that the Minnesota PCA has a program to remove old tires from the state, in part to reduce mosquito habitats.

Minnesota Department of Transportation. Bruce Johnson, with the Minnesota DOT, Office of Environmental Services, Stormwater Management, was contacted by phone on April 23, 2001. He pointed referred VBDS to Leo Holm, the section director, and Greg Busacker, an aquatic biologist. Greg Busacker was contacted by phone on April 23, 2001. Dwayne Stenlund, a soil ecologist, was contacted by phone on April 24, 2001 as a result of Greg Busacker's recommendation.

Summary of the conversation with Greg Busacker. Greg Busacker is an aquatic biologist employed by the Office of Environmental Services, Environmental Process Unit (EPU), which works on projects statewide. The EPU makes sure that construction districts follow state rules and regulations, and they act as liaisons between regulatory agencies regarding water and environmental issues.

The Minnesota Pollution Control Agency recently completed a very extensive BMP manual that has been adopted by Minnesota DOT. The Minnesota DOT has implemented a number of different BMP structures including sand filters, infiltration devices, and ponds, but prefer to utilize pond systems as often as possible. Mosquito production within Minnesota DOT BMP structures have not been considered; however, they have received complaints of mosquitoes associated with some of their structures from citizens.

In general, maintenance of Minnesota DOT BMP structures is poorly budgeted for. Structures are built without a budget for regular maintenance resulting in "crisis maintenance", which is essentially a response to public complaints or if Minnesota DOT

personnel happen to notice a problem while on the job. The issue of BMP maintenance seems to be a problem for the Minnesota DOT.

Summary of the conversation with Dwayne Stenlund. Dwayne Stenlund also works with the Office of Environmental Services as a soil ecologist. He was very passionate on the issue of stormwater BMP structures and had a wealth of knowledge on the subject.

Dwayne Stedlund believes that temporary ponds create more of a mosquito problem in Minnesota than do permanent ponds because of the lack of natural predators in temporary systems. In Minnesota, non-native fish such as*Gambusia affinis* can not be stocked into natural waterways. As a result, many "leaky" BMP ponds that drain into natural waterways cannot be stocked with mosquito fish. Dwayne Stenlund would like to see better use of natural, existing ecosystems for water quality purposes rather than the construction of federally mandated ponds and other BMP structures.

Dwayne Stenlund emphasized that there is a serious need for maintenance plans for all BMP structures. Most designs get lost over time and incoming crews frequently do not properly maintain structures because they are unaware of design features. In addition, there is a need for a maintenance cost estimate (e.g. $300 per month per acre) and other guidelines (e.g. what specific tools to be used in specific systems). A construction design manual with a maintenance plan needs to be produced along with a modern database with information such as location, design, maintenance schedule, etc.

NPDES, phase II is coming on line in Minnesota in 2003. The Minnesota DOT is exploring ways to utilize water in existing permanent ponds for other things such as irrigation, or dispersal. The Minnesota DOT would like to have ponds drain down completely after storm events to simplify maintenance procedures that are otherwise very difficult to conduct in permanent or semi-permanent bodies of water. One option is to have ponds self-dewater using "top skimmers" such as the Faircloth Skimmer (http://www.fairclothskimmer.com). The Faircloth Skimmer is a device that improves sediment trapping efficiency by regulating the filling and draining of sediment basins better than the conventional methods that use perforated risers or stones. This

skimmer allows the adjustment of drain down and retention times. Also, the use of plants able to withstand periods of temporary flooding would further improve water quality. Draining ponds down following storm events would allow more room for incoming water from subsequent storm events. Currently, many ponds flush themselves clean: incoming water resuspends pollutants and washes them out of the overflow.

Metropolitan Mosquito Control District. Joe Sanzone, the director of Metropolitan Mosquito Control District (MMCD), was contacted by phone on December 18, 2000. During the AMCA meetings in Dallas, Texas, VBDS met with Nancy Read (technical services), also with MMCD. She works with mosquitoes in the urban environment. On March 16, 2001, Nancy e-mailed VBDS some additional comments to add to the questionnaire prepared by Joe Sanzone.

Summary of the phone conversation with Joe Sanzone. MMCD deals primarily with temporary rain pockets, especially along river, pond, and lake banks. There are extensive areas of swampy habitats created by rainfall in Minnesota. Over 90% of MMCD's mosquito work deals with *Ae. vexans* and *Coq. perturbans*, both major nuisance species during the summer months. However, in the southeastern region of MMCD's district, *Ae. triseriatus* mosquitoes that transmit LaCrosse encephalitis virus are also controlled. Joe Sanzone was not aware of BMP structures in his jurisdiction.

NEW JERSEY

Summary. VBDS investigated BMP / vector issues in New Jersey, with particular interest in Somerset County. Each of New Jersey's 21 counties has a vector control agency that is responsible for mosquito control (http://www-rci.rutgers.edu/~insects/agencies.htm). The Somerset County Public Works Department has groups involved with both mosquito control and BMP issues. The Road Division, Mosquito Extermination/ Drainage Section (http://www-rci.rutgers.edu/~insects/somerset.htm) includes personnel that conduct local vector control. The Engineering Division (http://www.co.somerset.nj.us/division.htm) is involved with BMP design, construction, and maintenance and has written a BMP manual for their county.

The New Jersey Department of Environmental Protection, Division of Watershed Management is a regulatory agency responsible for preparing the BMP manual for the state. It is available on the Internet (http://www.state.nj.us/dep/watershedmgt/bmpmanual.htm).

The New Jersey Department of Transportation (http://www.state.nj.us/transportation/) is responsible for construction and maintenance of BMPs associated with their roads throughout the state.

New Jersey Department of Environmental Protection. Liz Rosenblatt, the coordinator of the Nonpoint Source Pollution Program, in the Division of Watershed Management, was contacted by phone on April 24, 2001.

Summary of the phone conversation with Liz Rosenblatt. The New Jersey Department of Environmental Protection (NJDEP) is a regulatory agency that sets rules, reviews plans, and writes the BMP manual for the state. NJDEP has been very cautious regarding mosquito issues because of the current West Nile Virus situation in the state; however, they have not specifically amended BMP designs because of this. BMP structures are designed, built, and maintained by local governments, and any associated mosquito issues would be handled by local county health agencies.

Liz Rosenblatt told VBDS that Somerset County is home to a highly regarded stormwater engineers in the state, Joe Skupien, and suggested he be contacted. She also suggested contacting Vicki Thompson, formerly employed with NJDEP, and currently employed by the Monmouth County Mosquito Extermination Commission.

New Jersey Department of Transportation. Lad Szalaj, a civil engineer in Design Services, Civil Engineering (Hydrology and Hydraulics) section, was contacted by phone on April 24, 2001.

Summary of the phone conversation with Lad Szalaj. The New Jersey Department of Transportation (NJDOT) utilizes a number of different structural BMPs including water quality swales, extended detention basins (designed for a 72 hr drain down time), mitigation wetlands, and premanufactured underground units (e.g. Downstream Defender, Terra Clean, Vortechnics). The dense populations present in New Jersey require that many units be placed below ground. These underground systems require much more frequent maintenance and NJDOT does not have adequate staff to get to them all in a timely fashion. The reality is that many sites do not receive the maintenance they require. NJDOT will be evaluating the "loading rate" of many different premanufactured units to try and establish a better maintenance schedule for each type and for each location, otherwise, regular, required maintenance will not be done.

Lad Szalaj was not aware of mosquito issues associated with NJDOT structural BMPs. He suggested VBDS contact a great stormwater engineer in Somerset County who has been very proactive in stormwater management issues named Joe Skupien.

Somerset County Public Works Department. Joe Skupien, a civil engineer who works for the Engineering Division, was contacted by phone on April 30, 2001.

Summary of the phone conversation with Joe Skupien. Joe Skupien had an incredible wealth of knowledge regarding stormwater systems and has been involved with their design and implementation for many years. In addition, he also teaches stormwater management for engineers at Rutgers University, stressing real-world issues involved with BMP design and implementation.

Stormwater issues in New Jersey began in 1975 with peak discharge issues for flood and erosion control. All new development in the state has been subjected to water quality issues since 1975. Originally, peak flows from developed sites had to equal pre-development rates; however, it was soon discovered that in order to maintain a similar water level downstream, peak flows from developed sites had to be reduced to about 75% of the pre-development rate. To achieve flood and erosion control goals, dry detention basins and ponds were constructed. Ponds for this purpose were built 6-8 feet deep and had steep sides. Large regional watersheds were built in valleys that could be dammed to slow the flow from large drainage areas. Regional watersheds worked well, but New Jersey later passed a watershed protection law that prevented water storage in valleys and waterways. As a result, as of approximately13 years ago, all stormwater management structures for quality and quantity have to be built at a local level (on site), on a comparatively small scale. There has been a considerable amount of research done comparing the benefits of regional facilities (i.e. large watersheds) used to treat stormwater runoff from large areas versus the construction of multiple smaller units designed to treat runoff from small areas.

There are hundreds of stormwater management structures in Somerset County, most which grew out of flood control (i.e. dry detention). Somerset County Public Works has been gradually weaning off structural BMPs to private owners and associations for maintenance. Currently, about 25% are contracted with private contractors for maintenance, whereas the remaining 75% are maintained by Public Works. The philosophy of Somerset County engineers has been to build "very dry" detention systems, or "very wet" ponds to prevent public health threats. In general, infiltration devices are not effective in New Jersey due to poor soil permeability.

Shallow wetland BMPs are best for water quality. The environmental groups, such as the New Jersey Department of Environmental Protection, have been pushing to have more shallow systems built. They believe that the comparatively lesser performance of extended detention basins for water quality warrants the construction of wetlands. In contrast, Somerset County has been pushing for dry systems which are cheaper to build, require far less maintenance, do not require specially trained professionals to work on them, and are more acceptable to homeowners. County

engineers have built concrete low-flow exit channels into extended detention basin (EDB) designs to improve the function of the EDB and simplify maintenance. Maintenance is essentially reduced to scraping and removing sediments accumulated on the concrete, and removing trash from the outlet screen and the basin floor. This has been a controversial issue with the environmental groups because they feel that the percent pollutant removal is reduced. Joe Skupien argues that EDBs built with these features function just as well as others, with the added benefit that the ease of maintenance (that anyone can do) will allow these units to function better in the long run. Joe Skupien believes that wetlands do work well for water quality, but require far too much management and maintenance of living organisms and pollutant uptake processes of the constructed habitat. There are far too many structural BMPs that require more time and expertise than most people are willing to put into them.

New Jersey has severe mosquito problems and the hysteria created by West Nile Virus by the media has made vector control a hot topic. Shallow wetland BMPs seem to be best for water quality, but are tremendous mosquito producers. These areas require that trained applicators with expertise in mosquito control be called upon for abatement. Joe Skupien feels that mosquito problems in dry detention systems can be solved much more quickly and easily by removing clogs in the system and allowing them to drain properly. It is his opinion that very few stormwater engineers and designers think about the details that are needed in field applications compared to the theoretical they create on paper. They need to create a better balance of theoretical versus actual. It is especially important that those involved in the design and construction of wetlands have expertise in this subject and commitment to the project. In addition, water quality has to be balanced with public health issues.

Somerset County Public Works engineers are actively involved with County vector personnel in the Mosquito Extermination/ Drainage Section, within the Road Division. The vector group has two foremen that are split up by expertise. Joe Skupien works closely with Jack Pinone, one of the foremen, on BMP design recommendations. Joe Skupien recently consulted with Jack Pinone regarding plans for a new 11-acre wetland project. Both men then present their ideas to the consultants involved with the design and construction. An example of a subject they frequently discuss with contract

engineers is access to sites. Both maintenance crews and vector control personnel have to have access to structures. The better the access is made, the less time is required to conduct routine inspections and maintenance. A simple access road that allows an inspector to drive up to a structure and be able to look at it from the car can reduce time spent at a site by over 2/3rds. The Engineering Division was responsible for preparing a BMP manual for the County. After consulting with a variety of different groups, the biggest concern was site accessibility.

OREGON

Summary. VBDS investigated BMP / vector issues in Oregon, with particular interest in and around the City of Portland (i.e. Washington and Multnomah Counties). Washington County does not have a vector control program. Additional information on this county can be found on the Internet (http://www.co.washington.or.us/cgi/home/washco.pl). Mosquito control in the city of Portland and throughout Multnomah County is conducted by Multnomah County Health Department, Vector Control (www.multnomah.lib.or.us/health/contprev/pests/). This agency concentrates most of its control efforts along the Columbia River in, but also does contract work in a very small area of Washington County.

The state of Oregon manages water quality with two different NPDES permits. The City of Portland manages a municipal NPDES permit with co-permittees Port of Portland and Multnomah County. The City of Portland has several bureaus, and 4 city commissioners. The most important bureau with regards to water quality is the Bureau of Environmental Services (http://www.enviro.ci.portland.or.us/). The BMP manual for the City of Portland provides information on all aspects of the city's stormwater program and is available on the Internet (http://www.enviro.ci.portland.or.us/swp.htm). It appears that several other state and local agencies may be involved with stormwater runoff and the NPDES permits such as the Portland Department of Transportation (http://www.trans.ci.portland.or.us/TransServices.asp). The Port of Portland (http://www.portofportland.com) is responsible for operating airports, marine terminals, and the import/export of cargo through the Columbia River. They are involved with many aspects of water quality including wetland mitigation and restoration within their jurisdiction.

The Oregon Department of Transportation (ODOT) (http://www.odot.state.or.us/) used to be a co-permitee on the municipal NPDES permit with the City of Portland. As a result of an agreement with the Department of Environmental Quality, ODOT now operates its stormwater program under its own state NPDES permit. Their BMP handbook entitled "Road Maintenance Water Quality & Habitat Guide" is available on the Internet (www.odot.state.or.us) under the subheading "Environment".

Multnomah County Health Department, Vector Control. David Turner, the mosquito control field supervisor, was contacted by phone on Jan 29, 2001, and several times thereafter. David Turner and the vector control program supervisor, Chris Wirth, agreed to host an organized tour of Portland BMPs for VBDS, Larry Walker Associates, and Caltrans on March 6th and 7th, 2001 that would include representatives from the City of Portland, Bureau of Environmental Services, and the Oregon Department of Transportation (see Appendix B).

Summary of several phone conversations with David Turner. There is no state vector control program in Oregon. Multnomah County Health Department, Vector Control (MCVC) is responsible for surveillance and abatement of vectors throughout Multnomah County and occasionally does contract work in a small part of Washington County.

Portland has a multitude of stormwater management and pollution control devices associated with freeways, roadways, parking lots, industrial parks, and housing developments. The city also has hundreds of underground catch basins and sumps that hold water for long periods of time, if not indefinitely. Stormwater management devices that catch debris are mandatory even at private residences when artificial surfaces (roofs, driveways, etc) exceed 500 sq. ft. These devices create suitable habitats for mosquito reproduction in addition to the extensive natural breeding sites in the area. MCVC is severely understaffed to do the widespread control of mosquitoes in natural and created habitats needed in Multnomah County.

MCVC works closely with several different agencies that manage various bodies of water including the Port of Portland, the City of Portland, Bureau of Environmental Services (BES), and the Department of Transportation. The relationship between MCVC and BES is not ideal. They have conflicts over jurisdiction and vector issues. Apparently, BES funds most of the city's rodent sewer baiting program, but some is contracted due to its extensiveness. On other issues, BES is apparently reluctant to acknowledge that some of their facilities and structures are significant sources of vectors. Because of this, they do not want to support vector surveillance and abatement at these sites. In contrast, MCVC has a good working relationship with the

Port of Portland which has gone above and beyond the needed financial support for vector control in their mitigation wetlands sites.

Dave Turner suggested that VBDS contact for Scott Carter, a wetland restoration specialist, at the Port of Portland for additional information on BMP structures.

Port of Portland. Scott Carter, a wetland restoration specialist in the Properties and Development Section, and Dorothy Sperry (involved with NPDES permits), were contacted by phone on Feb 16, 2001. Dorothy provided VBDS with a few pages of information on BMP types later the same day.

Summary of the phone conversation with Scott Carter. The Port of Portland is responsible for operating airports, marine terminals, and the import/export of cargo through the Columbia River. They are involved with many aspects of water quality including wetland mitigation and restoration within their jurisdiction. Scott Carter has a background in landscape, but is currently involved with wetland creation, mitigation, and restoration. He mentioned that Portland has a lot of floodwater situations, clay soils that promote surface water build-up, and wetlands. One of the projects he has been involved in is on Government Island (2500-2700 acres), in the Columbia River. This island was historically used for grazing cattle, but recently became the site for an approximately 400 acre wetland mitigation (mostly emergent wetland) constructed by the Port of Portland. This mitigation wetland created huge numbers of floodwater mosquitoes. To avoid possible complaints from citizens living along the river, the Port of Portland provides Multnomah County Health Department, Vector Control with funding to abate mosquitoes in approximately 350 acres of the mitigation site. Scott Carter is also currently involved with a wetland mitigation site adjacent to the Portland Exposition Center.

Scott Carter suggested that VBDS contact Dorothy Sperry, who works on NPDES permit issues in the same department, and Dave Hendrix, who deals with NPDES permit issues for the Multnomah County Drainage District (MCDD). MCDD is responsible for managing slews and drainage ways of the Columbia River, as well as operation of the dike that separates the river from the airport and the north part of the city, used for river overflow.

Summary of the phone conversation with Dorothy Sperry. Dorothy Sperry spent some time trying to explain the complexities of the NPDES permit within the different agencies. The Port of Portland, City of Portland, and Multnomah County are all co-permitees for the municipal NPDES permit. Apparently the Oregon Department of Transportation used to be a co-permitee, but as a result of an agreement with the Department of Environmental Quality, now operates its stormwater program under its own state NPDES permit. One of the problems Dorothy Sperry has encountered with regard to BMPs is that they are difficult to evaluate or quantify for effectiveness because there is no established way of doing it. She mentioned that each site creates its own unique situation making comparisons biased or impossible. She was very interested in knowing more about stormwater issues in California.

Dorothy Sperry suggested that VBDS contact Patrice Mango, the stormwater program manager for the City of Portland, Bureau of Environmental Services, responsible for coordinating all the bureaus for stormwater related issues, and Jeff Moore, the assistant environmental program coordinator for the Oregon Department of Transportation, who deals with stormwater issues.

City of Portland, Bureau of Environmental Services. Katie Bretsch, the program manager for the Bureau of Environmental Services (BES), was contacted by phone on February 23, 2001. Patrice Mango, with the BES planning group, was contacted by phone on February 26, 2001, who then forwarded the VBDS survey to her colleague, Dawn Hottenroth, an environmental specialist with the BES Stormwater Program. Dawn Hottenroth, contacted VBDS by phone on March 5, 2001.

Summary of the phone conversation with Katie Bretsch. The City of Portland is made op of 4 bureaus, each responsible for different aspects of the city. BES is in charge of the NPDES permit for the City and includes the Port of Portland and Multnomah County as co-permittees. Katie Bretsch is primarily responsible for stormwater BMP designs, their maintenance, and current operations, specifically those that are built by BES for stormwater management or for any stormwater runoff from the public right-of-way (i.e. culverts, roadside drains). She views the spraying ofBti (a microbial larvicide) as having been successful for control of mosquitoes in open water

areas. The cost involved is not excessive as viewed by BES standards, and the cost-per-acre is not unreasonable. If it is a question of spraying versus redesign of a stormwater structure such as an open pond, BES will opt to spray. Multnomah County Vector Control has asked BES to redesign ponds (i.e. don't vegetate perimeters of ponds and water margins); however, BES is unwilling to modify them because it would reduce the ability of ponds to remove pollutants.

Katie Bretch suggested that VBDS contact her counterpart at the Oregon Department of Transportation, Jeff Moore, and her counterpart at the Multnomah County DOT, Don Newell, the road maintenance system administrator.

Summary of the phone conversation with Patrice Mango. Patrice Mango is with the BES planning group that looks at BMPs in more of a long-range. She manages the NPDES stormwater permit citywide and is responsible for writing up the annual report for the municipal NPDES permit that includes BES, the Port of Portland, and Multnomah County. BES is using the Endangered Species Act (ESA) as leverage to push their water programs forward, especially as they relate to endangered salmon species that utilize local waterways for spawning.

Patrice Mango provided VBDS with a lot of interesting information on future goals for water quality in and around Portland and information on new BMPs. BES is working on the development of a "Green Streets Program" to create stormwater-management-friendly streets in residential areas. Another BMP under examination is the "Eco Roof", that would reduce the volume of stormwater runoff (acting similar to an extended detention basin) and improve water quality. This BMP is designed for use on the tops of buildings. A special impervious roof lining is covered with soil of about 4 inches deep, specific soil mixes, and specific plant communities (based on the climate). Due to the mass created by the Eco Roof, the building, and particularly the roof, has to be designed to support more weight. The Eco Roof filters bacteria and pollutants, acts as a building insulator against heat and cold, and reduces urban "heat island effect", improving air quality. Apparently the GAP headquarters in San Jose has a functional Eco Roof.

Patrice Mango suggested VBDS contact Liane Welch, an engineer who works on maintenance protocols for city facilities with the City of Portland, Bureau of Maintenance, who might have more information on BMP maintenance activities. Patrice Mango also mentioned that she would speak with Dawn Hottenroth, a lead person on OMM issues of BMPs in BES, who knew more about vector issues.

Summary of the phone conversation with Dawn Hottenroth. Dawn Hottenroth is an environmental specialist with the BES Stormwater Program. She works on policy and design issues associated with stormwater. She wrote a part of the early BMP manual for the City of Portland, BES. Dawn Hottenroth has knowledge on vector issues because she worked with San Diego County Environmental Health, Vector Control in the early 1990's. She agreed to complete a questionnaire for VBDS with any information she could provide.

Oregon Department of Transportation. Jeff Moore, the environmental program coordinator for the Oregon Department of Transportation (ODOT), Clean Water Unit, was contacted by phone on February 26, 2001.

Summary of the phone conversation with Jeff Moore. Jeff Moore is directly involved with the NPDES permit for ODOT. ODOT has made big improvements in the past 5 years in understanding how various BMPs for stormwater will perform. They have been gradually moving away from the use of wet ponds for water quality because of maintenance issues. It is difficult to remove all of the contaminated sediment from wet ponds and the work (i.e. draining, dredging, etc.) is very labor intensive. The last wet pond clean out was 3-4 years ago due primarily to a bacterial bloom in the water, not necessarily because the pond was ready for total sediment clean out. ODOT is in favor of other BMP structures that are easier to maintain such as swales.

Many areas of Portland have fine clay soils that, once suspended in water, take weeks or months to settle out. This reduces the water quality benefits of many BMPs for stormwater. Recently, many of ODOT's new BMPs do not involve structures, but rather are changes in procedures and protocols that reduce the quantity of pollutants in water runoff.

Jeff Moore suggested that VBDS contact Paul Wirfs, an urban hydraulic engineer within the ODOT Geology Unit, who is a designer and works with water quality issues statewide, and Paul Wirfs' counterpart, Randy Inloes, the maintenance supervisor in the Portland district that contains the most ODOT water-quality ponds who would better know the day-to-day practicalities of these BMPs.

TEXAS

Summary. VBDS investigated BMP / vector issues in Texas, with particular interest in the City of Austin. Mosquito collection and control in and around Austin is conducted by the Austin / Travis County Health and Human Services Department, Environmental Health Services, Rodent and Vector Control (http://www.ci.austin.tx.us/health). The Texas Department of Health, Zoonosis Control Division (http://www.tdh.state.tx.us/zoonosis) will identify mosquito samples submitted by the Austin / Travis County Health and Human Services Department, but is not involved directly with day-to-day field activities.

The City of Austin, Watershed Protection & Development Review Department is involved with many aspects of BMPs for stormwater runoff. Many of their ongoing activities with water quality BMP structures, including the Central Park Wet Pond, discussed in the Austin visit report (see Appendix C), can be viewed on the Internet (http://www.ci.austin.tx.us/watershed).

The Texas Department of Transportation (http://www.dot.state.tx.us) has built 6 BMP structures in Austin and is expecting to be mandated to build many more throughout the state in the near future as state regulations change.

Glenrose Engineering is a consulting firm based in Austin that is involved with stormwater issues. They are currently working with Caltrans in California as a third party in the Caltrans "cost group" that is trying to make BMPs affordable while functional. This company was selected by the Natural Resources Defense Council to help produce a productive and cooperative cost report.

Texas Department of Health, Zoonosis Control Division. Julia Rawlings, in the Zoonosis Control Division, was contacted by phone on March 26, 2001. Robin Seiferth, an entomologist in the parasitology / entomology branch, was contacted by phone on April 9, 2001.

Summary of the brief phone conversation with Julia Rawlings. Julia Rawlings is a specialist in zoonotic diseases and was not aware of issues related to mosquito production in stormwater management structures. She did not appear to have any

knowledge of stormwater BMPs. The Texas Department of Health, Zoonosis Control Division does not monitor or control mosquitoes in and around Austin. Austin / Travis County HHSD collects samples and performs abatement. The State will do the species identifications. Julia Rawlings suggested that VBDS contact Paul Fournier, the supervisor of the parasitology / entomology branch, for additional information.

Summary of the brief phone conversation with Robin Seiferth. Robin Seiferth had never heard of stormwater BMPs, thus was unable to provide VBDS with information on vector production associated with these structures. She suggested VBDS contact the Austin / Travis County Health & Human Services Department for information on mosquito issues in urban structures.

Austin / Travis County Health and Human Services Department. At the AMCA meeting in Dallas in February 2001, I found out that. I contacted Barrie Turano, the supervisor for Environmental Health Services, Rodent and Vector Control program, by phone on March 19, 2001.

Summary of the brief phone conversation with Barrie Turano. The Austin Rodent and Vector Control program seeks to control disease-carrying insects and rodents by providing baiting services, door-to-door educational outreach, coordination of neighborhood cleanups with the City of Austin Solid Waste Services Department, eliminating mosquito larva in standing water, and, when appropriate, spraying for mosquitoes in residential areas outside the city limits. Mosquito spraying within the city limits is performed in developed, recreational areas within the city-operated park system. The Austin Rodent and Vector Control program has no involvement with BMPs in Austin. In the event of a complaint, they will make a site assessment and, if appropriate, will abate vectors.

Barrie Turano suggested that VBDS contact Tom Bshara at the Austin Watershed Protection Agency for additional information.

City of Austin Watershed Protection & Development Review Department. Mike Kelly, an engineer in the Environmental Resource Management Division, was

contacted by phone on February 20, 2001. Pat Hartigan, the project coordinator for the department, was contacted by phone on April 10, 2001.

Summary of the brief phone conversation with Mike Kelly. The City of Austin Watershed Protection & Development Review Department stocks all of their constructed wet ponds with mosquitofish, *Gambusia affinis*, for mosquito control. However, ponds retrofitted into existing neighborhoods are often met with resistance from local residents who fear mosquito problems. Austin Watershed Protection apparently has no working relationship with the Austin / Travis County Health and Human Services Department, Environmental Health Services, Rodent and Vector Control.

Mike Kelly suggested that VBDS contact others within Austin Watershed Protection including Les Tull, who is in charge of BMP design, and either Pat Hartigan or John Gleeson, who should have more knowledge on mosquitoes. Mike Kelly suggested that VBDS contact Matt Hollon, with Glenrose Engineering in Austin.

Summary of the phone conversation with Pat Hartigan. There are hundreds of Austin-type sand media filters in and around Austin. Sand filters are associated with all new development. Their purpose is two-fold: to reduce pollution in runoff entering natural watersheds, and to improve hydrology by reducing the volume of water (by slowing it) that enters the watersheds. The increased volume of water runoff created by urban expansion was resulting in rapid erosion (and additional sediment loads) of stream embankments. These structures are generally trouble-free unless they receive large sediment loads. With large sediment loads, sand filters are prone to clogging.

Pat Hartigan mentioned that design and maintenance issues are addressed in Austin BMPs; however, maintenance is not regularly performed. Maintenance of sand filters is done by "crisis management", where the Austin Watershed Protection will respond to complaints of clogged filters or filters will be cleaned if City employees happen upon clogged units. In areas with slow-draining soils, water may stand for various lengths of time.

Pat Hartigan was not aware of mosquito problems associated directly with BMPs in Austin. He mentioned that all ponds are stocked with mosquito fish for mosquito control. Some of the flood-control ponds were designed to drain completely in a short

period of time; however, many frequently contain permanent bodies of water. He stated that it was his opinion that the numerous creeks in and around the city as well as urban and residential water standing in private residences probably contributed more to mosquito reproduction than structural BMPs.

Pat Hartigan suggested that VBDS contact Tom Schueler, the founder of the Center for Watershed Protection (CWP) (www.cwp.org). He mentioned that CWP had put out numerous publications on stormwater issues and may have information on vectors associated with BMP's.

Glenrose Engineering. Matt Hollon, a stormwater engineer, was contacted by phone on February 20, 2001. He was instrumental in organizing a half-day tour of representative structural BMPs in Austin on February 21, 2001 (see Appendix C) on very short notice with himself and Mike Barrett (University of Texas) for VBDS.

Summary of the brief phone conversation with Matt Hollon. Glenrose Engineering works with Caltrans as a third party in the Caltrans "cost group" in trying to make BMPs affordable while functional. This company was selected by the Natural Resources Defense Council to help produce a productive and cooperative cost report. Matt Hollon mentioned that Austin has several criteria associated with the construction of water quality BMPs, for example, non-permanent pools must drain in 72 hours or less and wet ponds are always stocked with mosquito fish. He also mentioned that he was not aware of any regular maintenance done to these structures. However, it is his opinion that water quality ponds probably do not contribute much to the background numbers of mosquitoes present in the city because of the thousands of natural and residential breeding sources.

Texas Department of Transportation. Jay McCurley, in the Advanced Planning Division, was contacted by phone on April 9, 2001.

Summary of the phone conversation with Jay McCurley. Jay McCurley is an "environmentalist" who works for the Texas Department of Transportation (TDOT) office in Dallas. He was knowledgeable on both vector issues and BMP issues. He had previously worked in vector control with the Dallas HHS Environmental Branch before

accepting a position with TDOT. He was not aware of anyone in TDOT who had been considering vector issues with regard to stormwater runoff, BMPs, or both. Part of the reason for this is because TDOT has very few structural BMPs. They built 6 sand filters in the city of Austin as a result of a previous litigation, but have not built any before or since. Jay McCurley was not aware of the maintenance schedule that TDOT had planned for the sand filters in Austin.

Sand filters were originally designed to drain in 24-48 hours, with no consideration of the sand media that quickly clogs. TDOT did not and does not want to have to build sand filters because of the frequent maintenance they require due to clogging. Where possible, TDOT will utilize vegetative cover techniques (including grassy swales and grass-lined ditches) because they provide similar pollutant removal from water runoff compared to more complex structures, they require almost no maintenance, and they are very cheap to build. JayMcCurley mentioned that as a result of ever-stringent regulations, TDOT would be required to build specific types of BMPs in the very near future including infiltration basins, wetlands, detention and retention ponds, and others. Many of these will probably need to be retrofitted into existing constructed areas.

VIRGINIA

Summary. VBDS investigated BMP / vector issues in Virginia, with particular interest in the northern region of the state adjacent to the District of Columbia. The Virginia Department of Health, Office of Epidemiology (http://www.vdh.state.va.us/epi/newhome.htm) makes recommendations on vector control and surveillance statewide, but is not involved with monitoring, surveillance, or abatement. The Virginia Department of Health also has a Division of Water Supply Engineering (http://www.vdh.state.va.us/dwse/index.htm) that is involved with human health issues related with water, but not directly with structural BMPs.

Mosquito control agencies in the state of Virginia are concentrated primarily along the southern coastal areas of the state, around the cities of Suffolk, Chesapeake, Norfolk, Hampton, and Yorktown. In the northern region of the state, Prince William County Public Works (http://www.co.prince-william.va.us/pworks) has a Gypsy Moth and Mosquito Control Branch that is responsible for vector surveillance and control. The Fairfax County Health Department (http://www.co.fairfax.va.us/service/hd/hdweb.htm) and the City of Alexandria Health Department (http://ci.alexandria.va.us/city/health) both historically had active mosquito control program until local government downsizing cut the programs. In part due to the appearance of West Nile Virus in the area, both department are trying to obtain funds to re-establish vector control programs. Information on all local health districts in Virginia can be found on the Internet (http://www.vdh.state.va.us/lhd/02.htm).

The Virginia Department of Environmental Quality (http://www.deq.state.va.us/) is in charge of NPDES permits, but is not directly involved with BMPs. The Virginia Department of Conservation and Recreation, Soil and Water Conservation Program (DCR) (http://www.dcr.state.va.us/sw/index.htm) is the agency that is in charge of BMP design and implementation issues for non-point source pollution. In the northern region of the state, several selected agencies that are responsible for stormwater related issues and structural BMPs were contacted including Prince William County Public Works (http://www.co.prince-william.va.us/pworks), Fairfax County Public Works and Environmental Services Department

(http://www.co.fairfax.va.us/gov/dpwes/homepage.htm), and the City of Alexandria Department of Transportation and Environmental Services (http://ci.alexandria.va.us/city/tr_es_ut_idx.html).

The Virginia Department of Transportation (http://www.vdot.state.va.us/) has worked with DCR to develop a statewide program addressing non-point pollution from stormwater runoff. They have a group called the Virginia Transportation Research Council (VTRC) (http://www.vdot.state.va.us/vtrc) that works in conjunction with the University of Virginia on BMP research activities. VRTC recently completed a study called *Testing of Ultra-Urban Best Management Practices,* written by Yu, S.L., and Stopinski, M.D. The article is available on the Internet at VTRC's website (http://www.vdot.state.va.us/vtrc/main/index_main.htm).

Virginia Department of Health, Division of Water Supply Engineering. Allan Weber, an engineer, was contacted by phone on April 13, 2001

Summary of the phone conversation with Allan Weber. The Division of Water Supply Engineering provides the State Department of Health with information on environmental assessments, but is not involved with BMP design, implementation, or maintenance. Allan Weber mentioned that in his experience, the primary BMP types built in Virginia are mitigation wetlands and sedimentation ponds. He suggested that VBDS contact the Department of Conservation and Recreation as well as the Department of Environmental Quality for information on vectors and BMP structures.

Virginia Department of Health, Office of Epidemiology. David Gaines, the entomologist for the State Department of Health, was contacted by phone on April 16, 2001.

Summary of the phone conversation with David Gaines. One of the tasks of the Office of Epidemiology is to make recommendations on mosquito control and surveillance, but this Office is not involved with monitoring, surveillance, or abatement. David Gaines mentioned that mosquito control in the state of Virginia as a whole is relatively low, especially in the northern section, thus there is not much data on mosquito production. Almost all the mosquito control programs in the state are

concentrated along the southern coastal regions, especially in tidal salt mash areas, where the population of people is most dense. Mosquito control is locally funded, therefore areas with large populations generally have a larger tax base that can support a mosquito control program, whereas less densely populated regions may not have the tax base to support a program. In the northern region of the state, there is a mosquito control program in Prince William County, (a wealthy county) that does mosquito control along the Potomac River as well as in urban areas. There has been at least one case of Malaria which appeared to have been contracted locally in the northern "neck area" of the state in a rural / agricultural area. *Anopheles* mosquitoes that can transmit malaria are very common in Virginia.

David Gaines was familiar with underground catch basins as well as above ground retention basins in Virginia. Water retention basins are designed with overflows, for when the water load is too high, but otherwise only drain by infiltration and/or evaporation. Many of these structures do not drain because of thick clay soils in many areas of the state and as a result can become sources of mosquitoes. From David Gaines' recollection, most of the BMP structures he has seen were associated with parking lots and new housing developments. He mentioned that many are surrounded by chain link fences and are not aesthetically pleasing. Apparently, roadside ditches frequently hold water for long periods of time and may become sources of mosquitoes.

David Gaines suggested that VBDS contact Dreda McCreary, the manager of Virginia Beach Mosquito Control, because she should have good knowledge on mosquito control in the state, and Kim Largen, at Prince William County Mosquito Control, for information on mosquitoes in northern Virginia.

Virginia Department of Environmental Quality. Burton Tuxford, of the Water Division, was contacted by phone on April 13, 2001.

Summary of the phone conversation with Burton Tuxford. The Virginia Department of Water Quality (VDEQ) is primarily responsible for enforcing state requirements and reviewing NPDES permits. VDEQ issues NPDES permits for the state of Virginia and specializes in point-source pollution issues, not non-point source issues, and are not involved in any aspect of BMP design or implementation.

Burton Tuxford suggested that VBDS contact the Department of Conservation and Recreation, Soil and Water Conservation Program, which is responsible for prescribing BMP methods and writing the state manuals for non-point source pollution. Specifically, he suggested speaking with Jack Frye, the head of the division, and Joe Battiata, one of the people involved directly with stormwater issues. BurtonTuxford also suggested VBDS contact Rick Woody, with the Virginia Department of Transportation, who is involved with BMPs in their stormwater program.

Virginia Department of Conservation & Recreation. Joe Battiata, the Stormwater Program Manager for the Soil and Water Conservation Program, was contacted by phone on April 17, 2001.

Summary of the phone conversation with Joe Battiata. Joe Battiata provided a considerable amount of information regarding structural BMPs. Erosion and sediment control in Virginia has been mandatory for approximately 20 years. The Virginia Department of Conservation and Recreation (VDCR) was historically involved with agricultural non-point source pollution. In 1990, after the passing of new stormwater programs and the arrival of NPDES permit requirements, VDCR adopted all aspects of non-point source pollution and became responsible for writing the BMP manual for the state. VDCR is the central stormwater BMP coordinator for all related research and/or studies in the state. VDCR works through local governments for BMP implementation. The chain is as follows: local government pays the Virginia Department of Environmental Quality for an NPDES permits, then they work with VDCR for oversight of local programs.

Interestingly, stormwater programs are not mandatory for local governments. In early 1990, 11 local governments adopted the stormwater program, with an additional 7 since then. With the recent advent of NPDES Phase II, another 43 local governments are expected to adopt the stormwater program over the next few years. There are a total of 166 local governments throughout the state that could eventually be involved with the stormwater program.

There are many different structural BMP designs in Virginia. Ponds and extended detention basins (EDB) have been used extensively. Many structures were

built in commercial areas behind buildings and fell into serious disrepair, possibly due to "the out of site, out of mind"theory. New structures are usually built out front, in view of people, and provide aesthetic value through careful landscaping and design. These new structures tend to be better maintained since they are highly visible. A new "enhanced" EDB design is being evaluated. These structures incorporate a marsh on the basin floor, which serves to prevent re-suspension of pollutants when new water enters the structure. Many of these enhanced EDBs have permanent to semi-permanent water.

There are a number of underground BMP structures, most of which are manufactured proprietary units such as Stormceptors, CDS, Vortechnics, etc. As a general rule, these filtering devices are good for removing total suspended solids (TSS), but are ineffective at removing nutrients such as nitrogen and phosphorous. Also, as flow rate increases through these units, efficiency decreases due to flow bypass. Vortechnics units have a much greater volume capacity than most others and thus are generally more effective simply because there is less chance of flow bypass. Maintenance of these units is required by the property owners. Property owners usually opt to sign an annual contract with a contractor (usually a representative of the BMP manufacturing company) for inspections and maintenance. As a result of required maintenance and/or contract agreements, these manufactured underground units are generally kept neat and reliable.

Some BMP structures have been built "offline" from main storm sewers. Low-flow diversions from the main storm sewer line feed these units. This allows smaller treatment structures to be built. The state also has several different types of sand filters including Delaware and Austin types.

As far as comparing efficacy of different structures, Joe Battiata mentioned that data is very scattered (e.g. 10 - 90% removal efficiency). This includes comparisons of similar designs as well as new versus older designs. In many cases, pollutants can become re-suspended when new water enters a BMP, affecting removal efficiency evaluations over time. This is what led to the "enhanced" EDBs, where the shallow marsh prevent some resuspension from happening.

Maintenance is a key factor in the function of all BMP structures in Virginia. Lack of maintenance usually results in gradual breakdown of the system and even failure of the structures. Over the past 10 years, monitoring efforts have shown that "percent removal efficiency", the criteria that has been used up to now to evaluate BMP performance, is somewhat meaningless. For example, two BMP units are compared for efficiency based on percent removal efficiency: one receives water with a high concentration of TSS and 90% of the TSS are removed by the BMP, the other receives relatively clean water with only background levels of TSS and nutrients and only 5% of the TSS is removed. Do these results indicate that the unit receiving the cleaner water is a poorer performer? VDCR is beginning to look more closely at downstream fauna to better determine the efficacy of stormwater BMPs rather than at percent removal efficiency.

Regarding mosquitoes, Joe Battiata mentioned that VDCR suggests that permanent water structures include "depth zones" to promote an ecosystem balance. This should provide suitable habitat for natural predators of mosquitoes. However, small pockets of water become a source of vectors, and some BMP designs hold stagnant water. In general, BMPs that were designed correctly experienced few mosquito problems.

Virginia Department of Transportation. Rick Woody, the program manager for the Aquatic Ecology Program, in the Environmental Division, was contacted by phone on April 16, 2001.

Summary of the phone conversation with Rick Woody. The Virginia Department of Transportation has a water quality research group that works in conjunction with the University of Virginia. This group is called the Virginia Transportation Research Council (VTRC) and they do research on the performance of stormwater BMPs. VTRC recently completed a study called *Testing of Ultra-Urban Best Management Practices*. Rick Woody suggested that VBDS contact Mike Fitch at VTRC for more information on BMP structures.

Virginia Transportation Research Council. Mike Fitch, a senior research scientist, was contacted by phone on April 23, 2001.

Summary of the phone conversation with Mike Fitch. The Virginia Transportation Research Council (VTRC) was formed out of a cooperative agreement between the Virginia Department of Transportation (VDOT) and the University of Virginia, in Charlottesville. VTRC is the research branch of VDOT that works out of the University of Virginia, Civil Engineering Department. VTRC receives federal and state funding for research on all things related to transportation such as safety, materials testing, intelligence transportation systems (ITS), and environmental issues. An advantage of being associated with the University is access to graduate students for conducting research. The total VTRC staff is approximately 200, 50 of which are full-time. Mike Fitch's environmental research group has 4-5 full-time staff.

Mike Fitch's environmental research group has a major focus on stormwater BMPs. In recent years, VDOT has been under pressure to implement "Ultra-Urban BMPs" (a term used to describe manufactured units such as CDS, Stormceptor, Vortechnics, etc.), in part as a result of corporate marketing that emphasizes the high removal rates possible with these structures. A graduate student with VTRC recently finished a research project focused on Ultra-Urban BMP structures as well as other BMPs such as grass swales and different types of vegetation and landscaping used along highways and parking lots.

Maintenance issues associated with structural BMPs are a major concern to VDOT. If structures are infrequently maintained, or if a large storm event occurs, pollutants are often resuspended and washed out of BMP structures, completely nullifying their intended purpose. In contrast, if structures are regularly maintained and cleaned out, pollutant removal rates remain relatively high. Unfortunately, overall performance of structural BMP technology types is difficult to quantify because efficacy data varies widely from structure to structure.

The cost associated with BMP maintenance and the personnel needed to effectively run a program has been difficult to "sell" to VDOT. It has been difficult to come up with a maintenance plan that can be effectively implemented. In addition, the issue of what to do with materials removed from BMP structures during clean-outs still

remains. Does this material become classified as toxic waste, hazardous waste, or otherwise, and how should it be disposed.

VDOT is concerned with vector issues within their BMP structures, especially with the spread of West Nile Virus (WNV) into Virginia. In 2000, there were approximately 7 birds diagnosed as seropositive to WNV in Virginia and this was a major concern for VDOT. VDOT would prefer to handle the vector issues within their BMP structures proactively through careful planning and prevention; a task currently being studied by VTRC.

Prince William County Public Works. Two people in the Environmental Services Division were contacted. Lou Jones, in the Gypsy Moth and Mosquito Control Branch, was contacted by phone on April 16, 2001. Oscar Guzman, in the Watershed Management Branch, was contacted by phone on April 17, 2001.

Summary of the phone conversation with Lou Jones. The mosquito control program in Prince William County is small, with 4 full time field staff. Vectors are controlled using both adulticide and larvicide techniques. In contrast to other areas in the northern part of Virginia, vector control treatments in Prince William County frequently involve adulticiding. Apparently, there is some pressure from "old timers" who have the "spray philosophy", regardless of the outcome.

There is a lot of growth in Prince William County and it may soon become a suburb of Washington DC. Lou Jones mentioned that most new housing tracts had detention/retention ponds associated with them. These frequently become sources of mosquitoes when they are not maintained. Overwintering adult *Cx. pipiens* mosquitoes have been collected in manholes.

Lou Jones suggested that VBDS contact Bruce Harrison, at the North Carolina Department of Health, and John Neely, in Craven County, North Carolina, for more information on vector related issues.

Summary of the phone conversation with Oscar Guzman. The concept of BMPs originated in northern Virginia in the mid 1970's, originally to protect the drinking water source in that area. In 1990, the Chesapeake Bay Act was passed which greatly

expanded the scope of clean water in the state of Virginia. There are hundreds of structural BMPs in Prince William County. There are several different types including extended detention basins (EDB), bioretention marsh areas, Stormceptors, and permanent ponds. EDBs are designed to drain dry in 40 hours or less, but due to clogging and lack of maintenance, mosquitoes often utilize them for breeding. As a result, the County has received public complaints of mosquitoes in ponds and EDBs. When this happens, County maintenance crews visit the sites to do maintenance and repairs if necessary. Several EDBs have been retrofitted with baffles to improve draw down time while preventing clogging and ultimately reducing the required maintenance.

Bioretention marshes are generally used in small drainage areas of 1 acre or less and filter water through a vegetated marsh zone. Water then infiltrates (preferred method), or is allowed to run off (where clay soils prevent infiltration). Stormceptors are generally only used for pre-treatment purposes, not water quality, because they do not remove enough pollutants. The County has few permanent ponds.

Fairfax County Health Department. Roy Eidem, the environmental health supervisor, was contacted by phone on April 17, 2001.

Summary of the phone conversation with Roy Eidem. Fairfax County does not have an active mosquito control program. Apparently the county did have a program until the local government was downsized in 1992, eliminating mosquito control. The current situation with West Nile Virus (WNV), and the recent find of a WNV positive bird in Fairfax County last year, has driven Fairfax County Health Department to try to obtain funds to re-establish a mosquito control program.

Roy Eidem is currently responsible for advising and education on mosquito-related issues. There is a County ordinance regarding mosquito-breeding sites and much of the education focuses on habitat reduction and management in urban areas. Ray Eidem is works with a member of the Fairfax County Department of Public Works on designing a strategy to deal with mosquitoes in their jurisdiction, which will include mosquitoes that may utilize BMPs for breeding. Roy Eidem suggested that VBDS contact Scott St.Clair, with the Fairfax County Department of Public Works, for information on stormwater BMPs.

Fairfax County Public Works and Environmental Services Department. Scott St.Clair, the director of the Maintenance and Stormwater Management Division, was contacted by phone on April 17, 2001. He provided VBDS with copies of BMP plans used in Fairfax County from the Fairfax County Public Facilities Manual and mentioned that the entire manual was available for purchase.

Summary of the phone conversation with Scott St.Clair. Fairfax County has thousands of BMPs for both water quality and for volume reduction, and Public Works and Environmental Services Department is responsible for a large percentage of them. The reason for many of the BMP structures in this county is because about 1/3 of the Fairfax County water runoff drains into the Accoquam Watershed which is the main drinking water supply.

Fairfax County Public Works and Environmental Services Department is responsible for maintenance of approximately 10 major lakes, 600 water quality BMPs, 300 volume reduction facilities, and 35,000 manholes. In addition, the County has approximately 1600 privately owned and operated facilities in commercial and residential areas. These can include sand filters, extended detention basins (EDB), ponds, and others. The County provides inspections of private facilities approximately every 5 years and then they will provide a punch list that need to be addressed by the owner if there are problems or maintenance issues.

EDBs are essentially the only accepted BMP for urban areas. Public Works has learned that having multiple small orifices for draining down the facilities requires too much maintenance. They have changed to the use of a single, larger opening, based on the size of the EDB, surrounded by a debris screen. This design is much less prone to clogging and thus requires far less maintenance. The debris screen is generally designed with holes 1/4 the size of the main drainage orifice.

The County has recently been hit with many concerns regarding mosquito production, especially since last year with the discovery of a local bird infected with West Nile Virus. Much of Fairfax County is in a coastal grade (stream grades can be as low at 0.25%) resulting in thousands of acres of wetlands. As a result, there are numerous areas for mosquito breeding in and around urban areas. In addition, the "Asian Tiger Mosquito", *Ae. albopictus*, the primary vector of dengue hemorragic fever,

is common in small containers in urban areas. However, Scott St.Clair did not know the extent of mosquito breeding in BMP structures.

City of Alexandria Health Department. Joe Fiander, one of the primary "mosquito people" for the Division of Environmental Health, was contacted by phone on April 17, 2001.

Summary of the phone conversation with Joe Fiander. Joe Fiander is employed by the State of Virginia, but is assigned to the City of Alexandria. The City had a mosquito program in the past, but it was eliminated due to budget cuts. With the presence of West Nile Virus in the area, a new vector control program may become established. Currently, the Health Department is starting a trapping program to determine what mosquito species are present in the area. This includes adult trapping, dead bird collections and testing, larval sampling, and larviciding. For larviciding, the City uses microbial larvicides (Bti and Bs), the insect growth regulator methoprene, and Agnique, a monomolecular film used for controlling 4th instars and pupae. Aqnique is non toxic and does not even have an MSDS sheet.

Most BMPs in the old part of the city are below ground structures. JoeFiander has not surveyed these structures as of yet, but he will be investigating them in the near future for possible vector production. In the newer areas of the city, primarily in the western regions, retention ponds are built into new housing developments. Many of these retention ponds are supposed to drain in 72 hours or less, but they frequently retain water for much longer periods and become a source of mosquitoes. The city has big problems with the "Asian Tiger" mosquito, *Ae. albopictus*, that breeds in urban containers.

City of Alexandria, Department of Transportation and Environmental Services. Bill Hicks, the watershed program administrator for the Division of Environmental Quality, was contacted by phone on April 19, 2001.

Summary of the phone conversation with Bill Hicks. The City of Alexandria is essentially 100% built out. When BMP issues began for stormwater runoff, there was little room to build large outdoor structures, thus almost all BMPs are built below ground.

In general, stormwater runoff will pass through some kind of filter prior to entering the main storm sewer. Most BMPs are small-scale and most are manufactured hydrodynamic structures such as Stormceptor, Baysaver, etc. Other underground BMPs include Austin sand filters and DC sand filters (developed in the District of Columbia). Almost all of these structures are privately owned and operated. The developer will put the units into the construction plans, and then the owner is responsible for upkeep and maintenance. Many owners opt to make contracts with a contractor for maintenance. There are a few regional ponds, mostly associated with newer housing tracts. The maintenance of these structures generally become the responsibility of homeowners associations.

Because of the scale of the stormwater program in the city, Alexandria is investigating the possibility of developing a "Stormwater Utility" department that would be responsible for all things related to stormwater including water quality, water quantity, BMP implementation, BMP maintenance, etc. In the opinion of Bill Hicks, this is probably the inevitable solution.

New BMP technology is focused on implementation of bioretention devices. Bioretention devices were developed in Prince Georges County, MD, and are very effective at removing metals from incoming water, usually through the use of mulch in a depression. These devices usually include vegetation, but are not necessarily heavily planted since the mulch is the main filtering device. Biofiltration basins are designed in areas with soils that allow infiltration, which is the preferred method, and generally drain down quickly. In areas with impervious clay soils, bioretention filters are built which function on the same principle, but have perforated PVC pipes buried below ground to allow drainage through the mulch filter.

Bill Hicks expects that the City will be more observant of mosquitoes in their BMP designs this year and in the future due to the presence of West Nile Virus in the area.

WISCONSIN

Summary. VBDS investigated BMP / vector issues in Wisconsin, with particular interest in the areas in and around Madison and Milwaukee. LaCrosse County Health Department, Vector Control (http://www.co.la-crosse.wi.us/health.htm) is responsible for mosquito surveillance and control in 8 surrounding Counties, 2 of which are in Minnesota. The emphasis of the program is on *Ae. triseriatus*, a container breeding/ tree hole mosquito, and the primary vector of LaCrosse encephalitis virus in the region. Wisconsin has a web site that provides contact information for their local public health departments statewide (www.dhfs.state.wi.us/dph_ops/lhdl.htm). The cities of Milwaukee and Madison do not have active vector control programs. Vector control in Milwaukee is conducted by the Milwaukee Department of Neighborhood Services, Nuisance Control (http://www.ci.mil.wi.us/citygov/dns/home.htm) on a complaint basis only. Vector control in Madison is conducted by the Madison Department of Public Health, Environmental Protection (http://www.ci.madison.wi.us/health/mdph.html), on a complaint basis only.

The Wisconsin Department of Commerce, Safety and Buildings division, Plumbing Program (http://commerce.state.wi.us/SB/SB-PlumbingProgram.html) provides plumbing consultation, inspection, plan review, and product review services. This agency is involved with BMP design and implementation in Wisconsin, and is currently preparing documents for the Wisconsin Department of Natural Resources (WDNR) on the subject. Additional information on stormwater and BMP structures in Wisconsin can be found on the WDNR Internet site (http://www.dnr.state.wi.us/org/land/forestry/usesof/bmp/bmpsourcesforhelp.htm) and on the University of Wisconsin Extension, Water Resources Program Internet site (http://clean-water.uwex.edu/index.html).

The City of Milwaukee, Department of Public Works (http://www.mpw.net/) and the City of Madison, Department of Public Works, Engineering Division (http://www.ci.madison.wi.us/engineering/) both design, implement, and maintain a large percentage of stormwater BMPs in their areas.

Wisconsin Department of Commerce. Lynita Docken, the Plumbing Program manager for the Program Development Bureau, Safety and Buildings Division, was contacted by phone on March 12, 2001.

Summary of the phone conversation with Lynita Docken. The Safety and Buildings division provides plumbing consultation, inspection, plan review, and product review services. The division administers certifications, licenses, and registrations of individuals engaged in plumbing. Lynita Docken was very familiar with BMPs as well as vector issues. She was currently in the process of revising plumbing rules for the State and she was serving on two Wisconsin Department of Natural Resources (WDNR) groups, one focused on stormwater and the other on erosion control (WDNR acts as the EPA for the State and issues NPDES permits). She, and a team of people,were currently in the process of preparing a state BMP manual for infiltration devices.

Lynita Docken was in the process of writing a report to DNR regarding state comments on the stormwater requirement code with regards to vectors and requested a copy of the VBDS out-of-state report to use as a citation. She was having great difficulty in finding any available information on vectors associated with structural BMPs. The goal is to have vector issues addressed by WDNR before they prepare the rules for NPDES, Phase II, which will require water runoff treatment from land of 1 acre or less. Apparently, constructed wetlands have produced vector species and some current designs have been built "with no surface water" in an attempt to eliminate the problem.

Lynita Docken suggested that VBDS contact Dick Otis, an on-site wastewater specialist working for Ayers and Associates, in Madison, and Robert Thibolodeaux, with the Wisconsin Department of Health.

LaCrosse County Health Department. Dave Geske, who runs the Vector Control program, was contacted by phone on December 15, 2000.

Summary of the phone conversation with Dave Geske. David Geske works in 8 surrounding Counties, 2 of which are in Minnesota. His emphasis is on surveillance and control of *Ae. triseriatus*, a container breeding/ tree hole mosquito, and the primary vector of LaCrosse encephalitis virus in the region. This species is generally not

associated with stormwater structures in the region; however, there are approximately 26 species of mosquitoes in his area that he may deal with.

The counties that Dave Geske works in contain many tributaries of the Mississippi River that create marsh complexes suitable for mosquito production. In general, most of his work does not include water resulting from stormwater runoff. Some of the holding ponds he has experienced, especially those located in lowlands, produce large numbers of *Ae. vexans* along the edges. This aggressive species of mosquito is responsible for numerous complaints in the urban and suburban regions. Some new developments are required to install retention ponds that have also resulted in the production of *Ae. vexans*, as have drainage areas along interstates in the metropolitan areas. Pammel Creek, a concrete channel that runs through LaCrosse, occasionally has problems with water ponding at the outlet due to silt buildup, creating mosquito habitat. *Cx. pipiens* mosquitoes are occasionally caught in adult traps, but larvae are found infrequently.

Dave Geske suggested that VBDS contact Pat Caffrey, with the City of LaCrosse Public Works Department, and Lynita Docken, with the Wisconsin Department of Commerce. Lynita Docken works with pollutants and wastewater and has contacted Dave Geske in the past to discuss potential vector issues associated with the construction of water management structures.

City of LaCrosse Department of Public Works. Pat Caffery was contacted by phone on Jan 30, 2001.

Summary of the phone conversation with Pat Caffery. Pat Caffery had not considered vector issues associated with stormwater systems, but had a good understanding of vectors such as mosquitoes and rodents. The Public Works Department is responsible for a variety of city services including streets, sewer, water runoff, erosion control, as well as the Pammel Creek system. Pammel Creek is a large drainage channel that receives stormwater runoff. Pat Caffery was not aware of any vector problems associated with this channel and he stated that the water is usually not stagnant, but flowing.

Pat Caffery was very familiar with BMP structures (i.e. wet ponds, dry ponds, etc.). In Wisconsin, cities with > 100,000 people, such as Madison and Milwaukee, are well into implementing "Phase I" of the EPA's water quality program. These cities were mandated to built different BMP's and were monitoring them for contaminant removal performance. Pat Caffery suggested that VBDS contact Public Works in Madison and Milwaukee.

Milwaukee Department of Neighborhood Services. Don Schaewe, with Nuisance Control, was contacted by phone on Oct 31, 2000.

Summary of the phone conversation with Don Schaewe. The city of Milwaukee does not have an active vector control program; however, vectors are abated by Nuisance Control in response to public complaints. All stormwater in the city is routed into underground sewer systems called the "Deep Tunnel Project" from where it is then treated. Don Schaewe suggested that VBDS contact the Milwaukee Metropolitan Sewage District for more information on stormwater issues.

City of Milwaukee, Department of Public Works. Tim Thur, a civil engineer, was contacted by phone on Feb 1, 2001.

Summary of the phone conversation with Tim Thur. Tim Thur was very familiar with BMP's and stormwater management. Many BMP structures have been built in and around Milwaukee, some by private developers and some by the Public Works Department. Those built by developers are reviewed by the City and inspected at different phases during construction. Some of the BMP types found in the area include retention and detention basins, whirlpool type units such as Vortechnics and Stormceptor, and "roof storage" where water flow is restricted from commercial flat roofs, essentially turning them into extended detention / sedimentation basins.

Citizens of Milwaukee and the surrounding areas frequently voice concern with potential mosquito problems and children drowning in new pond constructions. Ponds have to be built with a shallow grade of approximately 20 ft, followed by a "safety shelf" before dropping into deep water. Tim Thur was not aware of mosquito problems following the construction of ponds.

Privately maintained BMPs, especially extended detention basins, frequently become choked with tall grass and vegetation overgrowth, which is a problem that needs to be enforced. Tim Thur mentioned that maintenance issues such as this are always a concern and that he would like to see more frequent maintenance; however, most stormwater management structures are maintained infrequently. For example, catch basins are on a 3-year cleaning cycle.

Madison Department of Public Health. Doug Voegeli, the supervisor of Environmental Protection, was contacted by phone on December 20, 2000.

Summary of phone conversation with Doug Voegeli. The City of Madison has no organized vector control program. The Madison Department of Public Health, Environmental Health will respond to vector problems on a complaint basis only. Additionally, they are also involved with issuing discharge permits for water (e.g. pool draining, manufacturing plants, etc.). Doug Voegeli suggested that VBDS contact the Madison Neighborhood Plan Review, the Madison Public Works Department, and the Madison Sewer Utility.

City of Madison Department of Public Works. Jeff Benedict, a civil engineer with the Engineering Division, was contacted by phone on Jan 31, 2001.

Summary of the phone conversation with Jeff Benedict. Jeff Benedict was very knowledgeable on BMPs and stormwater runoff issues. He has been involved with stormwater and other runoff issues for many years and has designed, constructed, and retrofitted BMPs in and around the city. Madison has a multitude of BMP types including wet ponds, extended detention basins (EDB), and Stormceptors. Retention (wet) basins are used to collect runoff and preserve water quality and are mandated for any construction area of 80 acres or more. EDBs are also common, but used more frequently for flood control. Stormceptors require frequent maintenance and when possible, Public Works prefers devices that require less maintenance, for example, a pond that required dredging only every 10-20 years.

Lack of maintenance in BMP structures is a big issue. The initial cost of BMP construction is insignificant compared to the huge financial burden involved in the

maintenance of structures. Any development of 3 acres or more has to provide some form of stormwater detention in Madison; however, the developer can appeal this, and if approved, pay a one-time fee to Public Works. The fee would then be used to help fund larger projects in more critical areas. Currently, the big push in Madison for construction site erosion control.

Jeff Benedict was very knowledgeable of mosquito biology. He and his colleagues have done background research on mosquitoes. He noted that EDBs produce many more mosquitoes than permanent wet ponds. In fact, it is Jeff Benedict's opinion that retrofitting wet ponds in for dry ones can reduce mosquito problems in Madison; however, he also acknowledged that the wet ponds can be conducive to mosquito production and vegetation overgrowth because the perimeter shore has to be built with a 1-2% grade for safety. This results in water only 1 foot deep at 10 feet out from the shore. In general, mosquitoes are considered a "non-factor" in the construction of wet ponds. Jeff Benedict also noted that new homes built around wet ponds sell for more money in new developments, but residents generally protest the retrofitting of ponds into existing developments.

Conclusions

One of the most important lessons learned from this study was recognition of the overall number of government agencies involved with various aspects of stormwater runoff management. VBDS could have spent many additional months exploring stormwater issues within each state by contacting other agencies and interacting with other employees with varied backgrounds and specialties. Considering this, it should be noted that this report provides only a small overview of the overall situation.

Due to the size and scope of the nationwide programs aimed at managing and "cleaning" stormwater runoff, it is clear that vector issues must be addressed. It is important to realize that the innumerable constructed and planned structural BMP devices across the country will provide new habitat for vector production. This may result in an increase in the number of local vector species and may provide habitat for exotic species to become established. Several agencies in Maryland, NewJersey, and Virginia related that the rapid spread of West Nile Virus, transmitted by anthropophilic mosquitoes, is causing some to reconsider BMP strategies. Even if individual BMP structures only produce relatively small number of vectors, even infrequently, the cummulative impact will be compounded by the potentially large number of breeding sites available. Managing vectors in these created habitats is an urgent need. Rapid construction and poor interagency communication places an increasing burden upon vector control agencies.

In addition to the question of how to best manage vectors in the potentially large number of BMP structures, it is also evident from this study that operation and maintenance plans for many of these structures have yet to be thoroughly examined. "Crisis management" is the current maintenance paradigm used by various agencies including the Minnesota Department of Transportation and the Austin Watershed Protection & Development Review Department. This paradigm is probably the most common means used by other agencies based on the fact that many of these structures were reported as infrequently, irregularly, or never maintained. This is not a suitable solution, as regular maintenance is needed to preserve the intended level of BMP performance while reducing or eliminating the production of vectors. Contacts from the

Minnesota Department of Transportation, the Virginia Transportation Research Council, and the Virginia Department of Conservation & Recreation have evidence that shows a lack of regular maintenance can result in re-suspension of pollutants and effective wash-outs from structures. As suggested by the Alexandria Department of Transportation and Environmental Services, it seems inevitable that some kind of "Stormwater Utility" department be established in order to regularly manage and maintain BMPs. The initial costs of structural BMP construction are insignificant when compared to the financial burdens caused by regular maintenance.

The fact that agencies have differing opinions on which structures are most appropriate illustrates the fact that BMPs are constructed at rates exceeding the agencies' understanding of the long-term implications of these new BMPs. Several agencies are encouraging the use of non-structural BMPs that provide performance similar to that of structural BMPs, while reducing cost and maintenance. It is evident that the performance of existing structures cannot easily be evaluated and the long-term water quality benefits remain questionable.

This study provided a wealth of information on both BMP structures and associated vector issues in widely-separated areas of the United States. When considering the results of the out-of-state studies conducted by VBDS, there is no question that BMP structures can provide suitable habitats for vectors, with both local and exotic vector species utilizing them for reproduction. At this time, any resulting public health concerns are still poorly understood but, this study clearly demonstrates the need for communication and collaboration between agencies and states, particularly between those interested in water quality and vector control. Vector control agencies should be consulted to:

- provide input on design improvement
- ensure compliance with state health and safety codes
- minimize vector production and associated surveillance and control costs.

Biologists and engineers should strive to compliment each other, as modeled by the Somerset County Public Works Department.

APPENDIX A:

Contacted Agencies

COLORADO

Colorado Department of Public Health and Environment
Consumer Protection
Vector Control
Dale Tanda, Program Manager
4300 Cherry Creek Drive South
Denver, CO 80246-1530
(303) 692-3631 Dale
(303) 692-3654 Main
dale.tanda@state.co.us

City and County of Denver
Department of Environmental Health
Division of Animal Control
Vector Control
Diane Milholin, Inspector
666 S. Jason St.
Denver, CO 80223
(303) 698-5553 Diane
(303) 698-4959 FAX
milhobd@ci.denver.co.us

Colorado Mosquito Control
Michael McGinnis, President
9999 Old Wadsworth Blvd.
Broomfield, CO 80021
(303) 466-4515
(303) 466-1522 FAX
comosq@aol.com

City and County of Denver
Neighborhood Inspection Services
Community Planning and Development
Greg McKnight
200 W 140th Ave, Suite 304
Denver, CO 80223
(720) 865-3209 Office
(720) 865-3287 FAX
(303) 607-7416 Pager

Tri-County Health Department
Vector Control Program
Monte Deatrich, Supervisor
4301 E. 72 Ave.
Commerce City, CO 80022
(303) 288-6816 Main
(303) 287-9678 FAX
(303) 227-4012 Direct

MARYLAND

Maryland Department of Agriculture
Office of Plant Industries and Pest Management
Mosquito Control Section
Cyrus Lesser (Entomologist & head of mosq. section)
50 Harry S. Truman Parkway
Annapolis, MD 21401
(410) 841-5880 main
(410) 841-5870 Cyrus
lessercr@mda.state.md.us

Maryland Department of Agriculture
Office of Plant Industries and Pest Management
Mosquito Control Section
Mike Cantwell, west Maryland regional entomologist
6701 Lafayette Ave.
Riverdale, MD 20737
(310) 927-8357
skeetermd@erols.com

Calvert County Mosquito Control Program
Wilson Freeland, supervisor
175 Main Street
Prince Frederic, MD 20678
(410) 535-6924
freelavw@co.cal.md.us

Frederick County Health Department
Environmental Health Services
Mosquito Program
Tom Mohler, manager
350 Montevue Ln.
Frederick, MD 21702
(301) 631-3160 Tom
(301) 694-1029 main
tmohler@fredco-md.net

Maryland Department of Transportation
State Highway Administration
Highway Hydraulics Division
Doug Rose, chief engineer
Steve Udinski, engineer
707 North Calvert Street, MS C-201
Baltimore, MD 21202
(410) 545-0361 Doug
(410) 545-8405 Steve
sudzinski@sha.state.md.us

Maryland Department of the Environment
Water Management Administration
Non-Point Source Program
Ken Pensyl, Program Manager
Stewart Comstock
2500 Broening Highway
Baltimore, MD 21224
(410) 631-3543 Main
(410) 631-3561 Ken
(410) 631-3550 Stewart
scomstock@mde.state.md.us

MINNESOTA

Minnesota Department of Natural Resources
Waters, Central Office
John Stine
500 Lafayette Road
St. Paul, MN 55155-4032
(651) 296-4800 main
(651) 296-0440 John

Minnesota Pollution Control Agency
Policy and Planning Division
Community and Area-wide Programs Section
Water Unit 2
Don Jakes, unit supervisor
520 Lafayette Rd North
St. Paul, MN 55155-4194
(651) 296-7786
donald.jakes@pca.state.mn.us

Minnesota Department of Transportation
Office of Environmenatl Services
Greg Busacker, aquatic biologist
Dwayne Stenlund, soil ecologist
395 John Ireland Blvd.
St. Paul, MN 55155
(651) 284-3750 main
(651) 284-3759 Greg
(651) 284-3787 Dwayne
greg.busacker@dot.state.mn.us
dwayne.stenlund@dot.state.mn.us

Metropolitan MCD
Metro Counties Government Center
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APPENDIX B:

Summary Report of a Visit to Portland, Oregon

Exploring Structural Best Management Practices for Treating Stormwater Surface Runoff outside California

Summary of a Visit to Portland, Oregon

Department of Health Services
Vector-Borne Disease Section

Introduction

For the past year, the California Department of Health Services, Vector-Borne Disease Section (VBDS) has been gathering information on vector issues associated with structural Best Management Practices (BMP) for surface water runoff built outside the state of California. The primary purpose of this study was to develop a better understanding of the vector problems and solutions associated with different structural BMPs from vector control agencies. However, it also was intended to provide opinions and attitudes of vector control personnel toward the construction of these BMP structures and an indication of their abundance and distribution. As a direct result of the report based on this study, VBDS was asked to further explore vector issues associated with structural BMPs in specifically chosen cities and states known to have actively addressed surface water runoff through the use of BMPs.

This addendum to the original study is not limited to vector control agencies, but also includes other agencies involved with stormwater and/or local NPDES permits. For consistency, the same questionnaire was used to gather information; however, the study also includes summaries of telephone conversations and other information obtained. To further validate this study, VBDS was asked to travel out-of-state to gain further experience and make visual assessments of BMP structures.

Many government agencies within Oregon have implemented Best Management Practices (BMP) for treating surface stormwater runoff in compliance with local NPDES permits. VBDS organized a two-day trip to meet with representatives from several local Portland agencies involved with vectors and/or NPDES permits for stormwater runoff. On March 6-7, 2001, Marco Metzger, a public health biologist with VBDS, was accompanied on this trip by Dean Messer, a stormwater consultant with Larry Walker Associates, and Catherine Beitia, an environmental specialist with California State University, Sacramento. The purpose of this trip was to discuss and visit different structural BMPs, with particular interest in understanding design and maintenance factors that could influence vector production. The trip itinerary included meetings with personnel representing three government agencies and taking tours of structures in and around the city.

March 6th

Oregon Department of Transportation Meeting and Tour

We met with Jeff Moore and Paul Wirfs of the Oregon Department of Transportation (ODOT) offices in downtown Portland on the morning of March 6th and were later accompanied on a tour of 7 representative structural BMPs. Jeff Moore is the environmental program coordinator for the ODOT Clean Water Unit, and he assists with the coordination of their NPDES permit. ODOT operates independently, maintaining their own statewide NPDES permit. Paul Wirfs is a civil engineer involved with designing ODOT water quality structures. ODOT has their own BMP handbook available on the Internet (www.odot.state.or.us) under the subheading, "Environment", *Road Maintenance Water Quality & Habitat Guide*.

Portland has a long history associated with water quality issues and BMPs. The Tualatin River in Washington Co. was among the first water bodies in the United States to have a Total Maximum Daily Load (TMDL) assigned to it, specifically for phosphorous content. The river has since been reassessed and additional TMDLs have been added. Because of this, Washington Co. has a large number of structural BMPs designed to reduce the quantity of pollutants released into the river.

ODOT have gained much valuable experience in the past 5 years in understanding how different stormwater BMPs perform. They have been gradually moving away from the use of wet ponds for water quality because of their high maintenance needs and the difficulty in thoroughly removing all contaminated sediments. In addition, invasive cattails need to be managed periodically. The last wet pond "clean out" performed by ODOT was 3-4 years ago due primarily to a bacterial bloom in the water, not necessarily because the pond was ready for sediment removal. ODOT is opting for BMP structures that are easier to maintain such as swales.

In addition to maintenance issues associated with wet ponds, many areas of Portland have fine clay soils that once suspended in water take weeks or months to settle out. This reduces the efficacy of many structural BMPs for pollutant removal. Many of ODOT's newer BMPs do not involve structures, but rather are changes in procedures and protocols to reduce the quantity of pollutants in stormwater runoff. In

situations where structures must be built, ODOT suggests that designs have better access, using reinforced concrete for ramps and in any other parts of the structure where heavy equipment might need to be used for maintenance purposes. Their experience with structures that were built using shot-crete was severe damage and cracking to the structure by heavy maintenance equipment, sometimes after only one visit.

Jeff Moore was aware of vector issues associated with standing bodies of water; however ODOT does not currently contribute resources to Mulnomah County Health Department, Vector Control (MCVC) for surveillance and abatement of mosquitoes within ODOT BMP structures. MCVC uses County funds to perform routine mosquito surveillance and control in many ODOT structures in Multnomah Co., particularly the permanent water hazardous material (Haz-Mat) containment ponds and wet basins. ODOT structures in Washington Co. are not abated by MCVC. Only ODOT Site #1 (listed below) receives mosquito control. Other BMPs included in the ODOT tour may be utilized by vector species, but their significance remains unknown.

The all-day tour examined locations in both Multnomah Co. and Washington Co. The following list provides a short summary of each site and images of structures of particular interest. Location maps follow the list.

Site #1. Airport Way and Interstate 205 interchange Haz-Mat Pond.

This site was built to contain hazardous material spills from the adjacent roadways in the event of an accident. Although it was not built to address water quality issues, ODOT felt that it provided some important lessons learned that apply to any purpose-built water quality improvement pond. ODOT's main concerns with this structure were with maintenance and access, and they felt these issues should be considered in the design and construction of future structures. This structure has no provisions to allow it to be drained for maintenance procedures. There is no access road and getting maintenance equipment into the structure and then into the tight, winding channels for clean out is difficult. In addition, this structure was built with a heavy plastic liner that has slowly been settling and causing the sides of the structure to start subsiding. This structure holds water year-round, grows thick stands of cattails,

and is a source of mosquitoes, particularly *Culex tarsalis* and *Anopheles punctipennis*. MCVC does routine mosquito surveillance and control at this site every 3-4 weeks from approximately July to October, the peak season for these mosquito species.

Site #2. Ross Island Bridge (northwest) CDS / Extended Dry Detention Basin.

This unit was less than one year old. It was designed to receive stormwater runoff from road surfaces on the western sloping half of the Ross Island Bridge. Water is first directed through an underground CDS unit to remove heavy sediments before being discharged into the basin. The basin is provisioned with a concrete access pad for maintenance equipment. It was noted that the drainage outflows held standing water because they were designed with sumps. It was also noted that large sized "rip rap" at the bottom of the basin could create potential mosquito breeding habitat such as that experienced at the Caltrans Sorrento Valley EDB site in San Diego County.

Site #3. Trimet Park & Ride Infiltration Trench.

This unit was not owned and operated by ODOT, but rather by Trimet, the Portland agency that runs the local buses and lightrail trains. It was designed to receive water runoff from the parking lot. It was not noted if in-line catch basins or other structures served as prefilters to the water before being released onto the surface of the

infiltration trench. However, there was evidence suggesting that water had been flowing over the trench rather than into it; the surface of the trench was clogged with sediment and moss.

Site #4. Boones Ferry Road Bioswale.

This bioswale received surface water runoff from Boones Ferry Rd as well as from an adjacent parking lot. The original plans called for incorporating several flow spreaders along the length of the structure to keep the water evenly distributed across the swale. The construction crew misinterpreted the plans and raised several rock dams in place of flow spreaders. As a result, water ponds behind each dam and may sit for periods of time. In addition, this has also resulted in the accumulation of pockets of sediment.

Site #5. Beaverton-Tigard Hwy & Greenburg Rd Extended Dry Detention Basin.

This structure receives surface water runoff from the adjacent intersection. It was designed as a dry pond, with the bottom of the basin lowered approximately 6 inches below the outlet to increase the time interval between clean outs. However, lowering the basin floor resulted in the creation of a permanent pond of water.

Site #6. Tualatin MAX station Park & Ride Extended Dry Detention Basin.

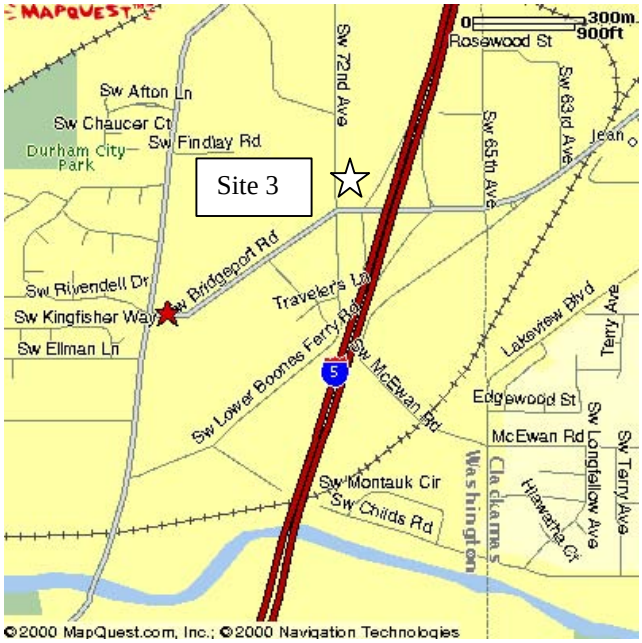
BMP designers were given a very small area in which they were required to build a water quality basin for treating surface water runoff from the MAX station Park & Ride lot as well as from the parking lot of the nearby apartment complex. The result is a deep basin with steep sides to accommodate the large volumes of incoming water. There is no access ramp into the basin for maintenance equipment.

Site #7. Orenco MAX station Park & Ride Extended Dry Detention Basin.

This structure was designed and built for treating surface water runoff from the MAX station Park & Ride lot. It is relatively new and incorporates a unique design with a long, narrow channel that partially surrounds the parking lot and functions as an extended detention basin. The inlet into the basin is only a few feet from the outlet; however, as water enters it is forced to back up in the long narrow basin.

March 6th, ODOT Tour Regional Map with BMP Site Locations

March 6th, ODOT Tour Site Location Maps



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Sw Borders St
Sw Hemlock
Crescent Grove Cemetery
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Sw Coral St
Sw 92nd Ave
Sw Locust St
Sw 87th Ave
Sw Oak Way
Sw Oak St
Sw 85th Ave
Sw Pine St
Sw Cascade Ave
Sw Shady Ln
Sw Spruce St
Sw Thorn St
Sw Longstaff St
217
Sw 83rd Ave
Sw Tiedeman Ave
Sw North Dakota St
Greenburg
Creton
Sw Greenburg Rd
Sw 90th Ave
Sw Lomita Ave
Sw Hall Blvd
Sw 98th Ave
Sw Lewis Ln
Sw Tangela Ct
Tigard Pl
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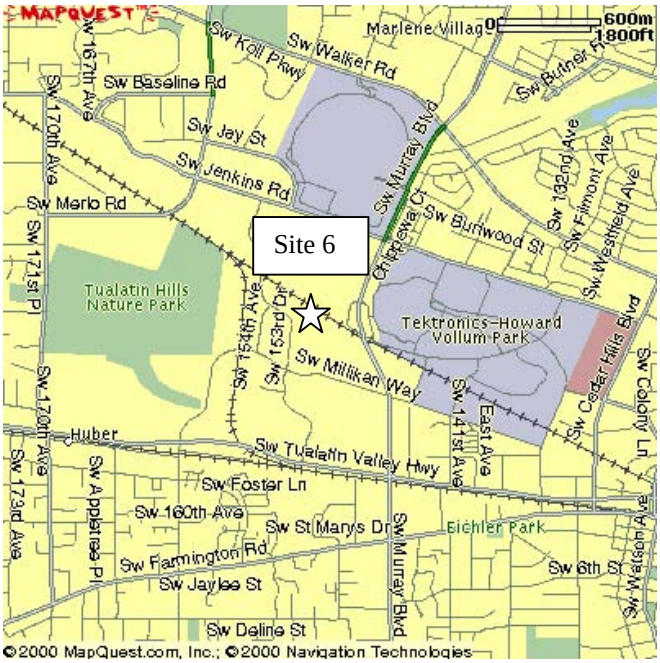
MAPQUEST
600m
1800ft
Site 6
Marlene Villag
Sw Koll Pkwy
Sw Walker Rd
Sw 167th Ave
Sw Baseline Rd
Sw Butner Rd
Sw Jay St
Sw Jenkins Rd
Sw Murray Blvd
Sw 132nd Ave
Sw Filmont Ave
Sw Merlo Rd
Sw 170th Ave
Sw 171st Pl
Chippewa Ct
Sw Burlwood St
Sw Westfield Ave
Tualatin Hills Nature Park
Sw 154th Ave
Sw 153rd Dr
Tektronics-Howard Vollum Park
Sw Millikan Way
Sw 141st Ave
East Ave
Sw Cedar Hills Blvd
Sw Colony Ln
Huber
Sw Tualatin Valley Hwy
Sw 170th Ave
Sw 173rd Ave
Sw Applewood Pl
Sw Foster Ln
Sw 160th Ave
Sw St Marys Dr
Sw Murray Blvd
Eichler Park
Sw Farmington Rd
Sw 6th St
Sw Watson Ave
Sw Jaylee St
Sw Deline St
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MAPQUEST
300m
900ft
Site 7
Ne Alocleck St
Ne Alocleck St
Forest Grove Junction
Nw Nicholas Ct
Nw Windstone St
Nw Swire Ln
Nw Amberview Ln
Nw Hodes Dr
Nw Cherry Ln
Nw Cornelius Pass Rd
Nw 206th Ave
Nw 225th Ave
Nw Birch St
Nw Wilkins St
Orenco Woods Golf Course
Nw Trailwalk Dr
Nw 226th Ave
Nw Autumncreek Way
Nw 227th Ave
Ne 74th Ave
Ne Woodsong St
Ne Danbury Ave
Nw Quatama Rd
Quatama
Nw Kian Ln
Nw F St
Nw K St
Nw J St
Nw H St
Nw A St
Ne Nelly St
Sw Kenneth Ct
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March 7th

Multnomah County Health Department, Vector Control & City of Portland, Bureau of Environmental Services Meeting and Tour

We met with David Turner, Chris Wirth, and Katie Bretsch on the morning of March 7th. David Turner is the mosquito control field supervisor and Chris Wirth is the supervisor for the vector control program. Katie Bretsch is the manager of the Collections Systems Operations and Maintenance program for the City of Portland, Bureau of Environmental Services (BES).

City of Portland, Bureau of Environmental Services. BES is one of four City bureaus. They manage the municipal NPDES permit for the City and include the Port of Portland and Multnomah County as co-permittees. BES has their own BMP manual (www.enviro.ci.portland.or.us/swp.htm) that provides information on all aspects of the city's stormwater program. Katie Bretsch is primarily responsible for stormwater BMP designs, their maintenance, and current operations. She specifically works with those that are built by BES for stormwater management, or for any stormwater runoff from the public right-of-way (i.e. culverts, road-side drains). BES has a $22 million dollar annual budget for water quality issues. The mission of BES is protection of both surface and ground waters, while putting strong value on multi-objective management, and a very high value on protecting endangered and non-target species. BES has been using the Endangered Species Act (ESA) as leverage to push the program forward, especially as it relates to endangered fish such as salmon that utilize local waterways. One of BES' future goals includes the development of a "Green Streets Program" to create stormwater-management-friendly streets in residential areas.

BES currently operates 9,210 sumps and 6,507 sedimentation manholes, and over 90 stormwater facilities that could hold open, standing water. BES views the spraying for mosquitoes as having been successful for control in their open water areas. The cost involved is not viewed as excessive by BES standards, and the cost-per-acre is not unreasonable. If it is a question of spraying vs. redesign of a stormwater structure such as an open pond, BES will opt to spray. MCVC has asked BES to redesign ponds

(i.e. no vegetated perimeters of ponds and water margins), however, BES has been reluctant to do this because it could reduce the ability of ponds to remove pollutants.

Multnomah County Health Department, Vector Control. Currently, there is no State vector control program in Oregon. MCVC is responsible for mosquito surveillance and control throughout Multnomah Co., and has a small contract area with the City of Durham in Washington Co. (3.6 square miles). This small agency has only 6 full-time staff and is badly understaffed for the extensive control of mosquitoes and rats that includes a cumulative area of approximately 1000 acres yearly. The active mosquito control treatment program runs from January through September.

MCVC works on lands owned and/or managed by several different agencies including BES, the Port of Portland, ODOT, East Multnomah County Drainage District (EMCDD), and the Portland Transportation Department (PTD) for mosquito surveillance and control. BES funds a large part of the city's rodent sewer baiting program; however, BES is reluctant to acknowledge that some of their facilities and structures (e.g. sedimentation manholes and sumps) create public health threats / nuisance by producing large numbers of mosquitoes. BES contributes approximately $20,000 annually for mosquito control. The Port of Portland provides sufficient financial support to MCVC for mosquito control in their mitigation wetlands sites. ODOT, EMCDD, and PTD do not contribute funds for vector control within their jurisdictions.

MCVC would like to see better communication between agencies. They are often not informed of the development of new sites until a problem arises or after structures are already built. MCVC would like to be involved in the design review and permitting process to reduce the potential of vector production. Accurate maps of facility locations as well as a description of the hydrology should be provided. MCVC recommendations would include building structures with steep sides and hand removal of vegetation on a regular basis. In addition, access ramps for boats would need to be included in the design of large structures and roads around smaller structures. The problem MCVC sees with the creation of new sites is that they require continuous vegetation maintenance and vector surveillance and control. They note that there are

ever increasing numbers of structures for the limited staff. In addition, MCVC has noted that once construction is complete there is very limited maintenance of these structures.

Rodents. In the Willamette Valley nutria rats and beaver can create drainage problems. These rodents frequently dam culverts and ponds causing water to stand longer and at higher level than anticipated. MCVC often removes beaver and nutria dams to restore proper water flow and may contract with local trappers to remove problem animals.

Mosquitoes. Mosquito control is done for both nuisance control and for disease prevention and control. There are 7 species of mosquitoes that are of particular importance in the Portland area that are regularly abated by MCVC. Larvicides are the only chemical compounds used for routine control. Large sites are treated by helicopter with contract companies. Mosquito fish can be used, but only in closed systems where it is not possible for them to get into natural waterways. Adulticiding in Multnomah County is restricted to a health emergency. The following list briefly summarizes the importance of each species and the approximate number of sites abated by Vector Control.

1) *Aedes washinoi* is a winter mosquito associated with seasonally flooded rain pools and ponds.. Breeding sites may be as small as 30 ft^2 to over 50 acres in size. They have only one generation per year, generally emerging as adults in mid-March. MCVC treats about 250 sites, mostly in neighborhoods and urban areas.

2) *Aedes vexans* and *Ae. sticticus* are floodwater mosquitoes. In the Portland area, these species primarily utilize the coastal floodplains and wetlands of the Columbia and Willamette rivers. They are generally found between April and mid-June. MCVC treats approximately 125 sites, most very large (150+ acres), by contract aerial larviciding.

3) *Coquillettidia perturbans* has a unique biology that makes them difficult to control. Larvae of this species attach to the roots of aquatic plants where they remain throughout their development. Larvae develop slowly starting in late fall and adults

emerge in early July. In the Portland area this species is only associated with cattail marshes and there is only one generation per year. The only effective control is to apply methoprene pellets (Altosid) at least 3 consecutive times. MCVC does not have the budget required to effectively control this species.

4) *Culex tarsalis* and *Anopheles punctipennis* are summer and fall species that utilize open bodies of water, especially year-round ponds. They are generally present between early July and October, with two characteristic population spikes, one in early July and the other in early September. MCVC treats approximately 800 sites every 3-4 weeks during peak season.

5) *Culex pipiens* is a polluted water mosquito. It is less common than *Cx. tarsalis* and has been found associated almost exclusively with polluted bodies of water. It will utilize underground sedimentation manholes and is common in the City's wastewater treatment plant. The sites treated for *Cx. tarsalis* and *An. punctipennis* listed above are all potential breeding sites for this species. Approximately 20 sites are recognized as producing large numbers of this species. The seasonality and control of *Cx. pipiens* mirrors that of *Cx. tarsalis*.

The tour visited 11 sites within northern Multnomah Co., most located in the vicinity of the Columbia River. MCVC does regular mosquito surveillance and control at all of the sites, except for the BES bioswale, Site #3. The following list provides a short summary of each site visited with images of structures of particular interest. Location maps follow the list.

Site #1. Ramsey Lake Stormwater Detention Facility.

This facility is one of the largest that we visited during the tour. It was designed to receive stormwater runoff from many acres of the surrounding industrial area. Water flows initially into a large concrete sedimentation basin. This basin can be drained for maintenance and has ramps leading into it from where a front-loader tractor can be driven in. From the sedimentation basin, water is directed into a large central pond from where it exits via a canal into the Columbia slough. The entire facility holds water year-round.

The facility itself is managed solely by BES; however, adjacent to this site is a seasonally flooded mitigation wetland area managed by the Port of Portland. MCVC abates a variety of mosquito species in this area. Floodwater mosquitoes are a regular problem in the mitigation wetland area, whereas *Culex tarsalis* and *Anopheles punctipennis* utilize the stormwater facility, particularly the central pond. Mosquito control at the stormwater facility is done exclusively by ground spraying. Mosquito fish can not be planted at this site because it empties directly into the Columbia slough. Beaver frequently dam the central pond creating drainage problems. A dam is visible in the second photo below.

Site #2. Sedimentation Manholes and Infiltration Sumps, University Park Site.

The City of Portland has 6,507 sedimentation manholes and 9,210 infiltration sumps. These units are designed to take stormwater runoff from residential streets and allow it to infiltrate into the ground (similar to a groundwater injection well). Water enters through an inlet grate, flows into a sedimentation chamber that is approximately 4 feet deep (similar in function to the Caltrans MCTT pre-filter sedimentation chamber), then passes into a perforated sump that is approximately 30 feet deep. In addition to trapping sediments and other pollutants, their purpose is to alleviate the water load in the storm drain system that can overflow into the sewer during periods of heavy rain, allowing raw sewage to be expelled into the rivers. According to BES, the average sedimentation manhole collects up to a yard of debris in one year. Maintenance (i.e. sediment removal) is scheduled only every 3-5 years. As a result, sedimentation chambers are frequently clogged with debris.

The manholes covering these structures have many circular openings that allow mosquitoes to access the water below. *Culex pipiens* larvae have been detected by MCVC from the sedimentation chambers and adults may utilize these structures to overwinter. MCVC has not yet monitored for mosquito larvae in the deep sumps. Water is present in these structures for many months.

Site #3. BES Water Pollution Control Laboratory, Bioswale.

These were test swales located at the BES Water Pollution Control Laboratory and consisted of two swales running parallel to one another. BES staff use this structure to obtain various data on swale performance such as pollutant removal efficiency and vegetation efficiency. It also receives some stormwater runoff from the BES parking lot.

Site #4. BES Water Pollution Control Laboratory, Water Quality Ornamental Pond.

This structure was built at the BES Water Pollution Control Laboratory to function as a water quality pond, receiving stormwater runoff from the surrounding neighborhood, while providing aesthetic value and a convenient study site. Aesthetically, this was without question one of the most pleasing BMPs to look at; however, it created excellent habitat for a variety of mosquitoes. The cattails provide habitat for *Coq. perturbans*, whereas *Culex tarsalis* and *Anopheles punctipennis* are regularly found in the pond. The center rip rap strip provides hundreds of microhabitats that are used by mosquito larvae (similar to the Caltrans Sorrento Valley EDB).

Site #5. Multnomah County Exposition Center Mitigation Wetlands.

This site is being built by the Port of Porland and is designed as a mitigation wetland habitat while functioning secondarily for water quality. The site is not yet complete, but will receive stormwater runoff from the giant Multnomah County Exposition Center parking lot located nearby.

Site #6. N.E. Airport Way & 116th, Haz-Mat Pond.

This facility was built and is managed by PTD. It is a permanent wet pond designed to capture hazardous material spills in the event of an accident on N.E. Airport Way or from the adjacent shopping center parking lots. A number of gate valves are incorporated into the design to allow hazardous materials to be trapped within the confines of the structure. A concrete maintenance ramp allows equipment to access the bottom of the pond for maintenance. MCVC regularly treats this site for *Culex tarsalis* and *Anopheles punctipennis*. The concrete vaults that house the flood gates provide additional shaded habitat for larval mosquitoes and retain water for most of the year. Vegetation around the perimeter of this site is generally minimal.

Site #7. N.E. Airport Way & 116th, Haz-Mat Pond #2.

This facility was also built by and is managed by PTD. It was designed very similarly to Site #6 described above. However, the access around this pond is limited by dense vegetation growing around the perimeter making mosquito surveillance and control difficult. In spring and summer, blackberry vines can create a nearly impenetrable barrier.

Site #8. N.E. Airport Way & 132nd, Drainage District Extended Detention Basins.

These two basins were designed and built by PTD, but are currently managed by EMCDD. They are two in-line settling basins connected by underground pipes. They receive stormwater runoff from the adjacent roadways, but do not drain completely and hold water year-round. They have the same mosquito problems associated with all of the permanent wet ponds. Access to the site is excellent by means of a gravel road and the ponds are easy to walk around. However, the banks of the ponds are very steep and there is no access for maintenance equipment to enter the ponds to perform maintenance.

Site #9. N.E. Airport Way & 170th, Haz-Mat Pond.

This was another wet pond designed and built by PTD for hazardous material spill recovery as discussed in Sites #6 & #7 above. It is currently managed by EMCDD. This site is considerably larger than the previous sites, but has similar mosquito problems. Vegetation, especially blackberry vines, can create impenetrable barriers around the perimeter of this remote site. MCVC utilizes a small boat to treat this site periodically.

Site #10. N.E. Airport Way & 170th, Mitigation Wetland.

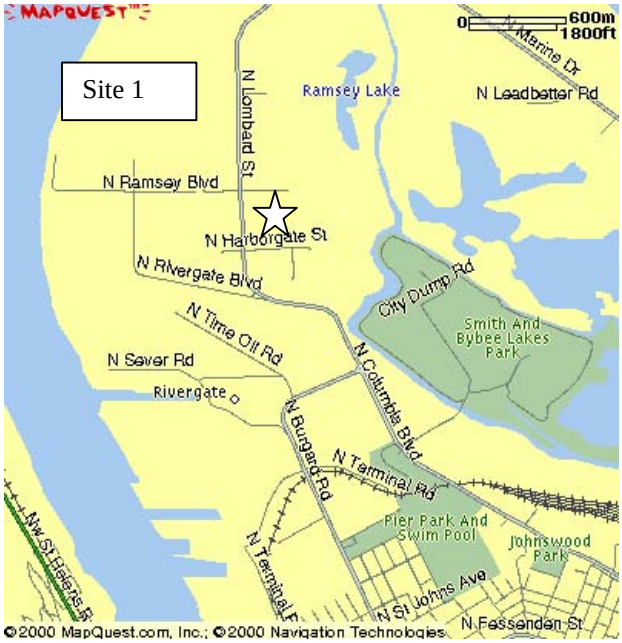
This facility was designed and built by PTD, but is currently managed by EMCDD, and was located near the Columbia River, almost directly across N.E. Airport Way from Site #9 described above. The area is a mitigation zone. A series of five ponds were built for wildlife habitat that receive water from a pump station that taps into an underground aquifer. The ponds are interconnected by underground pipes. Water is present at this site year-round and is regularly treated for mosquitoes that utilize these permanent bodies of water. Beaver are a problem at this site. The photos below illustrate a pond connector pipe grate partially clogged by beaver activity as well as the dozens of fallen trees cut by the beaver. MCVC regularly removes beaver dams and obstructions from this site allowing the ponds to properly drain to their designed levels.

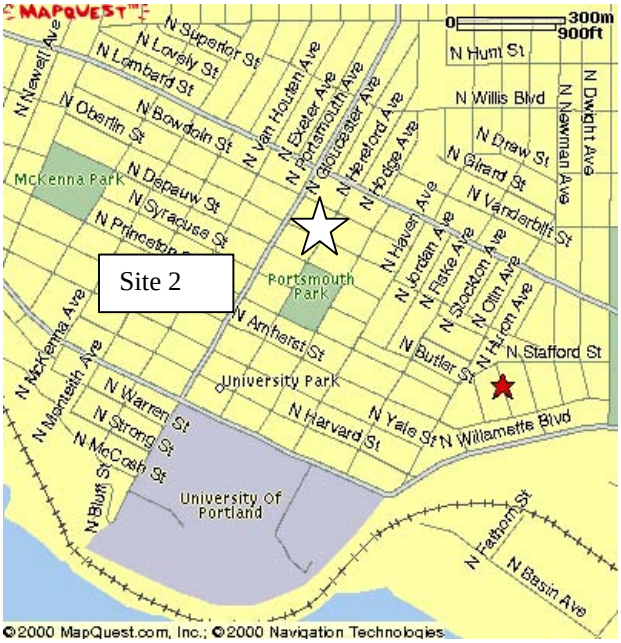
Site #11. Interstate 84 & N.E. 147th Ave, Concrete Detention Basin.

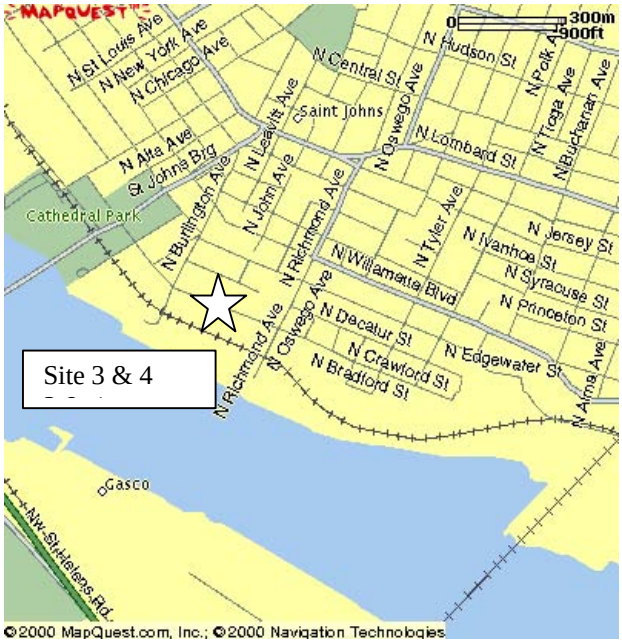
This facility was designed, built, and is maintained by ODOT to receive stormwater runoff from Interstate 84. It holds water all year and is a source of the "permanent water" mosquito species discussed above. This site does not drain completely creating ideal habitat for mosquito larvae. In addition, there are very steep banks with no access road for mosquito control or for maintenance. ODOT informed us that a small tractor had been carefully lowered into this basin using chains for sediment removal. Because of the difficulty encountered, sediment and debris were piled into a corner and left behind (see photo) for eventual removal.

March 7th, County Vector Control / City of Portland Tour Regional Map with BMP Site Locations

March 7th, County Vector Control / City of Portland Tour Site Location Maps







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Ne Simpson St
Columbia Slough
Ne Ainsworth Ct
Ne Jarrett St
Maywood Park
Ne Sandy Blvd
Ne Mason St
205
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MAPQUEST
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Ne Marine Dr
Ne Jarrett St
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Beech Park
Interstate 205 Ramp
Knott Park
John Luby Park
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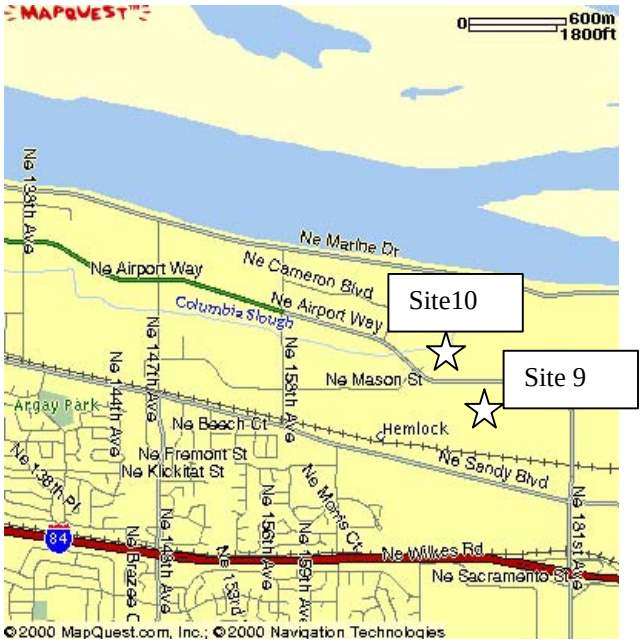
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Ne Sandy Blvd
Ne Wilkes Rd
Ne Sacramento St
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APPENDIX C:

Summary Report of a Visit to Austin, Texas

Exploring Structural Best Management Practices for Treating Stormwater Surface Runoff outside California

Summary of a Visit to Austin, Texas

Department of Health Services
Vector-Borne Disease Section

Introduction

For the past year, the California Department of Health Services, Vector-Borne Disease Section (VBDS) has been gathering information on vector issues associated with structural Best Management Practices (BMP) for surface water runoff built outside the state of California. The primary purpose of this study was to develop a better understanding of the vector problems and solutions associated with different structural BMPs from vector control agencies. However, it also was intended to provide opinions and attitudes of vector control personnel toward the construction of these BMP structures and an indication of their abundance and distribution. As a direct result of the report based on this study, VBDS was asked to further explore vector issues associated with structural BMPs in specifically chosen cities and states known to have actively addressed surface water runoff through the use of BMPs.

This addendum to the original study is not limited to vector control agencies, but also includes other agencies involved with stormwater and/or local NPDES permits. For consistency, the same questionnaire was used to gather information; however, the study also includes summaries of telephone conversations and other information obtained. To further validate this study, VBDS was asked to travel out-of-state to gain further experience and make visual assessments of BMP structures.

Austin is the only city in the state of Texas to have voluntarily implemented Best Management Practices (BMP) for treating urban surface stormwater runoff. Structural BMPs must be included as part of all new development in the City of Austin. There are only three types of structures that can be built for treating stormwater runoff: sand media filters, wet ponds, and retention / irrigation ponds. Retention / irrigation ponds redistribute water over the surrounding vegetated ground via sprinker system and are used primarily in new developments that are subject to "no discharge" rules.

Sand filters are the BMP structure of choice and there are thousands, particularly in the newer suburbs. There are two basic types of sand media filters: full-sedimentation and partial-sedimentation. Full-sedimentation structures have a solid separation between the sedimentation chamber and the sand media filter, whereas some water mixing occurs between the two chambers of partial-sedimentation structures. Full-

sedimentation structures are preferred by the City because they are thought to require less maintenance due to their large size. In contrast, partial-sedimentation structures are preferred by commercial / industrial developers because of the less overall space they require for a given runoff area. This is done despite the theory that partial-sedimentation structures will require more frequent maintenance because they are smaller and are more subject to becoming overloaded. The City of Austin, Watershed Protection is ultimately responsible for maintaining most BMP structures once development is complete. However, in the case of commercial / industrial development, the permanent owner of the building is ultimately responsible for the maintenance of the property's BMP structure(s).

Ideally, the City would like to have maintenance performed on their structural BMPs yearly, or at least every three years. However, in reality, many structures have not been maintained for much longer periods, or never. Apparently maintenance funding is not factored into city ordinances for these structures. In addition, it is likely that the actual number of sand filters in existence is unknown.

The City of Austin, Watershed Protection agency apparently has no working relationship with Austin / Travis County Health Department, Rodent and Vector Control. However, they stock all of their constructed wet ponds with *Gambusia* for mosquito control. Despite this, ponds retrofitted into existing neighborhoods are often met with resistance from local residents who fear potential mosquito problems.

Some information on the status of mosquitoes in Texas was gleaned from presentations given at the American Mosquito Control Association conference in Dallas. There are a variety of mosquito-borne diseases found in the state of Texas including St. Louis Encephalitis (SLE), LaCrosse Encephalitis (occasionally), Eastern Equine Encephalitis, Malaria (a few indiginous cases), and Dengue, which is the most common. There are several mosquito species of special concern. *Culex quinquefasciatus* is a competent vector of encephalitis, *Aedes albopictus*, also known as the Asian Tiger, is the main vector of dengue, and *Aedes vexans* and *Psorophora spp.* can create public nuisances. There is concern with SLE because there have been outbreaks as recent as 1995. *Aedes albopictus* breeds primarily in small containers and old tires. Private residences contribute to most of these mosquitoes, whereas *Culex quinquefaciatus*

breeds in larger bodies of water, especially those that are highly polluted such as inside storm sewers.

On short notice, Marco Metzger, a public health biologist with VBDS who was attending the AMCA annual conference in Dallas, organized a meeting for February 21, 2001 with two people in Austin: Matt Hollon (Glenrose Engineering) and Mike Barrett (University of Texas). The purpose of this meeting was to discuss and visit different structural BMPs, with particular interest in understanding design and maintenance factors that could influence vector production. We met at the Central Market at 11:30 AM. The approximately 3-hour meeting included visits to 9 structures within the city. The following list provides a short summary and photos of each site. A regional map with marked locations follows the list.

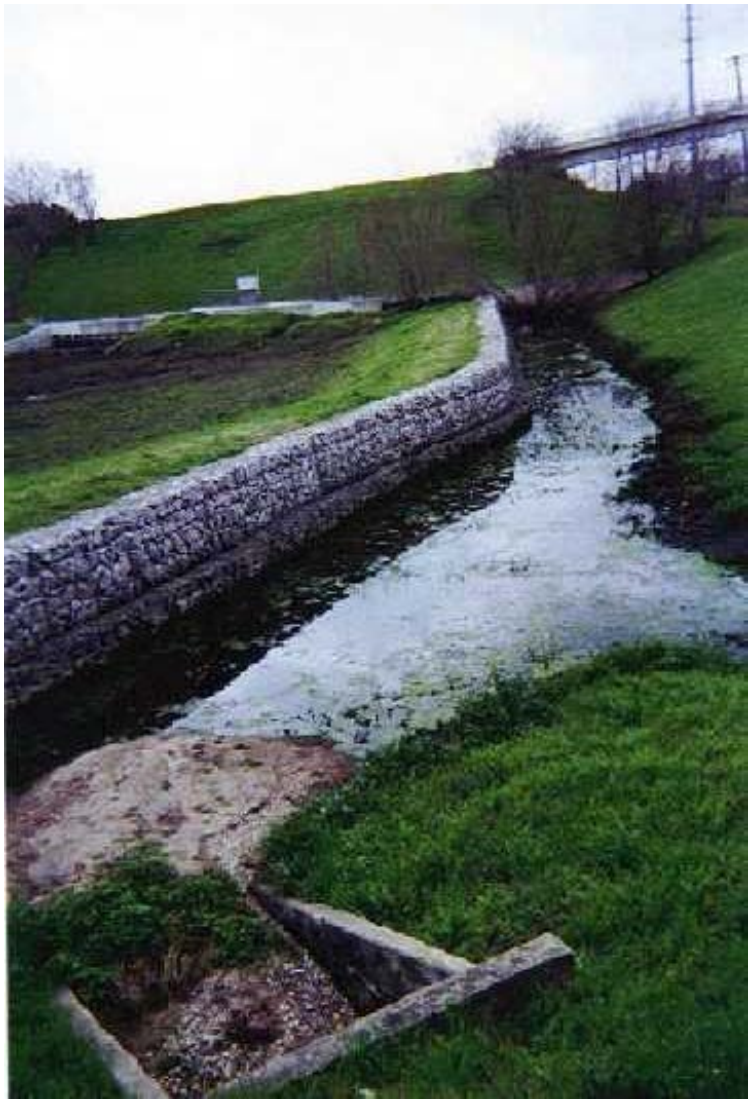
Site #1. Central Park, Wet Pond.

This series of ponds was designed by the City of Austin and is probably maintained through a contract with the neighboring shopping center. It receives urban water runoff from the shopping center parking lot, rooftops, and surrounding city streets. The three inlet pipes (2nd picture) suggest that this structure is capable of receiving large volumes of water. The structure was designed for water quality purposes, but it was also built for aesthetics and even has a fountain. It was noted that there were thick stands of living and dead cattail plants around the perimeter that appeared conducive to mosquito production (3rd picture).

CENTRAL PARK WET PONDS

Site #2. Far West, Flood Control / Water Quality Basin

This site was originally excavated for flood control purposes. It was later expanded (retrofitted) by the City of Austin to comply with water quality standards for incoming flow. To function as a water quality structure, the first basin became a settling chamber of sorts and a second basin was built (in the background of the first picture) to serve as a permanent water treatment wet pond. Overflow water then ultimately discharges into an adjacent creek. To allow for easy monitoring, several inflows along the roadway were modified to flow through a single narrow channel (2nd and 3rd pictures). It was noted that this structure was in disrepair and in severe need of maintenance and provided excellent habitat for mosquitoes. The inflow area leading from an inflow pipe to the main concrete inflow channel was (2nd picture) was flooded with approximately 8-12 inches of water, which based on plant and animal life, looked as if it had been there for months. The concrete channel that directed water from the inflow area into the first basin was flooded and had several large trees growing through the concrete (3rd picture).



Site #3. Quarry Lake Area, Sand Media Filter #1

This structure receives water runoff from the adjacent office building, roadway, and parking lot. It is a full-sedimentation structure as noted by the two separate chambers. It was built by the developer, but the building owner(s) is ultimately responsible for its function and maintenance. It was noted that the inlet channel was partially clogged with sediment accumulation and it appeared that water remained stagnant in the "dead-end" section, possibly due to a faulty grade.

Note: All sand filters visited were soil-lined.

Site #4. Quarry Lake Area, Sand Media Filter #2

This site was built near Site #3, on the other side of the adjacent office building. As noted previously for all commercial / industrial buildings, it was built by the developer, but the building owner(s) is ultimately responsible for its function and maintenance. It receives runoff from the building and from the parking lot. It is a partial-sedimantation unit, as noted by the rock wall held together by galvanized mesh (chicken wire), which allows some flow-through of water from the sedimentation side to the sand media side. No water was noted at this site.

Site #5. Quarry Lake Area, Sand Media Filter #3

The following three sites, Sites #5, 6, and 7, are all similar in function, but differ slightly in shape because their shapes conform to the parking lots. These sites were associated with a group of office buildings just down the street from Sites #3 and #4. They were all on different corners of the parking lot, literally 1-2 minute walking distance or less. They are all partial-sedimentation units, again as noted by the rock wall separating the two chambers. No significant areas of standing water were noted, but the deep structures with little or no barrier to falling (or driving) into them was alarming.

Site #6. Quarry Lake Area, Sand Media Filter #4

Same as above, but the outflow channel into which all the units discharge treated water can be seen in the forground.

Site #7. Quarry Lake Area, Sand Media Filter #5

Site #8. Quarry Lake Area, Giant Sand Media Filter

This was an enormous full-sedimentation sand filter located behind Seton NW Hospital in the Quarry Lake area. It was built by the Texas Department of Transportation along with the City of Austin; however, the City currently maintains it. This unit receives runoff from approximately 70 acres of nearby roadways and commercial runoff. The inlet was retrofitted into an existing flood channel to redirect water flow into the structure. The structure was currently undergoing maintenance due to clogging of the sand media. Because of this, areas in this structure that might hold standing water could not be assessed. However, the inlet area in the flood channel did have large areas of standing water that appeared to be there as a result of a faulty grade and sediment accumulation.

Site #9. Quarry Lake Area, Small Sand Media Filter

This was the final site visited. It was a very small full-sedimentation sand filter associated with the adjacent parking lot of a small shopping center. It wasapproximetly a mile from the other sand filters visited. No standing water was noted.

Austin, Texas Regional Map with BMP Site Locations

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APPENDIX D:

Maryland Department of Agriculture

"A preliminary survey for mosquito breeding in stormwater retention ponds in three Maryland counties"

APPENDIX E:

New Jersey Department of Environmental Protection, State Mosquito Control Commission

"Best Management Practices for Mosquito Control and Freshwater Wetlands Management"

APPENDIX F:

Completed Questionnaires*

* The following appendix contains pages that are not numbered consecutively. It should also be noted that not every participating vector control agency completed all six pages of the survey, thus some pages from individual responses will appear to be missing.

APPENDIX D:
DHS DRAFT ENGINEERING REVIEW REPORT

A Preliminary Assessment of Design Criteria for Vector Prevention in Structural Best Management Practices in Southern California

CALIFORNIA DEPARTMENT OF HEALTH SERVICES

VECTOR-BORNE DISEASE SECTION

Gray Davis
Governor
State of California

June 2001

Grantland Johnson, Secretary
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Diana M. Bontá, R.N., Dr.P.H., Director
Department of Health Services

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Introduction and Background

The importance of managing stormwater runoff is well known among transportation and stormwater management agencies and municipalities across the country. Federal and state laws regulating stormwater runoff have several purposes such as flood control, erosion control, improvement of water quality, and re-charge of underground aquifers. In recent years, stormwater management strategies have fallen under increasingly stringent regulations requiring the implementation of what have been termed Best Management Practices (BMPs). In general, BMPs serve to reduce the adverse environmental impact of human activities through the improvement of existing strategies or by the creation of new ones. BMPs for stormwater management may include modifying activity schedules, prohibitions or modifications of practices, maintenance procedures, etc. Best Management Practices may also involve the use of structures such as retention and detention ponds, swales, ditches, channels, vaults, infiltration basins, filtration systems and others.

The California Department of Transportation (Caltrans) is the agency responsible for managing California's state highway system. Its Storm Water Program has two primary goals: to comply with requirements of the federal Clean Water Act and resulting National Pollution Discharge Elimination System (NPDES) permit and other state requirements, and to provide the most cost-effective solutions for mitigating the harmful effects of stormwater runoff. In 1997, Caltrans began an extensive program plan to retrofit 32 selected facilities with 39 structural BMPs in Los Angeles (Caltrans District 7) and San Diego Counties (Caltrans District 11). These BMPs included biofiltration strips and swales, various media filtration technologies, extended detention basins, infiltration basins and trenches, continuous deflective separators, an oil/water separator, drain inlet inserts, and a wet basin. Construction began in September 1998 and was almost entirely completed during the following six months. There are currently 37 operational BMPs that are being monitored (2 remain to be constructed in Caltrans District 7), including 24 in Caltrans District 7 at 19 sites, and 13 in Caltrans District 11 at 12 sites.

The purpose of the Caltrans BMP Retrofit Pilot Study was to evaluate the water quality benefits and cost effectiveness of various structural designs retrofitted into

existing locations including freeways, interchanges, park and ride facilities, and maintenance stations. Potential negative consequences of these efforts may include direct impacts on the operations of vector control agencies and public health by increasing habitat availability for disease vectors[1] and nuisance pests. In 1998, the California Department of Health Services, Vector-Borne Disease Section (VBDS) entered into a Memorandum of Understanding (MOU) with Caltrans to provide technical expertise regarding vector production and the potential of vector-borne diseases within its stormwater BMP Retrofit Pilot Study. It was the intent of this MOU to protect public health by documenting and, where possible, mitigating vector production and harborage at the BMP study sites. The agreement required VBDS to establish a comprehensive vector surveillance and monitoring study, develop vector abatement protocols, and recommend appropriate engineering modifications to Caltrans BMPs that would reduce the potential of these structures to produce or harbor vectors. In addition to reviewing the BMP design criteria and monitoring maintenance and operations, VBDS conducted studies to identify which of these designs were least conducive to vector production.

The following report is based on observations and data obtained from weekly BMP site visits that began in early May 1999 and ran through April 2001. During this two-year study, numerous design features and operational events resulted in water accumulating and standing within BMP structures for various lengths of time. Standing water provided the habitat needed for the development of certain vectors, particularly mosquitoes. Caltrans attempted to resolve the design and maintenance issues that allowed vector breeding based on recommendations made by VBDS and the local vector control districts, and successfully implemented solutions to many of them. The purpose of this report is to address design features and other factors that created suitable habitat for the propagation of vectors within BMPs and provide corrective and/or preventative recommendations for future designs. This study provides an initial assessment of design criteria for vector prevention within stormwater structures.

[1] California Health & Safety Code, Section 2200. “Vector" means any animal capable of transmitting the causative agent of human disease or capable of producing human discomfort or injury, including, but not limited to, mosquitoes, flies, other insects, ticks, mites, and rodents.

Vector Surveillance, Monitoring, and Abatement

In accordance with the MOU, VBDS staff established comprehensive vector surveillance and monitoring plans for the 37 operational BMP devices conducted in collaboration with Greater Los Angeles County Vector Control District (GLACVCD), San Gabriel Valley Mosquito and Vector Control District (SGVMVCD), Los Angeles County West Vector Control District (LACWVCD), and San Diego County Vector Surveillance and Control (SDCVSC) in their respective jurisdictions. The primary tasks of the local vector control districts were weekly monitoring of all BMP study sites for immature stages of mosquitoes and midges. At the same time, VBDS staff maintained an overall independent surveillance schedule to monitor vegetative cover, predators of immature mosquitoes, physical and chemical properties of water, and evidence of rodent and other vector populations.

Several mosquito abatement procedures are currently accepted in California. For immature stages, control can be achieved by using microbial larvicides (*Bacillus thuringensis* var. *israelensis* [Bti]; *Bacillus sphaericus*), insect growth regulators (i.e. methoprene), and/or mosquitocidal oils that create a surface film (e.g. Witco® Golden Bear GB1111). For adults, pyrethroid insecticides may be applied as space sprays by air or ground equipment. A single vector abatement regimen was prepared by VBDS and implemented by the collaborating vector control districts as needed. A liquid formulation of methoprene (Altosid EC®: a juvenile hormone mimic that inhibits successful development of immature mosquitoes and a variety of midges) was selected because of its short residual activity, extremely low environmental toxicity, and negligible effects on larval population dynamics.

General Design and Maintenance Recommendations

A variety of vector species including mosquitoes, midges and rodents may utilize artificial habitats created by BMP structures designed to receive stormwater runoff. The following design and maintenance recommendations serve to prevent or reduce vector habitats within BMPs; however, the impacts, if any, of these recommendations on the intended pollutant removal efficiency of the structures are not addressed. During this two-year study, mosquitoes were found to be the most significant and persistent vectors associated with BMP structures. Because of this, recommendations focus primarily on preventing standing water, which is needed for the development of immature mosquitoes.

Stormwater BMPs are intended to have minimal operational oversight and maintenance; thus it is critical to design facilities in as simple a manner as possible. As a general recommendation, all BMP structures should be easily and safely accessible (e.g. avoid structures that fall under the definition of "confined space") to allow vector control personnel to effectively monitor and, if necessary, abate vectors. If utilizing covers, spring loaded or light weight access hatches should be included in the design that open easily and allow for sampling of vectors. Covers should seal completely. Mosquito larvicides are applied with hand held equipment at small sites and with backpack or truck mounted high-pressure sprayers at large sites. The effective swath width of most backpack or truck mounted larvicide sprayers (liquid or granule) is approximately seven meters on a windless day. As a result, road access (with provisions for turning a full-size work vehicle) should be provided along at least one side of large above-ground BMPs that are less than seven meters wide. Those BMPs that have shoreline-to-shoreline distances in excess of seven meters should have a perimeter road for access to both sides. It is important not to have vegetation and/ or other obstacles between the access road and the BMP that might obstruct the path of larvicides to the water; thus, roads should be built as close to the shoreline as possible. The periodic removal or mowing of invasive cattails and/ or other tall wetland vegetation including shrubs and trees is necessary.

The following criteria should be incorporated into the design of all structural BMPs to reduce the probability of mosquito breeding.

Dry Systems

1. Structures should be designed such that they not hold standing water for more than 72 hours (the minimum length of time for mosquito development). Provisions to prevent or reduce the possibility of clogged discharge orifices (e.g. debris screens) should be incorporated into the design. The use of weep holes are not recommended due to rapid clogging when adjacent to or within a sediment-laden area.
2. The hydraulic grade line of each site should be a primary factor in determining the appropriate BMP that will allow water to flow by gravity through the structure. (Pumps are subject to failure and require sumps that hold water and may create mosquito habitats. Structures that do not require pumping should be favored over those that do).
3. Designs should avoid the use of rip rap or concrete depressions that may hold standing water.
4. Distribution piping and containment basins should be designed with adequate slopes to drain fully and prevent standing water. The design slope should take into consideration buildup of sediment between maintenance periods
5. The use of barriers or diversions that result in standing water should be avoided.

Systems with Sumps or Basins

Structures designed with sumps or basins that retain water permanently or semi-permanently (e.g. MCTT, CDS, Delaware-type sand media filters, Canister-type media filters) should be sealed completely against adult mosquitoes. Adult female mosquitoes may utilize openings as small as 1/16th of an inch to access water for egg laying.

1. Structures should be designed with the appropriate pumping, piping, valves, or other necessary equipment to allow for easy dewatering of the unit if necessary.
2. If the sump or basin is completely sealed, with the exception of the inlet and outlet, the inlet and outlet should be fully submerged so female mosquitoes have access to only a limited surface area of water for egg laying.

Permanent Ponds

1. Permanent ponds should maintain water quality sufficient to support surface-feeding fish such as mosquitofish, *Gambusia affinis*, which feed on mosquito larvae.
2. Permanent pond shorelines should be accessible to both maintenance and vector control crews for: 1) periodic maintenance and/or control of emergent and pond-edge vegetation, and 2) for routine monitoring of mosquito immatures and abatement procedures, if necessary. Emergent plant density should be controlled so that natural mosquito predators are not inhibited or excluded from pond edges (i.e. fish should be able to swim between plant bases).
3. If possible, permanent ponds should be maintained with depths in excess of 4 feet to preclude invasive emergent vegetation such as cattails. The pond edges below the water surface should be fairly steep and uniform to discourage dense plant growth and reduce favorable mosquito habitat.
4. Rip rap or liners should be used in areas where vegetation is not necessary, to prevent unwanted growth.
5. Permanent ponds should be designed to allow for easy dewatering of the basin when needed.

Treatment Technologies

Biofiltration Strips and Swales

Design Criteria. Biofiltration swales and strips are densely vegetated BMPs that filter stormwater as it flows over and through vegetation. Biofiltration strips are broad vegetated surfaces that receive stormwater sheet flow directly from an impermeable surface and allow it to flow through in relatively thin sheets. In contrast, biofiltration swales are conveyance channels (typically trapezoidal shaped) that receive captured runoff. In the Caltrans BMP Retrofit Pilot Study, one strip and six swales were built to treat stormwater runoff from sections of freeway. The criteria for the vegetation required that it filter suspended solids, withstand a typical one-year storm event in southern California, adapt to the local climate, tolerate periods of high and low moisture, be slow growing, and require minimum maintenance. A species of grass, "saltgrass", met most of these criteria and was used exclusively in biofiltration structures. Figure 1 shows a typical biofiltration swale and biofiltration strip.

Monitoring Results. The four biofiltration swales in Caltrans District 7 incorporated energy dissipaters composed of small rock rip rap housed in shallow concrete depressions. During their first few months of operation, these energy dissipaters retained water following storm events and irrigation of saltgrass, and provided habitat for immature mosquitoes. In October 1999, the energy dissipaters were modified per VBDS and GLACVCD recommendations by filling the rip rap depressions with concrete and imbedding rocks into it. Following this modification, no other vector sources were detected at these sites. Mosquitoes and other vectors were not detected at the two biofiltration swales in Caltrans District 11 or at the biofiltration strip in Caltrans District 7 during this study.

Design Recommendations. With the exception of the original energy dissipaters used in Caltrans District 7, biofiltration strips and swales did not pond significant amounts of water during this study. Energy dissipaters that do not hold water are recommended (e.g. rocks embedded into concrete). Figure 2 shows biofiltration swale

inlet modifications that were made at sites in Caltrans District 7 to prevent accumulations of standing water.

Operation and Maintenance. Maintenance of biofiltration swales included monthly visual inspections during the wet season for evidence of ponding and channeling. Any ponding or channeling noted was corrected within ten days. Vegetation height was maintained at less than ten inches and barren spots were re-planted during the fall season. The maintenance that was performed was adequate to prevent ponding of water and breeding of mosquitoes; however, Figure 2 illustrates sediment build-up outside a biofiltration swale inlet pipe that could lead to standing water if not maintained regularly.

Biofiltration strip.
8/25/00
I-605 & SR 91

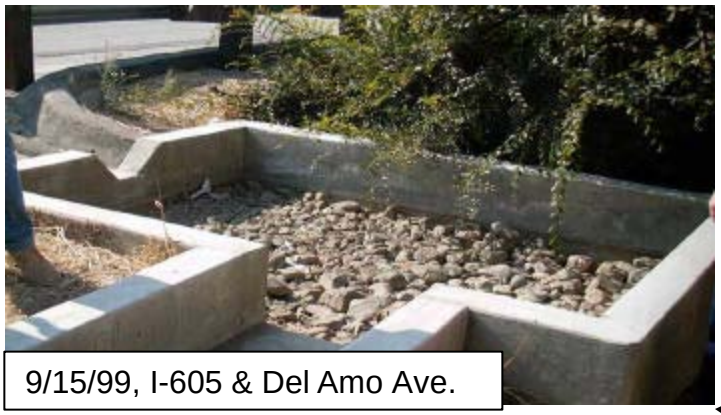
Biofiltration swale.
10/13/99
SR 78 & Melrose Ave.

Vector Prevention in Structural BMPs

Figure 1. Biofiltration Strips & Swales

State of California, DHS Vector-Borne Disease Section

Early-style energy dissipater. Rip rap depression holding water.
9/15/99
I-5 & I-605



9/15/99, I-605 & Del Amo Ave.

8/25/00
I-5 & I-605

Modified energy dissipaters grouted in to prevent standing water.

Inlet area subject to sediment build-up and subsequent ponding.
1/25/01
Cerritos MS

Vector Prevention in Structural BMPs

Figure 2. Inlets to Biofiltration Swales

State of California, DHS Vector-Borne Disease Section

Filtration Technologies

Media filters remove sediment and particulate pollutants from stormwater runoff. They are used for treating relatively small areas such as parking lots and maintenance yards. In general, water is directed into a sedimentation or settling vault where larger particulates settle out and accumulate on the bottom. From there, water is slowly released to a second filtering vault where fine particulates are removed as water percolates through a media matrix. Four filtration technologies (Austin, Multi-Chambered Treatment Train [MCTT], Canister, and Delaware) are included in 9 different structures of the Caltrans BMP Retrofit Pilot Study.

1) Austin-Type Sand Media Filters

Design Criteria. The design criteria for Austin-type sand media filters were originally developed in Austin, TX. A total of five structures were constructed for the Caltrans BMP Retrofit Pilot Study; three in Caltrans District 7 (Foothill and Eastern Regional Maintenance Stations and Termination Park and Ride) and two in Caltrans District 11 (La Costa Park and Ride and I-5 & SR 78 Park and Ride). These were designed to handle a 1-year, 24-hour storm in southern California.

Austin-type sand media filters consist of sedimentation vaults followed by sand media filter vaults. Sedimentation vaults were built 7-16 feet deep with a length to width ratio of 2:1, a slope of 0.1%, and a design detention time of 24 hours. They were designed with a 6 inch (150 mm) diameter PVC riser pipe with sized discharge orifices that draw down water slowly over time by gravity to a spreader trough in the sand media filter vault. If needed, a gate valve at the PVC riser connection in the sedimentation vault could be closed to detain water.

The sand media filters were designed to operate at a filtration rate of 0.0545 gpm/sq.ft (10.5 ft/d) assuming an average hydraulic head of 3 feet. The sand media consisted of 18 inches of 0.02 to 0.04 inch diameter sand over a layer of ½-inch to 2-inch diameter gravel. The sand and gravel were separated by a layer of geotextile fabric. The underdrain is a 6-inch diameter pipe with four-inch diameter laterals at a slope of 1%. The perforations are ½ inch on both sides of the pipe.

Because of the hydraulic grade line of the structures in Caltrans District 7, it is necessary to pump the filtered effluent into the storm drain system. The pumping system consists of a sump pump from the sand media filter bed, at the bottom of a 900 mm diameter vertical corrugated polyethylene pipe located approximately six feet below the surface of the sand media. The vertical corrugated polyethylene pipe was originally designed to be open to the atmosphere.

The design of Caltrans District 11 structures differed slightly from those built in Caltrans District 7. The sand media filters were built in line with the hydraulic grade line of the storm drain system and therefore, no pumping to the storm drain is required. This eliminated a potential habitat for immature mosquitoes.

Monitoring Results. Austin-type sand media filters regularly provided suitable aquatic habitats for immature mosquitoes following storm events. The two Caltrans District 11 sites, La Costa Park and Ride and the I-5 & SR 78 Park and Ride held standing water in spreader troughs and occasionally in the sedimentation vaults due to clogging and sediment build up. The spreader troughs at these sites were slightly modified to clear 4 inch diameter PVC connecting pipes, which unintentionally created persistent pockets of standing water. In Caltrans District 7, the three structures occasionally retained water in the spreader troughs, whereas sedimentation vaults occasionally retained water due to clogged pipes and/or failed effluent sump pumps. Standing water accumulated in a corner of the sedimentation vault of the Termination Park and Ride site due to a faulty grade.

Design Recommendations. In general, Austin-type sand media filters functioned as intended during this study; however, the following recommendations should be considered for future designs to minimize potential vector habitats. Figure 3 illustrates some examples of vector habitats created by these structures.

1. Pump sumps hold water and provide habitat for immature mosquitoes. In addition, these sumps cannot be sampled easily due to their depth and inaccessibility. Where possible, the installation of pumps and sumps

should be avoided. Where pumping cannot be avoided, a "mosquito proof" material should be installed over the top of the sump to prevent mosquitoes from accessing water.

2. It is critical that design plans, particularly hydraulic grades, are carefully adhered to during construction. The design slope of 0.1% in the sedimentation vaults was acceptable for proper drainage; however, the Termination Park and Ride site was constructed with a faulty grade in the sedimentation vault, which resulted in standing water that accumulated opposite the PVC riser pipe.
3. Spreader troughs designed to deliver water uniformly to adjacent sand media filters frequently hold water for long periods of time. Future designs should avoid the use of spreader troughs, or ensure that they hold water for no more than 72 hrs.

Operation and Maintenance. There are numerous maintenance issues associated with the Austin-type sand media filters that should be performed on a regular basis and are critical to prevent standing water and associated vector production. Any mosquito proofing materials (i.e. mosquito nets) should be inspected frequently and replaced annually as part of routine maintenance. Regular inspections should also include checking for clogged pipes or other vital components, measuring debris depth in the sedimentation vault, checking effluent pump function, and monitoring sand media filter performance. Appropriate maintenance should be performed based on inspections or as needed.

Proper and timely removal of sediment and debris from the sedimentation vault is necessary to prevent standing water as well as growth of opportunistic plants and the production of vectors that utilize exposed aquatic habitats with soil-lined bottoms for reproduction, particularly midges. During the course of the study, sedimentation vaults were inspected monthly during the wet season for sediment depth and were designed to be cleaned when the depth of sediment reaches 12 inches or greater. Cleaning of the sedimentation vaults was not required during the study period.

Where effluent pumps were installed, proper maintenance or a back-up system is necessary to ensure that water does not back up into the sedimentation and sand filter media vaults. Because the sand media filters are not backwashed, it is necessary to remove the top layer of sand media and replace it whenever draw down time exceeds 48 hours. Failure to remove and replace clogged sand media will result in inadequate filtration rates and ponding of water in the vaults. Removal of the top 2 inches of sand in these structures was necessary after approximately two years due to clogging.

Standing water in sedimentation vault
due to faulty grade.
10/5/99, Termination P&R

Standing water in sedimentation vault
due to clogged pipe.
12/00, La Costa Ave. P&R

Standing water in spreader trough.
10/5/00
Foothill MS

Mosquito netting on effluent pump sump in
sand media filter vault.
8/16/00, Foothill MS

Vector Prevention in Structural BMPs

Figure 3. Austin-Type Sand Media Filters

State of California, DHS Vector-Borne Disease Section

2) Multi-Chambered Treatment Trains (MCTT)

Design Criteria. Functionally, MCTT technology is similar to that of Austin-type sand media filters. MCTTs consist of a catch basin, a sedimentation vault with tube settlers and floating sorbent pads, and a sand/peat media filtration vault. Two MCTTs were constructed in Caltrans District 7 (Via Verde Park and Ride and Lakewood Park and Ride).

As part of the original design, the catch basin contained several mesh bags full of plastic "aeration balls" at the outlet of the influent pipe. These were supported on a grate above the water in the catch basin and served to facilitate removal of volatile organic compounds from stormwater as it passed through them. The bags were later removed for several reasons: 1) they did not provide significant removal of pollutants, 2) they clogged with trash and leaves, and 3) they prevented vector control personnel from monitoring the standing water below the support grate. As a result, no vector monitoring samples were collected from the catch basin prior to October 24, 2000.

From the catch basin, stormwater flows via a pipe into a sedimentation vault with a detention time of 12 hours. The sedimentation vault contains inclined tube settlers that facilitate sedimentation from incoming stormwater as well as floating sorbent pads designed to remove hydrocarbons. The tube settlers sit on top of fiberglass grating located on 30 mm deep beams three feet from the basin floor. Water passes upward through the plastic tube settlers over a three-foot high weir into a pump sump from where it is pumped into an adjacent sand/peat media filter vault. The design and placement of the pump sump results in a permanent pool of standing water in the sedimentation vault.

Water is pumped from the sedimentation vault pump sump onto a 24-inch-deep filter media bed consisting of a 50/50 blend of sand and peat moss. A geotextile fabric sits on top of the media to eliminate scouring and prolong filter media life. Water is then pumped to the storm drain system from a second sump located below the media filter, similar in design and function to pump sumps described for Austin-type sand media filter vaults in Caltrans District 7.

Monitoring Results. During this study, immature mosquitoes were consistently detected in the sedimentation vaults of the MCTTs. Of all the BMPs monitored in this study, MCTTs produced the greatest number of mosquitoes for the longest periods of time. Vector monitoring and abatement became difficult when the water level in the sedimentation vault dropped below the top of the tube settlers, allowing each plastic tube to become a protected "microhabitat" for immature mosquitoes.

Design Recommendations. Because of the frequency and density of immature mosquitoes detected in the MCTT sedimentation vaults during the study, numerous changes were proposed and/or made. Figure 4 illustrates the complexity of MCTT structures and provides a photo of the sedimentation vault cover retrofit. The following are recommendations for modifications, or modifications that were made during course of the study in an attempt to reduce or minimize vector habitat:

1. No immature mosquitoes have been detected in the catch basins since the aeration bags were removed; however, the current covers are made of wood and have wide gaps between the planks, which could allow mosquitoes to access the water below. Since the catch basins hold standing water permanently, the wood covers should be replaced with sealed units.
2. The pump sump design in the media filter vault is almost identical to those built for Austin-type sand media filters in Caltrans District 7. Pump sumps hold water and provide habitat for immature mosquitoes. In addition, these sumps cannot be sampled easily due to their depth and inaccessibility. Where possible, the installation of pumps and sumps should be avoided. Where pumping cannot be avoided, a "mosquito proof" material should be installed over the top of the sump to prevent mosquitoes from accessing water.
3. Several steps were taken to prevent mosquitoes from accessing permanent standing water present in multiple locations of the MCTTs. The effluent pump sump in the media filter vault was covered with fine-

mesh cloth. An aluminum cover was installed over the settling chamber during February 2001 (the influent pipe to the sedimentation vault is submerged in the catch basin). All joints at openings and hatches are constructed with tongue and groove joints and are sealed with gaskets meeting ASTM standard C 509. A smoke test was conducted to ensure that the covers were airtight. Vents for the basin were covered with a fine-mesh screen. No mosquitoes have been detected since the covers were installed. Further monitoring will be necessary to validate the effectiveness of the covers.

Operation and Maintenance. Where pumps were installed, proper pump maintenance is necessary to ensure that water does not back up into the sedimentation and media filter vaults. Because the media filters are not backwashed, it will be necessary to periodically remove the top layer of filter media and replace it. The media should be replaced whenever the drain time is greater than 72 hours or sediment accumulation is greater than 0.1 inch over more than 50 percent of the fabric surface area. Failure to remove and replace clogged filter media will result in standing water on the filter surface. The filters in this study were functional for over two years. It has not been necessary to replace media.

The biggest factor contributing to mosquito production was the fact that the sedimentation vault held water continuously. In an initial attempt to mitigate this, the sedimentation vault was pumped out annually on May 1, to avoid standing water during the dry summer months when mosquitoes are most abundant. However, even with pumping, it took several weeks for the vaults to dry completely, and mosquito breeding continued into the summer months. This maintenance was not an adequate solution to prevent breeding of mosquitoes and weekly monitoring and abatement was necessary for months. The aluminum covers may preclude access to mosquitoes. Routine maintenance of the aluminum covers should include replacing gaskets whenever they deteriorate and ensuring that the hatches are properly closed each time after opening. In addition, routine inspection and/or replacement of all mosquito screens is necessary.

Tube settlers in sedimentation vault. Standing water under grate. 8/25/00

Standing water in sedimentation vault pump sump. 8/25/00

Catch basin. Standing water below hinged grate. 2/08/01

Vector sampling below grate in sedimentation vault. 9/15/99

Retrofit aluminum cover over sedimentation vault. 3/26/01

Vector Prevention in Structural BMPs

Figure 4. Multi-Chambered Treatment Trains (MCTT) (Lakewood P&R)

State of California, DHS Vector-Borne Disease Section

3) Canister-Type Media Filter

Design Criteria. A single canister-type media filter manufactured by Stormwater Management Inc. (StormFilter™) was included in the Caltrans BMP Retrofit Pilot Study and installed at the Kearny Mesa Maintenance Station in Caltrans District 11. This BMP was built below ground and consists of sedimentation followed by treatment through canister filters containing a mixture of perlite/zeolite. The Kearny Mesa MS unit was built with a primary catch basin followed by three in-line canister filter vaults designed to handle a one year, 24 hour storm in southern California. Water moves through the structure via 12-inch diameter pipe. The influent pipe delivers water to an initial catch basin designed to remove large sediments and debris. Water then flows to a second, smaller catch basin located in the first canister filter vault. Water is directed over a weir, through a flow spreader, and into contact with the canister filters through which it passes to the storm drain.

According to the manufacturer's design criteria, 30 canisters are needed for each cfs of stormwater. As a result, three canister filter vaults (8 ft deep by 80 ft^2), containing a total of 81 perlite/zeolite filter canisters were included in the Kearny Mesa MS design. These vaults fill sequentially depending on the volume of stormwater runoff and the canister filters operate at a minimum hydraulic head of 2.3 feet. Each canister filter vault has a depression at the inflow designed to spread the flow of water. Because of its design, standing water remains permanently in both catch basins as well as in the spreader depressions.

The catch basin and the three canister filter vaults are sealed from above with aluminum covers. Covers were installed with spring-loaded doors for easy access, but were not completely sealed to prevent the entry of mosquitoes. Figure 5 illustrates the different components of the canister-type media filter.

Monitoring Results. Mosquito immatures were detected in the two catch basins as well as in the spreader troughs of the canister filter vaults. The aluminum covers may have reduced mosquito access to the standing water below, but gaps around and between the doors as well as small spaces around the door handles allowed many adult females to enter and lay eggs.

Design Recommendations. Several design features of the canister-type media filter allowed mosquito access to permanent sources of nutrient-rich standing water. The following are recommendations that should be considered in future designs to prevent or reduce vector production.

1. The sediment catch basins should not hold permanent standing water. They should be designed to drain down rapidly (72 hours or less).
2. Flow spreaders in the canister filter vaults should be designed to eliminate standing water.
3. If standing water must be present, access covers should be designed with adequate gaskets to prevent entry of mosquitoes. In addition, the potential for mosquitoes to access standing water under covered vaults via inlet or outlet pipes should be addressed.

Operation and Maintenance. Maintenance of these units includes changing out the filter media whenever it is discolored and packed with sediment and removing the sediment when it reaches 12 inches in the catch basin. Other necessary maintenance may include dewatering the unit during the summer months or routine treatment with a mosquito larvicide if breeding persists.

Standing water in
sediment catch basin.
8/17/00

Filter canisters containing a
mixture of perlite/zeolite media.
8/17/00

Aluminum covers over vaults.
8/17/00

Vector Prevention in Structural BMPs

Figure 5. Canister-Type Media Filter (Kearny Mesa MS)

State of California, DHS Vector-Borne Disease Section

4) Delaware-Type Sand Media Filter

Design Criteria. The design criteria for Delaware-type sand media filters were originally developed in the State of Delaware. A single Delaware-type sand media filter was included in the Caltrans BMP Retrofit Pilot Study and installed at the Escondido Maintenance Station in Caltrans District 11. This stormwater BMP was built below ground and consists of a sedimentation vault followed by a sand media filter vault designed to handle a one-year, 24-hour storm in southern California, with a total filter surface area of 720 ft^2 per acre of tributary area (the sedimentation chamber volume is 540 cubic feet per acre of tributary area). Stormwater flows from the maintenance station grounds to a 36" culvert and into the sedimentation vault. The sedimentation vault was constructed parallel to a sand media filter vault. To reach the sand media filter vault, the water level in the sedimentation vault must reach approximately 36 cm in depth and flow over a weir (1.5 feet of hydraulic head is required for filtration through the sand media). Standing water remains in the sedimentation vault permanently.

An 8-inch (200 mm) bypass line and gate valve are located at the end of the sedimentation vault to allow it to be dewatered for maintenance. This valve is normally closed; however, some water unintentionally seeps past, slowly draining the sedimentation vault until water only a few centimeters in depth remains.

The sedimentation and sand media vaults were sealed from above by heavy steel doors; however, the covers do not adequately seal to prevent entry of mosquitoes. In addition, the heavy steel doors do not have springs to allow for reasonable access to this structure. Figure 6 illustrates the different components of the Delaware-type sand media filter.

Monitoring Results. Small gaps between the individual steel doors allowed adult mosquitoes to access the standing water found in the sedimentation vault. This water, often as shallow as 1 inch, provided adequate habitat for immature mosquitoes.

Design Recommendations. Several design features of the Delaware-type sand media filter allowed mosquito to access the permanent standing water in the

sedimentation vault. The following are recommendations that should be considered in future designs to prevent or reduce vector production.

1. The weir between the sedimentation and sand media filter vaults results in permanent standing water in the sedimentation vault. The structure should not hold permanent standing water.
2. The sedimentation vault should be designed to drain down rapidly (72 hours or less) to prevent standing water. The slope of the sedimentation vault should be increased slightly to allow for proper and complete drainage when necessary.
3. Adequate gaskets need to be provided with covers to prevent entry of mosquitoes. In addition, future designs should include the use of lightweight aluminum and/or spring-loaded covers to improve access for maintenance and/or vector monitoring.

Operation and Maintenance. Delaware-type sand media filters require maintenance in several areas to prevent or reduce vector production, including sand media filter maintenance, sediment removal, and proper draining of the sedimentation basin between storm events.

Since the sand media filters are not backwashed, it is necessary to remove the top layer of sand filter media and replace it whenever there is excessive buildup of sediment or when the filtration rate drops to less than 9 ft per day. Failure to remove and replace sand media when it is clogged will result in inadequate filtration rates and ponding of water on the filter surface. The sand filter media in this structure was changed after approximately two years due to clogging.

Proper and timely removal of sediment and debris from the sedimentation basin is necessary to prevent standing water and the production of vectors. During the course of the study, the basin was inspected monthly during the wet season for sediment depth and was designed to be cleaned when the depth of sediment reached 12 inches or greater. The sedimentation basin was cleaned out and replaced in February 2001, with only a few centimeters of accumulated sediment build-up.

Provided that adequate time has passed for settling of suspended solids, the valve at the end of the sedimentation vault should be opened to allow the basin to drain between storm events and particularly prior to the summer months.

Heavy steel covers over sedimentation and sand media vaults. 1999

Sand media filter vault. 8/17/00

Sampling standing water for vectors in sedimentation vault. 1999

Vector Prevention in Structural BMPs

Figure 6. Delaware-Type Sand Media Filter (Escondido MS)

State of California, DHS Vector-Borne Disease Section

Extended Detention Basins (EDB)

Design Criteria. An EDB is a shallow depression lined with bare soil, vegetated soil, or concrete. Stormwater runoff is directed into these basins from where it slowly drains down (48-72 hours) into the storm drains by means of an outlet structure with appropriately sized discharge orifices. The extended detention period allows sediment and other pollutant particulates to settle to the floor of the structure, resulting in a cleaner effluent. Five EDBs were constructed as part of the Caltrans BMP Retrofit Pilot Study, two in Caltrans District 7 and three in Caltrans District 11. Each structure is unique in size and shape, and several have additional design features not found in others; however, they all have the same intended function. Figure 7 illustrates several examples of EDBs and their design and maintenance concerns.

Monitoring Results. No vector issues were detected at three of the soil-lined EDBs (two in Caltrans District 11 and one in Caltrans District 7) during this study; however, the remaining two sites had features that provided suitable habitat for immature mosquitoes.

The I-5 & I-605 EDB in Caltrans District 7 was built with a concrete-lined bottom. The effluent drained through discharge orifices in a PVC pipe that led into a $3ft^2$ concrete outlet sump, approximately 22 inches below the main exit pipe. This design resulted in a permanent pool of standing water as well as consistent mosquito production. The sump was modified and filled in February of 2001. No standing water or vector production has been detected at this site since.

The I-5 & SR-56 site (Sorrento Valley) in Caltrans District 11 incorporated two large rock rip-rap zones placed over filter fabric: one at the inlet to the basin (approximately 13 x 12 ft) and one in the center section of the basin (approximately 17 x 90 ft). An unintended consequence of this design feature was that over time, the rip rap created depressions in the basin floor up to 12 inches deep, despite the underlying filter fabric, that resulted in an attractive habitat for mosquitoes,. Water entering this basin drains at approximately the prescribed rate from the outflow, but the rip rap depressions do not infiltrate well and hold standing water for weeks. This habitat between the rocks not only protected larvae from potential predators and sunlight, but also effectively hid

them from vector control inspectors and made effective abatement difficult or impossible. In addition, VBDS noted that irrigation water runoff from a nearby hillside contributed to the water source present in the rip rap depression closest to the mouth of the influent pipe.

Design Recommendations. With the exception of the I-5 & SR 56 site, Caltrans EDBs generally did not hold significant amounts of standing water. Several recommendations pertaining to EDBs are listed below and should be considered in future designs to prevent or reduce vector production.

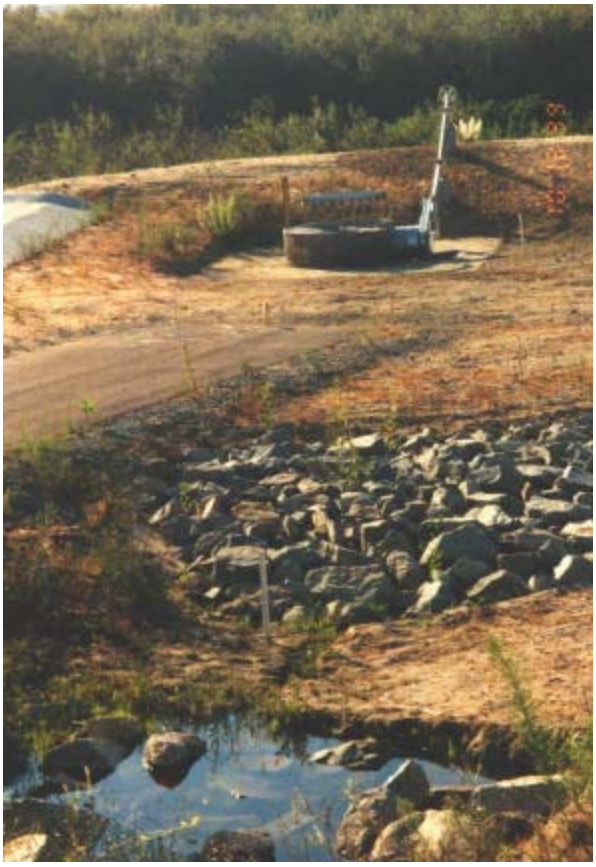
1. Avoid the use of sumps that hold water. The sump at the south end of the I-5 and I-605 EDB basin held water permanently. Initially, the sump was routinely pumped dry, but this maintenance had to be terminated due to water discharge regulations, resulting in mosquito production.
2. Avoid the use of loose-rock rip rap. Mosquitoes and other vectors are highly attracted to protected aquatic habitats. The I-5 and SR-56 site drained adequately with the exception of the rip rap zones where water collected between the rocks. The rip rap at the inlet of this basin should be replaced with rock embedded into concrete. The rip rap in the middle of the basin should be removed.

Operation and Maintenance. Routine sediment removal and control of invasive vegetation as well as frequent inspections of the outlet debris screen and discharge orifices are critical to the prevention of standing water in EDBs. During the course of this study, EDBs were inspected following every storm event. Debris was removed from the outlet screen when necessary and vegetation was trimmed and/or removed at least once per year. Sediment is scheduled for removal when it reaches 18 inches in depth or fills 10% of the basin volume, whichever is less. Further monitoring will be required to determine if the proposed sediment removal schedule will be adequate. During the course of the study, no sediment removal was required.

I-5 & Manchester Ave.

Recently completed. 10/13/99

Sediment and vegetation build-up around inlet. Subject to ponding. 3/26/01



Standing water in rip rap depressions.
10/13/99
I-5 & SR 56

Concrete-lined basin.
8/25/00
I-5 & I-605

Vector Prevention in Structural BMPs

Figure 7. Extended Detention Basins

State of California, DHS Vector-Borne Disease Section

Infiltration Basin/Infiltration Trenches

Design Criteria. Infiltration basins and trenches are depressions used to detain stormwater for a short period of time until it percolates to the groundwater table. During percolation, water is essentially filtered through the soil and pollutants are captured in site vegetation and soils by adsorption. Basins are used for large drainage areas such as freeways and store water in visible ponds whereas trenches are used for small drainage areas such as maintenance yards and store water out of sight within a gravel or aggregate matrix. In both designs, permeability has to be periodically restored by removing trapped sediments. The two infiltration trenches in the Caltrans BMP Retrofit Pilot Study (Altadena MS in Caltrans District 7 and at the Carlsbad MS in Caltrans District 11) are combined with biofiltration strips that function as a pre-filter. A single infiltration basin was built at the cloverleaf connector between northbound I-605 and westbound SR 91. The infiltration trenches are shown in Figure 8 while the infiltration basin is shown in Figure 9.

The Altadena Maintenance Station was designed with a biofiltration strip pre-filter that receives stormwater runoff before it reaches the infiltration trench. The biofiltration strip is approximately 25 ft x 64 ft, with a 2% slope. The curb-type flow spreader placed prior to the biofiltration strip can hold standing water permanently, if the plug located at the end of the curb is not removed to allow it to drain. The adjacent infiltration trench is filled with 3 feet of graded gravel and is approximately 30 x 62 ft. During this study, no standing water was ever detected in the trench.

The Carlsbad Maintenance Station was also designed with a biofiltration strip pre-filter followed by an infiltration trench. The biofiltration strip is approximately 91 feet long by 22 feet wide. Stormwater runoff is conveyed by a concrete swale through a partial flume to a concrete gutter, which acts as a side weir to spread flow over the length of the biofiltration strip, and was designed to handle runoff from a 25-year storm in southern California. Following the biofiltration strip, water is delivered to an infiltration trench designed to hold the volume from a one-year storm. The trench is 8 feet wide by 180 feet long. Infiltration rate was determined by two tests, which resulted in an I of 2.8 x 10^{-5} fps (8.7 x 10^{-6} m/s) average for the in-drill hole and 2.3 x 10^{-6} fps (7.1 x 10^{-7} m/s)

average for the laboratory sample. The total area of the trench (241 m^2) would give an 11-hour to 5.61-day detention time prior to percolation.

The infiltration basin at the I-605 & SR 91 was designed to handle flow volume from a 1-year, 24-hour storm in southern California. Water enters the basin from two locations: the first is a 300 mm plastic pipe on the east end of the basin with a 2% slope, the second is a 600 mm plastic pipe with a 1% slope on the south end of the basin. Outlets of both influent pipes into the basin have loose-rock rip rap energy dissipaters. Minimum infiltration rate of 1.94×10^{-4} cm/s was recommended in the design, which corresponds to a sand, loamy sand, sandy loam and silt loam soil group. Borings were collected which showed a soil with sandy material from 0.9 to 3.0 meters. From surface to 0.9 meters and 3.9 to 9.1 meters was sandy silt to clayey silt. Permeability rate was 1.6×10^{-4} cm/s, which was considered to be marginal. A detention time of 38 hours was estimated, based on a basin volume of 432 m^3, a depth of 0.22 m, and bottom surface area of 1,935 sq.m.

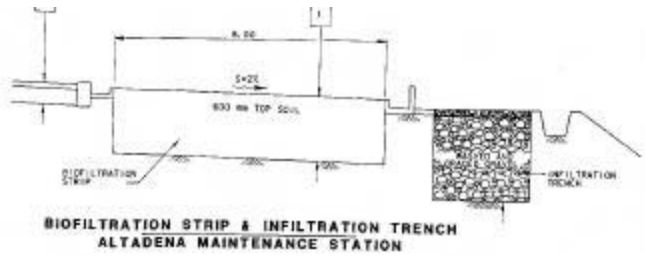
Monitoring Results. The two infiltration trenches and the infiltration basin percolated adequately during this study. No vectors were detected.

Design Recommendations. The primary concern with both the infiltration basins and trenches is ensuring adequate percolation to prevent standing water. Infiltration basins should not be constructed at locations that do not percolate due to improper soil type or high groundwater. The hydrogeology in California varies significantly from one site to the next and there are many locations that are not amenable to infiltration. Therefore it is important to develop statewide guidelines for evaluating sites and designing infiltration devices. To prevent standing water and mosquito production, standard design principles for infiltration basins should be followed such that standing water does not occur.

Operation and Maintenance. General guidelines for infiltration devices includes monitoring drain time after storm events, infiltration rates, depth to groundwater, sediment buildup, and condition of vegetation.

Properly designed infiltration basins require periodic maintenance to remove sediment, scarify the ground, or replant vegetation. Failure to conduct proper maintenance will result in reduced percolation rates and result in standing water.

In designs that include infiltration trench prefilters, such as the biofiltration strip prefilter at Altadena MS, the prefilter should be designed such that they do not hold standing water. The spreader trough at Altadena MS holds water after a storm event. In this design, the drain plug should be removed and the ditch drained within 72 hours of every storm event and the plug should be removed at the beginning of the dry season.



Typical design profile for an infiltration trench with a biofiltration strip prefilter.

Infiltration trench with biofiltration strip prefilter.
8/00
Carlsbad MS

Mosquito emergence traps above infiltration trench.
8/25/00

Altadena MS

Biofiltration strip prefilter. Spreader trough with standing water.
3/26/01

Biofiltration strip prefilter. Spreader trough drain plug. 08/25/00

Vector Prevention in Structural BMPs

Figure 8. Infiltration Trenches

State of California, DHS Vector-Borne Disease Section

11/17/00

8/25/00

Vector Prevention in Structural BMPs

Figure 9. Infiltration Basin
(I-605 & SR 91)

State of California, DHS Vector-Borne Disease Section

Continuous Deflective Separators (CDS)

Design Criteria. Continuous Deflective Separators (manufactured by CDS Technologies Inc.) are pre-cast, cylindrical devices designed to remove trash and debris, sand and sediments, and some oil and grease from stormwater runoff. The devices are typically placed downstream of drain inlets and installed below ground.

Two CDS units were installed in Caltrans right-of-ways as part of the BMP Retrofit Pilot Study, one located at I-210, east of Orcas Avenue and the other at I-210, east of Filmore Street. These were completed in early 2000, approximately 1 year after most of the other structures. Incoming stormwater runoff is directed by a weir from the storm drain at a 45-degree angle through an 8 x 12 inch rectangular opening into a cylindrical sump (3 ft diameter) where it creates a vortex. Debris, sand, and other large particles are deflected by this action into a debris basket at the bottom of the sump. Treated water passes through a metal screen (2400 micron screen at I-210, east of Orcas Avenue and 4800 micron screen at I-210, east of Filmore Street) and exits the unit through a 9 x 6 inch rectangular outlet, from where it flows by gravity back into the storm drain. By design, CDS devices hold permanent standing water in the cylindrical sump.

The CDS devices included in the Caltrans study are atypical installations. In most cases, CDS devices are installed completely below ground; however, the location of the Caltrans retrofit required that a portion of the device remain above ground. The influent and effluent pipes as well as approximately 20% of the cylindrical sump are above ground. Fiberglass lids were made for the sump and for the influent/effluent weir box. Two holes near the top of the sump support a rope that is attached to the debris basket to allow the basket to be lifted out of the unit for routine cleaning and maintenance. Figure 10 shows the east of Orcas Ave. site and illustrates many of the modifications made to the device in an attempt to prevent or reduce mosquito access to the permanent water in the sump.

Monitoring Results. The CDS devices provided a very attractive and accessible habitat for egg-laying adult mosquitoes. Adult female mosquitoes had multiple entrance points to access the sump water for egg laying including 1) the effluent pipe, 2) the

influent pipe, 3) the poorly sealed sump lid, 4) the poorly sealed weir box lid, and 5) the rope support holes in the sump. As a result, immature mosquitoes were extremely abundant in the nutrient-rich sump water.

Between November 2000 and January 2001, several modifications were made to the CDS devices in an attempt to "mosquito proof" the sumps. No mosquitoes have been detected since the modifications were made. Further monitoring will be necessary to validate the effectiveness of the modifications.

Design Recommendations. Because of the extensive mosquito production in these devices, numerous modifications were retrofitted to correct the problem. The modifications were limited by the design and installation of these particular devices, including the location of the hydraulic grade line; however, they were the most practical changes that could be made at these sites. The following is a list of modifications made to the CDS units in an attempt to eliminate vector production.

1. A ½ inch thick foam strip was glued to the weir box and CDS sump lids to eliminate access to mosquitoes through uneven sealing surfaces. In addition, the rope holes in the sump were sealed with caulk.
2. A mosquito net bag was installed over the effluent pipe to prevent entry of adult mosquitoes to the standing water in the sump. The first bag failed during high water flows and was modified to open during storm events and remain closed during periods of no flow.
3. The drain inlets to the CDS devices are located approximately 20 meters from the treatment sump (along the I-210) and could not be easily sealed against possible entry of mosquitoes. As a result, no changes were made to the inlet.

Permanent standing water will be present in the sumps of CDS devices by the nature of their design, unless they are pumped dry following every storm event. General recommendations for preventing mosquito access to the sumps in future CDS installations are provided below.

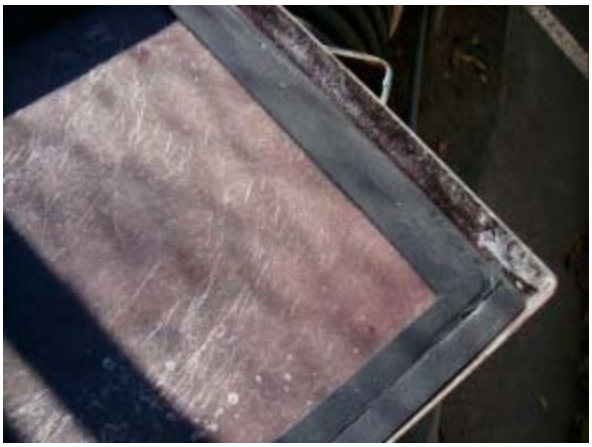
1. All lids or covers should seal tightly. If gaskets are present between the lid and the CDS device, they should be inspected periodically and replaced when necessary. Avoid lids with uneven sealing surfaces.
2. The inlet and outlet pipes to the device should be sealed or submerged to prevent access by mosquitoes. The inlet and outlet may be sealed either on the unit itself, or the inlet and outlet piping.
3. If the device cannot be properly sealed against mosquitoes, the sump should be pumped completely dry following every storm event. In addition, routine inspections should be made to check the sump for accumulation of water from illegal or non-stormwater discharges.
4. An alternative that may be considered is the inclusion of seep holes in the bottom of the sump that would allow the water to percolate into the ground. This would require testing to ensure that water can percolate into the soil. Percolation time should not exceed 72 hours and provisions to prevent or reduce the possibility of clogged seep holes should be incorporated into the design.

Operation and Maintenance. To prevent mosquito production during the summer months, water was pumped from the units in late May and taken off-site and the units were left dry until the fall storms. It was difficult to fully dewater the units, resulting in several inches of standing water at the bottom and continued mosquito breeding after dewatering. This maintenance alone was not adequate to prevent breeding of mosquitoes.

Ongoing maintenance will require routine inspections of all the mosquito proofing modifications including the sealing foam on the lids and the mosquito net bag on the effluent pipe. These should be replaced each year or as needed.

August 2000

Mosquito-proof bag on effluent pipe during storm. No end release for debris. 1/11/01



Foam seal on weir box lid. 11/17/00

Modified mosquito-proof bag on effluent pipe with end release for debris. 3/26/01

Foam seal for sump lid. 11/17/00

Vector Prevention in Structural BMPs

Figure 10. Continuous Deflective Separators (CDS) (East of Orcas)

State of California, DHS Vector-Borne Disease Section

Oil/Water Separator

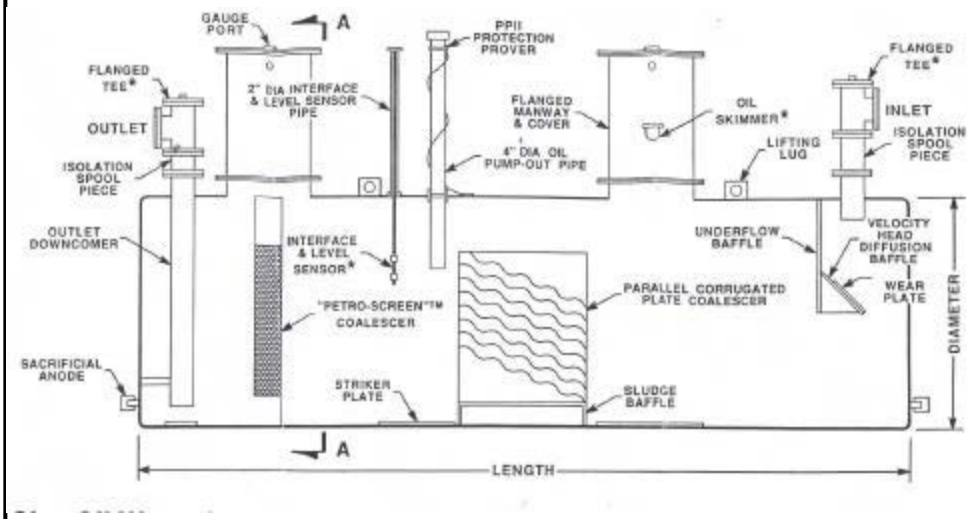
Design Criteria. A single oil/water separator device was included in the Caltrans BMP Retrofit Pilot Study and installed at the Alameda Maintenance Station in Caltrans District 7. The device consists of a cylindrical, horizontal, atmospheric steel vessel containing three separate sequential compartments. Stormwater runoff from the maintenance yard enters the first chamber through a flanged inlet pipe, which is located below the normal water surface level. Energy is dissipated by a head diffusion baffle located prior to the sedimentation chamber. A sludge baffle, which retains settleable solids, follows the sedimentation chamber. The water then enters an oil water separation chamber containing a removable polypropylene coalescer, designed to intercept oil globules. Water then exits the third chamber by gravity to the storm drain. The steel vessel was installed below grade with two covered access hatches above grade. Figure 11 provides design plans and an above-ground photo of the installed device.

Monitoring Results. During this study, immature mosquitoes were detected in a small plastic flume (not part of the oil/water separator) that held a small pool of standing water. This flume was used to monitor water flow during storm events. Although the oil/water separator is designed to hold standing water inside the steel vessel, no vectors were noted inside the structure. This is most likely due to the following reasons:

1. The steel vessel's inlet and outlet are both submerged.
2. Access ports into the vessel are tightly sealed.
3. Oil on the surface of the water inside the device may create lethal conditions for immature mosquitoes.

Design Recommendations. During the course of the study, this device did not harbor vectors. No modifications are recommended at this time.

8/25/00



Below-ground design plans.

Vector Prevention in Structural BMPs

Figure 11. Oil / Water Separator (Alameda MS)

State of California, DHS Vector-Borne Disease Section

Drain Inlet Inserts

Design Criteria. Proprietary drain inlet inserts (DII) filters by two manufacturers were included in the Caltrans BMP Retrofit Pilot Study; Fossil Filter™ (KriStar Enterprizes, Inc.) and Stream Guard™ (Foss Environmental). Fossil Filter™ inserts are trough-type devices filled with granular amorphous alumina silicate media, whereas the Stream Guard™ device is a sock-type insert made of a geotextile fabric. Both filters are designed to remove sediment (and adsorbed pollutants), oil, and grease. Three Caltrans maintenance stations in Caltrans District 7 were selected for DII retrofits including Foothill MS, Rosemead MS, and Las Flores MS. Each site was provisioned with both a Fossil Filter™ and a Stream Guard™.

Monitoring Results. During this study, no standing water was noted in the DII devices. However, each DII was provisioned with a small downstream, underground plastic effluent flume (not part of the DII) that held a small pool of standing water. These flumes were used to monitor water flow during storm events. Immature mosquitoes were detected in the Fossil Filter™ flume at Rosemead MS on several occasions.

Operation and Maintenance. Caltrans expended significant effort in the maintenance of DII devices to prevent debris from clogging the filters. Debris and trash were inspected and removed before and during each storm event. If these filters are not adequately maintained at this level, standing water and vector production could ensue.

Wet Basin

Design Criteria. Wet basins are permanent pools of water surrounded by a variety of wetland plant species. Stormwater from adjacent freeways and roadways and urban runoff is routed into these systems and pollutants are removed by physical and biological processes. Soluble nutrients in the water are reduced by plant uptake and constituents such as sediments, particulate trace metals, and organic nutrients settle and collect at the bottom of the basin. Wet basins maintain a permanent pool level. Only one wet basin was constructed as part of the Caltrans BMP Retrofit Pilot Study, located at I-5 and La Costa Ave. in Caltrans District 11.

The wet basin was designed to treat runoff from a 1-year, 24-hour storm in southern California. Water enters the structure through a forebay with a 4:1 side slope and a volume of 0.16 acre-ft. This is followed by a wet basin with a permanent pool volume of 0.63 acre-ft, and an average depth of 2.3 feet, which provides an effective 14-day detention time. Water will return to the permanent pool volume within 24 hours of a storm event. The side slopes of the wet basin are 1:6 around the sides and 1:3 from the basin invert to the shallow bench. Water is routed through the basin in a meandering fashion through the use of berms to avoid short-circuiting.

Mosquitofish, *Gambusia affinis*, were stocked in the pond at an initial density of 200 per surface acre for control of immature mosquitoes in the pond. Plant species at the wet basin include various species of bulrush, spikerush, and other marsh and/or aquatic plants that are native to southern California. Some of these plants can grow in water depths up to four feet.

Monitoring Results. Mosquitofish thrived in the wet basin during this study. Fish density remained high throughout the year, and smaller individuals were frequently observed swimming among the stems of the dense shoreline emergent vegetation. Despite the predatory fish, immature mosquitoes were frequently detected in small, isolated shoreline pockets of water among fallen cattails, accumulations of vegetation and plant debris, and algal mats.

Design Recommendations. The biggest concerns associated with wet basins or other permanent water sources are the control of emergent, invasive vegetation such as cattails and sedge as well as the maintenance of mosquitofish populations that keep mosquitoes in check. Wet basins should be designed to reduce the required maintenance and avoid creating vector habitats. Figure 12 illustrates the rapid growth of invasive, emergent vegetation in the wet basin. Dense emergent vegetation causes several problems: 1) it provides predator-free shoreline habitats for mosquito production, 2) it reduces or eliminates access to the pond for routine inspections and/or maintenance, and 3) it can interfere with volume capacity, water flow, and intended water quality benefits. Wet basins should be designed to allow the growth of vegetation only where it is necessary, and to limit the growth of vegetation throughout the remainder of the basin. The following design criteria should be considered:

1. The potential for cattail and sedge growth should be minimized. A minimal constant water depth of four feet or greater will reduce or prevent growth.
2. Side slopes of 2:1 will contain the width or thickness of emergent vegetation to 5 or 6 feet in the basin periphery. This should allow some penetration by mosquitofish and will allow access for vector control staff if mosquito abatement is necessary.
3. The maximum vegetated surface coverage should be 50%. Clumps or islands are preferred. Designs utilizing concrete, rock or liners should be used in areas where vegetation is not desired.
4. For large basins, a launch ramp should be provided to facilitate access for vector control and/or maintenance equipment.
5. A method for water inflow diversion from influent channels and pipes as well as a method for total basin dewatering should be incorporated in the design.

Operation and Maintenance. Regular maintenance of the basin is critical to maintaining a healthy population of mosquitofish. Overgrowth of vegetation and/or decaying vegetation may adversely impact mosquitofish and limit their access to

portions of the basin, while providing attractive habitats for vectors. The following maintenance procedures are recommended.

1. Monthly inspections to determine if and when vegetation control measures are necessary. When emergent vegetation spreads beyond the design parameters, or otherwise contributes to a problem with vector control, it should be promptly removed (or treated with a herbicide where appropriate). It is critical to begin vegetation control actions before the basin is excessively overgrown. Vegetation control may be needed annually, bi-annually, or more frequently as conditions demand.
2. Floating vegetation, such as water hyacinth and primrose, should be controlled monthly by physical removal (or the use of an aquatic herbicide where appropriate).
3. When prevailing winds, or surface currents within the basin, cause an accumulation of vegetation on a portion of the surface, removal should occur more frequently.
4. Outlets and overflow channels should be kept free of debris so surface outflows are not impeded by debris/vegetation accumulations in a portion of the basin.
5. The sediment in the bottom of the permanent pool should be removed every 2-5 years.
6. The presence or intermittent presence of mosquito eggs, larvae or pupae is evidence of mosquito breeding. Control measures should be initiated to supplement the maintenance recommendations already discussed.
    a. Consult the local vector control agency.
    b. Maintain an adequate population of the mosquitofish.
    c. Maintain a residual larvicide in the basin or establish a control plan that utilizes frequent treatments with non-residual larvicides.

Completed June 1999

January 2000

Dense cattail plants. April 11, 2000

Vegetation hand-removal.
August 17, 2000

Rapid vegetation re-growth and colonization.
February 8, 2001

Vector Prevention in Structural BMPs

Figure 12. Wet Basin
(I-5 & La Costa Ave.)

State of California, DHS Vector-Borne Disease Section

Conclusions

This collaborative study provides a preliminary assessment of vectors associated with a number of different structural BMP designs. During the course of the study, VBDS and the four collaborating vector control districts made design and maintenance recommendations that, once implemented, reduced or eliminated habitat previously available for vector production. It is critical that vector control professionals be consulted with regard to BMP design and maintenance to help minimize or prevent vector production. Vector control professionals can provide recommendations based on experience and research that can minimize the potential of structural BMPs to harbor and/or produce vectors. In other cases, local agencies may disapprove of specific designs or structures if they provide excessive habitat for vector species. Proper review of designs to ensure that vector issues have been addressed is necessary. This proactive, rather than reactive approach to the prevention of potential vector problems will ultimately result in cost savings, reduce the need for ongoing vector surveillance and control, and ensure compliance with the California Health and Safety Code. However, it is understood that some structural BMP designs will require ongoing vector surveillance and control.

Stormwater BMP structures are intended to have minimal operational oversight and maintenance, thus it is critical to design facilities in as simple a manner as possible. VBDS and vector control agencies throughout California recommend against the construction of stormwater BMP structures that hold permanent or semi-permanent sources of standing water; however, it is understood that some designs require this for water quality purposes and/ or for proper operation. Operation and maintenance criteria that reduces or prevents vector production should be incorporated into operation and maintenance manuals. Adequate funding for plan review, structure maintenance, and vector surveillance and control activities should be provided for prior to BMP construction. Ongoing cooperation between agencies and others responsible for construction and/or maintenance of stormwater management structures and vector control agencies will be needed to ensure that public health is not compromised.

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APPENDIX E:
3RD YEAR MONITORING REPORT – DISTRICT 7

CALTRANS
BMP RETROFIT PILOT PROGRAM

DISTRICT 7, LOS ANGELES

THIRD YEAR 2000/01 REPORT

BEST MANAGEMENT PRACTICES

OPERATIONS, MAINTENANCE & MONITORING

May 2001

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1.0 STORMWATER DATA

This summary report encapsulates the 2000/01 water quality monitoring data through April, 2001 at the District 7 sites involved in the Caltrans Best Management Practices (BMP) Retrofit Pilot Program (refer to Table 1-1 and Figure 1-1).

1.1 Objective

A primary objective of the Caltrans BMP Pilot Program is to evaluate the performance of BMPs. A comprehensive water quality monitoring study has been designed to meet these objectives by evaluating the BMPs' performance in the removal of contaminants from stormwater runoff and by understanding the level of effort required to maintain the BMPs at optimal effectiveness. Data collected from the 2000/01 wet season through April, 2001 is contained in this report and is used to evaluate the BMP's performance. Data includes:

- Rainfall data from storm events during the study period;
- Water quality and quantity of runoff into and discharged from the BMPs;
- Empirical observations of water quality, traffic, rainfall, and antecedent conditions; and
- Documentation records of inspection and maintenance activities performed.

In addition to the data collected above, this report contains characterization results of the following:

- Flow-weighted composite samples from the transfer pumps of the Via Verde Park & Ride and Lakewood Park & Ride MCTTs (74206 and 74208, respectively);
- Sump water from the I-210 Orcas Avenue and Filmore Street CDS Units (73102 and 73103, respectively);
- Sediment removed from the trench drain, which conveys flow into the Alameda Maintenance Station Oil/Water Separator (74201);
- Packing material removed from grit chambers of the Via Verde Park & Ride and Lakewood Park & Ride MCTTs (74206 and 74208, respectively);
- Sand blast media and sludge removed from the Via Verde Park & Ride MCTT (74206) sedimentation chamber;
- Core sand and sediment samples from the Eastern Maintenance Station, Foothill Maintenance Station, and Termination Park & Ride Sand Filters (74202, 74203, and 74204, respectively);
- Core soil and surface sediment samples from the I-605/SR-91 Infiltration Basin (73101);
- Sediment and media samples from the Foothill, Las Flores, and Rosemead Maintenance Station Drain Inlet Inserts (73216, 73217, and 73218, respectively); and

- Gross pollutants captured and bypassed by the Orcas and Filmore CDS Units (73102 and 73103, respectively).

1.2 Hydrology

The sections that follow describe BMP and site hydrological characteristics as observed during monitored storm events and maintenance inspections during 20001/01.

1.2.1 Precipitation During the Wet Season

Over the entire Los Angeles Basin, excluding mountain locations, the average annual precipitation ranges from less than 12 inches at the immediate coast to more than 20 inches at the foothills. The normal seasonal rainfall measured at downtown Los Angeles is 14.77 inches. On average, 92% of the seasonal precipitation falls between November 1st and April 30th. This percentage is roughly the same for all stations, regardless of elevation or distance from the ocean (National Weather Service, *The Climate of Los Angeles California*). Between October 2000 and April 2001, approximately 17.9 inches of precipitation fell on downtown Los Angeles. On average, October was wetter than usual, November and December were drier than usual, January and February were wetter than usual, March was drier than usual, and April was nearly average.

Figures 1-2a through 1-2m illustrate daily precipitation totals for the 2000/01 wet season at the BMP sites.

1.2.2 Precipitation During Monitored Events

Precipitation during each storm event was characterized by total rainfall, duration of rainfall, maximum intensity, days since last rainfall, and the magnitude of the event immediately preceding the monitored storm event (antecedent rainfall). Precipitation characteristics for each monitored event are summarized in Table 1-2. Maximum rainfall intensity (maximum hourly intensity calculated as twelve times the maximum rainfall recorded in any five minute period) for monitored events is summarized in Table 1-2. Rainfall variability from BMP sites during monitored events is graphically represented in Figures 1-3a through 1-3e. Cumulative rainfall is summarized graphically for each monitored event at each BMP site in Figures 1-4 through 1-27.

Each sampled storm event was preceded by at least 48 hours without rainfall, meeting the minimum antecedent dry period.

1.2.3 Stormwater Runoff During Monitored Events

Monitoring during 2000/01 marked the third wet season for both extended detention basins, Eastern Regional and Foothill Maintenance Station Sand Filters – Austin Type, and the drain inlet inserts. Monitoring during 2000/01 also marked the second wet season for the biofiltration swales and strips, Termination Park & Ride Sand Filter – Austin Type, the MCTTs, the infiltration basin and infiltration trench, and the oil/water

separator. Although there were monitoring equipment failures during this wet season (data from those failures was not used in calculating pollutant removal efficiencies of the BMPs), the minimum number of target storm events at each site were successfully sampled.

Monitoring was designed to isolate rainfall events and the runoff created by those events. Table 1-3 provides a summary of the runoff measured at each station in conjunction with each storm event. Figures 1-4 through 1-25 graphically summarize the influent and effluent flow during each monitored event at each BMP in response to rainfall. These figures also show when individual aliquots were collected as part of each composite sample.

In general, the drainage areas at each of the BMP sites are relatively small and impervious. This resulted in quick response times of inlet flow in relation to the advent of rain and fluctuations in rainfall intensity. It is important to note that because detention is an integral function of extended detention basins, sand filters, and the MCTTs, stormwater drained from these BMPs for many hours and often days. Fortunately, runoff from back-to-back storms did not commingle compromising the representativeness of a target storm event samples. Variation in stormwater detention (Table 1-3) was a factor of storm volume, duration, and BMP design. For extended detention basins, the outlet structure orifices regulated effluent flow. Sand filter detention times relied on sedimentation chamber throughput and sand bed percolation rate, while stormwater detention in the MCTTs was controlled by retaining stormwater in the settling chamber and later pumping it to the media bed where filtration characteristics regulated flow.

Detention times were calculated as the period between the start of inlet flow and the end of discharge flow. Some of the longer detention times were attributed to sediment and debris buildup that restricted flow through the BMP. This was noted at all the sand filters because of sediment buildup on the sand filter beds. Detention times also became prolonged at the sand filters because sediment impeded flow through the sedimentation chamber standpipe weep holes. Another factor that increased detention time at the sand filters was pump failure, which prevented the BMPs from discharging altogether.

Following is a summary of stormwater conditions entering and exiting the BMPs and monitoring strategies used to measure the flow rates and volumes:

Biofiltration Swales and Strips

Influent and effluent flow monitoring were conducted during each monitored storm event at the biofiltration strip and swale sites. Flow was measured using bubbler flow meters in conjunction with H-flumes. During several occasions, flow did not discharge through the biofilters because it infiltrated. During storms where the biofilters became saturated, and when there was continuous rainfall of moderate intensity, runoff was observed discharging through the biofilters.

During all sampled events, the volume of runoff entering the I-605/SR-91 Swale (73222b), the Cerritos Maintenance Station Swale (73223), and the I-5/I-605 Swale (73224) was greater than the volume of runoff discharging from the swales. However, because the freeway embankment may have been contributing runoff into the I-605 at Carson Swale (73225) through its side slope, there was one event where the volume of runoff entering the swale was less than the volume of runoff discharging the swales. Also, during two events, the volume of runoff entering the Altadena Maintenance Station Strip (73211a) was less than the volume of runoff discharging from the strip. This is attributed to some runoff bypassing the influent flume and sheet flowing directly into the strip during intense periods of rainfall. The size of the tributary area at the I-605/SR-91 Strip (73222a) control location is comparable to the size of the tributary area entering the strip, hence the volume of runoff entering the strip is similar to that passing through the control location.

Extended Detention Basins

Influent and effluent flow monitoring were conducted during each monitored storm event at the extended detention basin sites. Influent flow was measured using area/velocity flow meters and effluent flow was measured using bubbler flow meters in conjunction with primary flow measurement devices [H-flume at the I-5/I-605 EDB (074101) and V-notch weir at the I-605/SR-91 EDB (074102)].

As designed, the extended detention basins discharged runoff at regulated rates. During some cases the influent and effluent flow volumes were different. Most of the differences can be attributed to the inability to accurately measure low flow and surcharged pipe conditions. This inaccuracy affected the influent volumes more so than the effluent volumes, due in part to the steady regulated manner in which effluent discharged, whereas the influent fluctuated rapidly in direct response to rainfall intensity. Also, effluent flow measurement was more accurate because of the use of primary flow measurement devices; primary flow measurement devices could not be used to measure influent flows because of surcharged conditions. Other differences, specifically at the I-605/SR-91 Extended Detention Basin (074102), can be attributed to the infiltration of runoff within the BMP. Despite differences in influent and effluent volumes, flow proportioning of each sample aliquot was more than adequate.

Sand Filters – Austin Type

Influent and effluent flow monitoring were conducted during each monitored storm event at the sand filter sites. Influent flow was measured using area/velocity flow meters. Effluent flow rate was measured using bubbler flow meters, which were installed in the sumps of the sand filters. Relationships between flow curves provided by the pump manufacturer and depth of water in the sumps were developed. These relationships were field tested prior to the wet season and the flow meters were programmed with these algorithms accordingly.

As with the extended detention basins, differences between influent and effluent flow volumes can be attributed to the inability to accurately measure low flow and surcharged pipe conditions, and reaction to rapidly fluctuating flows in direct response to rainfall intensity. Effluent flow volumes at each site were calculated by the multiplying the number of times the sump was drained by the sump volume. Despite differences in influent and effluent volumes, flow proportioning of each sample aliquot was more than adequate.

Multi-chambered Treatment Trains

Influent and effluent flow monitoring were conducted during each monitored storm event at the MCTT sites. Influent flow was measured using area/velocity flow meters. Effluent flow rate was measured using bubbler flow meters, which were installed in the sumps of the media filter chamber of the MCTTs. Relationships between flow curves provided by the pump manufacturer and depth of water in the sumps were developed. These relationships were field tested prior to the wet season and the flow meters were programmed with these algorithms accordingly.

As with the extended detention basins, differences between influent and effluent flow volumes can be attributed to the inability to accurately measure low flow and surcharged pipe conditions, and reaction to rapidly fluctuating flows in direct response to rainfall intensity. Effluent flow volumes at each site were calculated by multiplying the depth of water transferred from the sedimentation chamber by the sedimentation chamber's area. Note that all water contained in the sedimentation chamber was not transferred to the media filter chamber; the water level was maintained approximately one foot above the settling tubes to allow the Vector Control Districts access. Also, because the Via Verde Park & Ride MCTT (74206) leaked, there are differences between influent and effluent flow volumes. Despite differences in influent and effluent volumes, flow proportioning of each sample aliquot was more than adequate. In addition to influent and effluent sampling, flow-weighted composite samples were manually collected from the transfer pumps beginning January 2001.

CDS Units

Flow monitoring was conducted during each monitored storm event at the CDS Units. Due to site constraints, influent and effluent flow was measured using bubbler flow meters in conjunction with H-flumes downstream of the CDS units. Monitoring equipment was installed in locations recommended by CDS. However, the influent strainer was relocated twice, based on CDS' subsequent recommendations, because of 1) gross pollutants being caught by the sampler strainer and Teflon tubing and 2) the strainer being located in an area of the weir box where total suspended solids concentrations appeared to be less than other areas of the weir box. Because of the short hydraulic residence time, influent and effluent flow rate differentials were negligible, thus allowing the influent sampler to be triggered by the flow monitoring equipment downstream of the CDS Units. Bypass flows were also monitored using bubbler flow meters attached the

CDS bypass weirs. Flow bypass occurred on several occasions primarily because of mosquito proofing bags installed downstream of the units (see Section 2.1.6).

Drain Inlet Inserts

Flow through the DIIs was continuously monitored throughout the wet season using bubbler flow meters in conjunction with Palmer-Bowlus flumes. The total flow volume passing through the DIIs was used to calculate pollutant removal efficiencies. DII pollutant removal efficiency results are presented in Section 1.4.3 of this report.

Oil/Water Separator

Flow through the Alameda Maintenance Station Oil/Water Separator (74201) was continuously monitored throughout the wet season using a bubbler flow meter in conjunction with a Palmer-Bowlus flume downstream of the unit. Because of the short hydraulic residence time, influent and effluent flow rate differentials were negligible and are considered to be the same.

Infiltration Basin and Infiltration Trench

At the I-605/SR-91 Infiltration Basin (73101), rainfall and water level within the BMP were measured during each monitored storm event. Water level was measured using a bubbler flow meter. Figure 1-26 graphically summarizes the infiltration rate during each monitored event at the BMP in response to rainfall. For each monitored event, ponded water within the infiltration basin infiltrated within 72 hours.

At the Altadena Maintenance Station Infiltration Trench (73211b), rainfall, influent flow, and water level within the BMP was measured during each monitored storm event. Flow was monitored using a bubbler flow meter in conjunction with an H-flume and water level within the infiltration trench was measured using a Troll 4000 pressure transducer. Figure 1-27 graphically summarizes the infiltration rate during each monitored event within the BMP in response to rainfall. For each monitored event, ponded water within the infiltration trench infiltrated within 72 hours.

1.2.4 Hydraulic Residence Time Evaluation

In accordance with the OMM Plan and supplemental guidance included in the October 13, 2000 Biweekly Status Report, hydraulic residence time (HRT) measurements were conducted at each biofiltration swale during 2000/01 wet season storm events. The intent of the HRT evaluation was to confirm that the HRT for the 1-year, 24-hour storm event was achieved by each biofiltration swale.

HRT evaluations were conducted when there was sufficient flow through the swale. Flow monitoring equipment was calibrated and initiated. A solution of Formulabs red dye was then poured into the inlet flume. Observations were noted as the dye flowed through the swale. Samples were collected in two-minute intervals once the dye was visually observed discharging from the swale. A total of 15 discrete samples were

collected in individual glass amber bottles and analyzed using a Turner Designs Aquafluor™ Handheld Fluorometer. Measurements made with the fluorometer were less impacted than measurements made with colorimeter last year. The test was repeated two times for a total of three runs at each swale.

HRT for each test was measured as the point in time in which 50% of the dye's mass passed through the swale. This was accomplished by integrating the area beneath the graph defined by discrete points. Where fluorescence concentrations did not approach the asymptote, the time at which this would have occurred was estimated. Plug flow was assumed. HRTs at the design flow rates were then estimated using the following procedure:

Subscript notation:

$_m$ - Measured during HRT test;
$_c$ - Calculated using measured quantities;
$_d$ - Under swale design conditions or calculated using design conditions;
$_a$ - Assumed value.

1. Calculate flow velocity (ft/s) during test: $V_c = Q_m/A_c$

   Q_m = Measured flow rate (cfs) [Averaged over each test run because of fluctuating flow rates.]

   A_c = Flow cross-sectional area (ft^2) [$A_c = b*d_m + Z*d_m^2$ for trapezoid.]

   d_m = Measured flow depth (ft) [Averaged over each test run because of fluctuating flow rates; depth of flow in swale estimated using depth of flow measured by the flow meter/H-flume, which was comparable to visual observations.]

   w_m = Measured water surface width (ft)

   b = Swale bed width (ft)

   Z = Side slope as horizontal:vertical ratio

2. Calculate Manning's n under test conditions: $n_c = (1.49/V_c)*R_c^{0.67}*s^{0.5}$

   R_c = Flow hydraulic radius (ft) [$R_c = (b*d_m + Z*d_m^2)/(b + 2*d_m*(Z^2 + 1)^{0.5})$ for trapezoid.]

   s = Longitudinal slope (ft/ft)

3. Calculate a value of HRT (HRT_c, min.) under test conditions to compare with value measured by timed dye travel (HRT_m, min.): $HRT_c = L/(V_c*60)$

   L = Swale length (ft)

4. For all swales tested, plot HRT_m versus HRT_c to check agreement based on how close points fall to a 1:1 line or a linear regression calculation. If agreement is relatively good, the scaling calculation below gives a reasonable estimate of HRT under design flow conditions. [Correlation analysis was conducted and agreement was good. Regression line slopes were calculated and agreement was good except for the I-5/I-605 Biofiltration Swale. Poor agreement may have been attributed to the first test when flow was nearly zero and all of the dye had yet to pass through the swale.]

5. Determine design flow rate (Q_d) [Obtained from the BMP Retrofit Pilot Program Basis of Design Report Drainage Design, District 7 Procurement]

6. Set up Manning's Equation to solve for the flow depth estimated to exist at design flow conditions (d_d, ft). In shallow flow, assuming a rectangular cross section, the equation would be: $Q_d = (1.49/n_c)*(w_m*d_d)[(w_m*d_d)/(w_m + 2*d_d)]^{0.67}*s^{0.5}$

   Use values of Q_d, n_c, w_m, and s from previous steps and solve iteratively for d_d. This equation assumes that water surface width does not vary much with small changes in flow depth. In deeper flows substitute the expressions for A and R appropriate to the swale shape.

7. Calculate flow cross-sectional area expected at design flow rate: In shallow flow, $A_d = d_d*w_m$ (In deeper flow use equation appropriate for swale shape.)

8. Calculate flow velocity expected at design flow rate: $V_d = Q_d/A_d$

9. Calculate ratio of calculated to design velocity: V_c/ V_d

10. Use the ratio from Step 9 as a scaling factor to estimate HRT at design flow: $HRT_d = HRT_m*(V_c/ V_d)$

The following paragraphs describe results of the 2000/01 HRT evaluations.

On February 25, 2001, HRT tests were performed at the I-605/SR-91 Swale. The vegetation height in the swale was measured to be approximately 6 to 9 inches.

> Test 1: Dye was poured into the inlet flume and reached the beginning of the swale at 16:13. Visual observations suggested that the dye reached the end of the swale approximately 19 minutes later at 16:32. A peak fluorescence of 1,520 ppm was recorded at 16:38 at the effluent (25 minutes after the dye had reached the beginning of the swale). Based on the procedure described above, the measured HRT is 9.6 minutes.
>
> Test 2: Dye was poured into the inlet flume and reached the beginning of the swale at 17:04. Visual observations suggested that the dye reached the end of the

swale approximately 15 minutes later at 17:19. A peak fluorescence of 3,380 ppm was recorded at 17:25 at the effluent (21 minutes after the dye had reached the beginning of the swale). Based on the procedure described above, the measured HRT is 9.2 minutes.

Test 3: Dye was poured into the inlet flume and reached the beginning of the swale at 17:50. Visual observations suggested that the dye reached the end of the swale approximately 14 minutes later at 18:04. A peak fluorescence of 2,613 ppm was recorded at 18:14 at the effluent (24 minutes after the dye had reached the beginning of the swale). Based on the procedure described above, the measured HRT is 19.6 minutes.

The estimated 1-year, 24-hour HRT for the I-605/SR-91 Swale is 9.8 minutes, less than the designed HRT of 12.4 but greater than the ideal HRT of 9 minutes. Data and calculations are shown in Worksheet 1a and Figure 1-28a graphically shows the events of the HRT evaluation.

On February 12, 2001 and February 19, 2001, HRT tests were performed at the Cerritos Maintenance Station. The vegetation height in the swale was measured to be approximately 6 to 10 inches.

Test 1: Dye was poured into the inlet flume and reached the beginning of the swale on February 12, 2001 at 11:32. Visual observations suggested that the dye reached the end of the swale approximately 2 minutes later at 11:34. A peak fluorescence of 3,096 ppm was recorded at 11:34 at the effluent (2 minutes after the dye had reached the beginning of the swale). Based on the procedure described above, the measured HRT is 2.2 minutes.

Test 2: Dye was poured into the inlet flume and reached the beginning of the swale on February 19, 2001 at 17:30. Visual observations suggested that the dye reached the end of the swale approximately 5 minutes later at 17:35. A peak fluorescence of 4,393 ppm was recorded at 17:39 at the effluent (9 minutes after the dye had reached the beginning of the swale). Based on the procedure described above, the measured HRT is 5.7 minutes.

Test 3: Dye was poured into the inlet flume and reached the beginning of the swale on February 19, 2001 at 18:16. Visual observations suggested that the dye reached the end of the swale approximately 4 minutes later at 18:20. A peak fluorescence of 4,965 ppm was recorded at 18:24 at the effluent (8 minutes after the dye had reached the beginning of the swale). Based on the procedure described above, the measured HRT is 10.2 minutes.

The estimated 1-year, 24-hour HRT for the Cerritos Maintenance Station Swale is 3.3 minutes, less than the designed HRT of 4.5 minutes. Data and calculations are shown in Worksheet 1b and Figure 1-28b graphically shows the events of the HRT evaluation.

On February 12, 2001 and February 19, 2001, HRT tests were performed at the I-5/I-605 Swale. The vegetation height in the swale was measured to be approximately 5 to 14 inches.

Test 1: Dye was poured into the inlet flume and reached the beginning of the swale on February 12, 2001 at 11:33. Visual observations suggested that the dye reached the end of the swale approximately 8 minutes later at 11:41. A peak fluorescence of 4,227 ppm was recorded at 11:45 at the effluent (12 minutes after the dye had reached the beginning of the swale). Based on the procedure described above, the measured HRT is 10.0 minutes.

Test 2: Dye was poured into the inlet flume and reached the beginning of the swale on February 19, 2001 at 16:20. Visual observations suggested that the dye reached the end of the swale approximately 16 minutes later at 16:36. A peak fluorescence of 2,987 ppm was recorded at 16:38 at the effluent (18 minutes after the dye had reached the beginning of the swale). Based on the procedure described above, the measured HRT is 6.2 minutes.

Test 3: Dye was poured into the inlet flume and reached the beginning of the swale on February 19, 2001at 17:05. Visual observations suggested that the dye reached the end of the swale approximately 12 minutes later at 17:17. A peak fluorescence of 3,098 ppm was recorded at 17:19 at the effluent (14 minutes after the dye had reached the beginning of the swale). Based on the procedure described above, the measured HRT is 6.0 minutes.

The estimated 1-year, 24-hour HRT for the I-5/I-605 Swale is 4.2 minutes, less than the designed HRT of 7.3 minutes. Data and calculations are shown in Worksheet 1c and Figure 1-28c graphically shows the events of the HRT evaluation.

On February 12, 2001 and February 24, 2001, HRT tests were performed at the I-605 at Carson Swale. The vegetation height in the swale was measured to be approximately 6 to 10 inches.

Test 1: Dye was poured into the inlet flume and reached the beginning of the swale on February 12, 2001 at 11:19. Visual observations suggested that the dye reached the end of the swale approximately 25 minutes later at 11:44. A peak fluorescence of 694 ppm was recorded at 11:46 at the effluent (27 minutes after the dye had reached the beginning of the swale). Based on the procedure described above, the measured HRT is 10.5 minutes.

Test 2: Dye was poured into the inlet flume and reached the beginning of the swale on February 24, 2001 at 13:20. Visual observations suggested that the dye reached the end of the swale approximately 12 minutes later at 13:32. A peak fluorescence of 4,654 ppm was recorded at 13:36 at the effluent (16 minutes after the dye had reached the beginning of the swale). Based on the procedure described above, the measured HRT is 7.9 minutes.

Test 3: Dye was poured into the inlet flume and reached the beginning of the swale on February 24, 2001 at 14:04. Visual observations suggested that the dye reached the end of the swale approximately 33 minutes later at 14:37. A peak fluorescence of 2,328 ppm was recorded at 14:49 at the effluent (45 minutes after the dye had reached the beginning of the swale). Based on the procedure described above, the measured HRT is 22.6 minutes.

The estimated 1-year, 24-hour HRT for the I-605 at Carson Swale is 6.6 minutes, less than the designed HRT of 9.0 minutes. Data and calculations are shown in Worksheet 1d and Figure 1-28d graphically shows the events of the HRT evaluation.

1.3 Analytical Results

The following sections provide an assessment of the overall quality of the data set, a summary of water quality data for each monitored event and solid sampling results.

1.3.1 Assessment of Quality Assurance/Quality Control Results

1.3.1.1 INTRODUCTION

Prior to determining BMP performance, laboratory reports were assessed and the data validated for overall precision, accuracy, representativeness, and completeness to establish data quality and usability. As part of this process, field and laboratory quality control (QC) data were assessed for compliance with the procedures and methods outlined in the Quality Assurance Project Plan (QAPP) presented in Appendix III of the Operation, Maintenance, and Monitoring (OMM) Plan. QC samples were collected during the 2000/01 wet season. Prior to each event a QC schedule was developed to determine the type of QC samples to be collected at each site in a manner to satisfy the requirements outlined in the OMM Plan - Quality Assurance Project Plan. Given the constraints associated with the collection of stormwater samples, the QC schedule was designed to be flexible in case sufficient sample was not obtained from the designated QC station. Table 1-4a summarizes the QC samples collected during each monitored storm event.

The data quality indicators used to evaluate the overall usability of the data for meeting the project Data Quality Objectives (DQOs) are described in the following paragraphs.

Precision

Precision measures the reproducibility of individual measurements under a given set of conditions. Precision was evaluated for each analyte based on field and laboratory duplicates. Field duplicate analyses were used to measure both field and laboratory precision, and to make an overall judgement as to whether the contaminants detected in the environmental samples are representative of conditions at the BMP location in which the field duplicate was collected. Laboratory duplicates were used to demonstrate method precision at the time of the analyses. Overall, precision was evaluated in terms

related to the mean concentration (relative percent difference). The relative percent difference (RPD) between the pair of samples was calculated using the following formula:

$$\%\text{RPD} = \frac{S - D}{S + \frac{D}{2}} \; x100$$

Where:

S = first sample value, and
D = duplicate sample value

Analytical results and the associated RPD results for both field duplicates and laboratory splits are presented in Appendices A and B, respectively.

Accuracy

Accuracy measures the bias in a measurement system by the degree of agreement between a measured value and an accepted reference or true value. The accuracy of the analytical determinations was evaluated using laboratory QC analyses such as laboratory control samples (LCS), matrix spikes (MS/MSD), and surrogate spikes (where applicable). Accuracy results for the LCS analyses were used to monitor the overall performance of all steps in the analysis, including sample preparation. Matrix spike accuracy data was used to provide information about the effect of each sample matrix on the preparation and analyses methodology. Surrogate spike recovery results (where applicable) were used to establish if the analytical method was performed properly. Accuracy is expressed as the percent recovery of a known concentration added and the measured concentration as shown in the following formula:

$$\%\text{Recovery} = \frac{S - U}{C_s} \; x100$$

Where:

S = Measured concentration of spiked aliquot, and
U = Measured concentration of unspiked aliquot, and
Cs = Concentration of spike added

Accuracy results are reported by the laboratory and are presented along with the associated analytical results in Appendix A.

Representativeness

Representativeness expresses the degree to which data accurately and precisely represents a characteristic of a population, parameter variations at a sampling point, a process condition, or an environmental condition. Sample representativeness was assessed in terms of percent storm captured, number of aliquots, and ultimately the evaluation of all associated blanks. Sample integrity was also evaluated with respect to adherence to the required preservation, storage, and holding times. A discussion of samples not meeting percent storm capture and/or minimum number of aliquots goals are discussed below. Blank results and adherence to holding times are discussed in the Data Validation Results section.

The OMM Plan defines a representative composite sample as being composed of a minimum of 12 aliquots, and representing at least 75 percent storm capture. All samples during the 2000/01 wet season met the 75 percent minimum storm capture goal, except four, which are indicated in Table 1-4b . The percent storm capture for samples was generally greater than 90 percent. Overall, excluding samples not considered representative (refer to Table 1-4b), the average percent storm capture was 98 percent. All but seven samples were composed of at least twelve aliquots (refer to Table 1-4b).

Completeness

Completeness is a measurement of the amount of valid data obtained from a measurement system compared to the amount that was expected to be obtained under normal conditions. Completeness was determined based on validation results and the number of valid data points (not rejected) relative to the total number of validated data. The overall completeness objective of 95 percent was met for all parameters. Percent completeness was calculated using the following formula:

$$\%\text{Completeness} = \frac{V}{T} \; x100$$

Where:

V = number of valid data points, and
T = total number of planned measurements

1.3.1.2 FIELD QA/QC

Blanks

Composite bottles and tubing were decontaminated in accordance with the procedures specified in the OMM Plan. All blanks were prepared in accordance with the project specifications as outlined in the OMM Plan - Quality Assurance Project Plan. Blank

sample results were evaluated to determine whether contamination was introduced as a result of sample equipment contribution (tubing blanks and composite bottle blanks) and analytical procedures (filter blanks and method blanks). Composite bottles (batches of 20) were not released for use unless blanks showed no contamination (i.e., blank results less than Reporting Limits). A review of this data showed that there were no contamination issues (i.e., all blank results were less than the Reporting Limits).

Field Duplicates

As shown in Table 1-4a, field duplicate samples were collected during storm events for a total of six field duplicates composite samples and four field duplicates grab samples. These samples were submitted "blind" to the laboratory and analyzed for the full list of analytes associated with grab and composite samples. Precision data, as measured by the RPD, was calculated for all parameters reported above the reporting limit and are presented in Appendix B.

There are no review criteria for field duplicate analyses comparability. It is expected that the results may have more variability than laboratory replicates, which measures only laboratory performance. It is likely that the variance in the RPD observed in samples is due to the heterogeneity of the samples.

1.3.1.3 LABORATORY QA/QC

To achieve the data quality needed to support project DQOs, all analyses for this investigation were performed using laboratory procedures in accordance with specified analytical protocols. To ensure comparability of the results and to maintain a high level of QC, a laboratory certified in the State of California under the Environmental Laboratory Accreditation Program (ELAP) performed the analyses.

The subsections below describe how each laboratory QC parameter was assessed for compliance with method-specific requirements. The results of this evaluation with respect to the data validation criteria are discussed in Section 1.3.1.5.

Method Blanks

A method blank was included in every analytical batch of twenty samples or less to demonstrate that the laboratory materials and environment were not introducing contamination to the analysis. Sample concentrations associated with method blanks containing target analytes were evaluated with respect to blank concentrations during the data validation to determine the need for qualification.

Laboratory Control Samples (LCS)

One LCS was prepared with each analytical batch of 20 samples or less. The LCS consists of laboratory prepared blanks to which is added a known concentration of all of the target analytes. The LCS was carried through the entire sample preparation and analysis procedure with the sample unknowns. LCS recoveries were used to demonstrate that the method is operating within acceptable limits. LCS accuracy results were evaluated with respect to the acceptance criteria specified in the QAPP.

Laboratory Replicates

As shown in Table 1-4a, nine composite samples and six grab samples were collected during storm events and were assigned for laboratory replicate analyses for the full list of analytes by the laboratory. These samples were split by the laboratory. Each aliquot of the sample was then analyzed and reported by the laboratory. Precision data as measured by the RPD was calculated for all parameters reported above the reporting limit and are presented in Appendix B. Precision data generated from laboratory splits were evaluated during the data validation with respect to the control limits specified in the QAPP. Laboratory duplicates with RPD limits outside the validation criteria and with both sample concentrations greater than 5x the RDL were flagged as estimated J for all samples analyzed within that batch.

Matrix Spike/Matrix Spike Duplicates (MS/MSD)

One set of matrix spike/matrix spike duplicate (MS/MSD) was prepared and analyzed for every analytical batch of 20 samples or less. As shown in Table 1-4a, MS/MSD analyses were performed on project samples collected during nine storm events. In this process, three sample aliquots were measured out, and a known amount of the target analyte(s) was spiked into two of the aliquots at the same concentration. The three portions were then prepared and analyzed in the same manner. The analysis of the two spiked aliquots generated recovery data, which was used to measure the effects of interferences in the sample matrix and reflect the overall accuracy of the determination. Additionally, the calculated RPD between the two measurements were used to assess matrix-specific precision. The selection of spiking analytes was consistent with the published method. Matrix spike accuracy and precision results were evaluated during the data validation with respect to the control limits specified in the QAPP.

Surrogates

Surrogate standards were added to all samples and QC samples tested by gas chromatography (GC). Surrogates are non-target compounds that are analytically similar to the analytes of interest. The surrogate compounds are spiked into the sample prior to the extraction or analysis. Surrogate recoveries were evaluated with respect to the acceptance criteria specified in the QAPP.

Holding Times

The holding time is the maximum amount of time that samples may be held before analysis and still be considered valid. Any holding time exceeded is listed in Appendix B.

Reporting Limits

Analytical methods and associated reporting limits (refer to Table 1-4c), specified in the OMM Plan, were adhered to.

1.3.1.4 DATA VALIDATION PROCESS

The following sections present the data validation effort performed to evaluate the usability of the sample data for meeting the project objectives.

Verification and Review

The verification and review process is based on overall accuracy, precision, and representativeness to establish data quality and usability. The approach used in the validation process involved the review of chain-of-custody forms; preparation, and use of checklists, which detail the required QC for each respective analytical method; verification and documentation of compliance with the applicable criteria; and, assignment of qualifiers to sample results associated with QC samples that do not meet the validation criteria. Data validation was done using the Caltrans Automated Data Validation (ADV) software. The evaluation of whether or not qualification of the data is deemed necessary followed basic guidelines from the United States Environmental Protection Agency (EPA) for evaluating inorganic and organic analysis (EPA February 1994a; EPA, 1994b). Each Electronic Data Deliverable (EDD) received from the laboratory was imported into the ADV software. Samples reported in the EDD as field QC samples such as field duplicates were assigned a field QC type and associated to "true" field samples. After making field QC assignments, the EDD was ready for automated validation. A project library meeting the project specifications as outlined in the OMM Plan - Quality Assurance Project Plan was selected, and then the automated validation routine was executed. During validation, all laboratory quality control results reported in the EDD were compared against the library criteria. When a quality control result exceeded limits established in the library, a validation flag was appended to the result records in all samples associated to that quality control sample. Holding times were also evaluated from sampling to analysis, sampling to extraction, and extraction to analysis dates, whichever applied. Method blanks, were evaluated and if target analytes were reported in blanks, appropriate qualifiers were appended to analyte result records for samples associated to those blanks.

Data Qualifiers

U Indicates the compound or element was an analyte, but was not detected at or above the contract required detection limit (CRDL).

J Indicates an estimated value.

R Indicates that QC determined the data are not usable.

UJ Indicates the compound or element was analyzed, but was not detected; the sample detection limit is an estimated value.

1.3.1.5 DATA VALIDATION RESULTS

Analytical results and associated data qualifiers are summarized in Tables 1-5a through 1-5d. The ADV software provided a number of validation summary reports, which are included in Appendix B. These included validation reports on a sample basis and Quality Control Outlier reports for each quality control element. Quality Control Outlier reports list results for quality control samples that have outliers (values exceeding library criteria). Quality Control outlier reports include a list of all samples and constituents reported in those samples associated to the affected quality control sample. Library validation criteria for the affected constituent are also included in the Quality Control Outlier reports.

1.3.2 Water Quality Results

Analyses were conducted on stormwater samples by a certified laboratory under the California Environmental Laboratory Accreditation Program (ELAP). The analyses were performed in accordance with methods and procedures outlined in the OMM Plan - Quality Assurance Project Plan and as specified by applicable EPA methods. The laboratory analyses performed on stormwater samples are listed in Table 1-4c. Analytical results are summarized in Table 1-5a.

1.3.3 Sediment and Waste Sampling Results

As part of the maintenance program, sediment is removed from the BMPs, tested, and properly disposed of. At the Alameda Maintenance Station Oil/Water Separator (74201), material that had collected in the trench drain during the 1999/2000 wet season, and had been removed and drummed, was sampled on November 7, 2000 for disposal purposes, and subsequently disposed.

On October 24, 2000 the plastic packing ball material was removed from the grit chambers of Via Verde MCTT (74206) and Lakewood MCTT (74208), and stored onsite in drums. This was to allow the grit chamber to be modified to allow easier sampling access for Vector Control District personnel, as described in Section 3.1.5. The material was tested for disposal purposes and subsequently disposed.

On January 16, 2001 sludge was removed from the Via Verde MCTT sedimentation chamber to allow work to begin to fix the leak, and stored onsite in drums. The material was tested for disposal purposes and subsequently disposed.

On March 1, 2001, sandblast residue from the leak fix at Via Verde MCTT was removed and drummed. The material was tested for disposal purposes and subsequently disposed.

On April 2-3, 2001, maintenance was done at all three Sand Filters in District 7, as described in Section 3.1.4. The first step was to sample the surface sediment and filter bed materials from within the sand filters. Nine cores were collected from locations on an equilateral grid, superimposed over the sand filter, to quantify sediment accumulation and quality data. The cores were driven 15 inches below the sediment surface and recovered. Each core was then subdivided into four sections as follows:

Section 1: 0-2 inches (i.e., mostly sediment crust)
Section 2: 2 to 5 inches
Section 3: 5 to 10 inches
Section 4: 10 to 15 inches

Each Section of the nine cores was homogenized to create four samples to represent the four different depths. Each sample will be analyzed

Analytical results and particle size distribution test results are summarized in Table 1-5b. Results of the particle size distribution tests are also presented in Figures 1-29a through 1-31d.

1.3.4 Soil Sampling Results

Core soil samples of the I-605/SR-91 Infiltration Basin (73101) were collected on May 1, 2001 following the end of the 2000/2001 wet season. Nine cores were collected from locations on an equilateral basin grid (superimposed over the basin). Each of the nine cores was collected using a hand-held, stainless steel soil probe. The probe was driven 1 meter [3.28 ft] below the ground surface and the core was recovered. Each core was then subdivided into three sections as follows:

Section 1 from the ground surface to 0.66 ft below the ground surface.
Section 2 was from 0.98 ft to 1.64 ft below the ground surface.
Section 3 was from 1.97 ft to 2.62 ft below the ground surface.

Similar depth intervals of each core were combined to prepare three samples: one from the surface to 0.66 ft below ground surface interval, one from 0.98 ft to 1.64 ft below ground surface interval and one from the 1.97 ft to 2.62 ft below the ground surface. Samples were sent to laboratories for total metals and TRPH analyses particle size distribution testing.

Analytical results and particle size distribution test results are summarized in Table 1-5c. Results of the particle size distribution tests are also presented in Figures 1-32a through 1-32c.

1.3.5 Drain Inlet Insert Sampling Results

As part of the pollutant removal efficiency evaluation, DII media and the material within the DIIs was collected on May 1, 2001 and sent to the laboratory for analysis. The samples were analyzed for total metals and TRPH. Unused DII media had previously been analyzed to assess background concentrations of the DIIs. The following DII components and materials were tested:

StreamGuard™ DII	Fossil Filter™ DII
Geotextile fabric	Adsorbent material
Absorbent material	Debris/litter/sediment
Debris/litter/sediment	

Results of the analyses are summarized in Table 1-5d. Results for the StreamGuard DII at Las Flores, which had to be replaced on January 23, 2001 due to a rip, are also summarized in Table 1-5d.

1.3.6 Vadose Zone Sampling

One pressure-vacuum lysimeter is installed in the I-605/SR-91 Infiltration Basin (73101) and one is installed in the Altadena Maintenance Station Infiltration Trench (73211b). Per plaintiff request and Caltrans agreement, an attempt to collect vadose zone samples following a storm event by applying a vacuum for a period of at least 24-hours were made.

Prior to collecting samples from each lysimeter, the vacuum equipment was set-up at each site to test for vacuum leaks. In each case no vacuum leaks were observed. A vacuum was applied to the lysimeter at the I-605/SR-91 Infiltration Basin for a period of greater than 24-hours following the October 27, 2000 storm event. A vacuum was applied to the lysimeter at the Altadena Maintenance Station Infiltration Trench for a period greater than 24-hours following the January 10, 2001, storm event. On both occasions, no fluids were observed.

1.4 Preliminary BMP Performance Evaluations

An evaluation of BMP performance was conducted to provide estimates of BMP efficiency (Tables 1-6a through 1-6h).

1.4.1 Biofiltration Strips and Swales, Extended Detention Basins, Sand Filters - Austin Type, and Multi-chambered Treatment Trains

BMP efficiencies presented in Tables 1-6a through 1-6e were calculated based upon Event Mean Concentrations (EMCs) and load estimates measured at the influent and effluent monitoring sites for each BMP. Average wet season efficiencies based on loads were also calculated and followed the Scoping Study methodology. For purposes of these calculations, the value of the reporting limit was used in cases where an analyte was reported as undetected. For the biofiltration strips and swales, and the I-605/SR-91 Extended Detention Basin (74102), load estimates were calculated using influent and effluent flow volumes measured by the monitoring equipment. For the I-5/I-605 Extended Detention Basin (74101), sand filters, and MCTTs, load estimates were calculated effluent flow volumes measured by the monitoring equipment. The following equations were used:

$$\text{Efficiency}(\%) = \frac{\text{EMC in} - \text{EMC out}}{\text{EMC in}} \text{ x}100$$

$$\text{Efficiency}(\%) = \frac{\text{Load in} - \text{Load out}}{\text{Load in}} \text{ x}100$$

and

Negative values indicate increases in concentration. Figures 1-33 through 1-37 are scatter plots graphically showing BMP pollutant removal efficiencies.

1.4.2 CDS Units

BMP efficiencies presented in Table 1-6f were calculated based upon EMCs and load estimates measured at the influent and effluent monitoring sites for each BMP. Average wet season efficiencies based on loads were calculated using 1) Scoping Study Methodology and 2) modified CDS Technologies, Inc. Mass Balance Approach. CDS Technologies, Inc. recommended in a letter dated August 31, 2000 that a mass balance approach be used to estimate pollutant removal efficiency because of auto sampler limitations in capturing solids in stormwater including particles larger than 100-125 microns. This approach requires collecting effluent data using flow monitoring equipment and auto samplers, and measurement of the mass and concentration of material collected by the CDS. This approach differs from the Scoping Study by precluding the use of an influent sampler. The point is argued that the performance of an effluent sampler would be no better than that of an influent sampler. Also, collecting and analyzing a representative sample of gross pollutants captured by the CDS would be questionable, considering its matrix. Furthermore, CDS' mass balance approach does not consider load of gross pollutants bypassing the CDS. Accordingly, the average wet season efficiency of the CDS units was assessed by evaluating the water quality pollutant removal efficiency using a mass balance approach considering only the water matrix. For

purposes of these calculations, the value of the reporting limit was used in cases where an analyte was reported as undetected. Efficiency of the CDS unit as a gross pollutant trap was also calculated. Results of gross pollutant removal efficiencies (% mass and volume captured vs. % mass and volume bypassed) are summarized in Figures 1-40a and 1-40b. Additionally, characterization of trapped and bypassed material are summarized in Figures 1-41a and 1-41b. These results are based on three clean-outs of the I-210 East of Orcas Avenue CDS unit and two clean-outs at the I-210 East of Filmore Street CDS unit. Clean-outs were conducted in accordance with the MID.

The following equations were used to calculate the water quality pollutant removal efficiencies:

Scoping Study Methodology:

$$\text{Efficiency (\%)} = \frac{\text{EMC in} - \text{EMC out}}{\text{EMC in}} \times 100$$

and

$$\text{Efficiency (\%)} = \frac{\text{Load in} - \text{Load out}}{\text{Load in}} \times 100$$

Modified CDS Technologies, Inc, Mass Balance Approach:

$$\text{Efficiency (\%)} = \frac{\text{Separation Chamber Load}}{\text{Outlet Loads} + \text{Separation Chamber Load} + \text{Bypass Loads}}$$

$$\text{Sepration Chamber Load} = \text{Chamber Voume} \times \text{Pollutant Concentration}$$

$$\text{Outlet Loads} = \sum \text{Individual Storm Event Loads (Mass x EMC)}$$

$$\text{Bypass Loads} = \sum \text{Individual Storm Event Bypass Loads (Mass x EMC)}$$

Note that Outlet Loads include any Bypassed Loads.

1.4.3 Drain Inlet Inserts

BMP efficiencies were estimated for four StreamGuard™ DIIs and three Fossil Filter™ DIIs, which were installed at the Foothill, Las Flores, and Rosemead Maintenance Stations. Two StreamGuard™ DIIs were installed at the Las Flores Maintenance Station because the first insert tore in January, which consequently required installation of a second StreamGuard™ DII. All DIIs were installed on 14 September 2000 and removed on 1 May 2001, except for the second Las Flores Maintenance Station StreamGuard™

DII, which was installed on 23 January 2001. Table 1-6g summarizes efficiency results and Worksheets 2a through 2n present the efficiency calculations.

To estimate the removal of contaminants by a DII, the procedure below was used. This procedure was taken from the Criteria for Determination of Additional Drain Inlet Insert Monitoring Requirements and Use of 1998-1999 Monitoring Results. For purposes of these calculations, the value of the reporting limit was used in cases where an analyte was reported as undetected.

1. For each of the five pollutants measured in the inlet media (total solids, total copper, total lead, total zinc, and TRPH), calculate percent efficiency representing the time interval since the last time the insert medium was changed, using the equation:

$$\text{Efficiency (\%)} = \frac{\text{Estimated Influent Pollutant Mass} - \text{Effluent Pollutant Mass}}{\text{Estimated Influent Pollutant Mass}} \times 100$$

2. Estimate the influent pollutant mass for the time interval according to:

$$\text{Estimated Influent Pollutant Mass} = \text{Insert Medium Pollutant Mass} + \text{Total Effluent Pollutant Mass for the time interval}$$

3. Calculate total effluent pollutant mass in two ways, and compute efficiency with each method for comparison:

   I. Storm-by-storm method:

      A. Estimate the effluent mass for each storm event in the time interval according to:

$$\text{Estimated Event Effluent Pollutant Mass} = \text{Effluent EMC} \times \text{Event Runoff Volume}$$

      B. For storm events that were successfully monitored, use the measured data.

      C. For any storm event during the time interval that met the deployment criteria but was not successfully monitored, estimate the EMC for that event as the mean of all EMCs measured for that case in all storm events during the time interval. How the mean EMC is determined depends on whether the data tend more to be normally or log-normally distributed. If the concentrations tend more to be normally distributed, use the arithmetic mean of the effluent EMCs. If they tend more to be log-normally distributed, calculate the mean effluent EMC by log-transforming individual storm EMCs, averaging, and then transforming back.

      D. Add the effluent pollutant masses from all storm events in the time interval.

Aggregated storm method:

A. Estimate the total effluent mass for all storm events in the time interval according to:

Estimated Total Effluent Pollutant Mass = Mean EMC x Total Runoff Volume

B. How the mean EMC is determined depends on whether the data tend more to be normally or log-normally distributed. If the concentrations tend more to be normally distributed, use the arithmetic mean of the effluent EMCs measured for that case in all storm events during the time interval. If they tend more to be log-normally distributed, calculate the mean effluent EMC by log-transforming individual storm EMCs, averaging, and then transforming back.

4. Compute mean efficiencies <u>for each pollutant and each wet season</u> by averaging results computed according to Steps 1-3 for all time intervals in that wet season.

Normality Test

Data sets were first tested for normality using the Shapiro-Wilk test. The Shapiro-Wilk (W) test is an effective method for evaluating whether the underlying distribution being tested is normally distributed. This test, which is a complex analysis of variance, was used to test a variable for departures from normality of the data. It requires a random sample of between 3 and 5,000 data points. Most authors agree that this is the most reliable quantification of non-normality for small to medium sized sample data set. In the Shapiro-Wilk test, the following hypotheses are tested:

H_0 : The population has a normal distribution.
H_1 : The population does not have a normal distribution.

The null hypothesis (H_o) of the test is that the sample data set is taken from a normal distribution, thus a significance level of < 0.05 rejects this supposition of normality. Parametric methods with variables for which W is significant should not be used. Results of this test are not clear evidence of normality or non-normality, but just one piece of evidence that can be helpful. The Shapiro-Wilk test statistic, W, is calculated using the formula below.

$$W = \frac{1}{d}\left[\sum_{i=1}^{k} a_i\left(x_{[n-i+1]} - x_{[i]}\right)\right]^2 \qquad d = \sum_{i=1}^{n}(x-\bar{x})^2$$

if n is even $k = \frac{n}{2}$ if n is odd $k = \frac{n-1}{2}$

where:

$\bar{x}$ = arithmetic mean
x_i = a number of the sample data
n = the number of sample data
a_i = the coefficient for the Shapiro-Wilk Test for normality (Gilbert, Table A6). Where the value of a_i is obtained knowing n.

The P value or critical level is the probability of rejecting the H_o when it is true. The null hypothesis is most often the hypothesis of "no difference". The term "significance level" (alpha) is used to refer to a pre-chosen probability and the term "P value" is used to indicate a probability that is calculated using the given data.

If the P value is less than the chosen significance level then you reject the null hypothesis (i.e., accept that your sample data gives reasonable evidence of a population difference for the observed parameters). It does NOT imply a "meaningful" or "important" difference.

The choice of significance level at which you reject the H_o is arbitrary. Traditionally the 5%, 1%, and 0.1% ($P < 0.05$, 0.01, and 0.001) regions are used. These numbers tend to give a false sense of security when in reality there are many factors that can contribute to the arbitrary nature of these levels. Ideally, random samples could be defined and the most appropriate test and one definitive conclusion could be made. However, because this cannot be done, optimization of research is done to minimize sources of uncertainty. A significance level or P-value of 0.05 (95% confidence interval) was used when performing the Shapiro-Wilk test.

Table 1-7 summarizes normality test results.

1.4.4 Oil/Water Separator

BMP efficiencies presented in Table 1-6h were calculated based upon first-flush grab sample concentrations collected at the influent and effluent locations. Load estimates were calculated using effluent flow volumes measured by the monitoring equipment. For purposes of these calculations, the value of the reporting limit was used in cases where an analyte was reported as undetected. The following equations were used:

$$\text{Efficiency (\%)} = \frac{\text{Grab Concentraion in} - \text{Grab Concentration out}}{\text{Grab Concentration in}} \times 100$$

and

$$\text{Efficiency (\%)} = \frac{\text{Load in} - \text{Load out}}{\text{Load in}} \times 100$$

Negative values indicate increases in concentration. Figure 1-36 is a scatter plot graphically showing BMP pollutant removal efficiencies.

Table 1-1: District 7 Sites

Site ID.	BMP Location	BMP Type
73101	I-605/SR-91	Infiltration Basin
73102	I-210 East of Orcas Avenue	Continuous Deflective Separator
73103	I-210 East of Filmore Street	Continuous Deflective Separator
73211a	Altadena Maintenance Station	Biofiltration Strip
73211b	Altadena Maintenance Station	Infiltration Trench
73216	Foothill Maintenance Station - North	StreamGuard™ Drain Inlet Insert
73216	Foothill Maintenance Station - South	Fossil Filter™ Drain Inlet Insert
73217	Las Flores Maintenance Station - North	StreamGuard™ Drain Inlet Insert
73217	Las Flores Maintenance Station - South	Fossil Filter™ Drain Inlet Insert
73218	Rosemead Maintenance Station - North	Fossil Filter™ Drain Inlet Insert
73218	Rosemead Maintenance Station - South	StreamGuard™ Drain Inlet Insert
73222a	I-605/SR-91	Biofiltration Strip
73222b	I-605/SR-91	Biofiltration Swale
73223	Cerritos Maintenance Station	Biofiltration Swale
73224	I-5/I-605	Biofiltration Swale
73225	I-605 at Carson	Biofiltration Swale
74101	I-5/I-605 Intersection	Extended Detention Basin
74102	I-605/SR-91 Intersection	Extended Detention Basin
74201	Alameda Maintenance Station	Oil/Water Separator
74202	Eastern Regional Maintenance Station	Sand Filter – Austin Type
74203	Foothill Maintenance Station	Sand Filter – Austin Type
74204	Termination Park & Ride	Sand Filter – Austin Type
74206	Via Verde Park & Ride	Multi-chambered Treatment Train
74208	Lakewood Park & Ride	Multi-chambered Treatment Train

Table 1-2: Rainfall Statistics for Each Monitored Event

Site/Event	Start Rain Date	Start Rain Time	End Rain Date	End Rain Time	Duration Rain (hrs: min)	Total Rain (inches)	Max Intensity (inches/ hour)	Antecedent Rain (days)	Antecedent Rain (inches)	Cumulative Precipitation
Event 1										
I-605/SR-91 Strip Swale, EDB, Cerritos Swale, Carson Swale	10/10/00	19:10	10/11/00	12:34	17:24:00	0.25	0.60	17.8	0.15	0.25
Lakewood MCTT	10/10/00	18:26	10/11/00	7:39	13:13:00	0.24	0.60	17.8	0.15	0.24
Rosemead DII	10/11/00	7:09	10/11/00	8:19	1:10:00	0.13	0.36	17.2	0.19	0.13
Event 2										
Altadena Strip	10/26/00	19:09	10/27/00	4:42	9:33:00	0.32	0.36	33.8	0.15	0.59
I-605/SR-91 Strip Swale, EDB, Cerritos Swale, Carson Swale	10/26/00	23:36	10/27/00	7:17	7:41:00	1.98	1.56	15.5	0.25	2.26
I-5/I-605 Swale, EDB	10/26/00	19:36	10/27/00	7:34	11:58:00	1.43	1.20	33.8	0.15	1.59
Eastern SF	10/26/00	6:16	10/27/00	5:47	23:31:00	1.25	0.96	33.3	0.15	1.25
Termination SF	10/26/00	3:02	10/27/00	7:42	28:40:00	1.65	0.84	14.6	0.19	1.92
Via Verde MCTT	10/26/00	7:06	10/27/00	6:59	23:53:00	0.91	1.32	33.3	0.15	1.00
Lakewood MCTT	10/26/00	19:29	10/27/00	7:46	12:17:00	1.17	0.84	15.5	0.24	1.41
Filmore CDS	10/26/00	5:26	10/27/00	4:31	23:05:00	1.19	0.48	33.2	0.15	1.23
Foothill DIIs, SF	10/26/00	6:02	10/27/00	5:52	23:50:00	0.78	1.44	33.3	0.29	0.82
Las Flores DIIs	10/26/00	17:21	10/27/00	2:23	9:02:00	2.11	3.12	33.8	0.13	2.15
Rosemead DIIs	10/26/00	5:43	10/27/00	5:28	23:45:00	0.88	0.96	14.9	0.13	1.01
Alameda OWS	10/26/00	19:02	10/27/00	4:51	9:49:00	0.28	0.24	15.5	0.13	0.44
Event 3										
I-605/SR-91 Swale, EDB, Cerritos Swale, Carson Swale	01/08/01	10:53	01/08/01	15:45	4:52:00	0.55	0.84	58.5	0.14	3.60
I-5/I-605 Swale, EDB	01/08/01	10:39	01/08/01	15:47	5:08:00	0.44	0.48	73.1	1.43	2.77
Lakewood MCTT	01/08/01	10:42	01/08/01	15:36	4:54:00	0.47	0.36	58.7	0.12	2.79
Las Flores DII	01/08/01	9:16	01/08/01	13:36	4:20:00	0.24	0.24	70.6	0.74	3.14
Alameda OWS	01/08/01	11:19	01/08/01	14:49	3:30:00	0.23	0.24	73.3	0.28	1.59
Event 4										
Altadena Strip	01/10/01	14:46	01/12/01	4:51	38:05:00	4.19	0.96	72.7	0.65	5.55
I-605/SR-91 Strip, Swale, EDB, Cerritos Swale, Carson Swale	01/10/01	15:35	01/12/01	14:16	46:41:00	3.47	2.16	2.0	0.55	7.07
I-5/I-605 Swale, EDB	01/10/01	15:01	01/12/01	13:42	46:41:00	4.10	4.44	2.0	0.44	6.87
Eastern SF	01/10/01	15:01	01/12/01	5:33	38:32:00	3.72	1.80	2.0	0.11	5.88
Via Verde MCTT	01/10/01	15:38	01/11/01	12:54	21:16:00	3.38	1.20	2.0	0.13	4.90
Lakewood MCTT	01/10/01	15:02	01/12/01	13:49	46:47:00	3.82	3.48	2.0	0.47	6.62
Filmore CDS	01/10/01	14:27	01/12/01	8:50	42:23:00	4.33	1.92	72.8	0.69	6.31
Foothill DIIs, SF	01/10/01	15:09	01/12/01	5:38	38:29:00	4.07	1.20	72.7	0.56	5.51
Las Flores DIIs	01/10/01	13:46	01/12/01	11:42	45:56:00	5.92	3.12	2.0	0.24	9.06
Rosemead DIIs	01/10/01	15:01	01/12/01	5:46	38:45:00	3.92	1.92	72.8	0.69	5.69
Alameda OWS	01/10/01	14:35	01/11/01	8:54	18:19:00	3.57	1.32	2.0	0.23	5.17
Event 5										
Altadena Strip	01/24/01	6:19	01/24/01	14:36	8:17:00	0.47	0.48	12.1	4.19	6.07
I-605/SR-91 Swale, EDB, Cerritos Swale, Carson Swale	01/24/01	6:29	01/24/01	7:52	1:23:00	0.30	1.20	11.7	3.47	7.38
I-5/I-605 Swale EDB	01/24/01	6:26	01/24/01	10:37	4:11:00	0.54	1.92	11.7	4.10	7.41
Eastern SF	01/24/01	6:35	01/24/01	12:59	6:24:00	0.64	0.60	12.0	3.72	6.52
Termination SF	01/24/01	6:45	01/24/01	10:53	4:08:00	0.36	0.96	11.7	0.46	7.97
Lakewood MCTT	01/24/01	6:09	01/24/01	10:45	4:36:00	0.43	1.08	11.7	3.82	7.05
Filmore CDS	01/24/01	5:50	01/24/01	12:57	7:07:00	0.60	0.72	11.9	4.33	6.99
Foothill DIIs, SF	01/24/01	6:40	01/24/01	15:29	8:49:00	0.48	0.60	12.0	4.07	6.02
Las Flores DIIs	01/24/01	4:23	01/24/01	12:29	8:06:00	0.52	0.72	11.7	5.92	9.58
Rosemead DIIs	01/24/01	6:32	01/24/01	11:56	5:24:00	0.49	0.48	12.0	3.92	6.18
Alameda OWS	01/24/01	6:01	01/24/01	9:59	3:58:00	0.31	0.60	12.1	0.26	5.82

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Site/Event	Start Rain Date	Start Rain Time	End Rain Date	End Rain Time	Duration Rain (hrs: min)	Total Rain (inches)	Max Intensity (inches/ hour)	Antecedent Rain (days)	Antecedent Rain (inches)	Cumulative Precipitation
Event 6										
Altadena Strip	02/10/01	4:06	02/10/01	16:40	12:34:00	0.46	0.60	14.4	0.38	6.99
I-605/SR-91 Strip and EDB	02/10/01	4:53	02/13/01	8:15	75:22:00	3.02	0.60	14.4	0.67	11.09
I-5/I-605 EDB	02/10/01	4:37	02/13/01	21:23	88:46:00	3.41	0.48	14.6	0.61	11.45
Eastern SF	02/10/01	7:22	02/13/01	21:55	86:33:00	4.16	0.84	14.7	0.36	11.05
Termination SF	02/10/01	5:27	02/11/01	14:46	33:19:00	0.48	0.24	14.4	0.73	9.19
Lakewood MCTT	02/10/01	4:34	02/13/01	21:47	89:13:00	3.28	0.60	14.4	0.68	11.02
Orcas CDS	02/10/01	0:32	02/10/01	12:56	12:24:00	0.42	0.24	14.3	0.41	7.39
Filmore CDS	02/10/01	2:14	02/10/01	12:56	10:42:00	0.55	0.36	16.6	0.50	8.05
Foothill DIIs, SF	02/10/01	4:38	02/10/01	13:50	9:12:00	0.26	0.48	14.6	0.22	6.52
Las Flores DIIs	02/10/01	1:15	02/11/01	10:16	33:01:00	0.96	1.32	14.3	0.91	11.46
Rosemead DIIs	02/10/01	5:03	02/10/01	13:42	8:39:00	0.30	0.84	14.6	0.34	6.91
Alameda OWS	02/10/01	5:14	02/10/01	13:19	8:05:00	0.31	0.36	14.5	0.65	6.80
Event 7										
Orcas CDS	02/24/01	8:32	02/28/01	12:51	100:19:00	2.13	0.24	10.2	4.49	14.18
Filmore CDS	02/24/01	10:30	02/28/01	13:34	99:04:00	2.22	0.48	10.4	3.95	14.37
Event 8										
I-5/I-605 EDB	03/06/01	0:11	03/07/01	0:16	24:05:00	0.67	0.48	5.5	3.83	16.78
I-605/SR-91 EDB	03/06/01	0:11	03/06/01	4:40	4:29:00	0.57	0.48	7.4	2.94	15.47
Eastern SF	03/06/01	0:35	03/06/01	6:17	5:42:00	0.42	0.48	5.5	3.80	15.70
Foothill SF	03/06/01	0:44	03/06/01	12:54	12:10:00	0.71	0.60	5.9	0.64	14.88
Termination SF	03/06/01	0:50	03/07/01	0:26	23:36:00	0.57	0.24	5.5	0.74	17.62
Orcas CDS	03/04/01	17:11	03/06/01	5:37	36:26:00	2.08	0.60	4.2	2.13	16.28
Filmore CDS	03/04/01	17:32	03/06/01	18:45	49:13:00	1.49	0.24	4.2	2.22	15.86
Event 9										
Altadena Strip	4/7/2001	0:17	4/7/2001	14:58	14:41:00	1.40	0.48	5.00	0.12	18.65
I-605/SR-91 Strip, Swale, EDB, Cerritos Swale, Carson Swale	4/7/2001	2:07	4/7/2001	8:48	6:41:00	0.58	0.48	31.9	0.57	16.09
I-5/I-605 Swale, EDB	4/7/2001	0:29	4/7/2001	9:30	9:01:00	0.79	1.20	31.6	0.58	17.57
Eastern SF	4/7/2001	0:35	4/7/2001	9:42	9:07:00	0.84	0.84	31.8	0.42	16.59
Foothill SF	4/7/2001	0:36	4/7/2001	10:34	9:58:00	1.12	0.48	28.1	0.28	16.42
Termination SF	4/7/2001	3:05	4/7/2001	9:51	6:46:00	0.75	0.24	31.8	0.52	18.39
Via Verde MCTT	4/7/2001	2:10	4/7/2001	10:54	8:44:00	0.85	1.08	28.1	0.19	14.15
Orcas CDS	4/7/2001	1:12	4/7/2001	9:52	8:40:00	1.11	0.72	31.8	1.64	17.69
Filmore CDS					0:00:00					
Event 10										
Altadena Strip	4/20/2001	18:08	4/20/2001	2.356	38:24:38	0.8	1.08	13.1	1.40	19.45
Foothill SF	4/20/2001	19:03	4/21/2001	0.18	9:16:12	0.77	0.48	13.4	1.12	17.21
Via Verde MCTT	4/20/2001	16:00	4/21/2001	2.32	63:40:48	0.84	1.2	13.2	0.85	15.07
Filmore CDS	4/20/2001	19:05	4/21/2001	10:36	15:31:00	0.6	0.24	12.7	0.62	17.49

Table 1-3: Flow Data for Each Monitored Event[1]

Site/Event	Start Flow Date	Start Flow Time	End Flow Date	End Flow Time	Duration Flow (hours: minutes)	Total Flow (cubic feet)	Volume to Sample (cf)	No. of Sample Alliqouts collected	Peak Flow (cfs)	% Storm Capture	Peak Capture	Detention Time (hrs:min)
Event 1												
I-605/SR-91 Strip Inf	10/10/00	19:06	10/11/00	14:18	19:12:00	154	5	23	0.059	79	Y	---
I-605/SR-91 Swale Inf	10/10/00	7:10	10/11/00	1:20	18:10:00	85	5	13	0.030	87	Y	---
Cerritos Swale Inf	10/10/00	19:16	10/11/00	8:27	13:11:00	242	7	27	0.121	90	Y	---
Carson Swale Inf	10/10/00	19:31	10/11/00	8:54	13:23:00	85	2	24	0.036	100	Y	---
Lakewood MCTT Inf	10/10/00	18:34	10/11/00	10:31	15:57:00	1508	21	55	0.831	100	Y	---
Lakewood MCTT Eff	10/11/00	11:48	10/12/00	13:16	25:28:00	989	20	98	0.228	100	Y	42:42:00
Rosemead DII SG	10/11/00	7:16	10/11/00	10:11	2:55:00	434	21	20	0.168	100	Y	---
Rosemead DII FF	10/11/00	7:20	10/11/00	8:47	1:27:00	79	5	8	0.040	100	Y	---
Event 2												
Altadena Strip Inf	10/26/00	19:10	10/27/00	6:10	11:00:00	1298	60	22	0.242	100	Y	---
Altadena Strip Eff	10/26/00	19:05	10/27/00	6:15	11:10:00	1199	60	18	0.236	100	Y	---
I-605/SR-91 Strip Inf	10/26/00	23:36	10/27/00	7:17	7:41:00	959	23	41	0.240	100	Y	---
I-605/SR-91 Strip Eff	10/27/00	1:45	10/27/00	5:24	3:39:00	1233	6	27	0.349	100	Y	---
I-605/SR-91 Swale Inf	10/27/00	1:00	10/27/00	8:26	7:26:00	1052	8	118	0.284	100	Y	---
I-605/SR-91 Swale Eff	10/27/00	2:24	10/27/00	4:54	2:30:00	479	6	67	0.239	96	Y	---
Cerritos Swale Inf	10/27/00	0:56	10/27/00	8:10	7:14:00	3559	23	140	0.627	90	Y	---
Cerritos Swale Eff	10/27/00	0:09	10/27/00	4:57	4:48:00	1862	23	46	0.540	100	Y	---
I-5/I-605 Swale Inf	10/26/00	19:54	10/27/00	7:48	11:54:00	1943	23	84	0.443	99	Y	---
I-5/I-605 Swale Eff	10/27/00	1:57	10/27/00	5:51	3:54:00	1165	13	65	0.375	100	Y	---
Carson Swale Inf	10/27/00	0:56	10/27/00	8:26	7:30:00	2306	9	82	0.314	95	Y	---
Carson Swale Eff	10/27/00	1:32	10/27/00	6:20	4:48:00	1562	9	98	0.322	98	Y	---
I-5/I-605 EDB Inf	10/26/00	20:01	10/29/00	0:58	52:57:00	55709	35	841	2.591	100	Y	---
I-5/I-605 EDB Eff	10/26/00	19:35	10/31/00	11:30	111:55:00	12227	35	349	0.119	100	Y	111:29:00
I-605/SR-91 EDB Inf	10/27/00	1:00	10/28/00	4:40	51:40:00	19121	38	499	1.865	100	Y	---
I-605/SR-91 EDB Eff	10/27/00	2:15	10/28/00	13:45	59:30:00	1413	21	67	0.024	100	Y	111:55:00
Eastern SF Inf	10/26/00	6:18	10/27/00	7:38	25:20:00	2855	10	221	0.233	100	Y	---
Foothill SF Inf	10/26/00	6:13	10/27/00	6:45	24:32:00	1770	12	118	0.282	100	Y	---
Foothill SF Eff	10/26/00	18:32	10/29/00	17:32	71:00:00	2112	12	886	0.151	100	Y	83:19:00
Termination SF Inf	10/26/00	2:50	10/27/00	4:47	25:57:00	14754	46	142	2.816	100	Y	---
Termination SF Eff	10/26/00	4:05	10/29/00	20:35	88:30:00	708	46	216	0.140	5	Y	89:45:00
Via Verde MCTT Inf	10/26/00	7:40	10/27/00	8:27	24:47:00	1912	10	151	0.651	100	Y	---
Via Verde MCTT Eff	10/29/00	14:03	10/29/00	18:00	3:57:00	477	15	99	0.146	100	Y	82:20:00
Lakewood MCTT Inf	10/26/00	19:37	10/27/00	4:59	9:22:00	5739	21	211	0.843	100	Y	---
Lakewood MCTT Eff	10/29/00	16:25	11/01/00	16:30	72:05:00	6425	174	56	0.230	100	Y	140:53:00
Filmore CDS Eff	10/26/00	5:39	10/27/00	6:42	25:03:00	5581	64	85	0.619	100	Y	---
Foothill SG Eff	10/26/00	6:06	10/27/00	15:21	33:15:00	1995	6	306	0.119	100	Y	---
Las Flores SG Eff	10/26/00	17:40	10/27/00	2:30	8:50:00	217	4	55	0.025	100	Y	---
Rosemead SG Eff	10/26/00	5:48	10/27/00	11:06	29:18:00	3185	21	148	0.464	100	Y	---
Foothill FF Eff	10/26/00	6:05	10/27/00	16:15	34:10:00	1607	15	61	0.426	97	Y	---
Las Flores FF Eff	10/26/00	17:21	10/27/00	4:00	10:39:00	2533	15	125	1.381	77	Y	---
Rosemead FF Eff	10/26/00	5:45	10/27/00	5:55	24:10:00	737	5	47	0.175	90	Y	---
Alameda OWS	10/26/00	5:05	10/27/00	22:05	41:00:00	297	N/A	N/A	0.111	N/A	N/A	---
Event 3												
I-605/SR-91 Swale Inf	01/08/01	11:00	01/08/01	16:59	5:59:00	950	8	59	0.172	98	Y	---
Cerritos Swale Inf	01/08/01	11:13	01/08/01	16:32	5:19:00	1120	23	48	0.458	100	Y	---
Cerritos Swale Eff	01/08/01	11:00	01/08/01	16:16	5:16:00	297	23	12	0.215	100	Y	---
I-5/I-605 Swale Inf	01/08/01	11:00	01/08/01	16:56	5:56:00	411	23	17	0.139	100	Y	---
Carson Swale Inf	01/08/01	11:55	01/08/01	17:47	5:52:00	327	9	34	0.051	97	Y	---
Carson Swale Eff	01/08/01	15:03	01/08/01	17:05	2:02:00	79	9	8	0.028	100	Y	---
I-5/I-605 EDB Inf	01/08/01	11:17	01/09/01	7:10	19:53:00	2095	35	50	0.243	100	Y	---
I-5/I-605 EDB Eff	01/08/01	11:45	01/09/01	5:22	17:37:00	1386	35	39	0.032	100	Y	18:05:00

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Site/Event	Start Flow Date	Start Flow Time	End Flow Date	End Flow Time	Duration Flow (hours: minutes)	Total Flow (cubic feet)	Volume to Sample (cf)	No. of Sample Alliqouts collected	Peak Flow (cfs)	% Storm Capture	Peak Capture	Detention Time (hrs:min)
I-605/SR-91 EDB Inf	01/08/01	10:56	01/08/01	21:22	10:26:00	1673	21	79	1.035	100	Y	---
Lakewood MCTT Inf	01/08/01	10:55	01/09/01	1:37	14:42:00	2862	21	130	0.434	100	Y	---
Lakewood MCTT Eff	01/10/01	11:10	01/10/01	15:45	4:35:00	3031	90	29	0.222	100	Y	52:50:00
Las Flores FF Eff	01/08/01	9:18	01/08/01	15:00	5:42:00	619	15	39	0.129	100	Y	---
Alameda OWS	01/08/01	11:25	01/08/01	15:50	4:25:00	361	N/A	N/A	0.099	N/A	N/A	---
Event 4												
Altadena Strip Inf	01/10/01	14:50	01/12/01	9:20	42:30:00	20242	133	151	0.525	99	Y	---
Altadena Strip Eff	01/10/01	14:40	01/12/01	6:20	39:40:00	15487	139	112	0.928	100	Y	---
I-605/SR-91 Strip Inf	01/10/01	18:48	01/13/01	11:06	64:18:00	923	23	110	0.129	87	Y	---
I-605/SR-91 Strip Eff	01/10/01	15:39	01/12/01	5:21	37:42:00	1575	6	69	0.379	85	Y	---
I-605/SR-91 Swale Inf	01/10/01	15:08	01/12/01	15:22	48:14:00	1726	13	130	0.251	98	Y	---
I-605/SR-91 Swale Eff	01/10/01	18:42	01/11/01	18:42	24:00:00	530	8	35	0.319	97	Y	---
Cerritos Swale Inf	01/10/01	15:10	01/12/01	15:02	47:52:00	10658	68	154	1.611	100	Y	---
Cerritos Swale Eff	01/10/01	17:15	01/11/01	1:10	7:55:00	908	40	17	0.619	100	Y	---
I-5/I-605 Swale Inf	01/10/01	15:23	01/12/01	12:47	45:24:00	6199	52	118	1.211	98	Y	---
I-5/I-605 Swale Eff	01/10/01	17:22	01/12/01	5:10	35:48:00	2389	36	65	1.209	97	Y	---
Carson Swale Inf	01/10/01	15:38	01/12/01	15:36	47:58:00	5783	23	235	0.992	99	Y	---
Carson Swale Eff	01/10/01	16:14	01/12/01	15:52	47:38:00	6344	17	305	0.839	92	Y	---
I-5/I-605 EDB Inf	01/10/01	15:50	01/12/01	16:53	49:03:00	145448	342	294	11.215	100	Y	---
I-5/I-605 EDB Eff	01/10/01	15:52	01/14/01	4:53	85:01:00	58830	342	171	5.436	100	Y	85:03:00
I-605/SR-91 EDB Inf	01/10/01	15:05	01/12/01	16:55	49:50:00	52676	228	230	1.885	100	Y	---
Eastern SF Inf	01/10/01	15:13	01/12/01	8:45	41:32:00	9507	112	85	1.138	100	Y	---
Eastern SF Eff	01/10/01	17:03	01/14/01	7:36	86:33:00	4932	112	392	0.139	100	Y	88:23:00
Foothill SF Inf	01/10/01	15:20	01/12/01	5:25	38:05:00	15974	202	65	0.928	100	Y	---
Via Verde Inf	01/10/01	15:44	01/12/01	13:09	45:25:00	22380	31	374	0.904	100	Y	---
Via Verde Eff	01/14/01	10:30	01/14/01	14:00	3:30:00	734	36	45	0.149	100	Y	94:16:00
Lakewood MCTT Inf	01/10/01	15:14	01/10/01	21:45	6:31:00	6151	52	107	0.592	100	Y	---
Lakewood MCTT Eff	01/13/01	10:15	01/13/01	20:45	10:30:00	6425	174	43	0.228	100	Y	77:31:00
Filmore CDS Eff	01/10/01	14:30	01/12/01	14:01	47:31:00	9671	150	64	0.463	100	Y	---
Foothill SG Eff	10-Jan-01	17:06	12-Jan-01	16:00	46:54:00	10548	11	452	0.156	100	Y	---
Las Flores SG Eff	01/10/01	13:55	01/12/01	9:55	44:00:00	933	36	26	0.033	100	Y	---
Rosemead SG Eff	01/10/01	15:08	01/12/01	12:24	45:16:00	13440	73	182	1.157	100	Y	---
Foothill FF Eff	01/10/01	15:18	01/12/01	12:45	45:27:00	12336	64	176	0.774	92	Y	---
Las Flores FF Eff	01/10/01	13:48	01/12/01	13:27	47:39:00	8222	54	152	1.611	100	Y	---
Rosemead FF Eff	01/10/01	15:06	01/12/01	6:45	39:39:00	3974	32	125	0.409	100	Y	---
Alameda OWS	01/10/01	14:40	01/11/01	11:55	21:15:00	4203	N/A	N/A	0.518	N/A	N/A	---
Event 5												
Altadena Strip Inf	01/24/01	6:30	01/24/01	11:15	4:45:00	1759	60	29	0.406	100	Y	---
Altadena StripEff	01/24/01	6:12	01/24/01	11:24	5:12:00	1294	60	21	0.344	100	Y	---
I-605/SR-91 Swale Inf	01/24/01	6:33	01/24/01	8:30	1:57:00	125	8	15	0.146	100	Y	---
Cerritos Swale Inf	01/24/01	6:29	01/24/01	7:52	1:23:00	532	23	22	0.569	100	Y	---
I-5/I-605 Swale Inf	01/24/01	6:30	01/24/01	14:54	8:24:00	724	23	31	0.504	100	Y	---
Carson Swale Inf	01/24/01	6:36	01/24/01	12:27	5:51:00	348	9	32	0.186	100	Y	---
Carson Swale Eff	01/24/01	7:35	01/24/01	13:35	6:00:00	216	9	19	0.109	95	Y	---
I-5/I-605 EDB Inf	01/24/01	6:44	01/25/01	8:31	25:47:00	9843	60	164	2.141	100	Y	---
I-5/I-605 EDB Eff	01/24/01	6:55	01/25/01	22:05	39:10:00	4764	60	78	0.055	100	Y	39:21:00
I-605/SR-91 EDB Inf	01/24/01	6:31	01/24/01	12:34	6:03:00	1327	27	49	1.064	100	Y	---
I-605/SR-91 EDB Eff	01/24/01	7:45	01/24/01	16:10	8:25:00	176	20	9	0.008	100	Y	9:39:00
Eastern SF Inf	01/24/01	6:38	01/24/01	14:30	7:52:00	1457	16	89	0.178	100	Y	---
Eastern SF Eff	01/24/01	8:27	01/29/01	9:33	121:06:00	1742	16	399	0.111	100	Y	122:55:00
Foothill SF Inf	01/24/01	6:51	01/24/01	16:27	9:36:00	1291	12	97	0.315	100	Y	---
Foothill SF Eff	01/24/01	9:30	01/29/01	7:50	118:20:00	1395	1000	66	0.149	100	Y	120:59:00
Termination SF Inf	01/24/01	6:35	01/24/01	15:39	9:04:00	7049	51	122	1.637	100	Y	---
Termination SF Eff	01/24/01	9:25	01/29/01	16:10	126:45:00	621	102	96	0.130	100	Y	129:35:00
Lakewood MCTT Inf	01/24/01	6:26	01/24/01	12:44	6:18:00	2664	24	84	1.132	100	Y	---

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Site/Event	Start Flow Date	Start Flow Time	End Flow Date	End Flow Time	Duration Flow (hours: minutes)	Total Flow (cubic feet)	Volume to Sample (cf)	No. of Sample Alliqouts collected	Peak Flow (cfs)	% Storm Capture	Peak Capture	Detention Time (hrs:min)
Lakewood MCTT Eff	01/25/01	13:40	01/25/01	21:00	7:20:00	2109	91	55	0.222	100	Y	38:34:00
Filmore CDS Eff	01/24/01	5:57	01/24/01	14:48	8:51:00	3157	89	33	2.011	94	Y	---
Foothill SG Eff	01/24/01	7:12	01/24/01	14:42	7:30:00	797	6	62	0.115	100	Y	---
Las Flores SG Eff	01/24/01	4:39	01/24/01	11:33	6:54:00	517	5	84	0.056	100	Y	---
Rosemead SG Eff	01/24/01	6:36	01/24/01	12:38	6:02:00	1754	30	57	0.347	98	Y	---
Foothill FF Eff	01/24/01	6:52	01/24/01	14:40	7:48:00	869	15	58	0.145	97	Y	---
Las Flores FF Eff	01/24/01	4:27	01/24/01	9:48	5:21:00	3384	15	112	0.499	98	Y	---
Rosemead FF Eff	01/24/01	6:36	01/24/01	12:12	5:36:00	383	5	28	0.087	93	Y	---
Alameda OWS	01/24/01	6:05	01/24/01	11:05	5:00:00	343	N/A	N/A	0.242	N/A	N/A	---
Event 6												
Altadena Strip Inf	02/10/01	4:10	02/10/01	18:50	14:40:00	1250	60	17	0.079	85	Y	---
Altadena Strip Eff	02/10/01	4:00	02/10/01	19:00	15:00:00	1417	60	22	0.411	96	Y	---
I-605/SR-91 Strip Inf	02/10/01	5:00	02/13/01	10:00	77:00:00	2150	6	88	0.090	96	Y	---
I-605/SR-91 Strip Eff	02/10/01	7:14	02/13/01	6:08	70:54:00	1631	6	267	0.135	100	Y	---
I-5/I-605 EDB Inf	02/10/01	7:14	02/10/01	11:13	3:59:00	104802	64	868	1.869	100	Y	---
I-5/I-605 EDB Eff	02/12/01	0:10	02/15/01	14:20	86:10:00	40358	64	590	1.825	100	Y	127:06:00
I-605/SR-91 EDB Inf	02/10/01	14:26	02/15/01	11:31	117:05:00	19932	45	782	0.404	100	Y	---
I-605/SR-91 EDB Eff	02/10/01	7:35	02/15/01	4:00	116:25:00	3695	30	123	0.091	100	Y	109:34:00
Eastern SF Inf	02/10/01	7:27	02/13/01	23:53	88:26:00	15544	24	833	1.141	100	Y	---
Eastern SF Eff	02/10/01	14:25	02/14/01	13:55	95:30:00	3185	48	735	0.120	100	Y	102:28:00
Foothill SF Inf	02/10/01	13:03	02/10/01	14:39	1:36:00	502	21	23	0.256	100	Y	---
Foothill SF Eff	02/10/01	8:42	02/11/01	15:39	30:57:00	558	100	146	0.149	100	Y	26:36:00
Termination SF Inf	02/10/01	5:14	02/11/01	15:46	34:32:00	5946	66	57	0.893	100	Y	---
Termination SF Eff	02/10/01	6:05	02/11/01	12:40	30:35:00	1464	132	104	0.129	100	Y	31:26:00
Lakewood MCTT Inf	02/10/01	5:04	02/12/01	11:42	54:38:00	7706	31	229	0.806	100	Y	---
Lakewood MCTT Eff	02/15/01	8:30	02/15/01	19:25	10:55:00	6425	165	52	0.228	100	Y	134:21:00
Orcas CDS Eff	02/10/01	5:48	02/10/01	15:21	9:33:00	991	37	27	0.590	100	Y	---
Filmore CDS Eff	02/10/01	2:12	02/10/01	13:29	11:17:00	2884	89	32	1.000	100	Y	---
Foothill SG Eff	02/10/01	13:05	02/10/01	23:50	10:45:00	818	30	26	0.098	96	Y	---
Las Flores SG Eff	02/10/01	1:20	02/11/01	10:35	33:15:00	190	5	38	0.022	100	Y	---
Rosemead SG Eff	02/10/01	5:06	02/10/01	20:21	15:15:00	1387	30	39	0.617	100	Y	---
Foothill FF Eff	02/10/01	13:05	02/10/01	23:50	10:45:00	7273	15	33	0.332	94	N	---
Las Flores FF Eff	02/10/01	1:18	02/11/01	10:51	33:33:00	984	15	65	0.346	100	Y	---
Rosemead FF Eff	02/10/01	5:00	02/10/01	14:15	9:15:00	236	5	7	0.209	64	Y	---
Alameda OWS	02/10/01	5:35	02/10/01	14:05	8:30:00	516	N/A	N/A	0.424	N/A	N/A	---
Event 7												
Orcas CDS Eff	02/24/01	11:50	02/28/01	13:59	98:09:00	3425	74	45	0.236	100	Y	---
Filmore CDS Eff	02/24/01	8:32	02/28/01	15:01	102:29:00	10746	175	59	0.498	100	Y	---
Event 8												
I-5/I-605 EDB Inf	03/06/01	0:25	03/07/01	9:00	32:35:00	7276	250	29	0.824	100	Y	---
I-5/I-605 EDB Eff	03/06/01	0:10	03/07/01	9:40	33:30:00	5225	250	20	0.071	100	Y	33:15:00
I-605/SR-91 EDB Inf	03/06/01	0:18	03/06/01	14:36	14:18:00	5878	115	50	0.771	100	Y	---
I-605/SR-91 EDB Eff	03/06/01	2:30	03/07/01	3:00	24:30:00	1053	85	12	0.017	100	Y	26:42:00
Eastern SF Inf	03/06/01	0:38	03/06/01	7:35	6:57:00	1263	55	22	0.198	100	Y	---
Eastern SF Eff	03/06/01	5:55	03/08/01	2:16	44:21:00	1192	112	137	0.105	100	Y	49:38:00
Foothill SF Inf	03/06/01	0:50	03/06/01	14:40	13:50:00	2511	133	18	0.240	100	Y	---
Foothill SF Eff	03/06/01	5:05	03/09/01	23:25	90:20:00	2294	600	70	0.149	100	Y	94:35:00
Termination SF Inf	03/06/01	0:30	03/07/01	2:33	26:03:00	10084	125	86	1.174	100	Y	---
Termination SF Eff	03/05/01	17:25	03/09/01	13:55	92:30:00	2760	500	74	0.129	100	Y	85:25:00
Orcas CDS Eff	03/04/01	17:54	03/06/01	7:02	37:08:00	5035	140	35	0.362	100	Y	---
Filmore CDS Eff	03/04/01	16:14	03/06/01	8:01	39:47:00	11475	250	45	0.828	100	Y	---
Event 9												
Altadena Strip Inf	4/7/2001	0:21	4/7/2001	16:36	16:15:00	6368	60	107	0.432	100	Y	---

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Site/Event	Start Flow Date	Start Flow Time	End Flow Date	End Flow Time	Duration Flow (hours: minutes)	Total Flow (cubic feet)	Volume to Sample (cf)	No. of Sample Alliqouts collected	Peak Flow (cfs)	% Storm Capture	Peak Capture	Detention Time (hrs:min)
Altadena Strip Eff	4/7/2001	1:33	4/7/2001	15:18	13:45:00	5937	60	97	0.430	99	Y	---
I-605/SR-91 Strip Inf	4/7/2001	2:45	04/07/01	9:45	7:00:00	267	23	11	0.085	100	Y	---
I-605/SR-91 Strip Eff	4/7/2001	3:15	4/7/2001	9:00	5:45:00	31	6	5	0.024	97	Y	---
I-605/SR-91 Swale Inf	4/7/2001	2:15	04/07/01	10:51	8:36:00	272	8	28	0.072	93	Y	---
Cerritos Swale Inf	4/7/2001	2:30	4/7/2001	5:26	2:56:00	1156	23	48	0.306	100	Y	---
Cerritos Swale Eff	4/7/2001	2:30	4/7/2001	9:10	6:40:00	357	23	15	0.167	100	Y	---
I-5/I-605 Swale Inf	4/7/2001	0:45	4/7/2001	16:33	15:48:00	937	23	39	0.423	100	Y	---
I-5/I-605 Swale Eff	4/7/2001	4:30	4/7/2001	5:09	0:39:00	220	13	11	0.241	100	Y	---
Carson Swale Inf	4/7/2001	2:36	4/7/2001	10:36	8:00:00	918	9	53	0.253	83	Y	---
I-5/I-605 EDB Inf	4/7/2001	1:20	4/8/2001	6:45	29:25:00	11004	35	286	2.428	100	Y	---
I-5/I-605 EDB Eff	4/7/2001	0:35	4/8/2001	12:00	35:25:00	6119	35	174	0.078	100	Y	34:40:00
I-605/SR-91 EDB Inf	4/7/2001	2:15	4/7/2001	13:57	11:42:00	2755	21	131	0.619	100	Y	---
I-605/SR-91 EDB Eff	4/7/2001	6:55	4/7/2001	23:00	16:05:00	625	7	89	0.015	100	Y	20:45:00
Eastern SF Inf	4/7/2001	0:47	4/7/2001	12:40	11:53:00	2235	13	168	0.221	100	Y	---
Eastern SF Eff	4/7/2001	4:23	4/8/2001	12:09	31:46:00	1872	13	573	0.105	100	Y	35:22:00
Foothill SF Inf	4/7/2001	0:46	4/7/2001	11:27	10:41:00	3120	21	144	0.312	100	Y	---
Foothill SF Eff	4/7/2001	4:50	4/10/2001	14:40	81:50:00	2790	63	629	0.148	100	Y	85:54:00
Termination SF Inf	4/7/2001	1:26	4/7/2001	21:28	20:02:00	13254	46	169	5.949	100	Y	---
Termination SF Eff	4/7/2001	2:10	4/9/2001	13:35	59:25:00	2708	100	251	0.137	100	Y	60:09:00
Via Verde MCTT Inf	4/7/2001	2:00	4/7/2001	13:08	11:08:00	1263	9	121	0.538	100	Y	---
Via Verde MCTT Eff	4/9/2001	14:15	4/9/2001	15:47	1:32:00	551	14	42	0.145	100	Y	61:47:00
Orcas CDS Eff	4/7/2001	3:51	4/7/2001	10:36	6:45:00	1864	27	68	0.473	100	Y	---
Event 10												
Altadena Strip Inf	04/20/01	18:09	04/21/01	0:42	6:33:00	3180	60	52	0.526	100	Y	---
Altadena Strip Eff	04/20/01	19:24	04/21/01	0:45	5:21:00	2483	60	41	0.936	100	Y	---
Foothill SF Inf	04/20/01	19:07	04/20/01	20:42	1:35:00	2112	21	96	0.324	100	Y	---
Foothill SF Eff	04/20/01	21:40	04/23/01	12:00	62:20:00	1891	210	153	0.148	100	Y	64:53:00
Via Verde MCTT Inf	04/20/01	16:21	04/21/01	16:05	23:44:00	1262	18	67	0.583	100	Y	---
Via Verde MCTT Eff	04/23/01	14:12	04/23/01	15:23	1:11:00	440	10	54	0.142	100	Y	71:02:00
Filmore CDS	04/20/01	17:43	04/21/01	2:18	8:35:00	4946	60	68	1.536	96	Y	---

Table 1-4a: Summary of QA/QC Samples

Storm Event	MS/MSD (Composite)	Laboratory Replicate (Composite)	Field Duplicate (Composite)	MS/MSD (Grab)	Laboratory Replicate (Grab)	Field Duplicate (Grab)
10/10/00 - 10/13/00	Cerritos MS Swale - Influent					
10/26/00 - 10/31/00	Lakewood P&R MCTT - Influent Foothill MS Sand Filter - Effluent	Lakewood P&R MCTT -Influent Foothill MS Sand Filter - Effluent	I-605 @ Carson Swale - Influent Foothill MS Sand Filter - Effluent	I-210 Filmore CDS - Effluent	I-210 Filmore CDS - Effluent	I-210 Filmore CDS - Effluent
1/8/01 - 1/10/01	I-605 @ Carson Swale - Influent	I-605 @ Carson Swale - Influent I-5/I-605 EDB - Influent	Lakewood P&R MCTT -Influent	Cerritos MS Swale - Influent Alameda MS Oil/Water Separator - Effluent (O&G)	Cerritos MS Swale - Influent	I-210 Filmore CDS - Influent
1/10/01 - 1/14/01	Via Verde P&R MCTT - Influent	I-605/SR-91 EDB - Influent	Las Flores Fossil Filter - Effluent	I-605/SR-91 Swale - Influent Alameda MS Oil/Water Separator - Influent (O&G) Via Verde P&R MCTT - Effluent I-5/I-605 EDB - Effluent	I-605/SR-91 Swale - Influent Alameda MS Oil/Water Separator - Influent (O&G) I-5/I-605 EDB - Effluent	I-605/SR-91 Swale - Influent
1/24/01 - 1/29/01	Rosemead MS StreamGuard – Effluent Termination P&R Sand Filter - Effluent	Rosemead MS StreamGuard - Effluent		Foothill MS Sand Filter – Influent Alameda MS Oil/Water Separator - Influent (O&G)	Foothill MS Sand Filter – Influent	I-5/I-605 Swale - Influent
2/10/01 - 2/15/01	Lakewood P&R MCTT -Influent	Lakewood P&R MCTT -Influent	I-210 Orcas CDS - Influent			
3/6/01 - 3/9/01	Termination P&R Sand Filter - Effluent	Termination P&R Sand Filter - Effluent				
4/6/01 - 4/10/01	I-5/I-605 EDB - Influent	I-5/I-605 EDB - Influent	Altadena MS Strip - Influent			
4/20/01 - 4/23/01	Via Verde P&R MCTT - Influent Foothill MS Sand Filter - Effluent					

Table 1-4b: Samples Comprised of Less Than Twelve Aliquots

Location	Date	No. of Aliquots	% Storm Capture	Comments	Figure Reference
Rosemead Maintenance Station – Fossil Filter™ DII	10/11/00	8	100	Sample is from first monitored event of the season. Sample results will be used as part of a mass-balance approach in calculating pollutant removal efficiency. Sample aliquots are well distributed across the hydrograph. Recommend accepting sample without qualification.	1-24a
Termination Park & Ride Sand Filter - Effluent	10/29/00	216	5	Pump failed during storm. Effluent sample was sent to laboratory for analysis prior to second storm event commingling with first storm event. Consequently, sample is not considered representative. Laboratory data not used in calculating efficiencies.	1-14a
I-605 @ Carson Biofiltration Swale – Effluent	1/8/01	9	100	Sample aliquots are well distributed across the hydrograph. Paired sample met minimum % storm capture and minimum number of aliquots. Recommend accepting sample without qualification.	1-9c
Rosemead Maintenance Station – Fossil Filter™ DII	211/00	7	64	Sample results will be used as part of a mass-balance approach in calculating pollutant removal efficiency. Sample aliquots are well distributed across the hydrograph. Recommend accepting sample without qualification.	1-24e
I-210 East of Orcas Avenue CDS Unit – Influent and Effluent	1/12/01	72, 100	0,0	Samples were sent to the laboratory for analysis. Upon review off flow data, flow meter failed during the storm event. Consequently, sample is not considered representative. Laboratory data not used in calculating efficiencies.	Not prepared
I-605/SR-91 Extended Detention Basin – Effluent	1/25/01	8	100	Sample aliquots are well distributed across the hydrograph. Paired sample met minimum % storm capture and minimum number of aliquots. Recommend accepting sample without qualification.	1-11d
I-605/SR-91 Biofiltration Strip – Influent, Effluent	4/7/01	11, 5	100, 97	Sample aliquots are well distributed across the hydrograph. Number of sample aliquots near minimum required. Paired sample met minimum % storm capture. Recommend accepting sample without qualification.	1-5e
I-5/I-605 Biofiltration Swale – Effluent	4/7/01	11	100	Sample aliquots are well distributed across the hydrograph. Number of sample aliquots near minimum required. Paired sample met minimum % storm capture and minimum number of aliquots. Recommend accepting sample without qualification.	1-8e

Table 1-4c: Analytical Methods and Reporting Limits

Stormwater Matrix			
Analyte	**Sample Type**	**Analytical Method**	**Reporting Limit**
Conventionals			
pH	Grab[1,2]/Composite	EPA 150.1	0.1 pH units
Specific Conductance	Grab[1,2]/Composite	EPA 120.1	1.0 umhos/cm
Hardness	Grab[1,2]/Composite	EPA 130.2	2 mg/L
Total Suspended Solids (TSS)	Grab[1,2]/Composite	EPA 160.2	1 mg/L
Total Dissolved Solids (TDS)	Grab[1]/Composite	EPA 160.1	1 mg/L
Turbidity	Composite	EPA 180.1	0.05 NTU
Total Organic Carbon (TOC)	Grab[1]/Composite	EPA 415.1	1 mg/L
Dissolved Organic Carbon (DOC)	Grab[1]/Composite	EPA 415.1	1 mg/L
Particle Size	Composite	Liquid Particle Counter	2 um
Nutrients			
Nitrate-N	Grab[1]/Composite	EPA 300	0.01 mg/L
Total Kjeldahl Nitrogen (TKN)	Grab[1]/Composite	EPA 351.3	0.1 mg/L
Total Phosphorus	Grab[1]/Composite	EPA 365.2	0.002 mg/L
Ammonia	Composite	EPA 350.2	0.1 mg/L
Dissolved Orhto-Phosphate	Grab[1]/Composite	EPA 365.2	0.03 mg/L
Total/Dissolved Metal			
Arsenic	Grab[1]/Composite	EPA 200.8	0.5 ug/L
Cadmium	Grab[1]/Composite	EPA 200.8	0.2 ug/L
Chromium	Grab[1]/Composite	EPA 200.8	1 ug/L
Copper	Grab[1]/Composite	EPA 200.8	1 ug/L
Lead	Grab[1]/Composite	EPA 200.8	1 ug/L
Nickel	Grab[1]/Composite	EPA 200.8	2 ug/L
Zinc	Grab[1]/Composite	EPA 200.8	1 ug/L
Organics			
TPH-diesel	Grab[1,2]/Composite[3]	EPA 8015M	250 ug/L
TPH-oil	Grab[1,2]/Composite[3]	EPA 8015M	200 ug/L
TPH-gasoline	Grab[1,2]/Composite[3]	EPA 8015M	50 ug/L
Oil & Grease	Grab[2]	EPA 1664	1 mg/L
Volatile Organic Compounds	Grab[1]	EPA 8260	1 ug/L
Bacteria			
Fecal Coliform	Grab	SM 9221	2 MPN/100 mL

Table 1-4c: Analytical Methods and Reporting Limits (concluded)

Sediment, Soil and Solid[4] Matrices			
Analyte	**Sample Type**	**Analytical Method**	**Reporting Limit**
Organics			
Total Recoverable Hydrocarbons (TRPH)	Composite	EPA 418.1(IR)/ 1664HEM	10 mg/kg
Organic Matter Content	Composite	ASTM D 2974 (Methods A & C)	0.1 %
Total Metals			
Copper	Composite	EPA 6020	2.5 mg/kg
Lead	Composite	EPA 6020	0.3 mg/kg
Zinc	Composite	EPA 6020	2.0 mg/kg
Particle Size Distribution[5]			
Sieve Analysis	Composite	Caltrans Test 202	---
Hydrometer Test	Composite	Caltrans Test 203	---
Sediment and Waste Matrix (Disposal)			
Organics			
Total Recoverable Petroleum Hydrocarbons (TRPH)	Composite	EPA 418.1	10 mg/kg
Volatile Organic Compounds	Composite	EPA 8260B	SW-846[9] Requirements
Total Metals			
California Code of Regulations (CCR), Title 22 Metals[6]	Composite	EPA 6020/ 7471	SW-846[9] Requirements
California Code of Regulations (CCR), Title 22 Waste Extraction Test (WET) Metals[7]	Composite	STLC Extraction	SW-846[9] Requirements
Toxicity Characteristic Leaching Procedure (TCLP) Metals[8]	Composite	TCLP 1311	SW-846[9] Requirements

1 Grab samples of CDS sumps were analyzed for this analyte.

2 Grab samples from influent and effluent of Alameda Maintenance Station Oil/Water Separator.

3 Composite samples of effluent from DIIs were analyzed for TPH (diesel, oil, and gasoline).

4 Solid matrices for DIIs include StreamGuard™ fabric and absorbent, and Fossil Filter™ adsorbent. Sediment.

5 Particle size distribution test is for Sand Filter sand and sediment and Infiltration Basin soil and sediment.

6 California Code of Regulations (CCR), Title 22 Metals (Sb, As, Ba, Be, Cd, Cr (total), Co, Cu, Hg, Pb, Mo, Ni, Se, Ag, Tl, V, and Zn). Initial waste characterization results may lead to a shorter list of metals for subsequent sediment disposal.

7 Any sample for total metals that are below the Total Threshold Limit Concentration [TTLC] but exceed the the ten times Soluble Threshold Limit Concentration (STLC) will be further analyzed using the WET procedure. WET extracts will be analyzed only for metals which exceed the ten times STLC criteria. Sediments associated with total metal results that exceed TTLC values are automatically considered hazardous and therefore do not need to undergo the WET procedure.

8 If any of the WET-soluble concentrations are equal to or greater than the TCLP regulatory thresholds, then analysis of the waste by TCLP may be required.

9 “Test Methods for Evaluating Solid Waste, Physical /Chemical Methods”. SW-846, Update III. (SW-846).

Table 1-5a: BMP Retrofit Pilot Study, Stormwater Laboratory Data - District 7

													Total (ug/L)							Dissolved (ug/L)						
Sample Date	BMP Location	Site ID	BMP Type	Sampling Location	% Storm Capture	pH	Specific Conductance (umhos/cm)	Hardness (mg/L)	TDS (mg/L)	TSS (mg/L)	DOC (mg/L)	TOC (mg/L)	As	Cd	Cr	Cu	Pb	Ni	Zn	As	Cd	Cr	Cu	Pb	Ni	Zn
Event 1																										
October 11, 2000	I-605/SR-91	073222a	Biofiltration Strip	Influent	79	7.1	218	76	216	132	51	60	4.9	3.0	15.5	107	220	31.6	687	3.0	3.0	7.0	94	203	26.5	658
October 11, 2000	I-605/SR-91	073222a	Biofiltration Strip	Effluent	NA; No effluent flow; no sample																					
October 10, 2000	I-605/SR-91	073222b	Biofiltration Swale	Influent	87	6.9	276	90	262	112	71	75	16.6	2.5	13.8	101	103	32	1093	15.9	1.5	7.3	66	22	29	755
October 10, 2000	I-605/SR-91	073222b	Biofiltration Swale	Effluent	NA; No effluent flow; no sample																					
October 11, 2000	Cerritos Maintenance Station	073223	Biofiltration Swale	Influent	90	7.6	300	90	310	142	72	90	13.3	2.5	14.6	154	294	35	959	9.1	1.0	8.7	71	43	25	415
October 11, 2000	Cerritos Maintenance Station	073223	Biofiltration Swale	Effluent	NA; No effluent flow; no sample																					
October 11, 2000	I-605 @ Carson	073225	Biofiltration Swale	Influent	100	7.8	257	80	244	474	48	58	9.2	8.3	39	232	2086	69	1542	6.0	4.6	4.4	80	414	21	498
October 11, 2000	I-605 @ Carson	073225	Biofiltration Swale	Effluent	NA; No effluent flow; no sample																					
October 11, 2000	I-105/Lakewood Boulevard Park & Ride	074208	Multi-Chambered Treatment Train	Influent	100	4.6	134	49	144	56	51	52	4.8	0.7	1.7	38	15.3	20.1	627	3.9	0.7	1U	33	7.2	18.1	601
October 13, 2000	I-105/Lakewood Boulevard Park & Ride	074208	Multi-Chambered Treatment Train	Effluent	100	7.4	264	80	282	21	79	81	3.2	1.5	3.0	31	4.8	22	356	2.3	1.0	2.5	23	2.3	19	294
October 11, 2000	Rosemead Maintenance Station	073218	Drain Inlet Insert - StreamGuard	Effluent	100	6.8	200	91	85	248	79	84	6.7	4.1	8.6	90	50	35	1250	5.7	2.8	2.5	66	10.2	33	919
October 11, 2000	Rosemead Maintenance Station	073218	Drain Inlet Insert - Fossil Filter	Effluent	100	7.4	142	56	83	150	44	45	14.1	0.8	13.6	88	55	14.8	1070	12.1	0.4	7.7	60	10.5	13.6	665
Event 2																										
October 27, 2000	Altadena Maintenance Station	073211	Biofiltration Strip	Influent	100	7.0	74	32	57	121	21	23	6.8	0.9	8.6	27	41	10	268	0.7	0.2	1.6	12	2.9	4.3	131
October 27, 2000	Altadena Maintenance Station	073211	Biofiltration Strip	Effluent	100	6.9	116	34	98	24	32	32	5.4	0.4	3.0	15	11	4.3	91	0.7	0.4	2.9	12	2.2	4.0	71
October 27, 2000	I-605/SR-91	073222a	Biofiltration Strip	Influent	100	7.2	51	23	24	88	9.5	10.0	0.9	0.4	1.9	15	30	3.8	101	0.6	0.3	1.5	12	12	3.1	79
October 27, 2000	I-605/SR-91	073222a	Biofiltration Strip	Effluent	100	7.0	190	34	124	62	30	30	2.5	0.4	1.7	15	4.1	2.8	137	0.5	0.4	1.5	14	1.4	2.5	126
October 27, 2000	I-605/SR-91	073222b	Biofiltration Swale	Influent	100	7.4	71	30	78	67	12.4	13.8	9.4	1.0	7.6	33	75	8.6	371	0.9	0.4	4.0	16	12	5.7	173
October 27, 2000	I-605/SR-91	073222b	Biofiltration Swale	Effluent	96	7.4	185	22	146	33	23	23	5.0	0.7	3.7	23	12	7.3	123	0.8	0.6	1.3	18	3.0	5.3	82
October 27, 2000	Cerritos Maintenance Station	073223	Biofiltration Swale	Influent	90	7.6	108	49	73	135	18.1	22	10.1	1.8	13.2	80	203	15	542	8.5	0.5	2.6	26	38	5.9	136
October 27, 2000	Cerritos Maintenance Station	073223	Biofiltration Swale	Effluent	100	7.6	72	22	77	54	12.9	19.9	4.5	0.2	1.8	16	20	3.0	75	0.6	0.2U	1.1	12	7.5	2.4	53
October 27, 2000	I-5/I-605 Intersection	073224	Biofiltration Swale	Influent	99	7.0	59	22	102	83	10.4	12.4	1.5	1.3	6.3	40	113	9.3	288	0.5U	0.4	1.2	15	18	4.3	113
October 27, 2000	I-5/I-605 Intersection	073224	Biofiltration Swale	Effluent	100	7.1	45	12	58	22	9.7	10.5	0.5	0.2	1.5	12	17	23	56	0.5U	0.2U	1U	9.9	6.7	1.9J	42
October 27, 2000	I-605 @ Carson	073225	Biofiltration Swale	Influent	95	8.0	78	35	62	84	10.4	12.7	2.8	1.5	9.6	46	371	13	249	0.5U	0.4	6.5	16.0	64	6.5	50
October 27, 2000	I-605 @ Carson	073225	Biofiltration Swale	Effluent	98	7.5	102	40	120	24	12.9	16.9	3.0	0.4	9.2	21	102	4.7	76	0.5U	0.3	4.2	15	43	3.4	42
October 27, 2000	I-5/I-605 Intersection	074101	Extended Detention Basin	Influent	100	7.0	75	30	55	132	10.0	13.2	3.4	1.3	9.5	54	269	12	489	0.5U	0.3	2.0	16	23	4.2	128
October 28, 2000	I-5/I-605 Intersection	074101	Extended Detention Basin	Effluent	100	7.0	49	19	23	13	8.5	8.8	2.1	0.7	3.9	11	32J	3.6	78	1.6	0.4	3.0	9.5	26J	3.1	62
October 27, 2000	I-605/SR-91 Interchange	074102	Extended Detention Basin	Influent	100	6.8	83	27	98	61	9.2	10.0	1.7	0.6	4.2	22	51	5.7	161	0.5U	0.2U	1.4	9.1	4.0	2.6	56
October 29, 2000	I-605/SR-91 Interchange	074102	Extended Detention Basin	Effluent	100	7.8	85	30	44	24	7.6	8.9	1.9	0.4	3.4	18	34J	4.9	96	0.5U	0.2	1.9	12	5.8J	3.2	59
October 27, 2000	Eastern Regional Maintenance Station	074202	Sand Filter	Influent	100	6.8	22	9	44	44	9.5	10.0	1.7	0.5	7.9	13	30	4.4	137	0.5U	0.2U	1U	5.1	2.1	1.7J	66
October 27, 2000	Eastern Regional Maintenance Station	074202	Sand Filter	Effluent	NA; Pump failure; no sample																					
October 27, 2000	Foothill Maintenance Station	074203	Sand Filter	Influent	100	6.7	62	27	40	57	16.9	17.1	17	0.9	3.8	23	28	5.4	448	14	0.5	1.6	14	5.2	2.8	362
October 29, 2000	Foothill Maintenance Station	074203	Sand Filter	Effluent	100	7.0	150	53	105	11	20	20	18	0.4	2.5	31	5.7J	4.7	93	18	0.3	2.4	30	5.7J	4.6	92
October 27, 2000	Termination P&R	074204	Sand Filter	Influent	100	6.4	32	8	20	78	10.0	11.1	1.3	0.4	4.9	23	19	7.5	190	0.5U	0.2U	3.3	7.4	1.3	2.9	72
October 29, 2000	Termination P&R	074204	Sand Filter	Effluent	5	7.1	98	31	99	6	17.5	18.6	2.5	0.2	1.6	23	2.1J	9.0	103	0.5U	0.2U	1U	22	1.7J	9.0	98
October 27, 2000	Via Verde P&R	074206	Multi-Chambered Treatment Train	Influent	100	6.7	37	9	40	22	14.7	15.2	0.5U	0.2U	1U	7.7	2.9	4.4	129	0.5U	0.2U	1U	6.9	1.7	4.0	118
October 29, 2000	Via Verde P&R	074206	Multi-Chambered Treatment Train	Effluent	100	8.0	122	36	108	12	14.0	14.9	1.8	0.2	1.9	14	2.7J	5.0	30	0.5U	0.2U	1U	13	2J	2.9	28
October 27, 2000	I-105/Lakewood Boulevard Park & Ride	074208	Multi-Chambered Treatment Train	Influent	100	6.5	24	5	52	34	7.9	17.0	1.0	0.2	2.1	12	8.1	4.9	151	1.0	0.2	2.0	12	8.0	4.8	148
October 31, 2000	I-105/Lakewood Boulevard Park & Ride	074208	Multi-Chambered Treatment Train	Effluent	100	7.3	95	35	76	8	14.7	15.4	2.0	0.3	1U	8	1J	6.5	57	0.5U	0.2U	1U	8	1UJ	5.7	47
October 27, 2000	I-210/East of Filmore Street	073103	Continuous Deflective Separation	Influent	100	7.5	68	28	67	58	16.9	17.2	0.9	0.6	4.0	20	19	6.1	201	0.5U	0.3	1.6	8.9	4.3	3.4	84
October 27, 2000	I-210/East of Filmore Street	073103	Continuous Deflective Separation	Effluent	100	8.0	55	23	58	57	8.9	12.3	0.6	0.6	4.6	20.2	21	5.4	176	0.5U	0.2U	1.0	6.4	3.2	2.1	44
October 27, 2000	Foothill Maintenance Station	073216	Drain Inlet Insert - StreamGuard	Effluent	100	7.0	75	21	52	8	23	23	2.9	0.5	2.1	30	6.0	10.4	406	2.9	0.4	1U	29	2.1	9.8	391
October 27, 2000	Las Flores Maintenance Station	073217	Drain Inlet Insert - StreamGuard	Effluent	100	6.4	98	32	76	22	16.7	18.2	2.2	0.9	3.5	15.7	5.9	6.0	123	0.5U	0.6	2.1	14	1.7	4.4	108
October 27, 2000	Rosemead Maintenance Station	073218	Drain Inlet Insert - StreamGuard	Effluent	100	7.1	59	23	48	51	14.9	17.1	7.4	1.5	4.4	35	25	9.9	342	1.0	1.1	2.2	27	7.1	7.3	300
October 27, 2000	Foothill Maintenance Station	073216	Drain Inlet Insert - Fossil Filter	Effluent	97	7.1	118	44	72	24	22	23	5.8	0.6	6.7	27	5.1	9.0	494	0.9	0.5	4.9	27	2.0	9.0	470
October 27, 2000 (A)	Las Flores Maintenance Station	073217	Drain Inlet Insert - Fossil Filter	Effluent	100	6.8	73	20	60	154	14.2	15.2	2.8	1.4	8.7	25	16	12	369	0.5U	0.6	3.0	13	1.4	5.7	190
October 27, 2000 (B)	Las Flores Maintenance Station	073217	Drain Inlet Insert - Fossil Filter	Effluent	100	6.8	70	21	36	207	13.9	15.4	3.3	2.2	5.7	24	7.2	8.2	191	0.5U	0.5	2.8	16	1.6	5.2	159
October 27, 2000	Rosemead Maintenance Station	073218	Drain Inlet Insert - Fossil Filter	Effluent	90	7.0	68	25	36	42	10.8	12.0	12	0.4	8.9	45	25	4.9	522	12	0.2	2.7	29	6.2	2.9	397
October 26, 2000	Alameda Maintenance Station	074201	Oil/Water Separator	Influent	NA	7.7	257	83		73																
October 26, 2000	Alameda Maintenance Station	074201	Oil/Water Separator	Effluent	NA	7.4	304	94		25																

Table 1-5a: BMP Retrofit Pilot Study, Stormwater Laboratory Data - District 7

Sample Date	BMP Location	Site ID	BMP Type	Sampling Location	% Storm Capture	Zn	Nitrate-Nitrogen (mg/L)	TKN (mg/L)	Total P (mg/L)	Diss Orthophosphate (mg/L)	Ammonia (mg/L)	Turbidity NTU	Fecal Coliform (MPN/ 100 ml)	TPH - Diesel (ug/L)	TPH - Oil (ug/L)	TPH - Gasoline (ug/L)	Oil and Grease (mg/L)
Event 3																	
January 8, 2001	I-605/SR-91	073222b	Biofiltration Swale	Influent	98	375	2.14J	5.43	0.23	0.12J							
January 8, 2001	I-605/SR-91	073222b	Biofiltration Swale	Effluent	NA; No effluent f												
January 8, 2001	Cerritos Maintenance Station	073223	Biofiltration Swale	Influent	100	389	4.38J	6.94	0.54	0.44J			17000	250U	960	50U	
January 8, 2001	Cerritos Maintenance Station	073223	Biofiltration Swale	Effluent	100	259	16.9J	6.10	0.20	0.47J			5000	762	3941	50U	
January 8, 2001	I-5/I-605 Intersection	073224	Biofiltration Swale	Influent	100	285	3.14J	9.95	0.17	0.14J							
January 8, 2001	I-5/I-605 Intersection	073224	Biofiltration Swale	Effluent	NA; No effluent f												
January 8, 2001	I-605 @ Carson	073225	Biofiltration Swale	Influent	97	192	1.93J	5.95	0.18	0.1J			13000	250U	1269	50U	
January 8, 2001	I-605 @ Carson	073225	Biofiltration Swale	Effluent	100	186	3.17J	6.15	2.24	0.96J			160000	250U	1423	50U	
January 9, 2001	I-5/I-605 Intersection	074101	Extended Detention Basin	Influent	100	319	3.58	8.78	2.62	0.46			11000	250U	1518	50U	
January 9, 2001	I-5/I-605 Intersection	074101	Extended Detention Basin	Effluent	100	222	4.06	7.81	0.58	0.07			50000	250U	1308	50U	
January 8, 2001	I-605/SR-91 Interchange	074102	Extended Detention Basin	Influent	100	539	1.40	7.76	0.30	0.22			50000	250U	1545	50U	
January 8, 2001	I-605/SR-91 Interchange	074102	Extended Detention Basin	Effluent	NA; Grab sample								3400	277	4366	50U	
January 8, 2001	Termination P&R	074204	Sand Filter	Influent	NA; Pump failure								3000	250U	1529	50U	
January 8, 2001	Termination P&R	074204	Sand Filter	Effluent	NA; Pump failure								2300	250U	1367	50U	
January 8, 2001	Via Verde P&R	074206	Multi-Chambered Treatment Train	Influent	NA; BMP leaked								1300	250U	1810	50U	
January 8, 2001	Via Verde P&R	074206	Multi-Chambered Treatment Train	Effluent	NA; BMP leaked												
January 8, 2001	I-105/Lakewood Boulevard Park & Ride	074208	Multi-Chambered Treatment Train	Influent	100	190	1.49	5.76	0.30	0.24	3.52	3.94	240	250U	1059	50U	
January 10, 2001	I-105/Lakewood Boulevard Park & Ride	074208	Multi-Chambered Treatment Train	Transfer Pump	100	125						0.66J					
January 10, 2001	I-105/Lakewood Boulevard Park & Ride	074208	Multi-Chambered Treatment Train	Effluent	100	38	1.43J	2.46	0.27	0.14J	1.1	1.1J	2300	250U	1012	50U	
January 8, 2001	I-210/East of Filmore Street	073103	Continuous Deflective Separation	Influent	NA; Grab sample								14000	250U	2658	50U	
January 8, 2001	I-210/East of Filmore Street	073103	Continuous Deflective Separation	Effluent	NA; Grab sample								30000	250U	2611	50U	
January 8, 2001	Las Flores Maintenance Station	073217	Drain Inlet Insert - Fossil Filter	Effluent	100	451	2.32J	6.42	0.36	0.23J				250U	1597	50U	
January 8, 2001	Alameda Maintenance Station	074201	Oil/Water Separator	Influent	NA									250U	1406	50U	7
January 8, 2001	Alameda Maintenance Station	074201	Oil/Water Separator	Effluent	NA									250U	1184	50U	1U
Event 4																	
January 12, 2001	Altadena Maintenance Station	073211a	Biofiltration Strip	Influent	99	44	0.21	0.21	0.15	0.06			900	526	3603	50U	
January 12, 2001	Altadena Maintenance Station	073211a	Biofiltration Strip	Effluent	100	23	0.21	0.75	0.26	0.14			2300	250U	1350	50U	
January 12, 2001	I-605/SR-91	073222a	Biofiltration Strip	Influent	87	60	0.39	1.27	0.17	0.03U			5000	250U	1207	50U	
January 12, 2001	I-605/SR-91	073222a	Biofiltration Strip	Effluent	85	35	0.96	1.58	2.00	0.84			2300	250U	1107	50U	
January 12, 2001	I-605/SR-91	073222b	Biofiltration Swale	Influent	98	75	0.28	0.80	0.18	0.03U			500	250U	1159	50U	
January 11, 2001	I-605/SR-91	073222b	Biofiltration Swale	Effluent	97	44	0.93J	2.82	2.17	1.2J			8000	250U	1117	50U	
January 12, 2001	Cerritos Maintenance Station	073223	Biofiltration Swale	Influent	100	94	0.40	1.25	0.19	0.05							
January 12, 2001	Cerritos Maintenance Station	073223	Biofiltration Swale	Effluent	100	21	0.67J	0.88	0.49	0.07J							
January 12, 2001	I-5/I-605 Intersection	073224	Biofiltration Swale	Influent	98	76	0.43	0.93	0.23	0.08			3400	250U	1575	50U	
January 12, 2001	I-5/I-605 Intersection	073224	Biofiltration Swale	Effluent	97	84	0.34	1.24	0.18	0.06			2300	250U	1336	50U	
January 12, 2001	I-605 @ Carson	073225	Biofiltration Swale	Influent	99	48	0.49	1.15	0.16	0.03U							
January 12, 2001	I-605 @ Carson	073225	Biofiltration Swale	Effluent	92	39	0.73	1.06	0.40	0.23							
January 12, 2001	I-5/I-605 Intersection	074101	Extended Detention Basin	Influent	100	54	0.34	0.81	0.16	0.03U			5000	250U	1240	50U	
January 14, 2001	I-5/I-605 Intersection	074101	Extended Detention Basin	Effluent	100	23	0.53	0.45	0.35	0.18			1600	250U	1675	50U	
January 12, 2001	I-605/SR-91 Interchange	074102	Extended Detention Basin	Influent	100	117	0.84	0.68	0.18	0.03U							
January 12, 2001	I-605/SR-91 Interchange	074102	Extended Detention Basin	Effluent	NA; Flow meter f												
January 12, 2001	Eastern Regional Maintenance Station	074202	Sand Filter	Influent	100	29	0.45	1.52	0.32	0.03U	0.4		800	250U	1434	50U	
January 14, 2001	Eastern Regional Maintenance Station	074202	Sand Filter	Effluent	100	21	0.38	0.59	0.13	0.03U	0.1U		2300	250U	200U	50U	
January 11, 2001	Foothill Maintenance Station	074203	Sand Filter	Influent	100	130	0.26J	1.61	0.18	0.07J	0.3		8000	250U	2551	50U	
January 10, 2001	Foothill Maintenance Station	074203	Sand Filter	Effluent	NA; Pump failure								11000	250U	1131	50U	
January 11, 2001	Via Verde P&R	074206	Multi-Chambered Treatment Train	Influent	100	47	0.15J	1.28	0.22	0.09J	0.7	1.65J	300	250U	200U	50U	
January 14, 2001	Via Verde P&R	074206	Multi-Chambered Treatment Train	Transfer Pump	100	95						1.17					
January 14, 2001	Via Verde P&R	074206	Multi-Chambered Treatment Train	Effluent	100	15	0.53	0.62	0.29	0.14	0.6	6.29	1100	250U	200U	50U	
January 10, 2001	I-105/Lakewood Boulevard Park & Ride	074208	Multi-Chambered Treatment Train	Influent	100	53	0.20	1.20	0.20	0.04	0.7	3.31					
January 13, 2001	I-105/Lakewood Boulevard Park & Ride	074208	Multi-Chambered Treatment Train	Transfer Pump	100	96						2.71					
January 13, 2001	I-105/Lakewood Boulevard Park & Ride	074208	Multi-Chambered Treatment Train	Effluent	100	26	0.66J	1.23	0.22	0.08J	0.5	1.93					
January 12, 2001	I-210/East of Orcas Avenue	073102	Continuous Deflective Separation	Influent	0, Flow meter fai	94	0.61	1.60	0.17	0.03U			13000	250U	1618	50U	
January 12, 2001	I-210/East of Orcas Avenue	073102	Continuous Deflective Separation	Effluent	0, Flow meter fai	114	0.43	2.01	0.14	0.07			11000	250U	1363	50U	
January 17, 2001	I-210/East of Orcas Avenue	073102	Continuous Deflective Separation	Sump	NA	1146	0.01U	11.8	0.19	0.07			>=160000	250U	200U	50U	
January 12, 2001	I-210/East of Filmore Street	073103	Continuous Deflective Separation	Influent	100	89	0.58	1.42	0.19	0.07			2300	250U	1,152	50U	
January 12, 2001	I-210/East of Filmore Street	073103	Continuous Deflective Separation	Effluent	100	70	0.57	0.22	0.18	0.09			300	250U	200U	50U	
January 17, 2001	I-210/East of Filmore Street	073103	Continuous Deflective Separation	Sump	NA	82	0.01U	13.0	0.10	0.03U			900	250U	200U	50U	
January 12, 2001	Foothill Maintenance Station	073216	Drain Inlet Insert - StreamGuard	Effluent	100	128	0.44	1.32	0.15	0.03U				250U	200U	50U	
January 12, 2001	Las Flores Maintenance Station	073217	Drain Inlet Insert - StreamGuard	Effluent	100	50	0.28	0.24	0.14	0.04				250U	200U	50U	
January 12, 2001	Rosemead Maintenance Station	073218	Drain Inlet Insert - StreamGuard	Effluent	100	126	0.52	1.48	0.56	0.06				250U	200U	50U	
January 12, 2001	Foothill Maintenance Station	073216	Drain Inlet Insert - Fossil Filter	Effluent	92	110	0.44	1.07	0.17	0.03U				250U	200U	50U	
January 12, 2001	Las Flores Maintenance Station	073217	Drain Inlet Insert - Fossil Filter	Effluent	100	39	0.69	0.80	0.20	0.04				250U	200U	50U	
January 12, 2001	Rosemead Maintenance Station	073218	Drain Inlet Insert - Fossil Filter	Effluent	100	194	0.67	1.60	0.20	0.07				250U	200U	50U	
January 10, 2001	Alameda Maintenance Station	074201	Oil/Water Separator	Influent	NA												14
January 10, 2001	Alameda Maintenance Station	074201	Oil/Water Separator	Effluent	NA												1U

Table 1-5a: BMP Retrofit Pilot Study, Stormwater Laboratory Data - District 7

Sample Date	BMP Location	Site ID	BMP Type	Sampling Location	% Storm Capture	pH	Specific Conductance (umhos/cm)	Hardness (mg/L)	TDS (mg/L)	TSS (mg/L)	DOC (mg/L)	TOC (mg/L)	As	Cd	Cr	Cu	Pb	Ni	Zn	As	Cd	Cr	Cu	Pb	Ni
Event 5																									
January 24, 2001	Altadena Maintenance Station	073211a	Biofiltration Strip	Influent	100	7.4	8	12	36	47	11	17	2.1	0.3	2.9	11	17	2.9	108	2.0	0.2U	1U	6.1	2.6	2U
January 24, 2001	Altadena Maintenance Station	073211a	Biofiltration Strip	Effluent	100	7.1	9.7	18	36	20	13	23	1.5	0.2U	2.2	6.9	8.0	2U	52	1.2	0.2U	1U	5.3	1.8	2U
January 24, 2001	I-605/SR-91	073222b	Biofiltration Swale	Influent	100	7.5	17	40	90	61	17	25	5.0	0.8	6.6	36	36	7.4	261	4.1	0.4	2.5	19	5.1	4.5
January 24, 2001	I-605/SR-91	073222b	Biofiltration Swale	Effluent	NA; No effluent flow; no sample																				
January 24, 2001	Cerritos Maintenance Station	073223	Biofiltration Swale	Influent	100	7.4	34	60	136	162	48	53	6.9	1.9	12	113	111	16	604	5.0	0.4	5.0	72	14	9.0
January 24, 2001	Cerritos Maintenance Station	073223	Biofiltration Swale	Effluent	NA; No effluent flow; no sample																				
January 24, 2001	I-5/I-605 Intersection	073224	Biofiltration Swale	Influent	100	7.4	20	35	66	63	14	30	1.6	1.3	7.0	54	122	9.4	313	1.1	0.5	1.9	26	23	4.8
January 24, 2001	I-5/I-605 Intersection	073324	Biofiltration Swale	Effluent	NA; Grab sample only; not enough flow for composite sample																				
January 24, 2001	I-605 @ Carson	073225	Biofiltration Swale	Influent	100	7.6	25	46	120	119	7.3	25	2.6	1.3	11	57	217	14	273	2.6	0.6	4.5	29	57	7.7
January 24, 2001	I-605 @ Carson	073225	Biofiltration Swale	Effluent	95	7.5	29	53	92	26	23	25	2.3	0.4	4.3	21	43	4.3	76	2.2	0.3	3.2	18	19	3.7
January 25, 2001	I-5/I-605 Intersection	074101	Extended Detention Basin	Influent	100	6.6	20	51	42	164	11	15	2.0	0.4	3.8	18	31	116	4.6	2.0	0.2	1.0	9.4	4.0	2.3
January 25, 2001	I-5/I-605 Intersection	074101	Extended Detention Basin	Effluent	100	6.8	20	33	48	39	14	19	1.9	0.4	2.7	16	26	4.0	108	1.5	0.2U	1U	2.6	1.1	1.2
January 25, 2001	I-605/SR-91 Interchange	074102	Extended Detention Basin	Influent	100	7.0	42	78	102	165	11	26	3.9	1.2	8.8	59	128	12	550	3.7	0.7	2.5	28	9.2	6.7
January 25, 2001	I-605/SR-91 Interchange	074102	Extended Detention Basin	Effluent	100	7.2	27	48	44	36	30	32	1.7	0.8	3.9	29	39	5.7	166	0.9	0.6	2.6	24	11	5.2
January 25, 2001	Eastern Regional Maintenance Station	074202	Sand Filter	Influent	100	6.8	11	28	14	65	10	20	3.0	1.0	7.5	23	24	4.2	274	2.8	0.6	1.8	17	4.9	2.6
January 29, 2001	Eastern Regional Maintenance Station	074202	Sand Filter	Effluent	100	8J	62	30	46	13	15	19	2.5	0.5	2.9	21	7.1	3.2	89	2.3	0.5	1.2	19	2.7	2.6
January 25, 2001	Foothill Maintenance Station	074203	Sand Filter	Influent	100	6.9	9	29	32	128	14	14	5.4	0.7	4.3	20	46	4.6	274	5.0	0.3	1.0	9.2	5.4	1.8
January 29, 2001	Foothill Maintenance Station	074203	Sand Filter	Effluent	100	7.8J	79	40	44	9	16	20	5.4	0.2U	1U	12	3.1	2.1	60	5.1	0.2U	1U	11	1.4	2U
January 24, 2001	Termination P&R	074204	Sand Filter	Influent	100	6.7	20	19	36	20	8.5	14	0.8	0.3	1.5	16	1.9	4.2	88	0.7	0.3	1.5	14	1.0	4.1
January 27, 2001	Termination P&R	074204	Sand Filter	Effluent	100	7.6J	54	34	36	6	9	14	0.6	0.2	1.0	11	1.0	3.8	162	0.6	0.2	1U	10	1U	3.5
January 24, 2001	I-105/Lakewood Boulevard Park & Ride	074208	Multi-Chambered Treatment Train	Influent	100	7.0	7	25	12	56	12	15	0.7	0.2	1.2	11	3.0	4.6	107	0.7	0.2	1.2	9.4	1.5	4.3
January 25, 2001	I-105/Lakewood Boulevard Park & Ride	074208	Multi-Chambered Treatment Train	Transfer Pump	100				10	8			0.7	0.2	1U	8.3	1U	4.7	94	0.5	0.2	1U	6.9	1U	4.7
January 25, 2001	I-105/Lakewood Boulevard Park & Ride	074208	Multi-Chambered Treatment Train	Effluent	100	6.8	13	24	30	8	11	14	0.8	0.2U	1U	6.5	1U	2.7	43	0.7	0.2U	1U	6.2	1U	2.6
January 24, 2001	I-210/East of Filmore Street	073103	Continuous Deflective Separation	Influent	100	7.5	15	35	118	41	8.6	12	3.2	0.6	4.5	26	18	5.4	178	3.1	0.3	2.3	16	4.2	3.9
January 24, 2001	I-210/East of Filmore Street	073103	Continuous Deflective Separation	Effluent	94	7.5	13	25	24	5.5	8.7	13	1.0	0.8	5.5	27	18	5.5	187	1.0	0.3	1.8	11	3.0	2.9
January 24, 2001	Foothill Maintenance Station	073216	Drain Inlet Insert - StreamGuard	Effluent	100	7.2	61	15	38	4	8.3	8.8	1.2	0.2	1.1	14	3.9	2.8	137	1.0	0.2U	1U	11	1.8	2.4
January 24, 2001	Las Flores Maintenance Station	073217	Drain Inlet Insert - StreamGuard	Effluent	100	7.2	31	53	88	41	26	31	2.9	0.8	4.5	16	2.4	5.3	59	2.9	0.8	3.6	15	1.1	4.5
January 24, 2001	Rosemead Maintenance Station	073218	Drain Inlet Insert - StreamGuard	Effluent	98	7.2	14	26	62	52	9.9	21	9.8	0.8	5.3	31	39	6.9	239	8.3	0.4	1.4	20	7.1	3.9
January 24, 2001	Foothill Maintenance Station	073216	Drain Inlet Insert - Fossil Filter	Effluent	97	7.0	92	18	40	27	13	19	2.6	0.5	2.8	19	18	4.6	193	2.5	0.2	1.1	12	3.8	2.9
January 24, 2001	Rosemead Maintenance Station	073218	Drain Inlet Insert - Fossil Filter	Effluent	93	7.1	13	26	46	18	12	16	4.2	0.2	2.9	24	12	2.8	329	4.0	0.2	2.3	22	9.5	2.4
January 24, 2001	Las Flores Maintenance Station	073217	Drain Inlet Insert - Fossil Filter	Effluent	98	7.2	30	50	100	76	26	31	7.4	0.8	5.2	26	5.0	9.8	59	7.0	0.8	2.8	24	2.5	7.1
January 24, 2001	Alameda Maintenance Station	074201	Oil/Water Separator	Influent	NA	7.0	45	81		629															
January 24, 2001	Alameda Maintenance Station	074201	Oil/Water Separator	Effluent	NA	6.7	13	27		7															
Event 6																									
February 10, 2001	Altadena Maintenance Station	073211	Biofiltration Strip	Influent	85	6.8J	58	23	32	27	16	18	5.8	0.2	1.5	9.5	5.6	3.3	80	5.2	0.2	1.0	8.4	1.0	2.3
February 10, 2001	Altadena Maintenance Station	073211	Biofiltration Strip	Effluent	96	6.6J	85	30	60	41	19	20	4.3	0.2	1.4	8.8	5.1	2.2	66	3.5	0.2U	1.0	7.9	1.2	2U
February 13, 2001	I-605/SR-91	073222a	Biofiltration Strip	Influent	96	6.6J	46	22	32	17	9.2	12.6	1.2	0.7	4.1	18	40	3.2	100	1.1	0.4	1.3	9.2	8.1	2U
February 13, 2001	I-605/SR-91	073222a	Biofiltration Strip	Effluent	100	6.8J	62	28	48	30	17	20	2.1	0.3	92	7.6	18	2U	40	2.1	0.2U	2.3	6.9	2.1	2U
February 14, 2001	I-5/I-605 Intersection	074101	Extended Detention Basin	Influent	100	6.5	71	22	50	19	11.3	14.3	1.0	0.2	3.1	9.5	10.7	2U	56	0.5U	0.2	2.1	8.2	6.1	2U
February 15, 2001	I-5/I-605 Intersection	074101	Extended Detention Basin	Effluent	100	6.8	48	20	29	45	8.7	9.8	1.4	0.3	2.8	9.5	18	2.7	69	0.9	0.2U	1.0	5.2	3.8	2U
February 14, 2001	I-605/SR-91 Interchange	074102	Extended Detention Basin	Influent	100	6.1	284	87	168	24	22	24	1.8	0.6	86	15	53	3.1	182	1.2	0.4	1.4	9.8	17	2.1
February 15, 2001	I-605/SR-91 Interchange	074102	Extended Detention Basin	Effluent	100	6.8	61	25	47	9	11	14	1.2	0.3	1.2	8.1	8.7	2U	64	0.8	0.2	1.0	7.4	4.7	2U
February 14, 2001	Eastern Regional Maintenance Station	074202	Sand Filter	Influent	100	6.7	37	13	5	37	5.4	7.8	1.4	0.3	27	6.0	6.6	2.4	63	1.2	0.2	11.3	5.4	3.8	2U
February 14, 2001	Eastern Regional Maintenance Station	074202	Sand Filter	Effluent	100	6.7	33	12	8	12	5.5	6.9	1.3	0.2U	1.7	4.0	2.8	2U	25	1.1	0.2U	1U	3.6	1.3	2U
February 10, 2001	Foothill Maintenance Station	074203	Sand Filter	Influent	100	6.7J	44	18	24	168	16.5	13.7	10.4	1.2	8.8	33	65	8.7	449	9.2	0.3	1.5	8.8	9.2	2.1
February 11, 2001	Foothill Maintenance Station	074203	Sand Filter	Effluent	100	6.8	85	32	52	11	18	20	7.8	0.2	1.0	13.7	4.3	2.5	59	7.2	0.2U	1.0	12.0	2.8	2U
February 11, 2001	Termination P&R	074204	Sand Filter	Influent	100	6.8	52	15	42	28	14.4	15.2	0.5	0.2	1U	9.7	1.4	3.5	79	0.5U	0.2	1U	9.2	1U	3.2
February 11, 2001	Termination P&R	074204	Sand Filter	Effluent	100	6.7	60	18	46	4	12.2	13.0	0.8	0.2	1U	9.5	1U	3.4	55	0.7	0.2	1U	9.1	1U	3.1
February 12, 2001	I-105/Lakewood Boulevard Park & Ride	074208	Multi-Chambered Treatment Train	Influent	100	6.9	29	7	18	14	6.8	9.1	0.9	0.4	1.1	6.4	2.2	3.1	70	0.5	0.2U	1U	4.8	1U	2.3
February 15, 2001	I-105/Lakewood Boulevard Park & Ride	074208	Multi-Chambered Treatment Train	Transfer Pump	100				1U	10			0.6	0.2U	1U	6.0	1U	2.9	66	0.5	0.2U	1U	5.0	1U	2.5
February 15, 2001	I-105/Lakewood Boulevard Park & Ride	074208	Multi-Chambered Treatment Train	Effluent	100	6.9	42	20	20	10	10	11	0.7	0.2U	1U	4.7	1U	2U	31	0.6	0.2U	1U	4.1	1U	2U
February 10, 2001	I-210/East of Orcas Avenue	073102	Continuous Deflective Separation	Influent	100	7J	87	30	32	139	14.7	15.4	1.6	0.9	5.9	36	38	7.1	320	1.5	0.2	1.5	9.4	1.6	2U
February 10, 2001	I-210/East of Orcas Avenue	073102	Continuous Deflective Separation	Effluent	100	6.9J	73	34	40	80	11	14	0.6	0.8	3.6	18	8.1	4.1	133	0.5	0.4	2.1	10.9	1.2	2.6
February 10, 2001	I-210/East of Filmore Street	073103	Continuous Deflective Separation	Influent	100	6.8J	55	24	28	34	11.1	11.3	0.5	0.4	2.2	10.5	5.3	2.7	100	0.5	0.3	1.2	6.8	1.4	2U
February 10, 2001	I-210/East of Filmore Street	073103	Continuous Deflective Separation	Effluent	100	6.9J	56	21	22	38	8.7	11	0.5	0.4	2.1	9.9	4.5	3.1	108	0.5U	0.2	1.3	7.1	1.3	2
February 10, 2001	Foothill Maintenance Station	073216	Drain Inlet Insert - StreamGuard	Effluent	96	7.5J	175	56	134	33	36	40	2.4	0.6	4.2	15	6.8	4.7	260	2.2	0.4	1.5	8.2	1.3	3.6
February 11, 2001	Las Flores Maintenance Station	073217	Drain Inlet Insert - StreamGuard	Effluent	100	7.1	108	37	76	52	16	21	2.5	0.4	2.5	7.2	1.7	4.3	57	2.0	0.3	2.3	7.0	1U	2.7
February 11, 2001	Rosemead Maintenance Station	073218	Drain Inlet Insert - StreamGuard	Effluent	100	7.0	88	28	64	45	15	25	4.6	1.5	2.4	22	12	6.0	190	3.7	1.1	1.2	18	1.3	4.3
February 11, 2001	Foothill Maintenance Station	073216	Drain Inlet Insert - Fossil Filter	Effluent	96	7.6	100	34	72	24	22	32	1.4	0.8	3.5	9.3	3.0	4.5	53	1.1	0.4	1.7	8.2	1.3	3.6
February 11, 2001	Las Flores Maintenance Station	073217	Drain Inlet Insert - Fossil Filter	Effluent	100	7.4	54	18	30	48	12	19	2.6	0.4	2.4	7.6	1.7	4.1	57	2.3	0.3	1.4	7.0	1U	2.5
February 11, 2001	Rosemead Maintenance Station	073218	Drain Inlet Insert - Fossil Filter	Effluent	64	7.2	91	32	58	44	8.8	17	5.0	0.3	1.9	16	9.0	2.8	255	4.8	0.2	1.5	13	3.1	2.1
February 10, 2001	Alameda Maintenance Station	074201	Oil/Water Separator	Influent	NA	7J	105	37		125															
February 10, 2001	Alameda Maintenance Station	074201	Oil/Water Separator	Effluent	NA	7J	52	25		7															

Table 1-5a: BMP Retrofit Pilot Study, Stormwater Laboratory Data - District 7

Sample Date	BMP Location	Site ID	BMP Type	Sampling Location	% Storm Capture	pH	Specific Conductance (umhos/cm)	Hardness (mg/L)	TDS (mg/L)	TSS (mg/L)	DOC (mg/L)	TOC (mg/L)	As	Cd	Cr	Cu	Pb	Ni	Zn	As	Cd	Cr	Cu	Pb	Ni
Event 7																									
February 28, 2001	I-210/East of Orcas Avenue	073102	Continuous Deflective Separation	Influent	100	6.2	60	33	36	27	7.9	10	4.1	0.5	3.2	20	7.8	3.3	82	0.5	0.2	1.3	9.4	1.6	2U
February 28, 2001	I-210/East of Orcas Avenue	073102	Continuous Deflective Separation	Effluent	100	6.4	61	34	36	23	8.1	9.4	3.6	0.4	2.6	17	6.8	3.2	77	0.5U	0.2	1.5	9.6	1.6	2.1
February 28, 2001	I-210/East of Filmore Street	073103	Continuous Deflective Separation	Influent	100	6.2	51	37	32	42	4.4	6.2	0.5	0.4	3.1	12	5.8	2.5	75	0.5U	0.2	1.7	7.0	1.7	2U
February 28, 2001	I-210/East of Filmore Street	073103	Continuous Deflective Separation	Effluent	100	6.3	47	27	24	8	6.7	7.8	3.7	0.3	2.7	12	5.9	2.4	76	0.5	0.2	1.5	6.7	1.4	2U
Event 8																									
March 7, 2001	I-5/I-605 Intersection	074101	Extended Detention Basin	Influent	100	7.2	65	39	22	69	9.6	11	1.4	0.3	1.5	11	17	2.5	64	1.4	0.3	1U	7.6	1.5	2.1
March 7, 2001	I-5/I-605 Intersection	074101	Extended Detention Basin	Effluent	100	7.3	66	30	42	23	9.0	10	1.6	0.2	1.8	12	18	2.8	59	1.4	0.2	1U	8.0	1.7	2.0
March 6, 2001	I-605/SR-91 Interchange	074102	Extended Detention Basin	Influent	100	7.2	83	41	48	74	9.1	9.5	1.7	0.5	6.2	20	43	6.3	282	1.4	0.3	1.7	10	2.8	3.8
March 6, 2001	I-605/SR-91 Interchange	074102	Extended Detention Basin	Effluent	100	8.1	381	202	286	17	33	39	3.5	0.6	1.6	25	13	6.4	159	3.2	0.4	1.0	21	1.3	6.1
March 6, 2001	Eastern Regional Maintenance Station	074202	Sand Filter	Influent	100	7.7	30	16	23	40	5.6	6.9	1.9	0.2	3.9	9.1	11	2.1	76	1.6	0.2U	1U	6.2	1U	2U
March 7, 2001	Eastern Regional Maintenance Station	074202	Sand Filter	Effluent	100	6.1	56	27	58	6J	4.0	4.3	2.0	0.2	1.0	7.0	1.0	2U	46	1.9	0.2	1U	6.6	1U	2U
March 6, 2001	Foothill Maintenance Station	074203	Sand Filter	Influent	100	7.2	19	8	1U	100	4.0	4.3	4.8	0.2	1.4	6.5	8.2	2U	127	4.6	0.2	1U	4.0	1U	2U
March 9, 2001	Foothill Maintenance Station	074203	Sand Filter	Effluent	100	6.8	68	28	64	7J	3.4	4.1	5.0	0.2	1U	6.9	3.2	2.2	98	4.7	0.2	1U	5.8	1U	2.1
March 7, 2001	Termination P&R	074204	Sand Filter	Influent	100	7.3	36	14	48	25	6.8	7.9	0.5U	0.2U	3.5	6.4	2.2	2.2	45	0.5U	0.2U	1.6	4.5	1U	2U
March 9, 2001	Termination P&R	074204	Sand Filter	Effluent	100	6.2	62	23	47	4J	3.5	3.9	1.1	0.2	1U	7.4	1U	2.3	47	1.1	0.2	1U	6.6	1U	2.2
March 6, 2001	I-210/East of Orcas Avenue	073102	Continuous Deflective Separation	Influent	100	7.7	49	32	32	25	6.7	7.2	0.5U	0.4	2.8	13	4.4	2.2	52	0.5U	0.2	1.4	6.3	1U	2U
March 6, 2001	I-210/East of Orcas Avenue	073102	Continuous Deflective Separation	Effluent	100	7.6	50	36	20	29	6.1	7.1	0.5U	0.3	2.3	10	2.8	2U	42	0.5U	0.2	1.3	6.5	1U	2U
March 30, 2001	I-210/East of Orcas Avenue	073102	Continuous Deflective Separation	Sump	NA	6.2	523	260	526	66	16	18	1.0	0.3	2.3	4.4	2.9	19	745	0.5U	0.2U	1U	1U	1U	17
March 6, 2001	I-210/East of Filmore Street	073103	Continuous Deflective Separation	Influent	100	7.6	44	26	34	36	6.6	6.6	0.5U	0.3	2.5	8.8	3.7	2U	50	0.5U	0.3	1.9	5.7	1U	2U
March 6, 2001	I-210/East of Filmore Street	073103	Continuous Deflective Separation	Effluent	100	7.7	48	22	54	45	6.0	6.8	0.5U	0.3	3.1	12	5.9	2.3	70	0.5U	0.2	1.6	5.4	1U	2U
Event 9																									
April 7, 2001	Altadena Maintenance Station	073211	Biofiltration Strip	Influent	100	7.3	22	23	20	92	6.3	7.9	1.1	0.3	2.9	9.2	17	2.8	103	0.5U	0.2U	1U	2.5	1U	2U
April 7, 2001	Altadena Maintenance Station	073211	Biofiltration Strip	Effluent	99	7.1	28	21	36	24	7.4	8.7	0.5U	0.2U	1U	3.1	3.0	2U	31	0.5U	0.2U	1U	2.4	1U	2U
April 7, 2001	I-605/SR-91	073222a	Biofiltration Strip	Influent	100	7.4	70	44	64	41	15	20	1.0	0.4	1.7	22	17	3.9	111	0.5U	0.3	1U	18	3.5	3.2
April 7, 2001	I-605/SR-91	073222a	Biofiltration Strip	Effluent	97	7.0	179	46	156	73	44	48	2.9	1.4	2.4	30	8.3	4.2	501	2.7	1.0	1.2	24	2.5	3.4
April 7, 2001	I-605/SR-91	073222b	Biofiltration Swale	Influent	93	7.2	76	34	126	46	19	32	9.8	1.0	3.7	50	25	6.6	395	8.3	0.6	1.2	37	2.0	4.9
April 7, 2001	I-605/SR-91	073222b	Biofiltration Swale	Effluent	NA; No effluent flow; no sample																				
April 7, 2001	Cerritos Maintenance Station	073223	Biofiltration Swale	Influent	100	7.4	99	49	77	148	22	32	6.9	1.4	8.8	69	92	11	443	4.8	0.3	1.4	23	2.6	4.6
April 7, 2001	Cerritos Maintenance Station	073223	Biofiltration Swale	Effluent	100	7.5	79	38	59	153	17	22	5.8	0.5	8.3	33	36	7.6	123	4.5	0.2U	1.2	13	2.4	2.2
April 7, 2001	I-5/I-605 Intersection	073224	Biofiltration Swale	Influent	100	7.1	145	48	138	73	36	37	1.7	1.4	5.5	70	88	12	389	0.5U	0.7	1.3	41	6.7	7.4
April 7, 2001	I-5/I-605 Intersection	073224	Biofiltration Swale	Effluent	100	7.3	39	23	32	14	8.4	13	0.5	0.3	1.7	15.5	23	2.3	63	0.5U	0.2U	1U	8.9	2.9	2U
April 7, 2001	I-605 @ Carson	073225	Biofiltration Swale	Influent	83	7.0	101	45	81	9	20	27	2.2	0.8	4.1	33	75	8.0	145	1.9	0.4	1.5	21	6.2	5.6
April 7, 2001	I-605 @ Carson	073225	Biofiltration Swale	Effluent	NA; Sampler failed; no sample																				
April 8, 2001	I-5/I-605 Intersection	074101	Extended Detention Basin	Influent	100	6.6	100	51	73	59	20	26	1.9	0.4	2.8	22	24	5.9	119	1.2	0.2	2.0	13	1.8	5.4
April 8, 2001	I-5/I-605 Intersection	074101	Extended Detention Basin	Effluent	100	6.3	85	30	85	44	18	23	2.0	0.4	3.1	21	29	5.2	105	1.3	0.2	1U	12	2.2	3.3
April 7, 2001	I-605/SR-91 Intersection	074102	Extended Detention Basin	Influent	100	7.3	106	55	83	93	21	28	2.3	0.7	6.7	39	78	7.8	347	1.5	0.3	1.5	23	7.0	4.0
April 7, 2001	I-605/SR-91 Intersection	074102	Extended Detention Basin	Effluent	100	6.2	91	41	68	22	15	20	1.8	0.4	1.3	24	23	3.3	122	1.5	0.3	1U	18	4.1	2.6
April 7, 2001	Eastern Regional Maintenance Station	074202	Sand Filter	Influent	100	7.3	37	25	40	25	7.6	8.7	1.5	0.2	2.5	6.7	6.3	2.3	90	1.3	0.2	1U	5.0	1U	2U
April 8, 2001	Eastern Regional Maintenance Station	074202	Sand Filter	Effluent	100	6.5	40	40	44	16	8.1	8.6	1.7	0.2U	1.7	7.0	3.1	2U	45	1.7	0.2U	1U	6.3	1U	2U
April 7, 2001	Foothill Maintenance Station	074203	Sand Filter	Influent	100	6.8	35	21	33	51	8.4	11	4.7	0.4	2.0	10	9.8	2.9	179	4.2	0.2	1U	6.6	1.4	2U
April 10, 2001	Foothill Maintenance Station	074203	Sand Filter	Effluent	100	7.0	79	19	65	7	14	17	8.0	0.2U	1.1	10	1.5	2U	46	7.1	0.2U	1U	8.8	1U	2U
April 7, 2001	Termination P&R	074204	Sand Filter	Influent	100	6.8	56	27	54	14	18	22	0.5U	0.2	1U	17	2.6	5.4	157	0.5U	0.2	1U	14	1.1	4.7
April 9, 2001	Termination P&R	074204	Sand Filter	Effluent	100	6.2	46	24	55	1U	13	15	1.1	0.2	1U	14	1.1	3.9	81	1.0	0.2	1U	12	1U	3.2
April 7, 2001	Via Verde P&R	074206	Multi-Chambered Treatment Train	Influent	100	6.7	27	19	10	118	6.2	6.7	0.5U	0.4	4.7	17	15	8.3	267	0.5U	0.2U	1U	3.0	1U	2U
April 6, 2001	Via Verde P&R	074206	Multi-Chambered Treatment Train	Transfer Pump	100				24	1U			0.5U	0.2U	1U	4.7	1.1	2.1	77	0.5U	0.2U	1U	3.7	1U	2U
April 9, 2001	Via Verde P&R	074206	Multi-Chambered Treatment Train	Effluent	100	6.7	56	31	44	5	11	14	0.5U	0.2U	1U	4.1	1U	2U	13	0.5U	0.2U	1U	3.1	1U	2U
April 7, 2001	I-210/East of Orcas Avenue	073102	Continuous Deflective Separation	Influent	100	7.2	58	28	36	41	9.9	12	0.5U	0.3	2.0	15	5.1	2.7	74	0.5U	0.2	1U	9.6	1U	2U
April 7, 2001	I-210/East of Orcas Avenue	073102	Continuous Deflective Separation	Effluent	100	7.1	53	28	48	35	7.9	10	0.5U	0.2	1.7	12	3.8	2.2	57	0.5U	0.2U	1U	8.2	1U	2U
April 7, 2001	I-210/East of Filmore Street	073103	Continuous Deflective Separation	Influent	NA; Effluent sampler failed; grab sample only																				
April 7, 2001	I-210/East of Filmore Street	073103	Continuous Deflective Separation	Effluent	NA; Effluent sampler failed; grab sample only																				
Event 10																									
April 21, 2001	Altadena Maintenance Station	073211	Biofiltration Strip	Influent	100	7.6	18	10	21	49	2.9	3.8	2.8	0.4	3.5	11	22	3.4	126	2.0	0.2U	1U	2.2	1U	2U
April 21, 2001	Altadena Maintenance Station	073211	Biofiltration Strip	Effluent	100	7.5	27	20	25	21	4.6	5.4	2.1	0.2U	1.0	3.6	3.7	2U	36	1.7	0.2U	1U	2.3	1U	2U
April 21, 2001	Foothill Maintenance Station	074203	Sand Filter	Influent	100	7.2	29	9	43	85	5.3	6.0	9.9	0.6	3.2	15	22	3.6	222	8.2	0.2U	1U	5.6	1.5	2U
April 23, 2001	Foothill Maintenance Station	074203	Sand Filter	Effluent	100	8.2	52	28	22	13	5.0	7.9	7.9	0.2U	1U	8.4	1.8	2U	56	7.7	0.2U	1U	7.8	1U	1U
April 21, 2001	Via Verde P&R	074206	Multi-Chambered Treatment Train	Influent	100	7.3	36	19	43	72	6.7	7.7	1.0	0.4	3.2	13	11	4.9	182	0.5U	0.2U	1U	6.0	1U	3.0
April 23, 2001	Via Verde P&R	074206	Multi-Chambered Treatment Train	Transfer Pump	100				38	3			0.5U	0.7	1U	3.7	1U	2.3	68	0.5U	0.2U	1U	2.8	1U	2U
April 23, 2001	Via Verde P&R	074206	Multi-Chambered Treatment Train	Effluent	90	6.7	53	2.1	27	6	6.3	6.6	0.5U	0.4	1U	3.2	1U	6.2	20	0.5U	0.3	1U	1.7	1U	2U
April 20, 2001	I-210/East of Orcas Avenue	073102	Continuous Deflective Separation	Influent	NA; Grab sample only; not enough flow for composite sample																				
April 20, 2001	I-210/East of Orcas Avenue	073102	Continuous Deflective Separation	Effluent	NA; Grab sample only; not enough flow for composite sample																				
May 2, 2001	I-210/East of Orcas Avenue	073102	Continuous Deflective Separation	Sump	NA	5.4	363	184	312	40	116	136	1.0	0.6	4.7	9.6	6.6	9.8	394	0.6	0.2U	2.4	1.7	1U	8.4
April 21, 2001	I-210/East of Filmore Avenue	073103	Continuous Deflective Separation	Influent	100	7.7	54	26	64	32	5.3	7.2	0.5U	0.5	3.3	17	12	4.1	141	0.5U	0.2U	1U	5.7	1U	2.0
April 21, 2001	I-210/East of Filmore Avenue	073103	Continuous Deflective Separation	Effluent	82	7.6	54	28	36	44	9.4	10	0.5U	0.4	2.5	14	8.8	3.5	107	0.5U	0.2U	1U	6.0	1U	2.2
May 2, 2001	I-210/East of Filmore Avenue	073103	Continuous Deflective Separation	Sump	NA	6.6	182	94	143	17	32	38	0.6	0.2	1.4	4.5	2.5	3.2	192	0.5U	0.2U	1.0	1.4	1U	2.9

Table 1-5d: BMP Retrofit Pilot Study, Drain Inlet Insert Solid Matrix Laboratory Data District 7

Sample Date	Location	Site ID	BMP Type	Sampling Location	Total (mg/kg) Cu	Pb	Zn	TRPH (mg/kg)
Solids Matrix (StreamGuard Fabric)								
May 1, 2001	Foothill Maintenance Station	073216	Drain Inlet Insert - StreamGuard	Used - StreamGuard Fabric	66.5	132	1160	333U
May 1, 2001	Las Flores Maintenance Station	073217	Drain Inlet Insert - StreamGuard	Used - StreamGuard Fabric	21.4	23.8	143	333U
May 1, 2001	Rosemead Maintenance Station	073218	Drain Inlet Insert - StreamGuard	Used - StreamGuard Fabric	96.7	259	1670	457
Solids Matrix (StreamGuard Absorbent)								
May 1, 2001	Foothill Maintenance Station	073216	Drain Inlet Insert - StreamGuard	Used - StreamGuard Absorbent	14.8	26.1	86.5	8950
May 1, 2001	Las Flores Maintenance Station	073217	Drain Inlet Insert - StreamGuard	Used - StreamGuard Absorbent	7.7	13.0	46.4	50600
May 1, 2001	Rosemead Maintenance Station	073218	Drain Inlet Insert - StreamGuard	Used - StreamGuard Absorbent	24.8	46.1	229	46400
Solids Matrix (StreamGuard Sediment)								
May 1, 2001	Foothill Maintenance Station	073216	Drain Inlet Insert - StreamGuard	Used - StreamGuard Sediment	89.9	126	1140	10900
May 1, 2001	Las Flores Maintenance Station	073217	Drain Inlet Insert - StreamGuard	Used - StreamGuard Sediment	12.1	12.1	86.3	333U
May 1, 2001	Rosemead Maintenance Station	073218	Drain Inlet Insert - StreamGuard	Used - StreamGuard Sediment	16.1	21.6	118	333U
Solids Matrix (Fossil Filter Adsorbent)								
May 1, 2001	Foothill Maintenance Station	073216	Drain Inlet Insert - Fossil Filter	Used - Fossil Filter Adsorbent	49.9	95.8	413	333U
May 1, 2001	Las Flores Maintenance Station	073217	Drain Inlet Insert - Fossil Filter	Used - Fossil Filter Adsorbent	22.2	16.2	147	333U
May 1, 2001	Rosemead Maintenance Station	073218	Drain Inlet Insert - Fossil Filter	Used - Fossil Filter Adsorbent	41.3	74.6	543	333U
Solids Matrix (Fossil Filter Sediment)								
May 1, 2001	Foothill Maintenance Station	073216	Drain Inlet Insert - Fossil Filter	Used - Fossil Filter Sediment	33.0	55.6	352	333U
May 1, 2001	Las Flores Maintenance Station	073217	Drain Inlet Insert - Fossil Filter	Used - Fossil Filter Sediment	22.3	24.1	274	360
May 1, 2001	Rosemead Maintenance Station	073218	Drain Inlet Insert - Fossil Filter	Used - Fossil Filter Sediment	53.7	60.4	755	333U

Table 1-5b: BMP Retrofit Pilot Study, Sediment Sampling Laboratory Data - District 7

Sample Date	BMP Location	Site ID	BMP Type	Total (mg/L) Ag	As	Ba	Be	Cd	Cu	Co	Cr	Pb	Zn	Mo	Ni	Sb	Se	Tl	V	Hg	Organic Matter Content %	STLC Pb (mg/L)	TRPH (mg/L)	VOCs (ug/L)[b] Toluene
Rinsate Matrix (Plastic Packing Balls)																								
March 6, 2001	Lakewood P& R MCTT	074208	MCTT	0.0012	0.015	0.56	0.0013	0.0058	0.19	0.026	0.12	0.33	1.9	0.014	0.080	0.0089	0.0025	.0010	0.12	.0020	—	—	10.0U	—
March 6, 2001	Via Verde P & R MCTT	074206	MCTT	0.0023	0.013	0.43	.0010	0.0058	0.23	0.019	0.062	0.35	1.7	0.010	0.077	0.020	.0020	.0010	0.075	.0020	—	—	32.1	1.0
Solids Matrix (Sandblast Material)				Total (mg/kg)																			mg/kg	ug/kg
March 6, 2001	Via Verde P & R MCTT	074206	MCTT	1.3[c]	22.2[c]	401[c]	0.84[c]	1.8[c]	1330[c]	37.7[c]	47.6[c]	5.1[c]	140[c]	4.5[c]	29.2[c]	1.0U[c]	1.0U[c]	0.50U[c]	101[c]	0.040	—	—	320	—
Solids Matrix (Sludge)																								
March 6, 2001	Via Verde P & R MCTT	074206	MCTT	0.18	3.1	118	0.29	1.5	41.2	6.4	29.3	53.9	535	2.4	22.0	3.6	0.66	0.16	31.3	0.050	—	—	1240	4200
Solids Matrix (Sediment)																								
November 7, 2000	Alameda M S	74201	OWS	0.36	5.0	213	0.18	1.7	106	6.4	43.5	189[a]	702	5.3	26.6	2.1	0.27	0.10U	26.5	0.073	—	12.6	4640	—
April 2, 2001	Termination P & R Section 1	074204	SF	0.10U	0.76	30.2	0.10U	0.26	11.3	1.2	3.4	11.3	69.5	0.48	3.4	0.22	0.62	0.10U	5.6	0.040	1.8	—	783	—
April 2, 2001	Termination P & R Section 2	074204	SF	0.10U	0.73	6.2	0.10U	0.10U	1.1	0.32	0.46	1.4	12.5	0.10U	0.48	0.20U	0.20U	0.10U	1.5	0.040	0.4	—	333U	—
April 2, 2001	Termination P & R Section 3	074204	SF	0.10U	0.20U	4.3	0.10U	0.10U	0.58	0.27	0.31	1.4	7.6	0.10U	0.43	0.20U	0.20U	0.10U	1.3	0.040	0.3	—	333U	—
April 2, 2001	Termination P & R Section 4	074204	SF	0.10U	0.20U	4.8	0.10U	0.10U	0.54	0.68	0.26	1.6	7.4	0.10U	0.31	0.20U	0.20U	0.10U	1.3	0.040	0.3	—	333U	—
April 3, 2001	Eastern Regional M S Section	074202	SF	0.10U	1.2	19.9	0.10U	0.26	7.5	1.1	9.8	24.6	61.3	0.35	3.1	0.20U	0.20U	0.10U	5.6	0.040	1.9	—	550	—
April 3, 2001	Eastern Regional M S Section	074202	SF	0.10U	0.52	9.1	0.10U	0.11	2.8	0.53	3.9	9.3	25.1	0.14	1.3	0.20U	0.20U	0.10U	2.9	0.040	0.8	—	333U	—
April 3, 2001	Eastern Regional M S Section	074202	SF	0.10U	0.23	5.1	0.10U	0.10U	0.85	0.31	1.0	2.7	10.5	0.10U	0.42	0.20U	0.20U	0.10U	1.6	0.040	0.4	—	333U	—
April 3, 2001	Eastern Regional M S Section	074202	SF	0.10U	0.27	4.0	0.10U	0.10U	0.63	0.28	0.51	1.6	9.5	0.10U	0.44	0.20U	0.20U	0.10U	1.4	0.040	0.4	—	333U	—
April 3, 2001	Foothill M S Section 1	074203	SF	0.10U	1.7	17.2	0.10U	0.23	6.7	1.4	2.9	15.7	76.8	0.27	2.4	0.20U	0.20U	0.10U	5.1	0.040	1.4	—	390	—
April 3, 2001	Foothill M S Section 2	074203	SF	0.10U	0.89	7.6	0.10U	0.10U	2.0	0.63	0.95	4.5	29.6	0.10U	0.81	0.20U	0.20U	0.10U	2.6	0.040	0.6	—	333U	—
April 3, 2001	Foothill M S Section 3	074203	SF	0.10U	0.44	5.0	0.10U	0.10U	0.89	0.37	0.53	2.3	18.0	0.10U	0.55	0.20U	0.20U	0.10U	1.8	0.040	0.4	—	333U	—
April 3, 2001	Foothill M S Section 4	074203	SF	0.10U	0.52	4.1	0.10U	0.10U	0.60	0.50	0.36	2.0	13.0	0.10U	0.31	0.20U	0.20U	0.10U	1.9	0.040	0.4	—	333U	—

"—" - Not Analyzed

Due to the nature of the plastic packing ball samples, analyzing the samples directly was not possible. The balls were rinsed with DI water and the rinsate was analyzed.

U Results noted as "result"U were not detected at or above the stated limit.

Metals results for the Sand Filters are being evaluated for the need for WET analysis.

[a] 10X STLC < Concentration < TTLC, thus requiring WET procedure.

[b] Parameters with results > Reporting Limit

c Elevated reporting limit. The reporting limit is elevated due to matrix interference.

Table 1-5c: BMP Retrofit Pilot Study, Soil Sampling Laboratory Data - District 7

Sample Date	BMP Location	Site ID	BMP Type	Sampling Location	Total (mg/kg)			
Solids Matrix (Soil)					Cu	Pb	Zn	TRPH (mg/kg)
May 1, 2001	I-605/SR-91 Interchange	073101	Infiltration Basin	I-605/SR-91 Baseline Soil; 0.0-0.2 meter depth	20.1	6.7	46.9	333U
May 1, 2001	I-605/SR-91 Interchange	073101	Infiltration Basin	I-605/SR-91 Baseline Soil; 0.3-0.5 meter depth	16.4	6.4	42.2	333U
May 1, 2001	I-605/SR-91 Interchange	073101	Infiltration Basin	I-605/SR-91 Baseline Soil; 0.6-0.8 meter depth	12.7	3.5	31.0	333U

Table 1-6a: BMP Pollutant Removal Efficiencies (Biofiltration Strips)

	Altadena MS Strip 27 October, 2000				Altadena MS Strip 12 January, 2001				Altadena MS Strip 24 January, 2001				Altadena MS Strip 10 February, 2001				Altadena MS Strip 7 April, 2001				Altadena MS Strip 21 April, 2001			
	EMCs		Efficiency	% Diff. in	EMCs		Efficiency	% Diff. in	EMCs		Efficiency	% Diff. in	EMCs		Efficiency	% Diff. in	EMCs		Efficiency	% Diff. in	EMCs		Efficiency	% Diff. in
	Influent	Effluent	(%)	Load	Influent	Effluent	(%)	Load	Influent	Effluent	(%)	Load	Influent	Effluent	(%)	Load	Influent	Effluent	(%)	Load	Influent	Effluent	(%)	Load
TDS (mg/L)	57	98	-72	-59	1U	1U	na	na	36	36	0	26	32	60	-88	-113	20	36	-80	-68	21	25	-19	7
TSS (mg/L)	121	24	80	82	55	5	91	93	47	20	57	69	27	41	-52	-72	92	24	74	76	49	21	57	67
DOC (mg/L)	21	32	-52	-41	3.3	3.5	-6	19	11	13	-18	13	16	19	-19	-35	6.3	7.4	-17	-10	2.9	4.6	-59	-24
TOC (mg/L)	23	32	-39	-29	3.7	3.5	5	28	17	23	-35	0	18	20	-11	-26	7.9	8.7	-10	-3	3.8	5.4	-42	-11
Total As (ug/L)	6.8	5.4	21	27	1.7	1.0	41	55	2.1	1.5	29	47	5.8	4.3	26	16	1.1	0.5U	>55	>58	2.8	2.1	25	41
Total Cd (ug/L)	0.9	0.4	56	59	0.2U	0.2U	na	na	0.3	0.2U	>33	>51	0.2	0.2	0	-13	0.3	0.2U	>33	>38	0.4	0.2U	>50	>61
Total Cr (ug/L)	8.6	3.0	65	68	1U	1.0	<0	<23	2.9	2.2	24	44	1.5	1.4	7	-6	2.9	1U	>66	>68	3.5	1.0	71	78
Total Cu (ug/L)	27	15	44	49	3.3	2.9	12	33	11	6.9	37	54	9.5	8.8	7	-5	9.2	3.1	66	69	11	3.6	67	74
Total Pb (ug/L)	41	11	73	75	2.2	1.3	41	55	17	8.0	53	65	5.6	5.1	9	-3	17	3.0	82	84	22	3.7	83	87
Total Ni (ug/L)	10	4.3	57	60	2U	2U	na	na	2.9	2U	>31	>49	3.3	2.2	33	24	2.8	2U	>29	>33	3.4	2U	>41	>54
Total Zn (ug/L)	268	91	66	69	47	24	49	61	108	52	52	65	80	66	18	6	103	31	70	72	126	36	71	78
Dissolved As (ug/L)	0.7	0.7	0	8	0.6	0.6	0	23	2.0	1.2	40	56	5.2	3.5	33	24	0.5U	0.5U	na	na	2.0	1.7	15	34
Dissolved Cd (ug/L)	0.2	0.4	-100	-85	0.2U	0.2U	na	na	0.2U	0.2U	na	na	0.2	0.2U	>0	>-13	0.2U	0.2U	na	na	0.2U	0.2U	na	na
Dissolved Cr (ug/L)	1.6	2.9	-81	-67	1U	1.0	<0	<23	1U	1U	na	na	1.0	1.0	0	-13	1U	1U	na	na	1U	1U	na	na
Dissolved Cu (ug/L)	12	12	0	8	3.3	2.9	12	33	6.1	5.3	13	36	8.4	7.9	6	-7	2.5	2.4	4	10	2.2	2.3	-5	18
Dissolved Pb (ug/L)	2.9	2.2	24	30	1.7	1U	>41	>55	2.6	1.8	31	49	1.0	1.2	-20	-36	1U	1U	na	na	1U	1U	na	na
Dissolved Ni (ug/L)	4.3	4.0	7	14	2U	2U	na	na	2U	2U	na	na	2.3	2U	>13	>1	2U	2U	na	na	2U	2U	na	na
Dissolved Zn (ug/L)	131	71	46	50	44	23	48	60	58	43	26	45	66	63	5	-8	40	23	43	46	35	20	43	55
Nitrate-Nitrogen (mg/L)	0.84	2.06	-145	-127	0.21	0.21	0	23	0.39	0.49	-26	8	0.51	0.8	-57	-78	0.23	0.29	-26	-18	0.28	0.01U	>96	>97
TKN (mg/L)	4.14	4.65	-12	-4	0.21	0.75	-257	-173	1.42	1.38	3	29	1.20	1.20	0	-13	2.06	2.17	-5	2	1.07	1.67	-56	-22
Total P (mg/L)	1.83	2.97	-62	-50	0.15	0.26	-73	-33	0.08	0.28	-250	-157	0.11	0.44	-300	-353	0.23	0.37	-61	-50	0.10	0.22	-120	-72
Diss. Orthophosphate (mg/L)	1.39	2.58	-86	-71	0.06	0.14	-133	-79	0.08	0.23	-188	-111	0.03U	0.38	<-1167	<-1336	0.03	0.23	-667	-615	0.06	0.22	-267	-186
Storm Volume (cubic feet)	1298	1199			20242	15487			1759	1294			1250	1417			6368	5937			3180	2483		

	I-605/SR-91 Strip 11 October, 2000				I-605/SR-91 Strip 27 October, 2000				I-605/SR-91 Strip 12 January, 2001				I-605/SR-91 Strip 13 February, 2001				I-605/SR-91 Strip 7April, 2001			
	EMCs		Efficiency	% Diff. in	EMCs		Efficiency	% Diff. in	EMCs		Efficiency	% Diff. in	EMCs		Efficiency	% Diff. in	EMCs		Efficiency	% Diff. in
	Influent	Effluent	(%)	Load	Influent	Effluent	(%)	Load	Influent	Effluent	(%)	Load	Influent	Effluent	(%)	Load	Influent	Effluent	(%)	Load
TDS (mg/L)	216	99	54	99	24	124	-417	-564	10	48	-380	-719	32	48	-50	-14	64	156	-144	72
TSS (mg/L)	132	92	30	99	88	62	30	9	51	2	96	93	17	30	-76	-34	41	73	-78	79
DOC (mg/L)	51	27	47	99	9.5	30	-216	-306	4.4	10	-127	-288	9.2	17	-85	-40	15	44	-193	66
TOC (mg/L)	60	29	52	99	10.0	30	-200	-286	6.0	11	-83	-213	12.6	20	-59	-20	20	48	-140	72
Total As (ug/L)	4.9	2	55	99	0.9	2.5	-178	-257	0.9	1.0	-11	-90	1.2	2.1	-75	-33	1.0	2.9	-190	66
Total Cd (ug/L)	3.0	1	79	100	0.4	0.4	0	-29	0.4	0.3	25	-28	0.7	0.3	57	67	0.4	1.4	-250	59
Total Cr (ug/L)	15.5	35	-127	97	1.9	1.7	11	-15	1.5	1.2	20	-37	4.1	92	-2144	-1602	1.7	2.4	-41	84
Total Cu (ug/L)	107	16	85	100	15	15	0	-29	13	10	23	-31	18	7.6	58	68	22	30	-36	84
Total Pb (ug/L)	220	10	96	100	30	4.1	86	82	24	1.6	93	89	40	18	55	66	17	8.3	51	94
Total Ni (ug/L)	31.6	3	91	100	3.8	2.8	26	5	2.7	2.2	19	-39	3.2	2U	>38	>53	3.9	4.2	-8	87
Total Zn (ug/L)	687	211	69	100	101	137	-36	-74	71	54	24	-30	100	40	60	70	111	501	-351	48
Dissolved As (ug/L)	3.0	2	45	99	0.6	0.5	17	-7	0.8	0.7	13	-49	1.1	2.1	-91	-45	0.5U	2.7	<-440	<37
Dissolved Cd (ug/L)	3.0	0	84	100	0.3	0.4	-33	-71	0.3	0.2	33	-14	0.4	0.2U	>50	>62	0.3	1.0	-233	61
Dissolved Cr (ug/L)	7.0	2	78	100	1.5	1.5	0	-29	1.3	1.0	23	-31	1.3	2.3	-77	-34	1U	1.2	<-20	<86
Dissolved Cu (ug/L)	94	14	85	100	12	14	-17	-50	11	10	9	-55	9.2	6.9	25	43	18	24	-33	85
Dissolved Pb (ug/L)	203	2	99	100	12	1.4	88	85	14	1.6	89	80	8.1	2.1	74	80	3.5	2.5	29	92
Dissolved Ni (ug/L)	26.5	2	91	100	3.1	2.5	19	-4	2.6	1.2	54	21	2U	2U	na	na	3.2	3.4	-6	88
Dissolved Zn (ug/L)	658	187	72	100	79	126	-59	-105	60	35	42	0	48	22	54	65	96	402	-319	51
Nitrate-Nitrogen (mg/L)	3.95	2	49	99	0.46	4.14	-800	-1057	0.39	0.96	-146	-320	0.32	0.14	56	67	0.01U	0.60	<-5900	<-597
TKN (mg/L)	8.40	5	36	99	1.43	4.20	-194	-278	1.27	1.58	-24	-112	0.29	0.50	-72	-31	2.75	9.58	-248	60
Total P (mg/L)	0.55	2	-174	96	0.12	1.88	-1467	-1914	0.17	2.00	-1076	-1908	0.11	0.78	-609	-438	0.42	0.23	45	94
Diss. Orthophosphate (mg/L)	0.08	1	-1038	85	0.05	1.59	-3080	-3989	0.03U	0.84	<-2700	<-4678	0.03U	0.53	<-1667	<-1240	0.34	0.18	47	94
Storm Volume (cubic feet)	154	2			959	1233			923	1575			2150	1631			267	31		

Notes:

Hilighted values were estimated by calculating the mean of the EMCs using the Scoping Study methodology.

Average wet season removal efficiencies calculated using the Scoping Study methodology.

Where EMC was non-detect then Reporting Limit was used.

"U" = Analyte not detected above Reporting limit.

Table 1-6b: BMP Pollutant Removal Efficiencies (Biofiltration Swales)

	I-605/SR-91 Swale 10 October, 2000				I-605/SR-91 Swale 27 October, 2000				I-605/SR-91 Swale 8 January, 2001				I-605/SR-91 Swale 12 January, 2001				I-605/SR-91 Swale 24 January, 2001				I-605/SR-91 Swale 7 April, 2001			
	EMCs		Efficiency	% Diff. in	EMCs		Efficiency	% Diff. in	EMCs		Efficiency	% Diff. in	EMCs		Efficiency	% Diff. in	EMCs		Efficiency	% Diff. in	EMCs		Efficiency	% Diff. in
	Influent	Effluent	(%)	Load	Influent	Effluent	(%)	Load	Influent	Effluent	(%)	Load	Influent	Effluent	(%)	Load	Influent	Effluent	(%)	Load	Influent	Effluent	(%)	Load
TDS (mg/L)	262	175	33	65	78	146	-87	15	122	175	-44	96	10	200	-1900	-514	90	175	-95	75	126	175	-39	87
TSS (mg/L)	112	57	49	73	67	33	51	78	96	57	40	98	30	73	-143	25	61	57	6	88	46	57	-25	89
DOC (mg/L)	71	24	66	82	12.4	23	-85	16	27	24	11	97	2.8	25	-793	-174	17	24	-41	82	19	24	-26	88
TOC (mg/L)	75	26	66	82	13.8	23	-67	24	33	26	22	98	3.8	28	-637	-126	25	26	-2	87	32	26	20	93
Total As (ug/L)	16.6	5	70	84	9.4	5.0	47	76	4.8	5	-4	97	4.9	5.0	-2	69	5.0	5	0	87	9.8	5	49	95
Total Cd (ug/L)	2.5	1	78	88	1.0	0.7	30	68	0.3	1	-83	95	0.3	0.3	0	69	0.8	1	31	91	1.0	1	45	95
Total Cr (ug/L)	13.8	3	78	89	7.6	3.7	51	78	2	3	-50	96	2.0	2.0	0	69	6.6	3	55	94	3.7	3	19	93
Total Cu (ug/L)	101	21	79	89	33	23	30	68	59	21	64	99	10	19	-90	42	36	21	41	92	50	21	58	96
Total Pb (ug/L)	103	10	90	95	75	12	84	93	79	10	87	100	7.5	8.0	-7	67	36	10	72	96	25	10	59	96
Total Ni (ug/L)	32	6	80	89	8.6	7.3	15	61	16	6	60	99	2.8	5.3	-89	42	7.4	6	14	89	6.6	6	3	91
Total Zn (ug/L)	1093	96	91	95	371	123	67	85	446	96	78	99	138	53	62	88	261	96	63	95	395	96	76	98
Dissolved As (ug/L)	15.9	4	72	85	0.9	0.8	11	60	4.4	4	1	97	4.6	4.8	-4	68	4.1	4	-7	86	8.3	4	47	95
Dissolved Cd (ug/L)	1.5	0	68	83	0.4	0.6	-50	32	0.3	0	-59	95	0.3	0.3	0	69	0.4	0	-20	85	0.6	0	20	93
Dissolved Cr (ug/L)	7.3	1	80	89	4.0	1.3	68	85	1.9	1	23	98	1.8	1.6	11	73	2.5	1	42	93	1.2	1	-21	89
Dissolved Cu (ug/L)	66	18	73	86	16	18	-13	49	36	18	51	99	7.4	17	-130	29	19	18	8	88	37	18	53	96
Dissolved Pb (ug/L)	22	3	85	92	12	3.0	75	89	11	3	71	99	1.2	3.4	-183	13	5.1	3	37	92	2.0	3	-60	85
Dissolved Ni (ug/L)	29	5	83	91	5.7	5.3	7	58	13	5	61	99	2.5	4.8	-92	41	4.5	5	-12	86	4.9	5	-3	91
Dissolved Zn (ug/L)	755	66	91	95	173	82	53	78	375	66	82	99	75	44	41	82	135	66	51	94	281	66	76	98
Nitrate-Nitrogen (mg/L)	5.49	1	75	87	0.88	1.70	-93	12	2.14	1	36	98	0.28	0.93	-232	-2	0.82	1	-68	79	1.0	1	-38	87
TKN (mg/L)	6.50	3	54	75	1.16	3.21	-177	-26	5.43	3	44	98	0.80	2.82	-253	-8	1.99	3	-52	81	3.48	3	13	92
Total P (mg/L)	0.54	2	-258	-89	0.33	1.66	-403	-129	0.23	2	-740	76	0.18	2.17	-1106	-270	0.11	2	-1657	-125	0.29	2	-566	39
Diss. Orthophosphate (mg/L)	0.06	1	-2011	-1018	0.11	1.33	-1109	-451	0.12	1	-956	70	0.03U	1.20	<-3900	<-1128	0.09	1	-1307	-80	0.27	1	-369	57
Storm Volume (cubic feet)	85	45			1052	479			950	27			1726	530			125	16			272	25		

	Cerritos MS Swale 11 October, 2000				Cerritos MS Swale 27 October, 2000				Cerritos MS Swale 8 January, 2001				Cerritos MS Swale 12 January, 2001				Cerritos MS Swale 24 January, 2001				Cerritos MS Swale 7 April, 2001			
	EMCs		Efficiency	% Diff. in	EMCs		Efficiency	% Diff. in	EMCs		Efficiency	% Diff. in	EMCs		Efficiency	% Diff. in	EMCs		Efficiency	% Diff. in	EMCs		Efficiency	% Diff. in
	Influent	Effluent	(%)	Load	Influent	Effluent	(%)	Load	Influent	Effluent	(%)	Load	Influent	Effluent	(%)	Load	Influent	Effluent	(%)	Load	Influent	Effluent	(%)	Load
TDS (mg/L)	310		100	100	73	77	-5	45	192	166	14	77	154	78	49	96	136	97	29	99	77	59	23	76
TSS (mg/L)	142		100	100	135	54	60	79	315	191	39	84	144	135	6	92	162	141	13	99	148	153	-3	68
DOC (mg/L)	72		100	100	18.1	12.9	29	63	39	32	18	78	4.5	3.9	13	93	48	19	60	99	22	17	23	76
TOC (mg/L)	90		100	100	22	19.9	10	53	51	44	14	77	6.2	4.6	26	94	53	27	49	99	32	22	31	79
Total As (ug/L)	13.3		100	100	10.1	4.5	55	77	8.5	7.3	14	77	4.1	3.2	22	93	6.9	5	23	99	6.9	5.8	16	74
Total Cd (ug/L)	2.5		100	100	1.8	0.2	89	94	2.3	1.4	39	84	0.4	0.2U	>50	>96	1.9	1	67	100	1.4	0.5	64	89
Total Cr (ug/L)	14.6		100	100	13.2	1.8	86	93	11	11	0	73	2.7	1.5	44	95	12	7	44	99	8.8	8.3	6	71
Total Cu (ug/L)	154		100	100	80	16	80	90	96	73	24	80	18	11	39	95	113	36	68	100	69	33	52	85
Total Pb (ug/L)	294		100	100	203	20	90	95	128	95	26	80	26	9.0	65	97	111	46	59	99	92	36	61	88
Total Ni (ug/L)	35		100	100	15	3.0	80	90	19	15	21	79	5.2	1.8	65	97	16	8	51	99	11	7.6	31	79
Total Zn (ug/L)	959		100	100	542	75	86	93	502	284	43	85	95	33	65	97	604	145	76	100	443	123	72	91
Dissolved As (ug/L)	9.1		100	100	8.5	0.6	93	96	1.7	5.6	-229	13	3.5	3.0	14	93	5.0	4	14	99	4.8	4.5	6	71
Dissolved Cd (ug/L)	1.0		100	100	0.5	0.2U	>60	>79	1.7	1.1	35	83	0.3	0.2U	>33	>94	0.4	0	-10	98	0.3	0.2U	>33	>79
Dissolved Cr (ug/L)	8.7		100	100	2.6	1.1	58	78	2.8	3.3	-18	69	1.2	1U	>17	>93	5.0	2	66	99	1.4	1.2	14	74
Dissolved Cu (ug/L)	71		100	100	26	12	54	76	57	42	26	80	11	8.0	27	94	72	20	73	100	23	13	43	83
Dissolved Pb (ug/L)	43		100	100	38	7.5	80	90	21	10	52	87	3.7	1.6	57	96	14	6	57	99	2.6	2.4	8	71
Dissolved Ni (ug/L)	25		100	100	5.9	2.4	59	79	15	12	20	79	4.9	1.3	73	98	9.0	5	47	99	4.6	2.2	52	85
Dissolved Zn (ug/L)	415		100	100	136	53	61	80	389	259	33	82	94	21	78	98	283	100	65	99	118	29	75	92
Nitrate-Nitrogen (mg/L)	5.49		100	100	1.00	0.82	18	57	4.38	16.9	-286	-2	0.40	0.67	-68	86	1.23	7	-433	92	0.80	2.51	-214	3
TKN (mg/L)	8.40		100	100	2.24	1.43	36	67	6.94	6.10	12	77	1.25	0.88	30	94	4.5	3	39	99	3.09	1.92	38	81
Total P (mg/L)	0.66		100	100	0.40	0.37	8	52	0.54	0.20	63	90	0.19	0.49	-158	78	0.72	1	29	99	0.25	0.87	-248	-7
Diss. Orthophosphate (mg/L)	0.11		100	100	0.08	0.30	-275	-96	0.44	0.47	-7	72	0.05	0.07	-40	88	0.68	1	22	99	0.14	0.85	-507	-88
Storm Volume (cubic feet)	242	0			3559	1862			1120	297			10658	908			532	8			1156	357		

Notes:

Hilighted values were estimated by calculating the mean of the EMCs using the Scoping Study methodology.

Average wet season removal efficiencies calculated using the Scoping Study methodology.

Where EMC was non-detect then Reporting Limit was used.

"U" = Analyte not detected above Reporting limit.

Table 1-6b: BMP Pollutant Removal Efficiencies (Biofiltration Swales)

	I-5/I-605 Swale 27 October, 2000				I-5/I-605 Swale 8 January, 2001				I-5/I-605 Swale 12 January, 2001				I-5/I-605 Swale 24 January, 2001				I-5/I-605 Swale 7 April, 2001			
	EMCs		Efficiency	% Diff. in	EMCs		Efficiency	% Diff. in	EMCs		Efficiency	% Diff. in	EMCs		Efficiency	% Diff. in	EMCs		Efficiency	% Diff. in
	Influent	Effluent	(%)	Load	Influent	Effluent	(%)	Load	Influent	Effluent	(%)	Load	Influent	Effluent	(%)	Load	Influent	Effluent	(%)	Load
TDS (mg/L)	102	58	43	66	174		100	100	40	38	5	63	66	43	34	88	138	32	77	95
TSS (mg/L)	83	22	73	84	138		100	100	2	36	-1700	-594	63	25	60	93	73	14	81	95
DOC (mg/L)	10.4	9.7	7	44	54		100	100	2.5	4.1	-64	37	14	8	45	90	36	8.4	77	95
TOC (mg/L)	12.4	10.5	15	49	58		100	100	3.0	5.4	-80	31	30	10	67	94	37	13	65	92
Total As (ug/L)	1.5	0.5	67	80	1.6		100	100	0.5U	0.6	<-20	<54	1.6	1	67	94	1.7	0.5	71	93
Total Cd (ug/L)	1.3	0.2	85	91	2.6		100	100	0.4	0.5	-25	52	1.3	0	73	95	1.4	0.3	79	95
Total Cr (ug/L)	6.3	1.5	76	86	8.8		100	100	1U	1.4	<-40	<46	7.0	2	78	96	5.5	1.7	69	93
Total Cu (ug/L)	40	12	70	82	89		100	100	8.4	17	-102	22	54	15	72	95	70	15.5	78	95
Total Pb (ug/L)	113	17	85	91	148		100	100	8.1	22	-172	-5	122	21	83	97	88	23	74	94
Total Ni (ug/L)	9.3	23	-147	-48	21		100	100	2.5	3.1	-24	52	9.4	12	-28	77	12	2.3	81	95
Total Zn (ug/L)	288	56	81	88	547		100	100	94	106	-13	57	313	76	76	96	389	63	84	96
Dissolved As (ug/L)	0.5U	0.5U	na	na	1.0		100	100	0.5U	0.5	<0	<61	1.1	1	55	92	0.5U	0.5U	na	na
Dissolved Cd (ug/L)	0.4	0.2U	>50	>70	0.4		100	100	0.4	0.4	0	61	0.5	0	45	90	0.7	0.2U	>71	>93
Dissolved Cr (ug/L)	1.2	1U	>17	>50	1U		100	100	1U	1U	na	na	1.9	1	47	90	1.3	1U	>23	>82
Dissolved Cu (ug/L)	15	9.9	34	60	18		100	100	6.5	12	-85	29	26	10	60	93	41	8.9	78	95
Dissolved Pb (ug/L)	18	6.7	63	78	1.3		100	100	2.4	4.4	-83	29	23	5	79	96	6.7	2.9	57	90
Dissolved Ni (ug/L)	4.3	1.9	56	74	10		100	100	2.5	2.5	0	61	4.8	2	55	92	7.4	2U	>73	>94
Dissolved Zn (ug/L)	113	42	63	78	285		100	100	76	84	-11	57	128	54	58	92	171	29	83	96
Nitrate-Nitrogen (mg/L)	0.60	0.52	13	48	3.14		100	100	0.43	0.34	21	70	0.82	1	-73	68	1.75	2.69	-54	64
TKN (mg/L)	1.69	1.40	17	50	9.95		100	100	0.93	1.24	-33	49	2.02	2	23	86	4.59	1.98	57	90
Total P (mg/L)	0.22	0.36	-64	2	0.17		100	100	0.23	0.18	22	70	0.24	0	-39	75	0.25	0.42	-68	61
Diss. Orthophosphate (mg/L)	0.22	0.19	14	48	0.14		100	100	0.08	0.06	25	71	0.03U	2	-7982	-1385	0.12	2.98	-2383	-483
Storm Volume (cubic feet)	1943	1165			411	0			6199	2389			724	133			937	220		

	I-605 at Carson 11 October, 2000				I-605 at Carson 27 October, 2000				I-605 at Carson 8 January, 2001				I-605 at Carson 12 January, 2001				I-605 at Carson 24 January, 2001				I-605 at Carson 7 April, 2001			
	EMCs		Efficiency	% Diff. in	EMCs		Efficiency	% Diff. in	EMCs		Efficiency	% Diff. in	EMCs		Efficiency	% Diff. in	EMCs		Efficiency	% Diff. in	EMCs		Efficiency	% Diff. in
	Influent	Effluent	(%)	Load	Influent	Effluent	(%)	Load	Influent	Effluent	(%)	Load	Influent	Effluent	(%)	Load	Influent	Effluent	(%)	Load	Influent	Effluent	(%)	Load
TDS (mg/L)	244		100	100	62	120	-94	-31	118	152	-29	69	8	110	-1275	-1408	120	92	23	52	81	119	-47	3
TSS (mg/L)	474		100	100	84	24	71	81	170	110	35	84	57	13	77	75	119	26	78	86	9	46	-414	-238
DOC (mg/L)	48		100	100	10.4	12.9	-24	16	30	21	30	83	4.0	5.9	-48	-62	7.3	23	-215	-96	20	17	16	45
TOC (mg/L)	58		100	100	12.7	16.9	-33	10	32	24	25	82	5.0	6.7	-34	-47	25	25	0	38	27	19	28	53
Total As (ug/L)	9.2		100	100	2.8	3.0	-7	27	4.0	4.7	-18	72	2.0	2.5	-25	-37	2.6	2.3	12	45	2.2	3	-44	6
Total Cd (ug/L)	8.3		100	100	1.5	0.4	73	82	2.1	0.8	62	91	0.4	0.2	50	45	1.3	0.4	69	81	0.8	0	41	61
Total Cr (ug/L)	39		100	100	9.6	9.2	4	35	11	7.6	31	83	2.9	3.1	-7	-17	11	4.3	61	76	4.1	6	-53	-1
Total Cu (ug/L)	232		100	100	46	21	54	69	83	46	45	87	13	13	0	-10	57	21	63	77	33	26	21	48
Total Pb (ug/L)	2086		100	100	371	102	73	81	412	189	54	89	41	31	24	17	217	43	80	88	75	100	-33	12
Total Ni (ug/L)	69		100	100	13	4.7	64	76	20	9.2	54	89	3.5	2.4	31	25	14	4.3	69	81	8.0	5	33	56
Total Zn (ug/L)	1542		100	100	249	76	69	79	412	244	41	86	66	42	36	30	273	76	72	83	145	115	21	48
Dissolved As (ug/L)	6.0		100	100	0.5U	0.5U	na	na	2.8	4.0	-43	65	1.9	2.1	-11	-21	2.6	2.2	15	47	1.9	3	-35	11
Dissolved Cd (ug/L)	4.6		100	100	0.4	0.3	25	49	0.7	0.5	29	83	0.3	0.2U	>33	>27	0.6	0.3	50	69	0.4	0	17	46
Dissolved Cr (ug/L)	4.4		100	100	6.5	4.2	35	56	3.2	4.1	-28	69	2.7	2.7	0	-10	4.5	3.2	29	56	1.5	4	-138	-57
Dissolved Cu (ug/L)	80		100	100	16.0	15	6	36	33	32	3	77	8.9	9.0	-1	-11	29	18	38	61	21	19	9	40
Dissolved Pb (ug/L)	414		100	100	64	43	33	54	36	32	11	79	6.8	7.9	-16	-27	57	19	67	79	6.2	28	-353	-198
Dissolved Ni (ug/L)	21		100	100	6.5	3.4	48	65	10	6.1	39	85	3.1	1.7	45	40	7.7	3.7	52	70	5.6	4	31	54
Dissolved Zn (ug/L)	498		100	100	50	42	16	43	192	186	3	77	48	39	19	11	116	53	54	72	78	83	-6	30
Nitrate-Nitrogen (mg/L)	5.62		100	100	0.74	0.90	-22	18	1.93	3.17	-64	60	0.49	0.73	-49	-63	1.10	1.19	-8	33	1.14	2	-36	11
TKN (mg/L)	7.50		100	100	1.45	1.56	-8	27	5.95	6.15	-3	75	1.15	1.06	8	-1	3.11	2.39	23	52	1.99	3	-48	2
Total P (mg/L)	0.93		100	100	0.22	0.39	-77	-20	0.18	2.24	-1144	-201	0.16	0.40	-150	-174	0.09	0.41	-356	-183	0.15	1	-495	-291
Diss. Orthophosphate (mg/L)	0.08		100	100	0.07	0.27	-286	-161	0.1	0.96	-860	-132	0.03U	0.23	<-667	<-741	0.09	0.34	-278	-134	0.32	0	-45	5
Storm Volume (cubic feet)	85	0			2306	1562			327	79			5783	6344			348	216			918	604		

Notes:

Hilighted values were estimated by calculating the mean of the EMCs using the Scoping Study methodology.

Average wet season removal efficiencies calculated using the Scoping Study methodology.

Where EMC was non-detect then Reporting Limit was used.

"U" = Analyte not detected above Reporting limit.

Table 1-6c: BMP Pollutant Removal Efficiencies (Extended Detention Basins)

	I-5/I-605 EDB 27 October, 2000				I-5/I-605 EDB 9 January, 2001				I-5/I-605 EDB 12 January, 2001				I-5/I-605 EDB 25 January, 2001				I-5/I-605 EDB 14 February, 2001				I-5/I-605 EDB 7 March, 2001				I-5/I-605 EDB 8 April, 2001			
	EMCs		Efficiency	% Diff. in	EMCs		Efficiency	% Diff. in	EMCs		Efficiency	% Diff. in	EMCs		Efficiency	% Diff. in	EMCs		Efficiency	% Diff. in	EMCs		Efficiency	% Diff. in	EMCs		Efficiency	% Diff. in
	Influent	Effluent	(%)	Load	Influent	Effluent	(%)	Load	Influent	Effluent	(%)	Load	Influent	Effluent	(%)	Load	Influent	Effluent	(%)	Load	Influent	Effluent	(%)	Load	Influent	Effluent	(%)	Load
TDS (mg/L)	55	23	58	58	208	178	14	14	64	69	-8	-8	42	48	-14	-14	50	29	42	42	22	42	-91	-91	73	85	-16	-16
TSS (mg/L)	132	13	90	90	208	50	76	76	39	148	-279	-279	164	39	76	76	19	45	-137	-137	69	23	67	67	59	44	25	25
DOC (mg/L)	10.0	8.5	15	15	37	35	5	5	3.8	8.7	-129	-129	11	14	-27	-27	11.3	8.7	23	23	9.6	9.0	6	6	20	18	10	10
TOC (mg/L)	13.2	8.8	33	33	38	38	0	0	4.1	11	-168	-168	15	19	-27	-27	14.3	9.8	31	31	11	10	9	9	26	23	12	12
Total As (ug/L)	3.4	2.1	38	38	3.3	3.2	3	3	1.5	1.5	0	0	2.0	1.9	5	5	1.0	1.4	-40	-40	1.4	1.6	-14	-14	1.9	2.0	-5	-5
Total Cd (ug/L)	1.3	0.7	46	46	1.1	1.3	-18	-18	0.2	0.2U	>0	>0	0.4	0.4	0	0	0.2	0.3	-50	-50	0.3	0.2	33	33	0.4	0.4	0	0
Total Cr (ug/L)	9.5	3.9	59	59	4.7	4.2	11	11	1.8	1.2	33	33	3.8	2.7	29	29	3.1	2.8	10	10	1.5	1.8	-20	-20	2.8	3.1	-11	-11
Total Cu (ug/L)	54	11	80	80	52	52	0	0	6.3	6.7	-6	-6	18	16	11	11	9.5	9.5	0	0	11	12	-9	-9	22	21	5	5
Total Pb (ug/L)	269	32	88	88	49	32	35	35	5.1	11	-116	-116	31	26	16	16	10.7	18	-68	-68	17	18	-6	-6	24	29	-21	-21
Total Ni (ug/L)	12	3.6	70	70	13	12	8	8	2U	3.5	<-75	<-75	116	4.0	97	97	2U	2.7	<-35	<-35	2.5	2.8	-12	-12	5.9	5.2	12	12
Total Zn (ug/L)	489	78	84	84	412	247	40	40	68	99	-46	-46	4.6	108	-2248	-2248	56	69	-23	-23	64	59	8	8	119	105	12	12
Dissolved As (ug/L)	0.5U	1.6	<-220	<-220	2.7	2.7	0	0	1.3	0.5U	>62	>62	2.0	1.5	25	25	0.5U	0.9	<-80	<-80	1.4	1.4	0	0	1.2	1.3	-8	-8
Dissolved Cd (ug/L)	0.3	0.4	-33	-33	0.8	1.0	-25	-25	0.2	0.2U	>0	>0	0.2	0.2U	>0	>0	0.2	0.2U	>0	>0	0.3	0.2	33	33	0.2	0.2	0	0
Dissolved Cr (ug/L)	2.0	3.0	-50	-50	2.1	2	5	5	1U	1U	na	na	1.0	1U	>0	>0	2.1	1.0	52	52	1U	1U	na	na	2.0	1U	>50	>50
Dissolved Cu (ug/L)	16	9.5	41	41	39	44	-13	-13	4.9	5.1	-4	-4	9.4	2.6	72	72	8.2	5.2	37	37	7.6	8.0	-5	-5	13	12	8	8
Dissolved Pb (ug/L)	23	26	-13	-13	32	7.6	76	76	1U	4.8	<-380	<-380	4.0	1.1	73	73	6.1	3.8	38	38	1.5	1.7	-13	-13	1.8	2.2	-22	-22
Dissolved Ni (ug/L)	4.2	3.1	26	26	7.1	11	-55	-55	2U	3.2	<-60	<-60	2.3	1.2	48	48	2U	2U	na	na	2.1	2.0	5	5	5.4	3.3	39	39
Dissolved Zn (ug/L)	128	62	52	52	319	222	30	30	54	23	57	57	3.2	21	-556	-556	47	46	2	2	40	32	20	20	77	58	25	25
Nitrate-Nitrogen (mg/L)	0.84	0.40	52	52	3.58	4.06	-13	-13	0.34	0.53	-56	-56	0.79	0.76	4	4	0.31	0.22	29	29	0.5	0.5	0	0	1.29	1.18	9	9
TKN (mg/L)	1.79	0.67	63	63	8.78	7.81	11	11	0.81	0.45	44	44	2.06	2.19	-6	-6	0.56	0.60	-7	-7	0.9	0.6	33	33	1.96	1.72	12	12
Total P (mg/L)	0.49	0.29	41	41	2.62	0.58	78	78	0.16	0.35	-119	-119	0.22	0.24	-9	-9	0.24	0.20	17	17	0.25	0.18	28	28	0.51	0.34	33	33
Diss. Orthophosphate (mg/L)	0.10	0.2	-100	-100	0.46	0.07	85	85	0.03U	0.18	<-500	<-500	0.14	0.13	7	7	0.08	0.08	0	0	0.08	0.07	13	13	0.30	0.40	-33	-33
Storm Volume (cubic feet)	12227	12227			1386	1386			58830	58830			4764	4764			40358	40358			5225	5225			6119	6119		

	I-605/SR-91 EDB 27 October, 2000				I-605/SR-91 EDB 8 January, 2001				I-605/SR-91 EDB 12 January, 2001				I-605/SR-91 EDB 25 January, 2001				I-605/SR-91 EDB 14 February, 2001				I-605/SR-91 EDB 6 March, 2001				I-605/SR-91 EDB 7 April, 2001			
	EMCs		Efficiency	% Diff. in	EMCs		Efficiency	% Diff. in	EMCs		Efficiency	% Diff. in	EMCs		Efficiency	% Diff. in	EMCs		Efficiency	% Diff. in	EMCs		Efficiency	% Diff. in	EMCs		Efficiency	% Diff. in
	Influent	Effluent	(%)	Load	Influent	Effluent	(%)	Load	Influent	Effluent	(%)	Load	Influent	Effluent	(%)	Load	Influent	Effluent	(%)	Load	Influent	Effluent	(%)	Load	Influent	Effluent	(%)	Load
TDS (mg/L)	98	44	55	97	166	98	41	99	208	98	53	100	102	44	57	94	168	47	72	95	48	286	-496	-7	83	68	18	81
TSS (mg/L)	61	24	61	97	150	22	85	100	58	22	61	100	165	36	78	97	24	9	63	93	74	17	77	96	93	22	76	95
DOC (mg/L)	9.2	7.6	17	94	23	20	12	99	5.2	20	-289	97	11	30	-173	64	22	11	50	91	9.1	33	-263	35	21	15	29	84
TOC (mg/L)	10.0	8.9	11	93	31	24	23	99	6.6	24	-261	97	26	32	-23	84	24	14	42	89	9.5	39	-311	26	28	20	29	84
Total As (ug/L)	1.7	1.9	-12	92	3.7	2	45	99	1.7	2	-20	99	3.9	1.7	56	94	1.8	1.2	33	88	1.7	3.5	-106	63	2.3	1.8	22	82
Total Cd (ug/L)	0.6	0.4	33	95	2.1	1	76	100	0.6	1	16	99	1.2	0.8	33	91	0.6	0.3	50	91	0.5	0.6	-20	79	0.7	0.4	43	87
Total Cr (ug/L)	4.2	3.4	19	94	10	2	77	100	2.3	2	-2	99	8.8	3.9	56	94	86	1.2	99	100	6.2	1.6	74	95	6.7	1.3	81	96
Total Cu (ug/L)	22	18	18	94	73	22	70	100	20	22	-9	99	59	29	51	93	15	8.1	46	90	20	25	-25	78	39	24	38	86
Total Pb (ug/L)	51	34	33	95	159	25	84	100	103	25	76	100	128	39	70	96	53	8.7	84	97	43	13	70	95	78	23	71	93
Total Ni (ug/L)	5.7	4.9	14	94	17	5	73	100	4.5	5	-2	99	12	5.7	53	94	3.1	2U	>35	>88	6.3	6.4	-2	82	7.8	3.3	58	90
Total Zn (ug/L)	161	96	40	96	636	124	81	100	170	124	27	99	550	166	70	96	182	64	65	93	282	159	44	90	347	122	65	92
Dissolved As (ug/L)	0.5U	0.5U	na	na	2.7	1	47	99	1.3	1	-10	99	3.7	0.9	76	97	1.2	0.8	33	88	1.4	3.2	-129	59	1.5	1.5	0	77
Dissolved Cd (ug/L)	0.2U	0.2	<0	<93	1.0	0	65	100	0.4	0	13	99	0.7	0.6	14	89	0.4	0.2	50	91	0.3	0.4	-33	76	0.3	0.3	0	77
Dissolved Cr (ug/L)	1.4	1.9	-36	90	3.5	2	56	100	1.2	2	-27	99	2.5	2.6	-4	86	1.4	1.0	29	87	1.7	1.0	41	89	1.5	1U	>33	>85
Dissolved Cu (ug/L)	9.1	12	-32	90	37	17	54	100	12	17	-42	99	28	24	14	89	9.8	7.4	24	86	10	21	-110	62	23	18	22	82
Dissolved Pb (ug/L)	4.0	5.8	-45	89	16	6	63	100	17	6	65	100	9.2	11	-20	84	17	4.7	72	95	2.8	1.3	54	92	7.0	4.1	41	87
Dissolved Ni (ug/L)	2.6	3.2	-23	91	12	4	67	100	3.6	4	-9	99	6.7	5.2	22	90	2.1	2U	>5	>82	3.8	6.1	-61	71	4.0	2.6	35	85
Dissolved Zn (ug/L)	56	59	-5	92	539	96	82	100	117	96	18	99	244	141	42	92	135	62	54	91	176	116	34	88	193	95	51	89
Nitrate-Nitrogen (mg/L)	0.80	0.83	-4	92	1.40	1	23	99	0.84	1	-28	99	1.34	1.47	-10	85	0.86	0.38	56	92	0.7	1.8	-157	54	1.05	0.62	41	87
TKN (mg/L)	1.73	1.62	6	93	7.76	1	82	100	0.68	1	-111	98	4.5	1.78	60	95	0.76	0.94	-24	77	1.3	1.4	-8	81	2.06	1.38	33	85
Total P (mg/L)	0.54	0.41	24	94	0.30	0	-14	99	0.18	0	-89	98	0.18	0.36	-100	73	0.20	0.17	15	84	0.21	0.32	-52	73	0.26	0.41	-58	64
Diss. Orthophosphate (mg/L)	0.32	0.3	6	93	0.22	0	1	99	0.03U	0	-625	94	0.09	0.14	-56	79	0.05	0.08	-60	70	0.03U	0.17	<-467	<-2	0.12	0.35	-192	34
Storm Volume (cubic feet)	19121	1413			1673	17			52676	451			1327	176			19932	3695			5878	1053			2755	625		

Notes:

Hilighted values were estimated by calculating the mean of the EMCs using the Scoping Study methodology.

Average wet season removal efficiencies calculated using the Scoping Study methodology.

Where EMC was non-detect then Reporting Limit was used.

"U" = Analyte not detected above Reporting limit.

Table 1-6d: BMP Pollutant Removal Efficiencies (Sand Filters - Austin Type)

	Eastern SF 27 October, 2000				Eastern SF 12 January, 2001				Eastern SF 25 January, 2001				Eastern SF 14 February, 2001				Eastern SF 6 March, 2001				Eastern SF 7 April, 2001			
	EMCs		Efficiency	% Diff. in	EMCs		Efficiency	% Diff. in	EMCs		Efficiency	% Diff. in	EMCs		Efficiency	% Diff. in	EMCs		Efficiency	% Diff. in	EMCs		Efficiency	% Diff. in
	Influent	Effluent	(%)	Load	Influent	Effluent	(%)	Load	Influent	Effluent	(%)	Load	Influent	Effluent	(%)	Load	Influent	Effluent	(%)	Load	Influent	Effluent	(%)	Load
TDS (mg/L)	44	53.5	-22	-22	56	70	-25	-25	14	46	-229	-229	5	8	-60	-60	23	58	-152	-152	40	44	-10	-10
TSS (mg/L)	44	12	74	74	103	10	90	90	65	13	80	80	37	12	68	68	40	6	85	85	25	16	36	36
DOC (mg/L)	9.5	25	-168	-168	3.6	90	-2400	-2400	10	15	-50	-50	5.4	5.5	-2	-2	5.6	4.0	29	29	7.6	8.1	-7	-7
TOC (mg/L)	10.0	28	-181	-181	4.0	94	-2250	-2250	20	19	5	5	7.8	6.9	12	12	6.9	4.3	38	38	8.7	8.6	1	1
Total As (ug/L)	1.7	2	-5	-5	1.1	1.4	-27	-27	3.0	2.5	17	17	1.4	1.3	7	7	1.9	2.0	-5	-5	1.5	1.7	-13	-13
Total Cd (ug/L)	0.5	0	48	48	0.2U	0.2U	na	na	1.0	0.5	50	50	0.3	0.2U	>33	>33	0.2	0.2	0	0	0.2	0.2U	>0	>0
Total Cr (ug/L)	7.9	3	67	67	1.6	5.3	-231	-231	7.5	2.9	61	61	27	1.7	94	94	3.9	1.0	74	74	2.5	1.7	32	32
Total Cu (ug/L)	13	9	31	31	6.0	5.1	15	15	23	21	9	9	6.0	4.0	33	33	9.1	7.0	23	23	6.7	7.0	-4	-4
Total Pb (ug/L)	30	3	88	88	9.1	2.4	74	74	24	7.1	70	70	6.6	2.8	58	58	11	1.0	91	91	6.3	3.1	51	51
Total Ni (ug/L)	4.4	3	33	33	2U	5.3	<-165	<-165	4.2	3.2	24	24	2.4	2U	>17	>17	2.1	2U	>5	>5	2.3	2U	>13	>13
Total Zn (ug/L)	137	48	65	65	36	31	14	14	274	89	68	68	63	25	60	60	76	46	39	39	90	45	50	50
Dissolved As (ug/L)	0.5U	2	-218	-218	1.1	0.7	36	36	2.8	2.3	18	18	1.2	1.1	8	8	1.6	1.9	-19	-19	1.3	1.7	-31	-31
Dissolved Cd (ug/L)	0.2U	0	-31	-31	0.2U	0.2U	na	na	0.6	0.5	17	17	0.2	0.2U	>0	>0	0.2U	0.2	<0	<0	0.2	0.2U	>0	>0
Dissolved Cr (ug/L)	1U	1	-16	-16	1.0	1.6	-60	-60	1.8	1.2	33	33	11.3	1U	>91	>91	1U	1U	na	na	1U	1U	na	na
Dissolved Cu (ug/L)	5.1	8	-60	-60	4.8	4.7	2	2	17	19	-12	-12	5.4	3.6	33	33	6.2	6.6	-6	-6	5.0	6.3	-26	-26
Dissolved Pb (ug/L)	2.1	1	32	32	2.5	1.1	56	56	4.9	2.7	45	45	3.8	1.3	66	66	1U	1U	na	na	1U	1U	na	na
Dissolved Ni (ug/L)	1.7	2	-25	-25	2U	2U	na	na	2.6	2.6	0	0	2U	2U	na	na	2U	2U	na	na	2U	2U	na	na
Dissolved Zn (ug/L)	66	42	36	36	29	21	28	28	102	77	25	25	54	23	57	57	47	43	9	9	76	41	46	46
Nitrate-Nitrogen (mg/L)	0.29	1	-128	-128	0.45	0.38	16	16	0.50	0.76	-52	-52	0.27	0.31	-15	-15	0.3	1.0	-233	-233	0.41	0.75	-83	-83
TKN (mg/L)	0.61	2	-243	-243	1.52	0.59	61	61	0.74	8.8	-1089	-1089	0.58	0.56	3	3	0.01U	0.5	<-4900	<-4900	0.64	0.63	2	2
Total P (mg/L)	0.11	0	-61	-61	0.32	0.13	59	59	0.18	0.17	6	6	0.13	0.24	-85	-85	0.11	0.04	64	64	0.12	0.22	-83	-83
Diss. Orthophosphate (mg/L)	0.05	0	-33	-33	0.03U	0.03U	na	na	0.03U	0.03U	na	na	0.03U	0.03U	na	na	0.03U	0.03U	na	na	0.03	0.22	-633	-633
Ammonia (mg/L)	na	na	na	na	0.4	0.1U	>75	>75	0.5	0.41	18	18	0.41	0.37	10	10	0.1U	0.1U	na	na	0.5	0.3	40	40
Storm Volume (cubic feet)	117	117			4932	4932			1742	1742			3185	3185			1192	1192			1865	1865		

	Foothill SF 27 October, 2000				Foothill SF 11 January, 2001				Foothill SF 25 January, 2001				Foothill SF 10 February, 2001				Foothill SF 6 March, 2001				Foothill SF 7 April, 2001				Foothill SF 20 April, 2001			
	EMCs		Efficiency	% Diff. in	EMCs		Efficiency	% Diff. in	EMCs		Efficiency	% Diff. in	EMCs		Efficiency	% Diff. in	EMCs		Efficiency	% Diff. in	EMCs		Efficiency	% Diff. in	EMCs		Efficiency	% Diff. in
	Influent	Effluent	(%)	Load	Influent	Effluent	(%)	Load	Influent	Effluent	(%)	Load	Influent	Effluent	(%)	Load	Influent	Effluent	(%)	Load	Influent	Effluent	(%)	Load	Influent	Effluent	(%)	Load
TDS (mg/L)	40	105	-163	-163	98	61	38	38	32	44	-38	-38	24	52	-117	-117	1U	64	<-6300	<-6300	33	65	-97	-97	43	22	49	49
TSS (mg/L)	57	11	81	81	57	10	83	83	128	9	93	93	168	11	93	93	100	7	93	93	51	7	86	86	85	13	85	85
DOC (mg/L)	16.9	20	-18	-18	3.4	14	-310	-310	14	16	-14	-14	16.5	18	-9	-9	4.0	3.4	15	15	8.4	14	-67	-67	5.3	5.0	6	6
TOC (mg/L)	17.1	20	-17	-17	4.0	16	-299	-299	14	20	-43	-43	13.7	20	-46	-46	4.3	4.1	5	5	11	17	-55	-55	6.0	7.9	-32	-32
Total As (ug/L)	17	18	-6	-6	7.9	9	-11	-11	5.4	5.4	0	0	10.4	7.8	25	25	4.8	5.0	-4	-4	4.7	8.0	-70	-70	9.9	7.9	20	20
Total Cd (ug/L)	0.9	0.4	56	56	0.4	0	42	42	0.7	0.2U	>71	>71	1.2	0.2	83	83	0.2	0.2	0	0	0.4	0.2U	>50	>50	0.6	0.2U	>67	>67
Total Cr (ug/L)	3.8	2.5	34	34	1U	1	-27	-27	4.3	1U	>77	>77	8.8	1.0	89	89	1.4	1U	>29	>29	2.0	1.1	45	45	3.2	1U	>69	>69
Total Cu (ug/L)	23	31	-35	-35	6.7	14	-105	-105	20	12	40	40	33	13.7	58	58	6.5	6.9	-6	-6	10	10	0	0	15	8.4	44	44
Total Pb (ug/L)	28	5.7	80	80	3.4	3	1	1	46	3.1	93	93	65	4.3	93	93	8.2	3.2	61	61	9.8	1.5	85	85	22	1.8	92	92
Total Ni (ug/L)	5.4	4.7	13	13	2U	3	-29	-29	4.6	2.1	54	54	8.7	2.5	71	71	2U	2.2	<-10	<-10	2.9	2U	>31	>31	3.6	2U	>44	>44
Total Zn (ug/L)	448	93	79	79	144	69	52	52	274	60	78	78	449	59	87	87	127	98	23	23	179	46	74	74	222	56	75	75
Dissolved As (ug/L)	14	18	-29	-29	7.6	8	-10	-10	5.0	5.1	-2	-2	9.2	7.2	22	22	4.6	4.7	-2	-2	4.2	7.1	-69	-69	8.2	7.7	6	6
Dissolved Cd (ug/L)	0.5	0.3	40	40	0.4	0	46	46	0.3	0.2U	>33	>33	0.3	0.2U	>33	>33	0.2	0.2	0	0	0.2	0.2U	>0	>0	0.2U	0.2U	na	na
Dissolved Cr (ug/L)	1.6	2.4	-50	-50	1U	1	-23	-23	1.0	1U	>0	>0	1.5	1.0	33	33	1U	1U	na	na	1U	1U	na	na	1U	1U	na	na
Dissolved Cu (ug/L)	14	30	-114	-114	5.9	13	-114	-114	9.2	11	-20	-20	8.8	12.0	-36	-36	4.0	5.8	-45	-45	6.6	8.8	-33	-33	5.6	7.8	-39	-39
Dissolved Pb (ug/L)	5.2	5.7	-10	-10	1.7	2	-28	-28	5.4	1.4	74	74	9.2	2.8	70	70	1U	1U	na	na	1.4	1U	>29	>29	1.5	1U	>33	>33
Dissolved Ni (ug/L)	2.8	4.6	-64	-64	2U	2	-16	-16	1.8	2U	>-11	>-11	2.1	2U	>5	>5	2U	2.1	<-5	<-5	2U	2U	na	na	2U	2U	na	na
Dissolved Zn (ug/L)	362	92	75	75	130	63	52	52	160	48	70	70	159	55	65	65	96	87	9	9	134	42	69	69	113	50	56	56
Nitrate-Nitrogen (mg/L)	0.83	3.08	-271	-271	0.26	1	-361	-361	0.6	0.93	-55	-55	0.68	1.10	-62	-62	0.3	0.7	-133	-133	0.33	0.84	-155	-155	0.32	0.52	-63	-63
TKN (mg/L)	2.37	2.48	-5	-5	1.61	2	-50	-50	1.25	8.4	-572	-572	2.40	1.00	58	58	1.2	0.8	33	33	1.06	1.16	-9	-9	1.89	0.79	58	58
Total P (mg/L)	0.34	0.26	24	24	0.18	0	-137	-137	0.10	0.16	-60	-60	0.32	0.11	66	66	0.20	0.002U	>99	>99	0.21	0.16	24	24	0.17	0.18	-6	-6
Diss. Orthophosphate (mg/L)	0.16	0.15	6	6	0.07	0	-30	-30	0.09	0.03U	>67	>67	0.05	0.05	0	0	0.03U	0.03U	na	na	0.05	0.14	-180	-180	0.07	0.11	-57	-57
Ammonia (mg/L)	na	na	na	na	0.3	0	-2	-2	0.9	0.30	67	67	1.00	0.22	78	78	0.5	0.6	-20	-20	0.43	0.24	44	44	0.7	0.1	86	86
Storm Volume (cubic feet)	2112	2112			2821	2821			1333	1333			558	558			2309	2309			2808	2808			1891	1891		

Notes:

Hilighted values were estimated by calculating the mean of the EMCs using the Scoping Study methodology.

Average wet season removal efficiencies calculated using the Scoping Study methodology.

Where EMC was non-detect then Reporting Limit was used.

"U" = Analyte not detected above Reporting limit.

Table 1-6d: BMP Pollutant Removal Efficiencies (Sand Filters - Austin Type)

	Termination SF 27 October, 2000				Termination SF 24 January, 2001				Termination SF 11 February, 2001				Termination SF 7 March, 2001				Termination SF 7 April, 2001			
	EMCs		Efficiency	% Diff. in	EMCs		Efficiency	% Diff. in	EMCs		Efficiency	% Diff. in	EMCs		Efficiency	% Diff. in	EMCs		Efficiency	% Diff. in
	Influent	Effluent	(%)	Load	Influent	Effluent	(%)	Load	Influent	Effluent	(%)	Load	Influent	Effluent	(%)	Load	Influent	Effluent	(%)	Load
TDS (mg/L)	20	46	-131	-131	36	36	0	0	42	46	-10	-10	48	47	2	2	54	55	-2	-2
TSS (mg/L)	78	4	95	95	20	6	70	70	28	4	86	86	25	4	84	84	14	1U	>93	>93
DOC (mg/L)	10.0	10	-1	-1	8.5	9	-6	-6	14.4	12.2	15	15	6.8	3.5	49	49	18	13	28	28
TOC (mg/L)	11.1	12	-12	-12	14	14	0	0	15.2	13.0	14	14	7.9	3.9	51	51	22	15	32	32
Total As (ug/L)	1.3	1	30	30	0.8	0.6	25	25	0.5	0.8	-60	-60	0.5U	1.1	<-120	<-120	0.5U	1.1	<-120	<-120
Total Cd (ug/L)	0.4	0	50	50	0.3	0.2	33	33	0.2	0.2	0	0	0.2U	0.2	<0	<0	0.2	0.2	0	0
Total Cr (ug/L)	4.9	1	80	80	1.5	1.0	33	33	1U	1U	na	na	3.5	1U	>71	>71	1U	1U	na	na
Total Cu (ug/L)	23	11	54	54	16	11	31	31	9.7	9.5	2	2	6.4	7.4	-16	-16	17	14	18	18
Total Pb (ug/L)	19	1	95	95	1.9	1.0	47	47	1.4	1U	>29	>29	2.2	1U	>55	>55	2.6	1.1	58	58
Total Ni (ug/L)	7.5	3	55	55	4.2	3.8	10	10	3.5	3.4	3	3	2.2	2.3	-5	-5	5.4	3.9	28	28
Total Zn (ug/L)	190	89	53	53	88	162	-84	-84	79	55	30	30	45	47	-4	-4	157	81	48	48
Dissolved As (ug/L)	0.5U	1	-72	-72	0.7	0.6	14	14	0.5U	0.7	<-40	<-40	0.5U	1.1	<-120	<-120	0.5U	1.0	<-100	<-100
Dissolved Cd (ug/L)	0.2U	0	0	0	0.3	0.2	33	33	0.2	0.2	0	0	0.2U	0.2	<0	<0	0.2	0.2	0	0
Dissolved Cr (ug/L)	3.3	1	70	70	1.5	1U	>33	>33	1U	1U	na	na	1.6	1U	>38	>38	1U	1U	na	na
Dissolved Cu (ug/L)	7.4	10	-28	-28	14	10	29	29	9.2	9.1	1	1	4.5	6.6	-47	-47	14	12	14	14
Dissolved Pb (ug/L)	1.3	1	23	23	1.0	1U	>0	>0	1U	1U	na	na	1U	1U	na	na	1.1	1U	>9	>9
Dissolved Ni (ug/L)	2.9	3	-4	-4	4.1	3.5	15	15	3.2	3.1	3	3	2U	2.2	<-10	<-10	4.7	3.2	32	32
Dissolved Zn (ug/L)	72	68	6	6	81	115	-42	-42	60	54	10	10	27	45	-67	-67	135	53	61	61
Nitrate-Nitrogen (mg/L)	1.04	4	-302	-302	0.51	0.93	-82	-82	0.59	1.18	-100	-100	0.2	0.8	-300	-300	0.36	0.01U	>97	>97
TKN (mg/L)	1.76	4	-118	-118	2.26	7.9	-250	-250	2.00	1.20	40	40	1.2	0.6	50	50	1.60	0.14	91	91
Total P (mg/L)	0.22	0	50	50	0.09	0.16	-78	-78	0.14	0.09	36	36	0.08	0.09	-13	-13	0.15	0.10	33	33
Diss. Orthophosphate (mg/L)	0.10	0	57	57	0.03U	0.03U	na	na	0.03U	0.03U	na	na	0.03U	0.03U	na	na	0.08	0.08	0	0
Ammonia (mg/L)	na	na	na	na	1.6	0.49	69	69	1.10	0.49	55	55	0.4	0.2	50	50	0.8	0.16	80	80
Storm Volume (cubic feet)	720	720			621	621			1464	1464			2844	2844			2708	2708		

Notes:

Hilighted values were estimated by calculating the mean of the EMCs using the Scoping Study methodology.

Average wet season removal efficiencies calculated using the Scoping Study methodology.

Where EMC was non-detect then Reporting Limit was used.

"U" = Analyte not detected above Reporting limit.

Table 1-6e: BMP Pollutant Removal Efficiencies (MCTTs)

	Via Verde MCTT 27 October, 2000				Via Verde MCTT 11 January, 2001				Via Verde MCTT 7 April, 2001				Via Verde MCTT 20 April, 2001			
	EMCs		Efficiency	% Diff. in	EMCs		Efficiency	% Diff. in	EMCs		Efficiency	% Diff. in	EMCs		Efficiency	% Diff. in
	Influent	Effluent	(%)	Load	Influent	Effluent	(%)	Load	Influent	Effluent	(%)	Load	Influent	Effluent	(%)	Load
TDS (mg/L)	40	108	-170	-170	16	98	-513	-513	10	44	-340	-340	43	27	37	37
TSS (mg/L)	22	12	45	45	34	22	35	35	118	5	96	96	72	6	92	92
DOC (mg/L)	14.7	14.0	5	5	2.2	25	-1036	-1036	6.2	11	-77	-77	6.7	6.3	6	6
TOC (mg/L)	15.2	14.9	2	2	4.3	49	-1040	-1040	6.7	14	-109	-109	7.7	6.6	14	14
Total As (ug/L)	0.5U	1.8	<-260	<-260	0.5U	0.7	<-40	<-40	0.5U	0.5U	na	na	1.0	0.5U	>50	>50
Total Cd (ug/L)	0.2U	0.2	<0	<0	0.2U	0.2U	na	na	0.4	0.2U	>50	>50	0.4	0.4	0	0
Total Cr (ug/L)	1U	1.9	<-90	<-90	1U	1U	na	na	4.7	1U	>79	>79	3.2	1U	>69	>69
Total Cu (ug/L)	7.7	14	-82	-82	2.7	4.1	-52	-52	17	4.1	76	76	13	3.2	75	75
Total Pb (ug/L)	2.9	2.7	7	7	1U	1.4	<-40	<-40	15	1U	>93	>93	11	1U	>91	>91
Total Ni (ug/L)	4.4	5.0	-14	-14	2U	2U	na	na	8.3	2U	>76	>76	4.9	6.2	-27	-27
Total Zn (ug/L)	129	30	77	77	48	129	-169	-169	267	13	95	95	182	20	89	89
Dissolved As (ug/L)	0.5U	0.5U	na	na	0.5U	0.6	<-20	<-20	0.5U	0.5U	na	na	0.5U	0.5U	na	na
Dissolved Cd (ug/L)	0.2U	0.2U	na	na	0.2U	0.2U	na	na	0.2U	0.2U	na	na	0.2U	0.3	<-50	<-50
Dissolved Cr (ug/L)	1U	1U	na	na	1U	1U	na	na	1U	1U	na	na	1U	1U	na	na
Dissolved Cu (ug/L)	6.9	13	-88	-88	2.6	4.0	-54	-54	3.0	3.1	-3	-3	6.0	1.7	72	72
Dissolved Pb (ug/L)	1.7	2	-18	-18	1U	1.3	<-30	<-30	1U	1U	na	na	1U	1U	na	na
Dissolved Ni (ug/L)	4.0	2.9	28	28	2U	2U	na	na	2U	2U	na	na	3.0	2U	>33	>33
Dissolved Zn (ug/L)	118	28	76	76	47	15	68	68	57	9.5	83	83	87	13	85	85
Nitrate-Nitrogen (mg/L)	0.59	1.11	-88	-88	0.15	0.53	-253	-253	0.02	0.73	-3550	-3550	0.42	0.74	-76	-76
TKN (mg/L)	2.63	2.93	-11	-11	1.28	0.62	52	52	1.76	1.80	-2	-2	2.02	1.24	39	39
Total P (mg/L)	0.26	0.38	-46	-46	0.22	0.29	-32	-32	0.37	0.12	68	68	0.19	0.08	58	58
Diss. Orthophosphate (mg/L)	0.21	0.23	-10	-10	0.09	0.14	-56	-56	0.10	0.12	-20	-20	0.10	0.04	60	60
Ammonia (mg/L)	na	na	na	na	0.7	0.6	14	14	0.9	0.6	33	33	1.2	0.3	75	75
Storm Volume (cubic feet)	477	477			734	734			551	551			440	440		

	Lakewood MCTT 11 October, 2000				Lakewood MCTT 27 October, 2000				Lakewood MCTT 8 January, 2001				Lakewood MCTT 10 January, 2001			
	EMCs		Efficiency	% Diff. in	EMCs		Efficiency	% Diff. in	EMCs		Efficiency	% Diff. in	EMCs		Efficiency	% Diff. in
	Influent	Effluent	(%)	Load	Influent	Effluent	(%)	Load	Influent	Effluent	(%)	Load	Influent	Effluent	(%)	Load
TDS (mg/L)	144	282	-96	-96	52	76	-46	-46	66	92	-39	-39	88	48	45	45
TSS (mg/L)	56	21	63	63	34	8	76	76	59	20	66	66	28	8	71	71
DOC (mg/L)	51	79	-55	-55	7.9	14.7	-86	-86	25	11	56	56	3.8	6.2	-63	-63
TOC (mg/L)	52	81	-56	-56	17.0	15.4	9	9	35	12	66	66	4.8	7.7	-60	-60
Total As (ug/L)	4.8	3.2	33	33	1.0	2.0	-100	-100	1.2	1.4	-17	-17	0.6	0.9	-50	-50
Total Cd (ug/L)	0.7	1.5	-114	-114	0.2	0.3	-50	-50	0.5	0.2U	>60	>60	0.2U	0.2U	na	na
Total Cr (ug/L)	1.7	3.0	-76	-76	2.1	1U	>52	>52	1.6	1U	>38	>38	1U	1U	na	na
Total Cu (ug/L)	38	31	18	18	12	8	33	33	21	11	48	48	6.3	7.8	-24	-24
Total Pb (ug/L)	15.3	4.8	69	69	8.1	1	88	88	5.7	1U	>82	>82	1.3	1U	>23	>23
Total Ni (ug/L)	20.1	22	-9	-9	4.9	6.5	-33	-33	11	6.0	45	45	3.2	7.1	-122	-122
Total Zn (ug/L)	627	356	43	43	151	57	62	62	285	41	86	86	56	37	34	34
Dissolved As (ug/L)	3.9	2.3	41	41	1.0	0.5U	>50	>50	1.0	1.3	-30	-30	0.5U	0.6	<-20	<-20
Dissolved Cd (ug/L)	0.7	1.0	-43	-43	0.2	0.2U	>0	>0	0.4	0.2U	>50	>50	0.2U	0.2U	na	na
Dissolved Cr (ug/L)	1U	2.5	<-150	<-150	2.0	1U	>50	>50	1U	1U	na	na	1U	1U	na	na
Dissolved Cu (ug/L)	33	23	30	30	12	8	33	33	18	10	44	44	5.5	7.0	-27	-27
Dissolved Pb (ug/L)	7.2	2.3	68	68	8.0	1U	>88	>88	1.3	1U	>23	>23	1U	1U	na	na
Dissolved Ni (ug/L)	18.1	19	-5	-5	4.8	5.7	-19	-19	10	5.6	44	44	2.9	3.0	-3	-3
Dissolved Zn (ug/L)	601	294	51	51	148	47	68	68	190	38	80	80	53	26	51	51
Nitrate-Nitrogen (mg/L)	4.40	0.31	93	93	0.28	0.45	-61	-61	1.49	1.43	4	4	0.20	0.66	-230	-230
TKN (mg/L)	6.10	6.50	-7	-7	1.66	2.70	-63	-63	5.76	2.46	57	57	1.20	1.23	-3	-3
Total P (mg/L)	0.48	0.28	42	42	0.21	0.41	-95	-95	0.30	0.27	10	10	0.20	0.22	-10	-10
Diss. Orthophosphate (mg/L)	0.31	0.58	-87	-87	0.11	0.12	-9	-9	0.24	0.14	42	42	0.04	0.08	-100	-100
Ammonia (mg/L)	na	na	na	na	na	na	na	na	3.52	1.1	69	69	0.7	0.5	29	29
Storm Volume (cubic feet)	989	989			6425	6425			3031	3031			6425	6425		

	Lakewood MCTT 24 January, 2001				Lakewood MCTT 12 February, 2001			
	EMCs		Efficiency	% Diff. in	EMCs		Efficiency	% Diff. in
	Influent	Effluent	(%)	Load	Influent	Effluent	(%)	Load
TDS (mg/L)	12	30	-150	-150	18	20	-11	-11
TSS (mg/L)	56	8	86	86	14	10	29	29
DOC (mg/L)	12	11	8	8	6.8	10	-47	-47
TOC (mg/L)	15	14	7	7	9.1	11	-21	-21
Total As (ug/L)	0.7	0.8	-14	-14	0.9	0.7	22	22
Total Cd (ug/L)	0.2	0.2U	>0	>0	0.4	0.2U	>50	>50
Total Cr (ug/L)	1.2	1U	>17	>17	1.1	1U	>9	>9
Total Cu (ug/L)	11	6.5	41	41	6.4	4.7	27	27
Total Pb (ug/L)	3.0	1U	>67	>67	2.2	1U	>55	>55
Total Ni (ug/L)	4.6	2.7	41	41	3.1	2U	>35	>35
Total Zn (ug/L)	107	43	60	60	70	31	56	56
Dissolved As (ug/L)	0.7	0.7	0	0	0.5	0.6	-20	-20
Dissolved Cd (ug/L)	0.2	0.2U	>0	>0	0.2U	0.2U	na	na
Dissolved Cr (ug/L)	1.2	1U	>17	>17	1U	1U	na	na
Dissolved Cu (ug/L)	9.4	6.2	34	34	4.8	4.1	15	15
Dissolved Pb (ug/L)	1.5	1U	>33	>33	1U	1U	na	na
Dissolved Ni (ug/L)	4.3	2.6	40	40	2.3	2U	>13	>13
Dissolved Zn (ug/L)	90	25	72	72	59	28	53	53
Nitrate-Nitrogen (mg/L)	0.40	0.88	-120	-120	0.20	0.50	-150	-150
TKN (mg/L)	1.9	1.2	37	37	1.10	0.78	29	29
Total P (mg/L)	0.10	0.10	0	0	0.11	0.10	9	9
Diss. Orthophosphate (mg/L)	0.08	0.05	38	38	0.03U	0.03U	na	na
Ammonia (mg/L)	1.1	0.6	45	45	0.84	0.53	37	37
Storm Volume (cubic feet)	2109	2109			6425	6425		

Notes:

Hilighted values were estimated by calculating the mean of the EMCs using the Scoping Study methodology.

Average wet season removal efficiencies calculated using the Scoping Study methodology.

Where EMC was non-detect then Reporting Limit was used.

"U" = Analyte not detected above Reporting limit.

Table 1-6f: BMP Pollutant Removal Efficiencies (CDS Units)

	Orcas CDS 10 February, 2001				Orcas CDS 28 February, 2001				Orcas CDS 6 March, 2001				Orcas CDS 7 April, 2001			
	EMCs		Efficiency	% Diff. in	EMCs		Efficiency	% Diff. in	EMCs		Efficiency	% Diff. in	EMCs		Efficiency	% Diff. in
	Influent	Effluent	(%)	Load	Influent	Effluent	(%)	Load	Influent	Effluent	(%)	Load	Influent	Effluent	(%)	Load
TDS (mg/L)	32	40	-25	-25	36	36	0	0	32	20	38	38	36	48	-33	-33
TSS (mg/L)	139	80	42	42	27	23	15	15	25	29	-16	-16	41	35	15	15
DOC (mg/L)	14.7	11	25	25	7.9	8.1	-3	-3	6.7	6.1	9	9	9.9	7.9	20	20
TOC (mg/L)	15.4	14	9	9	10	9.4	6	6	7.2	7.1	1	1	12	10	17	17
Total As (ug/L)	1.6	0.6	63	63	4.1	3.6	12	12	0.5U	0.5U	na	na	0.5U	0.5U	na	na
Total Cd (ug/L)	0.9	0.8	11	11	0.5	0.4	20	20	0.4	0.3	25	25	0.3	0.2	33	33
Total Cr (ug/L)	5.9	3.6	39	39	3.2	2.6	19	19	2.8	2.3	18	18	2.0	1.7	15	15
Total Cu (ug/L)	36	18	50	50	20	17	15	15	13	10	23	23	15	12	20	20
Total Pb (ug/L)	38	8.1	79	79	7.8	6.8	13	13	4.4	2.8	36	36	5.1	3.8	25	25
Total Ni (ug/L)	7.1	4.1	42	42	3.3	3.2	3	3	2.2	2U	>9	>9	2.7	2.2	19	19
Total Zn (ug/L)	320	133	58	58	82	77	6	6	52	42	19	19	74	57	23	23
Dissolved As (ug/L)	1.5	0.5	67	67	0.5	0.5U	>0	>0	0.5U	0.5U	na	na	0.5U	0.5U	na	na
Dissolved Cd (ug/L)	0.2	0.4	-100	-100	0.2	0.2	0	0	0.2	0.2	0	0	0.2	0.2U	>0	>0
Dissolved Cr (ug/L)	1.5	2.1	-40	-40	1.3	1.5	-15	-15	1.4	1.3	7	7	1U	1U	na	na
Dissolved Cu (ug/L)	9.4	10.9	-16	-16	9.4	9.6	-2	-2	6.3	6.5	-3	-3	9.6	8.2	15	15
Dissolved Pb (ug/L)	1.6	1.2	25	25	1.6	1.6	0	0	1U	1U	na	na	1U	1U	na	na
Dissolved Ni (ug/L)	2U	2.6	<-30	<-30	2U	2.1	<-5	<-5	2U	2U	na	na	2U	2U	na	na
Dissolved Zn (ug/L)	85	84	1	1	38	42	-11	-11	20	27	-35	-35	42	39	7	7
Nitrate-Nitrogen (mg/L)	0.71	0.91	-28	-28	0.7	0.7	0	0	0.6	0.6	0	0	0.56	0.58	-4	-4
TKN (mg/L)	1.20	1.30	-8	-8	0.8	0.7	13	13	0.01U	0.01U	na	na	1.68	2.67	-59	-59
Total P (mg/L)	0.24	0.20	17	17	0.18	0.18	0	0	0.09	0.10	-11	-11	0.21	0.17	19	19
Diss. Orthophosphate (mg/L)	0.07	0.03U	>57	>57	0.03U	0.03U	na	na	0.03U	0.03U	na	na	0.11	0.14	-27	-27
Storm Volume (cubic feet)	991	991			3425	3425			5035	5035			1864	1864		

	Filmore CDS 27 October, 2000				Filmore CDS 12 January, 2001				Filmore CDS 24 January, 2001				Filmore CDS 10 February, 2001			
	EMCs		Efficiency	% Diff. in	EMCs		Efficiency	% Diff. in	EMCs		Efficiency	% Diff. in	EMCs		Efficiency	% Diff. in
	Influent	Effluent	(%)	Load	Influent	Effluent	(%)	Load	Influent	Effluent	(%)	Load	Influent	Effluent	(%)	Load
TDS (mg/L)	67	58	13	13	62	50	19	19	118	24	80	80	28	22	21	21
TSS (mg/L)	58	57	2	2	67	54	19	19	41	5.5	87	87	34	38	-12	-12
DOC (mg/L)	16.9	8.9	47	47	5.1	4.2	18	18	8.6	8.7	-1	-1	11.1	8.7	22	22
TOC (mg/L)	17.2	12.3	28	28	5.8	6.2	-7	-7	12	13	-8	-8	11.3	11	3	3
Total As (ug/L)	0.9	0.6	33	33	0.6	0.6	0	0	3.2	1.0	69	69	0.5	0.5	0	0
Total Cd (ug/L)	0.6	0.6	0	0	0.5	0.4	20	20	0.6	0.8	-33	-33	0.4	0.4	0	0
Total Cr (ug/L)	4.0	4.6	-15	-15	2.1	2.5	-19	-19	4.5	5.5	-22	-22	2.2	2.1	5	5
Total Cu (ug/L)	20	20.2	-1	-1	13	13	0	0	26	27	-4	-4	10.5	9.9	6	6
Total Pb (ug/L)	19	21	-11	-11	6.5	6.7	-3	-3	18	18	0	0	5.3	4.5	15	15
Total Ni (ug/L)	6.1	5.4	11	11	2.9	3.0	-3	-3	5.4	5.5	-2	-2	2.7	3.1	-15	-15
Total Zn (ug/L)	201	176	12	12	102	85	17	17	178	187	-5	-5	100	108	-8	-8
Dissolved As (ug/L)	0.5U	0.5U	na	na	0.6	0.6	0	0	3.1	1.0	68	68	0.5	0.5U	>0	>0
Dissolved Cd (ug/L)	0.3	0.2U	>33	>33	0.4	0.3	25	25	0.3	0.3	0	0	0.3	0.2	33	33
Dissolved Cr (ug/L)	1.6	1.0	38	38	1.8	1.7	6	6	2.3	1.8	22	22	1.2	1.3	-8	-8
Dissolved Cu (ug/L)	8.9	6.4	28	28	12	11	8	8	16	11	31	31	6.8	7.1	-4	-4
Dissolved Pb (ug/L)	4.3	3.2	26	26	4.7	4.0	15	15	4.2	3.0	29	29	1.4	1.3	7	7
Dissolved Ni (ug/L)	3.4	2.1	38	38	2.9	2.5	14	14	3.9	2.9	26	26	2U	2	<0	<0
Dissolved Zn (ug/L)	84	44	48	48	89	70	21	21	113	93	18	18	75	79	-5	-5
Nitrate-Nitrogen (mg/L)	0.74	0.62	16	16	0.58	0.57	2	2	0.73	0.59	19	19	0.49	0.53	-8	-8
TKN (mg/L)	1.72	1.31	24	24	1.42	0.22	85	85	1.33	1.15	14	14	0.68	0.73	-7	-7
Total P (mg/L)	0.20	0.17	15	15	0.19	0.18	5	5	0.10	0.12	-20	-20	0.10	0.12	-20	-20
Diss. Orthophosphate (mg/L)	0.06	0.05	17	17	0.07	0.09	-29	-29	0.07	0.03U	>57	>57	0.03U	0.03U	na	na
Storm Volume (cubic feet)	5581	5581			9671	9671			3157	3157			2884	2884		

	Filmore CDS 28 February, 2001				Filmore CDS 6 March, 2001				Filmore CDS 20 April, 2001			
	EMCs		Efficiency	% Diff. in	EMCs		Efficiency	% Diff. in	EMCs		Efficiency	% Diff. in
	Influent	Effluent	(%)	Load	Influent	Effluent	(%)	Load	Influent	Effluent	(%)	Load
TDS (mg/L)	32	24	25	25	34	54	-59	-59	64	36	44	44
TSS (mg/L)	42	8	81	81	36	45	-25	-25	32	44	-38	-38
DOC (mg/L)	4.4	6.7	-52	-52	6.6	6.0	9	9	5.3	9.4	-77	-77
TOC (mg/L)	6.2	7.8	-26	-26	6.6	6.8	-3	-3	7.2	10	-39	-39
Total As (ug/L)	0.5	3.7	-640	-640	0.5U	0.5U	na	na	0.5U	0.5U	na	na
Total Cd (ug/L)	0.4	0.3	25	25	0.3	0.3	0	0	0.5	0.4	20	20
Total Cr (ug/L)	3.1	2.7	13	13	2.5	3.1	-24	-24	3.3	2.5	24	24
Total Cu (ug/L)	12	12	0	0	8.8	12	-36	-36	17	14	18	18
Total Pb (ug/L)	5.8	5.9	-2	-2	3.7	5.9	-59	-59	12	8.8	27	27
Total Ni (ug/L)	2.5	2.4	4	4	2U	2.3	<-15	<-15	4.1	3.5	15	15
Total Zn (ug/L)	75	76	-1	-1	50	70	-40	-40	141	107	24	24
Dissolved As (ug/L)	0.5U	0.5	<0	<0	0.5U	0.5U	na	na	0.5U	0.5U	na	na
Dissolved Cd (ug/L)	0.2	0.2	0	0	0.3	0.2	33	33	0.2U	0.2U	na	na
Dissolved Cr (ug/L)	1.7	1.5	12	12	1.9	1.6	16	16	1U	1U	na	na
Dissolved Cu (ug/L)	7.0	6.7	4	4	5.7	5.4	5	5	5.7	6.0	-5	-5
Dissolved Pb (ug/L)	1.7	1.4	18	18	1U	1U	na	na	1U	1U	na	na
Dissolved Ni (ug/L)	2U	2U	na	na	2U	2U	na	na	2.0	2.2	-10	-10
Dissolved Zn (ug/L)	44	44	0	0	31	31	0	0	43	49	-14	-14
Nitrate-Nitrogen (mg/L)	0.5	0.4	20	20	0.4	0.4	0	0	0.01U	0.01U	na	na
TKN (mg/L)	0.7	0.8	-14	-14	0.01U	0.01U	na	na	1.47	1.04	29	29
Total P (mg/L)	0.07	0.16	-129	-129	0.11	0.11	0	0	0.10	0.09	10	10
Diss. Orthophosphate (mg/L)	0.03U	0.03U	na	na	0.03U	0.03U	na	na	0.06	0.05	17	17
Storm Volume (cubic feet)	10746	10746			11475	11475			4946	4946		

Notes:

Hilighted values were estimated by calculating the mean of the EMCs using the Scoping Study methodology.

Average wet season removal efficiencies calculated using the Scoping Study methodology.

Where EMC was non-detect then Reporting Limit was used.

"U" = Analyte not detected above Reporting limit.

Table 1-6g BMP Pollutant Removal Efficiencies (Drain Inlet Inserts)

Foothill MS StreamGuard DII
2000 - 2001 Wet Season Statistics

Parameter	% Diff. In Load Storm-by-Storm Method	% Diff. in Load Aggregate Method
Sediment	12	12
T-Cu	1	1
T-Pb	7	6
T-Zn	1	1
Hydrocarbons	3	3

Effluent (cf) 56172

Las Flores MS StreamGuard DII - First Removal
2000 - 2001 Wet Season Statistics

Parameter	% Diff. In Load Storm-by-Storm Method	% Diff. in Load Aggregate Method
Sediment	66	73
T-Cu	27	22
T-Pb	57	46
T-Zn	22	19
Hydrocarbons	66	60

Effluent (cf) 1282

Las Flores MS StreamGuard DII - Second Removal
2000 - 2001 Wet Season Statistics

Parameter	% Diff. In Load Storm-by-Storm Method	% Diff. in Load Aggregate Method
Sediment	64	63
T-Cu	9	9
T-Pb	37	38
T-Zn	12	12
Hydrocarbons	35	35

Effluent (cf) 5417

Rosemead MS StreamGuard DII
2000 - 2001 Wet Season Statistics

Parameter	% Diff. In Load Storm-by-Storm Method	% Diff. in Load Aggregate Method
Sediment	5	5
T-Cu	0	0
T-Pb	1	1
T-Zn	1	1
Hydrocarbons	1	1

Effluent (cf) 74374

Foothill MS Fossil Filter DII
2000 - 2001 Wet Season Statistics

Parameter	% Diff. In Load Storm-by-Storm Method	% Diff. in Load Aggregate Method
Sediment	24	23
T-Cu	3	2
T-Pb	13	9
T-Zn	2	2
Hydrocarbons	1	0

Effluent (cf) 32355

Las Flores MS Fossil Filter DII
2000 - 2001 Wet Season Statistics

Parameter	% Diff. In Load Storm-by-Storm Method	% Diff. in Load Aggregate Method
Sediment	17	17
T-Cu	2	2
T-Pb	6	6
T-Zn	2	2
Hydrocarbons	1	1

Effluent (cf) 42428

Rosemead MS Fossil Filter DII
2000 - 2001 Wet Season Statistics

Parameter	% Diff. In Load Storm-by-Storm Method	% Diff. in Load Aggregate Method
Sediment	27	28
T-Cu	4	4
T-Pb	9	8
T-Zn	5	5
Hydrocarbons	2	2

Effluent (cf) 23652

Notes:

Dissolved solids fraction and gross solids fraction of effluent not accounted for in mass balance.

Efficiencies include sediment/debris entrapped by the DII. Extensive maintenance was conducted before, during, and after storm events to clear sediment and debris from the DII. Sediment and debis removed from the DII was temporarily stored onsite and then analyzed at the same time as DII. Efficiencies would significantly decrease if litter removal was discounted from the efficiency calculations.

Flow measured continuously while DII was installed.

Where EMC was non-detect then Reporting Limit was used.

Table 1-6h: BMP Pollutant Removal Efficiencies (Oil/Water Separator)

	Alameda OWS 26 October, 2000				Alameda OWS 8 January, 2001				Alameda OWS 10 January, 2001				Alameda OWS 24 January, 2001				Alameda OWS 10 February, 2001			
	EMCs		Efficiency	% Diff. in	EMCs		Efficiency	% Diff. in	EMCs		Efficiency	% Diff. in	EMCs		Efficiency	% Diff. in	EMCs		Efficiency	% Diff. in
	Influent	Effluent	(%)	Load	Influent	Effluent	(%)	Load	Influent	Effluent	(%)	Load	Influent	Effluent	(%)	Load	Influent	Effluent	(%)	Load
TSS (mg/L)	73	25	66	66	113	1U	>99	>99					629	7	99	99	125	7	94	94
TPH - Diesel (ug/L)	250U	250U	na	na	250U	250U	na	na									250U	250U	na	na
TPH - Oil (ug/L)	3080	2690	13	13	1406	1184	16	16									200U	200U	na	na
TPH - Gasoline (ug/L)	50U	86	<-72	<-72	50U	50U	na	na									50U	50U	na	na
Oil and Grease (mg/L)	213	6.0	97	97	7	1U	>85	>85	14	1U	>93	>93	15	1U	>93	>93	1U	1U	na	na
Storm Volume (cubic feet)	297	297			361	361			4203	4203			343	343			516	516		

Notes:

Hilighted values were estimated by calculating the mean of the EMCs using the Scoping Study methodology.

Average wet season removal efficiencies calculated using the Scoping Study methodology.

Where EMC was non-detect then Reporting Limit was used.

Table 1-6i: Annual Wet Season BMP Pollutant Removal Efficiencies

Altadena MS Strip
2000 - 2001 Wet Season Statistics

Parameter	Minimum Load Removal (%)	Maximum Load Removal (%)	Average Season Removal (%)
TDS	-113	26	-64
TSS	-72	93	67
DOC	-41	19	-18
TOC	-29	28	-16
T-As	16	58	31
T-Cd	-13	61	45
T-Cr	-6	78	59
T-Cu	-5	74	50
T-Pb	-3	87	75
T-Ni	23	60	46
T-Zn	6	78	63
D-As	7	56	35
D-Cd	-85	26	-6
D-Cr	-67	26	-8
D-Cu	-7	36	15
D-Pb	-36	55	28
D-Ni	1	26	13
D-Zn	-8	60	40
N-N	-127	97	-220
TKN	-173	29	9
T-P	-353	-33	-68
D-OP	-1336	-71	-126

Influent (cf) 64838
Effluent (cf) 58558

I-605/SR-91 Strip
2000 - 2001 Wet Season Statistics

Parameter	Minimum Load Removal (%)	Maximum Load Removal (%)	Average Season Removal (%)
TDS	-719	99	1
TSS	-34	99	0
DOC	-306	99	-13
TOC	-286	99	1
T-As	-257	99	3
T-Cd	-29	100	50
T-Cr	-1602	97	-444
T-Cu	-31	100	64
T-Pb	66	100	89
T-Ni	-39	100	75
T-Zn	-74	100	22
D-As	-49	99	-6
D-Cd	-71	100	55
D-Cr	-34	100	51
D-Cu	-55	100	61
D-Pb	80	100	97
D-Ni	-4	100	75
D-Zn	-105	100	21
N-N	-1057	99	47
TKN	-278	99	-19
T-P	-1914	96	-309
D-OP	-4678	94	-554

Influent (cf) 7688
Effluent (cf) 6014

I-605/SR-91 Swale
2000 - 2001 Wet Season Statistics

Parameter	Minimum Load Removal (%)	Maximum Load Removal (%)	Average Season Removal (%)
TDS	-514	96	72
TSS	25	98	81
DOC	-174	97	81
TOC	-126	98	83
T-As	69	97	86
T-Cd	68	95	88
T-Cr	69	96	89
T-Cu	42	99	91
T-Pb	67	100	96
T-Ni	42	99	88
T-Zn	85	99	95
D-As	60	97	86
D-Cd	32	95	81
D-Cr	73	98	89
D-Cu	29	99	87
D-Pb	13	99	93
D-Ni	41	99	88
D-Zn	78	99	95
N-N	-2	98	83
TKN	-26	98	80
T-P	-270	76	-59
D-OP	-1128	70	-150

Influent (cf) 7907
Effluent (cf) 1869

Cerritos MS Swale
2000 - 2001 Wet Season Statistics

Parameter	Minimum Load Removal (%)	Maximum Load Removal (%)	Average Season Removal (%)
TDS	45	100	88
TSS	68	100	85
DOC	63	100	91
TOC	53	100	90
T-As	74	100	88
T-Cd	84	100	94
T-Cr	71	100	89
T-Cu	80	100	93
T-Pb	80	100	94
T-Ni	79	100	92
T-Zn	85	100	95
D-As	13	100	86
D-Cd	79	100	88
D-Cr	69	100	91
D-Cu	76	100	92
D-Pb	71	100	96
D-Ni	79	100	92
D-Zn	80	100	92
N-N	-2	100	48
TKN	67	100	89
T-P	-7	100	80
D-OP	-96	100	62

Influent (cf) 36283
Effluent (cf) 6955

I-5/I-605 Swale
2000 - 2001 Wet Season Statistics

Parameter	Minimum Load Removal (%)	Maximum Load Removal (%)	Average Season Removal (%)
TDS	63	100	85
TSS	-594	100	95
DOC	37	100	90
TOC	31	100	90
T-As	54	100	86
T-Cd	52	100	91
T-Cr	46	100	91
T-Cu	22	100	91
T-Pb	-5	100	94
T-Ni	-48	100	62
T-Zn	57	100	92
D-As	40	100	74
D-Cd	61	100	79
D-Cr	50	100	71
D-Cu	29	100	83
D-Pb	29	100	86
D-Ni	61	100	87
D-Zn	57	100	87
N-N	48	100	63
TKN	49	100	86
T-P	2	100	44
D-OP	-1385	100	-606

Influent (cf) 25979
Effluent (cf) 9797

I-605 at Carson
1999 - 2000 Wet Season Statistics

Parameter	Minimum Load Removal (%)	Maximum Load Removal (%)	Average Season Removal (%)
TDS	-1408	100	10
TSS	-238	100	76
DOC	-96	100	18
TOC	-47	100	29
T-As	-37	100	11
T-Cd	45	100	80
T-Cr	-17	100	50
T-Cu	-10	100	67
T-Pb	12	100	83
T-Ni	25	100	75
T-Zn	30	100	74
D-As	-21	100	4
D-Cd	27	100	68
D-Cr	-57	100	2
D-Cu	-11	100	37
D-Pb	-198	100	76
D-Ni	40	100	55
D-Zn	11	100	47
N-N	-63	100	11
TKN	-1	100	14
T-P	-291	100	-239
D-OP	-741	100	-322

Influent (cf) 24411
Effluent (cf) 26318

Notes:
Average wet season removal efficiencies calculated using the Scoping Study methodology.

Table 1-6i: Annual Wet Season BMP Pollutant Removal Efficiencies

I-5/I-605 EDB
2000 - 2001 Wet Season Statistics

Parameter	Minimum Load Removal (%)	Maximum Load Removal (%)	Average Season Removal (%)
TDS	-91	58	7
TSS	-279	90	51
DOC	-129	23	4
TOC	-168	33	6
T-As	-40	38	7
T-Cd	-50	46	11
T-Cr	-20	59	27
T-Cu	-9	80	30
T-Pb	-116	88	59
T-Ni	-75	97	77
T-Zn	-2248	84	60
D-As	-220	62	-2
D-Cd	-33	33	-8
D-Cr	-50	52	12
D-Cu	-13	72	12
D-Pb	-380	76	41
D-Ni	-60	48	-1
D-Zn	-556	57	54
N-N	-56	52	2
TKN	-7	63	17
T-P	-119	78	48
D-OP	-500	85	10

Influent (cf) 193284
Effluent (cf) 193284

I-605/SR-91 EDB
2000 - 2001 Wet Season Statistics

Parameter	Minimum Load Removal (%)	Maximum Load Removal (%)	Average Season Removal (%)
TDS	-7	100	92
TSS	93	100	97
DOC	35	99	85
TOC	26	99	87
T-As	63	99	91
T-Cd	79	100	94
T-Cr	94	100	98
T-Cu	78	100	94
T-Pb	93	100	97
T-Ni	82	100	94
T-Zn	90	100	96
D-As	59	99	92
D-Cd	76	100	92
D-Cr	85	100	91
D-Cu	62	100	90
D-Pb	84	100	94
D-Ni	71	100	92
D-Zn	88	100	95
N-N	54	99	89
TKN	77	100	95
T-P	64	99	86
D-OP	-2	99	82

Influent (cf) 158792
Effluent (cf) 16983

Eastern SF
2000 - 2001 Wet Season Statistics

Parameter	Minimum Load Removal (%)	Maximum Load Removal (%)	Average Season Removal (%)
TDS	-229	-10	-53
TSS	36	90	78
DOC	-2400	29	-261
TOC	-2250	38	-189
T-As	-27	17	-1
T-Cd	0	50	35
T-Cr	-231	94	71
T-Cu	-4	33	17
T-Pb	51	91	77
T-Ni	-165	33	0
T-Zn	14	68	59
D-As	-218	36	-9
D-Cd	-31	17	2
D-Cr	-60	91	56
D-Cu	-60	33	-13
D-Pb	0	66	47
D-Ni	-25	0	-3
D-Zn	9	57	34
N-N	-233	16	-78
TKN	-4900	61	-11
T-P	-85	64	-9
D-OP	-633	0	-99
NH3	0	75	34

Influent (cf) 26023
Effluent (cf) 26023

Foothill SF
2000 - 2001 Wet Season Statistics

Parameter	Minimum Load Removal (%)	Maximum Load Removal (%)	Average Season Removal (%)
TDS	-6300	49	13
TSS	81	93	90
DOC	-310	15	-36
TOC	-299	5	-53
T-As	-70	25	-1
T-Cd	0	83	64
T-Cr	-27	89	65
T-Cu	-105	58	19
T-Pb	1	93	89
T-Ni	-29	71	39
T-Zn	23	87	74
D-As	-69	22	-9
D-Cd	0	46	28
D-Cr	-50	33	-6
D-Cu	-114	-20	-62
D-Pb	-28	74	43
D-Ni	-64	5	-17
D-Zn	9	75	62
N-N	-361	-55	-149
TKN	-572	58	-42
T-P	-137	99	-93
D-OP	-180	67	-20
NH3	-20	86	53

Influent (cf) 29084
Effluent (cf) 29084

Termination SF
2000 - 2001 Wet Season Statistics

Parameter	Minimum Load Removal (%)	Maximum Load Removal (%)	Average Season Removal (%)
TDS	-131	2	62
TSS	70	95	95
DOC	-6	49	45
TOC	-12	51	49
T-As	-120	30	-26
T-Cd	0	50	34
T-Cr	0	80	59
T-Cu	-16	54	58
T-Pb	29	95	81
T-Ni	-5	55	38
T-Zn	-84	53	86
D-As	-120	14	-54
D-Cd	0	33	25
D-Cr	0	70	41
D-Cu	-47	29	36
D-Pb	0	23	7
D-Ni	-10	32	21
D-Zn	-67	61	79
N-N	-302	97	-633
TKN	-250	91	-112
T-P	-78	50	43
D-OP	0	57	63
NH3	50	80	64

Influent 19997
Effluent 19997

Notes:
Average wet season removal efficiencies calculated using the Scoping Study methodology.

Table 1-6i: Annual Wet Season BMP Pollutant Removal Efficiencies

Via Verde MCTT
2000 - 2001 Wet Season Statistics

Parameter	Minimum Load Removal (%)	Maximum Load Removal (%)	Average Season Removal (%)
TDS	-513	37	-151
TSS	35	96	82
DOC	-1036	6	-79
TOC	-1040	14	-160
T-As	-260	50	-43
T-Cd	0	50	18
T-Cr	-90	79	54
T-Cu	-82	76	43
T-Pb	-40	93	85
T-Ni	-27	76	23
T-Zn	-169	95	70
D-As	-20	0	-5
D-Cd	-50	0	-13
D-Cr	0	0	0
D-Cu	-88	72	-23
D-Pb	-30	0	-13
D-Ni	0	33	20
D-Zn	68	85	79
N-N	-3550	-76	-49
TKN	-11	52	10
T-P	-46	68	10
D-OP	-56	60	-16
NH3	14	75	34

Influent (cf) 3670
Effluent (cf) 3670

Lakewood MCTT
2000 - 2001 Wet Season Statistics

Parameter	Minimum Load Removal (%)	Maximum Load Removal (%)	Average Season Removal (%)
TDS	-150	45	-32
TSS	29	86	71
DOC	-86	56	-12
TOC	-60	66	6
T-As	-100	33	-2
T-Cd	-114	60	-10
T-Cr	-76	52	9
T-Cu	-24	48	29
T-Pb	23	88	75
T-Ni	-122	45	-1
T-Zn	34	86	61
D-As	-30	50	20
D-Cd	-43	50	-2
D-Cr	-150	50	-4
D-Cu	-27	44	31
D-Pb	0	88	65
D-Ni	-19	44	13
D-Zn	51	80	63
N-N	-230	93	41
TKN	-63	57	17
T-P	-95	42	0
D-OP	-100	42	-16
NH3	29	69	57

Influent (cf) 40923
Effluent (cf) 40923

Orcas CDS
2000 - 2001 Wet Season Statistics

Parameter	Minimum Load Removal (%)	Maximum Load Removal (%)	Average Season Removal (%)
TDS	-33	38	-8
TSS	-16	42	29
DOC	-3	25	16
TOC	1	17	10
T-As	0	63	28
T-Cd	11	33	18
T-Cr	15	39	27
T-Cu	15	50	33
T-Pb	13	79	62
T-Ni	3	42	26
T-Zn	6	58	42
D-As	0	67	35
D-Cd	-100	0	-26
D-Cr	-40	7	-14
D-Cu	-16	15	-1
D-Pb	0	25	8
D-Ni	-30	0	-9
D-Zn	-35	7	-2
N-N	-28	0	-9
TKN	-59	13	-45
T-P	-11	19	11
D-OP	-27	57	6

Influent (cf) 35678
Effluent (cf) 35678

Filmore CDS
2000 - 2001 Wet Season Statistics

Parameter	Minimum Load Removal (%)	Maximum Load Removal (%)	Average Season Removal (%)
TDS	-59	80	34
TSS	-25	87	3
DOC	-52	47	9
TOC	-26	28	-1
T-As	-640	69	-10
T-Cd	-33	25	3
T-Cr	-24	24	-6
T-Cu	-36	18	0
T-Pb	-59	27	1
T-Ni	-15	15	2
T-Zn	-40	24	6
D-As	0	68	30
D-Cd	0	33	20
D-Cr	-8	38	14
D-Cu	-4	31	14
D-Pb	0	29	20
D-Ni	0	38	14
D-Zn	-5	48	15
N-N	-8	20	13
TKN	-14	85	39
T-P	-129	15	-9
D-OP	-29	57	12

Influent 98282
Effluent 98282

Alameda OWS
2000 - 2001 Wet Season Statistics

Parameter	Minimum Load Removal (%)	Maximum Load Removal (%)	Average Season Removal (%)
TSS	66	99	94
TPH - Diesel	0	0	0
TPH - Oil	0	16	19
TPH - Gasoline	-72	0	-26
Oil and Grease	0	97	98

Influent (cf) 18083
Effluent (cf) 18083

Notes:
Average wet season removal efficiencies calculated using the Scoping Study methodology.

Table 1-6i: Annual Wet Season BMP Pollutant Removal Efficiencies

	Orcas CDS 10 February,2001		Orcas CDS 28 February, 2001		Orcas CDS 6 March, 2001		Orcas CDS 7 April, 2001		Orcas CDS Non-Monitored Events		Orcas CDS	Orcas CDS 2 May, 2001		Orcas CDS
	Effluent EMC	Effluent Load (lbs)	Effluent EMC	Effluent Load (lbs)	Effluent EMC	Effluent Load (lbs)	Effluent EMC	Effluent Load (lbs)	Estimated Effluent EMC	Effluent Load (lbs)	Sum of Effluent Loads (lbs)	Sump EMC	Separation Chamber Load (lbs)	% Efficiency
TDS (mg/L)	40	2.46947	36	7.68127	20	6.27335	48	5.57387	36	54.63976	76.63772	312	0.52	0.67821
TSS (mg/L)	80	4.93894	23	4.90748	29	9.09635	35	4.06428	41.75	63.36695	86.37400	40	0.07	0.07761
DOC (mg/L)	11	0.67910	8.1	1.72829	6.1	1.91337	7.9	0.91737	8.275	12.55956	17.79768	116	0.19	1.08138
TOC (mg/L)	14	0.86431	9.4	2.00566	7.1	2.22704	10	1.16122	10.125	15.36743	21.62567	136	0.23	1.04380
Total As (ug/L)	0.6	0.00004	3.6	0.00077	0.5U	0.00016	0.5U	0.00006	0.5	0.00076	0.00178	1.0	0.00	0.09420
Total Cd (ug/L)	0.8	0.00005	0.4	0.00009	0.3	0.00009	0.2	0.00002	0.403	0.00061	0.00086	0.6	0.00	0.11638
Total Cr (ug/L)	3.6	0.00022	2.6	0.00055	2.3	0.00072	1.7	0.00020	2.55	0.00387	0.00557	4.7	0.00	0.14143
Total Cu (ug/L)	18	0.00111	17	0.00363	10	0.00314	12	0.00139	14.25	0.02163	0.03090	9.6	0.00	0.05209
Total Pb (ug/L)	8.1	0.00050	6.8	0.00145	2.8	0.00088	3.8	0.00044	5.375	0.00816	0.01143	6.6	0.00	0.09677
Total Ni (ug/L)	4.1	0.00025	3.2	0.00068	2U	0.00063	2.2	0.00026	2.69	0.00408	0.00590	9.8	0.00	0.27775
Total Zn (ug/L)	133	0.00821	77	0.01643	42	0.01317	57	0.00662	77.25	0.11725	0.16168	394	0.00	0.40707
Dissolved As (ug/L)	0.5	0.00003	0.5U	0.00011	0.5U	0.00016	0.5U	0.00006	0.5	0.00076	0.00111	0.6	0.00	0.09047
Dissolved Cd (ug/L)	0.4	0.00002	0.2	0.00004	0.2	0.00006	0.2U	0.00002	0.2	0.00030	0.00046	0.2	0.00	0.07337
Dissolved Cr (ug/L)	2.1	0.00013	1.5	0.00032	1.3	0.00041	1U	0.00012	1	0.00216	0.00313	2.4	0.00	0.12849
Dissolved Cu (ug/L)	10.9	0.00067	9.6	0.00205	6.5	0.00204	8.2	0.00095	8.8	0.01336	0.01907	1.7	0.00	0.01495
Dissolved Pb (ug/L)	1.2	0.00007	1.6	0.00034	1U	0.00031	1U	0.00012	1	0.00152	0.00236	1	0.00	0.07093
Dissolved Ni (ug/L)	2.6	0.00016	2.1	0.00045	2U	0.00063	2U	0.00023	2	0.00304	0.00450	8.4	0.00	0.31186
Dissolved Zn (ug/L)	84	0.00519	42	0.00896	27	0.00847	39	0.00453	48	0.07285	0.10000	106	0.00	0.17748
Nitrate-Nitrogen (mg/L)	0.91	0.05618	0.7	0.14936	0.6	0.18820	0.58	0.06735	0.6975	1.05865	1.51974	0.01	0.00	0.00110
TKN (mg/L)	1.30	0.08026	0.7	0.14936	0.01U	0.00314	2.67	0.31005	1.22	1.84713	2.38993	19.6	0.03	1.35689
Total P (mg/L)	0.20	0.01235	0.18	0.03841	0.10	0.03137	0.17	0.01974	0.1625	0.24664	0.34850	2.52	0.00	1.19831
Diss. Orthophosphate (mg/L)	0.03U	0.00185	0.03U	0.00640	0.03U	0.00941	0.14	0.01626	0.03	0.04553	0.07945	0.2	0.00	0.42043
Eff Storm Volume (L)	28062		96986		142576		52783		689896			Chamber Vol (L)	762.4	

	Filmore CDS 27 October,2000		Filmore CDS 12 January,2001		Filmore CDS 24 January, 2001		Filmore CDS 10 February, 2001		Filmore CDS 28 February, 2001		Filmore CDS 6 March, 2001		Filmore CDS 20 April, 2001		Filmore CDS Non-Monitored Events		Filmore CDS	Filmore CDS 2 May, 2001		Filmore CDS
	Effluent EMC	Effluent Load (lbs)	Effluent EMC	Effluent Load (lbs)	Effluent EMC	Effluent Load (lbs)	Effluent EMC	Effluent Load (lbs)	Effluent EMC	Effluent Load (lbs)	Effluent EMC	Effluent Load (lbs)	Effluent EMC	Effluent Load (lbs)	Estimated Effluent EMC	Effluent Load (lbs)	Sum of Effluent Loads (lbs)	Sump EMC	Separation Chamber Load (lbs)	% Efficiency
TDS (mg/L)	58	20.16554	50	30.12391	24	4.72015	22	3.95265	24	16.06675	54	38.60258	36	11.09243	35.67	110.71190	235.43591	143	0.24	0.10177
TSS (mg/L)	57	19.81786	54	32.53382	5.5	1.08170	38	6.82730	8	5.35558	45	32.16882	44	13.55741	34.42	106.83218	218.17467	17	0.03	0.01307
DOC (mg/L)	8.9	3.09437	4.2	2.53041	8.7	1.71105	8.7	1.56309	6.7	4.48530	6.0	4.28918	9.4	2.89636	7.77	24.10707	44.67683	32	0.05	0.11999
TOC (mg/L)	12.3	4.27649	6.2	3.73536	13	2.55675	11	1.97632	7.8	5.22169	6.8	4.86107	10	3.08123	10.05	31.19301	56.90192	38	0.06	0.11189
Total As (ug/L)	0.6	0.00021	0.6	0.00036	1.0	0.00020	0.5	0.00009	3.7	0.00248	0.5U	0.00036	0.5U	0.00015	1.09	0.00338	0.00722	0.6	0.00	0.01393
Total Cd (ug/L)	0.6	0.00021	0.4	0.00024	0.8	0.00016	0.4	0.00007	0.3	0.00020	0.3	0.00021	0.4	0.00012	0.48	0.00150	0.00272	0.2	0.00	0.01234
Total Cr (ug/L)	4.6	0.00160	2.5	0.00151	5.5	0.00108	2.1	0.00038	2.7	0.00181	3.1	0.00222	2.5	0.00077	3.32	0.01029	0.01965	1.4	0.00	0.01195
Total Cu (ug/L)	20.2	0.00702	13	0.00783	27	0.00531	9.9	0.00178	12	0.00803	12	0.00858	14	0.00431	16.02	0.04971	0.09258	4.5	0.00	0.00815
Total Pb (ug/L)	21	0.00730	6.7	0.00404	18	0.00354	4.5	0.00081	5.9	0.00395	5.9	0.00422	8.8	0.00271	10.82	0.03357	0.06014	2.5	0.00	0.00697
Total Ni (ug/L)	5.4	0.00188	3.0	0.00181	5.5	0.00108	3.1	0.00056	2.4	0.00161	2.3	0.00164	3.5	0.00108	3.82	0.01185	0.02150	3.2	0.00	0.02496
Total Zn (ug/L)	176	0.06119	85	0.05121	187	0.03678	108	0.01940	76	0.05088	70	0.05004	107	0.03297	123.17	0.38228	0.68475	192	0.00	0.04701
Dissolved As (ug/L)	0.5U	0.00017	0.6	0.00036	1.0	0.00020	0.5U	0.00009	0.5	0.00033	0.5U	0.00036	0.5U	0.00015	0.50	0.00155	0.00322	0.5	0.00	0.02604
Dissolved Cd (ug/L)	0.2U	0.00007	0.3	0.00018	0.3	0.00006	0.2	0.00004	0.2	0.00013	0.2	0.00014	0.2U	0.00006	0.20	0.00062	0.00130	0.2	0.00	0.02571
Dissolved Cr (ug/L)	1.0	0.00035	1.7	0.00102	1.8	0.00035	1.3	0.00023	1.5	0.00100	1.6	0.00114	1U	0.00031	1.40	0.00435	0.00876	1.0	0.00	0.01914
Dissolved Cu (ug/L)	6.4	0.00223	11	0.00663	11	0.00216	7.1	0.00128	6.7	0.00449	5.4	0.00386	6.0	0.00185	8.03	0.02493	0.04742	1.4	0.00	0.00495
Dissolved Pb (ug/L)	3.2	0.00111	4.0	0.00241	3.0	0.00059	1.3	0.00023	1.4	0.00094	1U	0.00071	1U	0.00031	2.26	0.00701	0.01332	1	0.00	0.01259
Dissolved Ni (ug/L)	2.1	0.00073	2.5	0.00151	2.9	0.00057	2	0.00036	2U	0.00134	2U	0.00143	2.2	0.00068	2.15	0.00667	0.01328	2.9	0.00	0.03661
Dissolved Zn (ug/L)	44	0.01530	70	0.04217	93	0.01829	79	0.01419	44	0.02946	31	0.02216	49	0.01510	63.16	0.19603	0.35270	53	0.00	0.02520
Nitrate-Nitrogen (mg/L)	0.62	0.21556	0.57	0.34341	0.59	0.11604	0.53	0.09522	0.4	0.26778	0.4	0.28595	0.01U	0.00308	0.51	1.58758	2.91463	0.01	0.00	0.00058
TKN (mg/L)	1.31	0.45546	0.22	0.13255	1.15	0.22617	0.73	0.13116	0.8	0.53556	0.01U	0.00715	1.04	0.32045	0.88	2.71581	4.52430	4.67	0.01	0.17283
Total P (mg/L)	0.17	0.05911	0.18	0.10845	0.12	0.02360	0.12	0.02156	0.16	0.10711	0.11	0.07863	0.09	0.02773	0.14	0.43453	0.86072	2.48	0.00	0.48095
Diss. Orthophosphate (mg/L)	0.05	0.01738	0.09	0.05422	0.03U	0.00590	0.03U	0.00539	0.03U	0.02008	0.03U	0.02145	0.05	0.01541	0.03	0.09311	0.21150	1.65	0.00	1.29161
Eff Storm Volume (L)	158037		273854		89397		81666		304294		324938		140056		1410810			Chamber Vol (L)	762.4	

Notes:

Average wet season removal efficiencies calculated using the modified CDS methodology.

Where EMC was non-detect then Reporting Limit was used.

"U" = Analyte not detected above Reporting limit.

Table 1-7: Normality Test Summary

Data		Shapiro-Wilk			
		W Statistic	P value	Evidence of Normality	Transform Data (Y/N)
StreamGuard™ DII – TSS	Foothill MS	0.8674	0.29	No evidence of non-normality	N
	Las Flores MS	0.9607	0.78	No evidence of non-normality	N
	Rosemead MS	0.7678	0.05	No evidence of non-normality	N
StreamGuard™ DII - Total Cu	Foothill MS	0.8059	0.11	No evidence of non-normality	N
	Las Flores MS	0.7918	0.09	No evidence of non-normality	N
	Rosemead MS	0.8098	0.10	No evidence of non-normality	N
StreamGuard™ DII - Total Pb	Foothill MS	0.9473	0.70	No evidence of non-normality	N
	Las Flores MS	0.7965	0.10	No evidence of non-normality	N
	Rosemead MS	0.9535	0.76	No evidence of non-normality	N
StreamGuard™ DII - Total Zn	Foothill MS	0.8612	0.26	No evidence of non-normality	Y; other StreamGuard™ DII data tend to be non-normal
	Las Flores MS	0.7114	0.02	Unlikely	Y
	Rosemead MS	0.7066	0.01	Unlikely	Y
StreamGuard™ DII - TPH	Foothill MS	0.6298	0.00	Most data are ND	N
	Las Flores MS	0.6298	0.00	Most data are ND	N
	Rosemead MS	0.6785	0.00	Most data are ND	N
Fossil Filter™ DII - TSS	Foothill MS	0.8397	0.19	No evidence of non-normality	N
	Las Flores MS	0.9049	0.44	No evidence of non-normality	N
	Rosemead MS	0.9028	0.42	No evidence of non-normality	N
Fossil Filter™ DII - Total Cu	Foothill MS	0.8707	0.30	No evidence of non-normality	N
	Las Flores MS	0.9096	0.46	No evidence of non-normality	N
	Rosemead MS	0.8300	0.14	No evidence of non-normality	N
Fossil Filter™ DII - Total Pb	Foothill MS	0.7347	0.03	Unlikely	N; other Fossil Filter™ DII data tend to be normal
	Las Flores MS	0.8878	0.35	No evidence of non-normality	N
	Rosemead MS	0.8054	0.09	No evidence of non-normality	N
Fossil Filter™ DII - Total Zn	Foothill MS	0.8783	0.33	No evidence of non-normality	N
	Las Flores MS	0.7729	0.05	No evidence of non-normality	N
	Rosemead MS	0.8137	0.10	No evidence of non-normality	N
Fossil Filter™ DII - TPH	Foothill MS	0.6298	0.00	Most data are ND	N
	Las Flores MS	0.7736	0.05	Most data are ND	N
	Rosemead MS	0.7695	0.04	Most data are ND	N

Figure 1-1: Map of Study Area, Caltrans District 7 Los Angeles

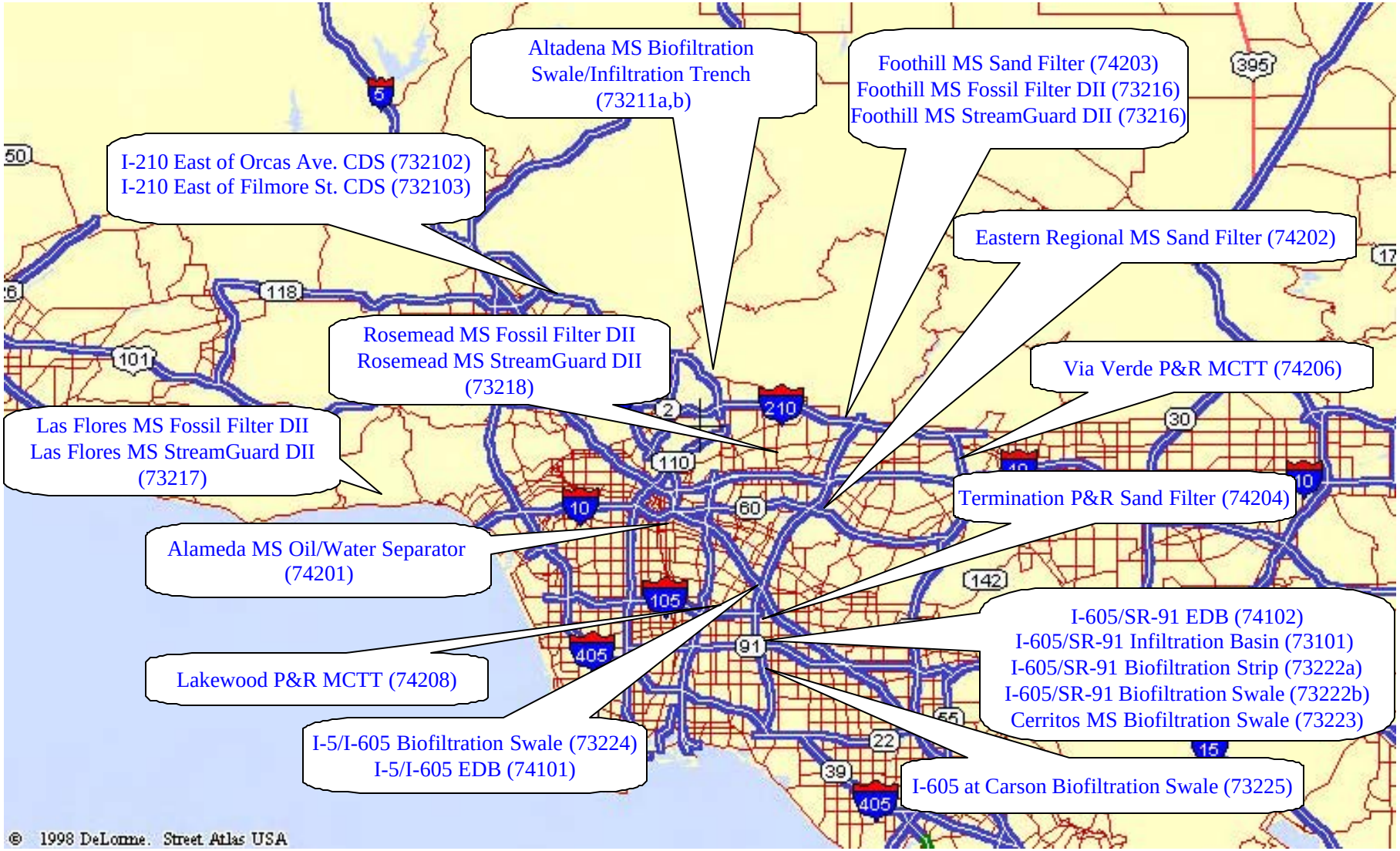


Figure 1-2a: Daily Precipitation Totals for Altadena Maintenance Station

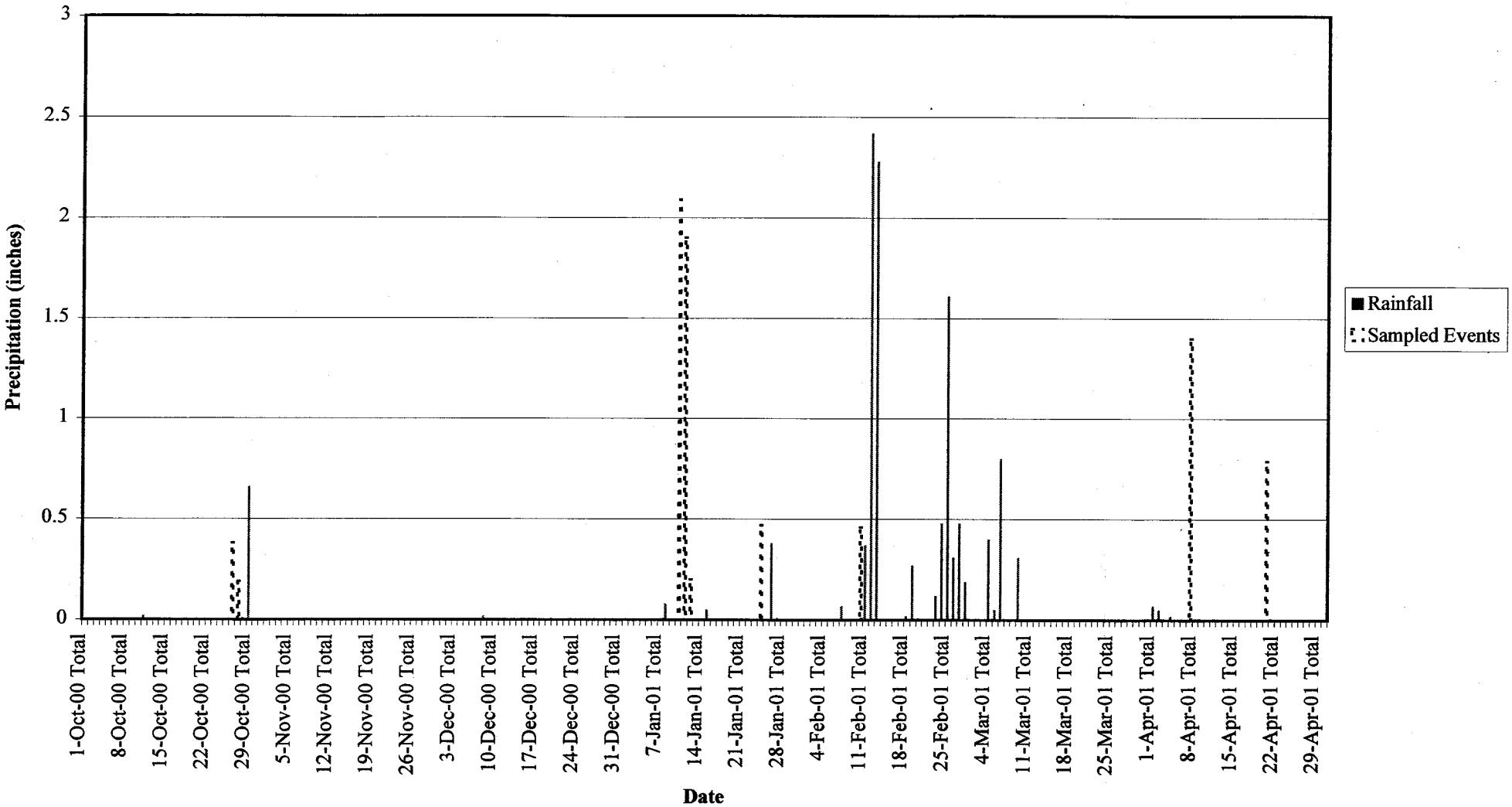


Figure 1-2b: Daily Precipitation Totals for Cerritos Maintenance Station I-605/SR-91 Strip, Swale, Extended Detention Basin, Infiltration Basin, and I-605 at Carson Swale

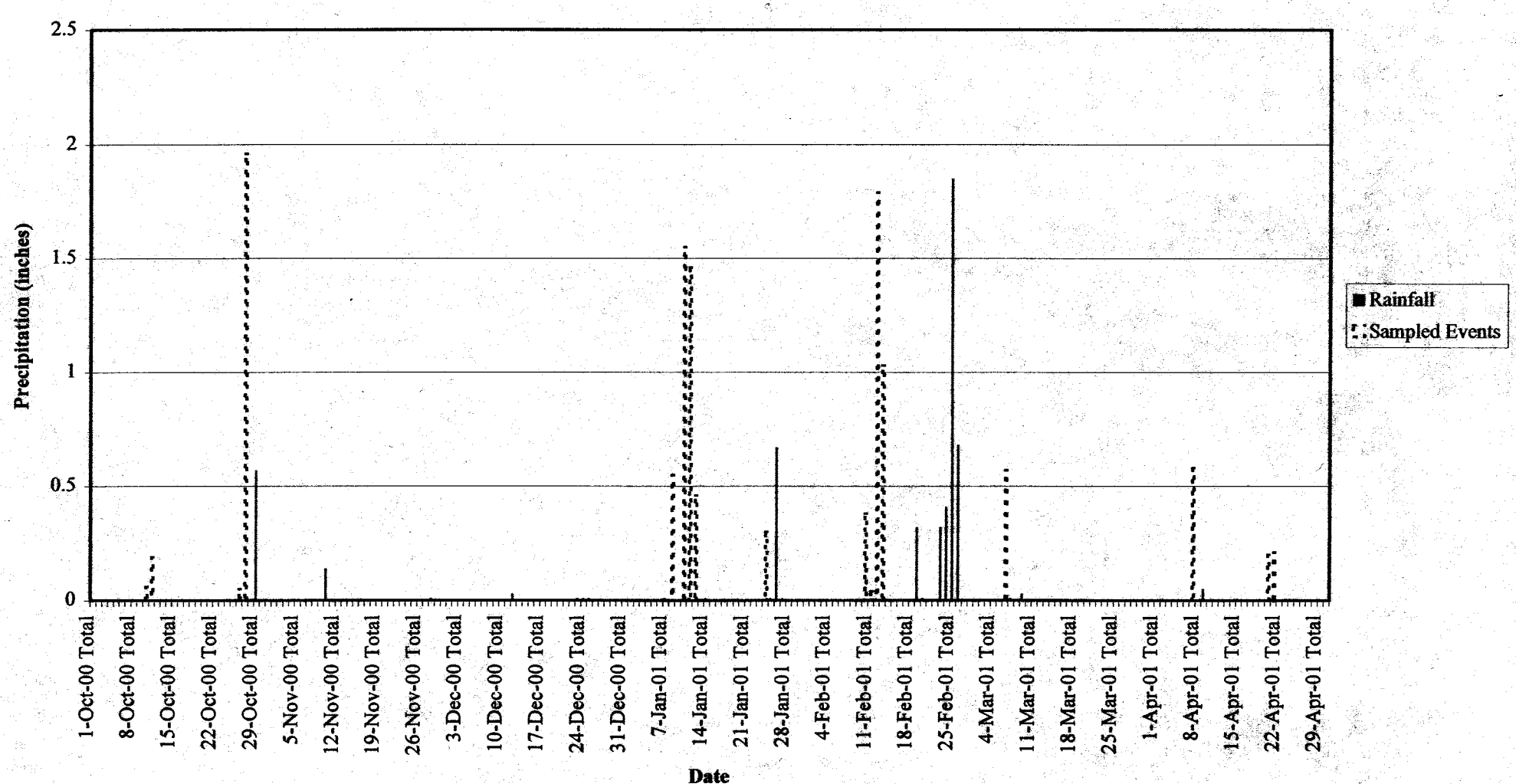


Figure 1-2c: Daily Precipitation Totals for I-5/I-605 Swale and Extended Detention Basin

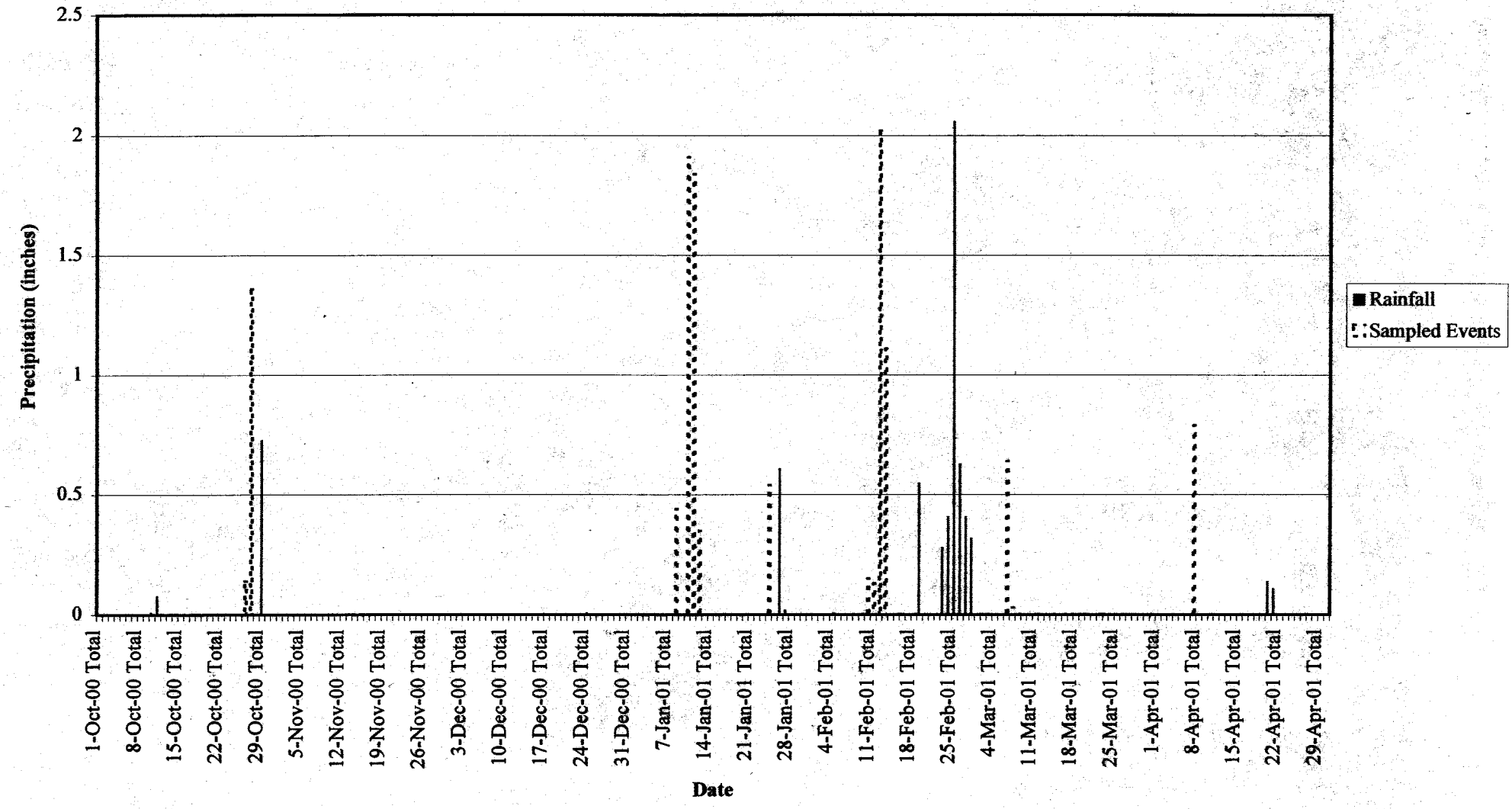


Figure 1-2d: Daily Precipitation Totals for Eastern Maintenance Station Sand Filter - Austin Type

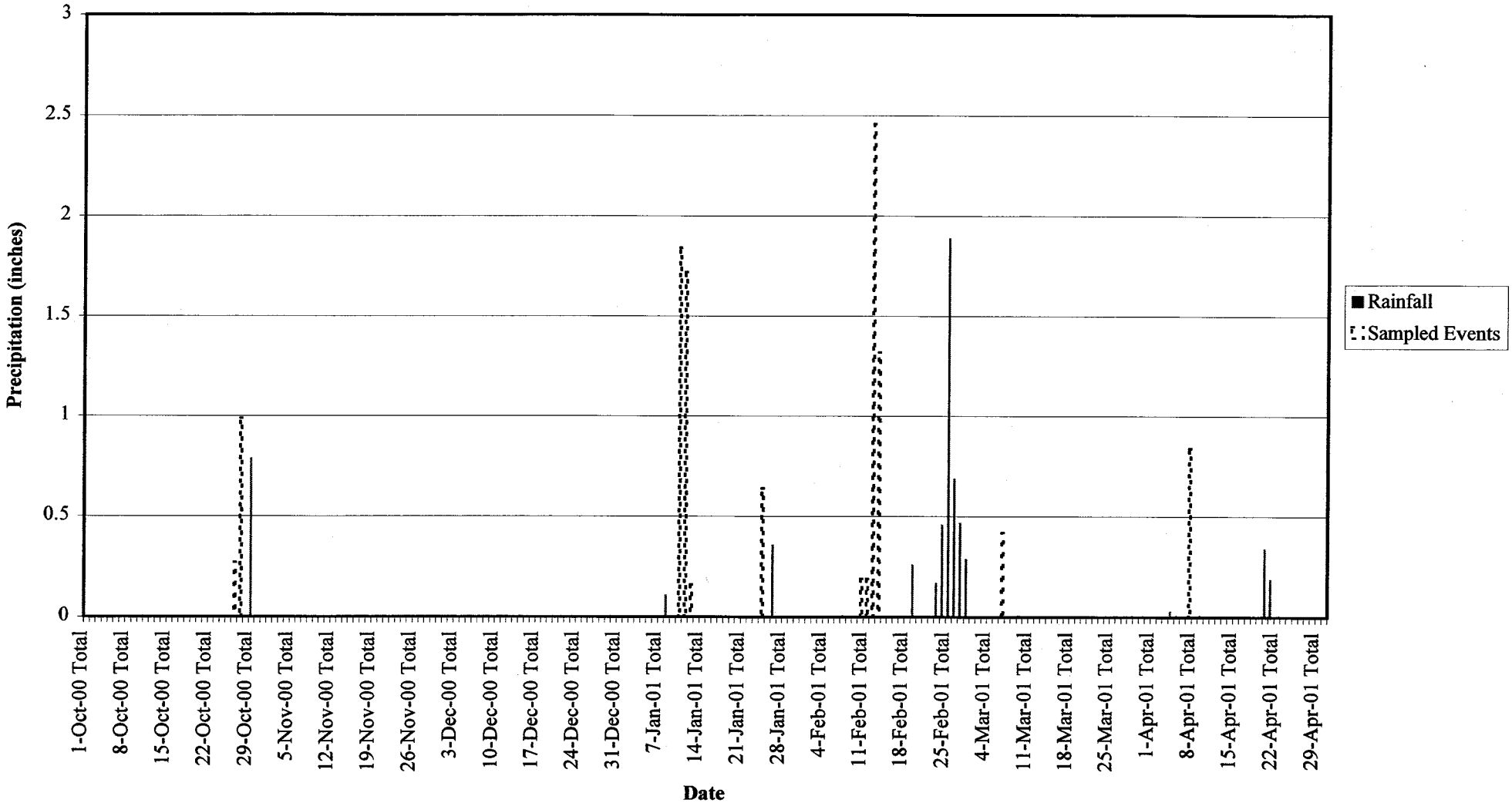


Figure 1-2e: Daily Precipitation Totals for Termination Park & Ride Sand Filter - Austin Type

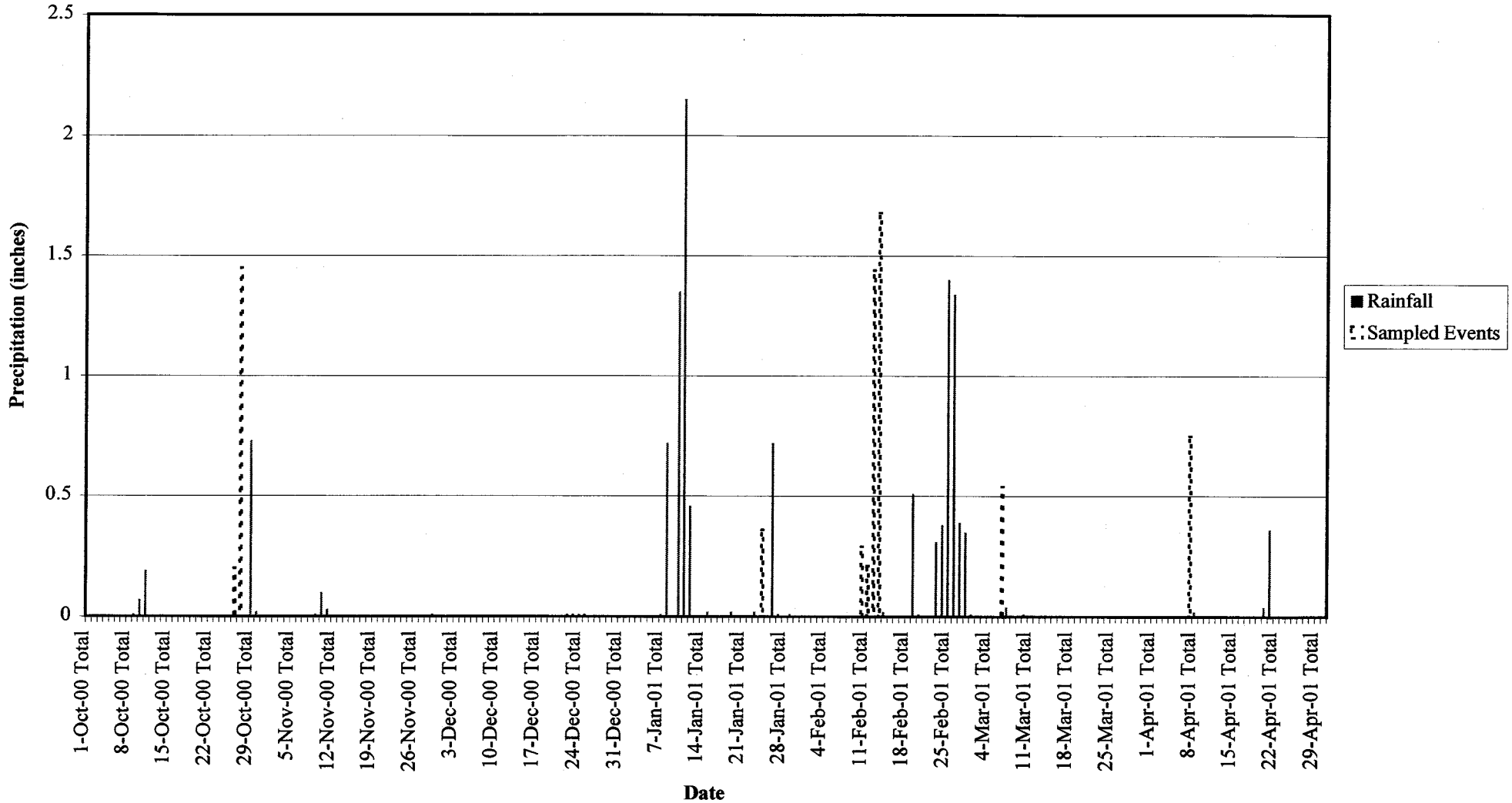


Figure 1-2f: Daily Precipitation Totals for Via Verde Park & Ride MCTT

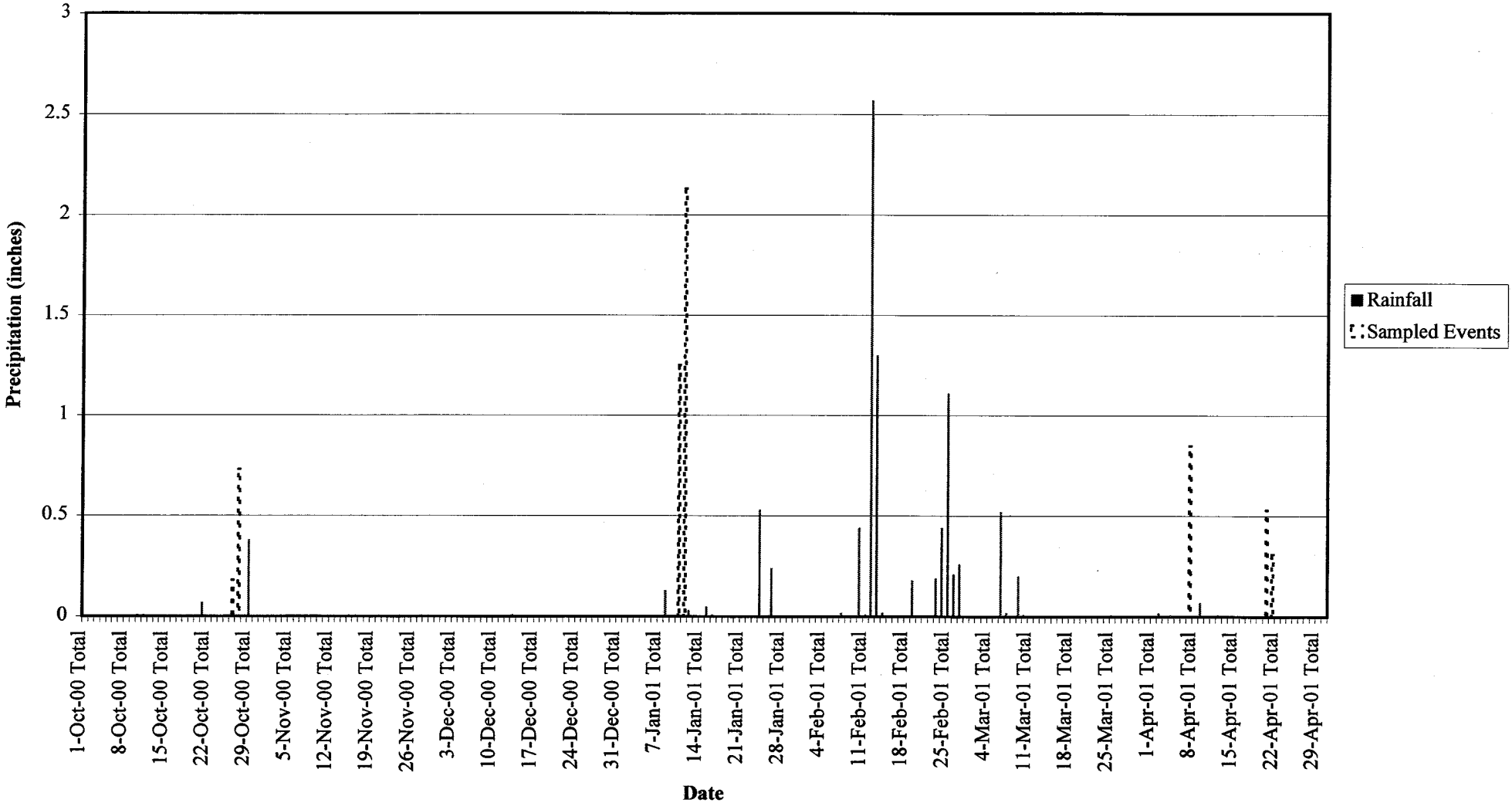


Figure 1-2g: Daily Precipitation Totals for Lakewood Park & Ride MCTT

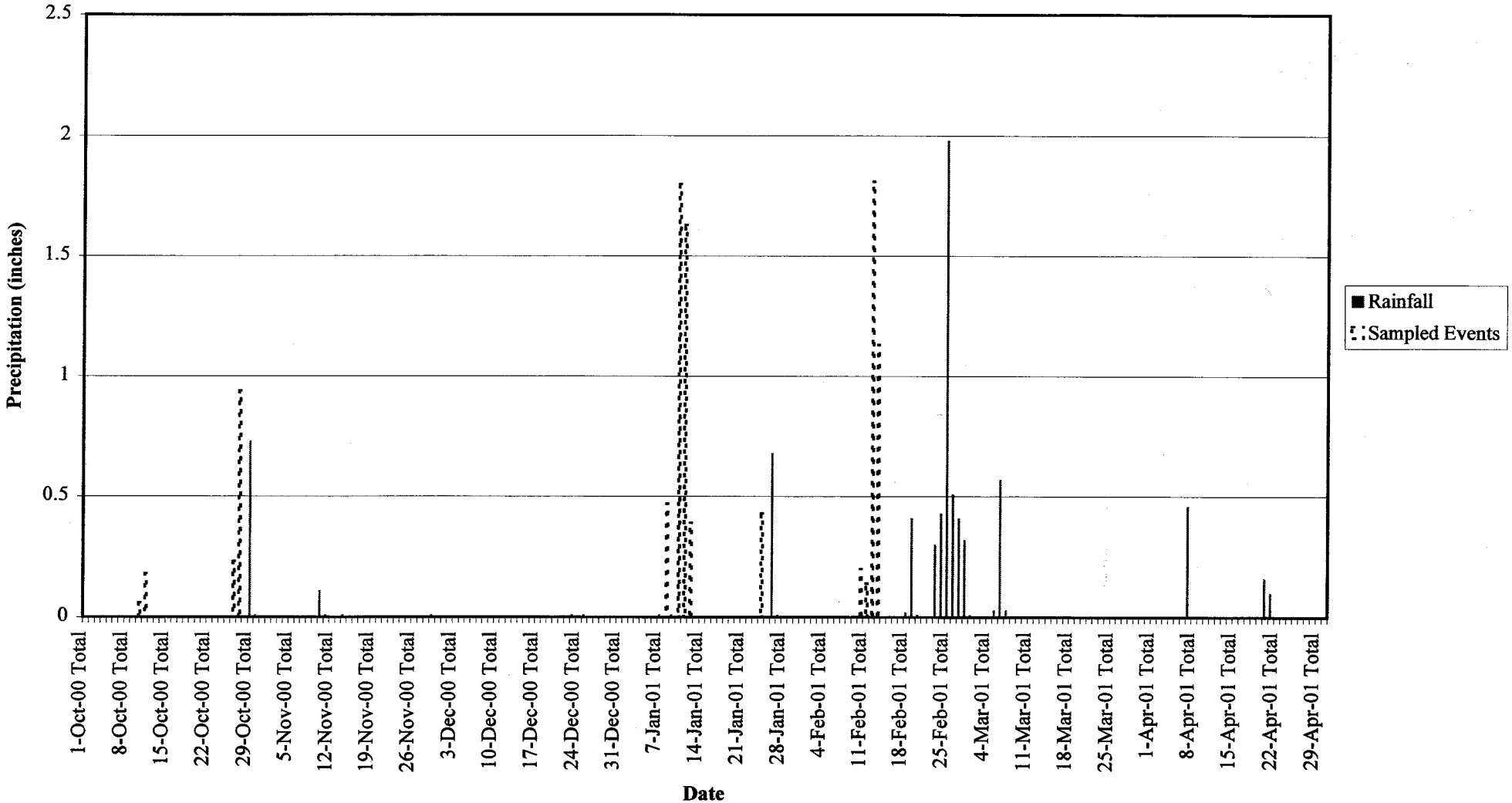


Figure 1-2h: Daily Precipitation Totals for I-210 East of Orcas Avenue CDS

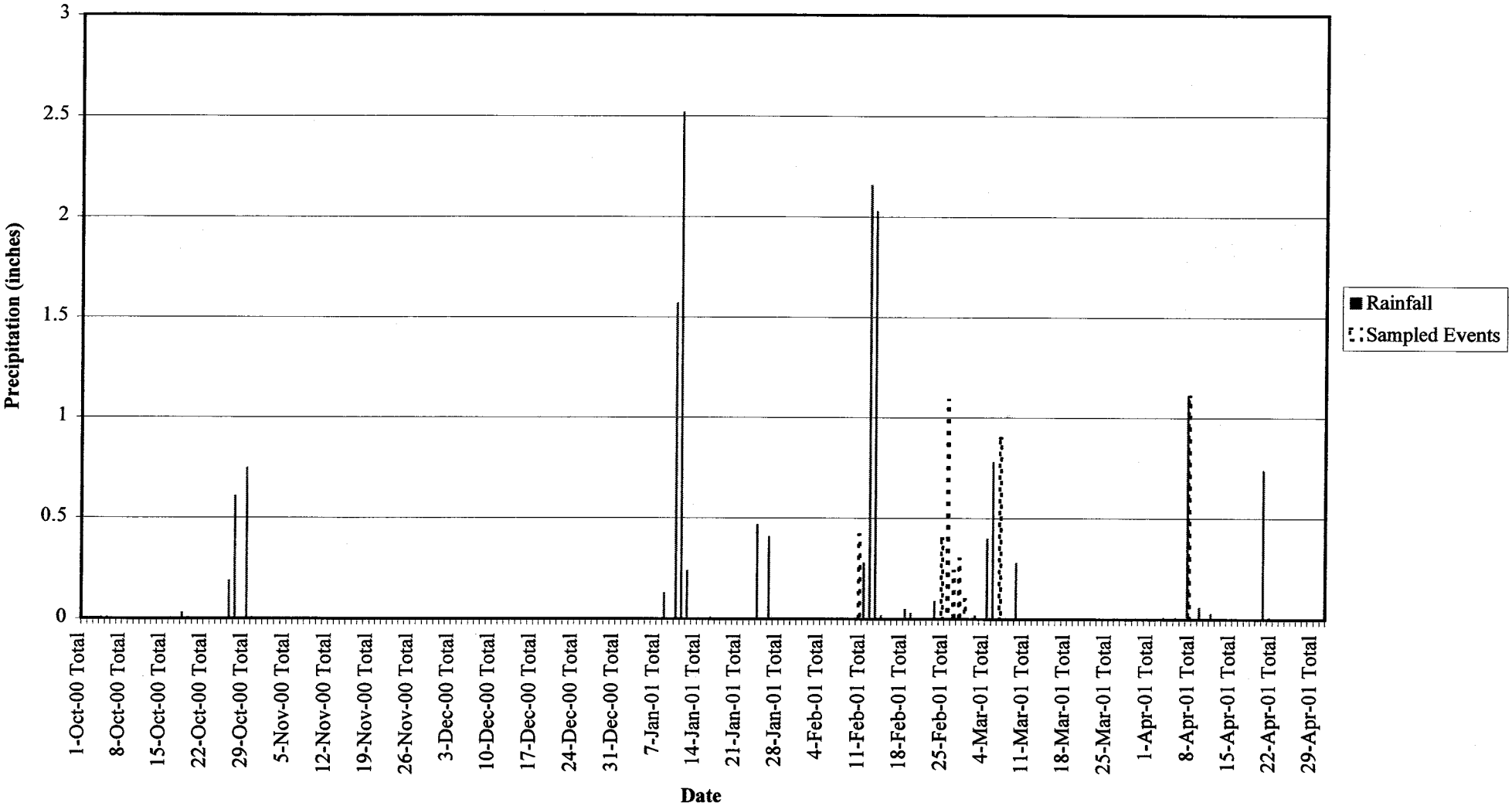


Figure 1-2i: Daily Precipitation Totals for I-210 East of Filmore Street CDS

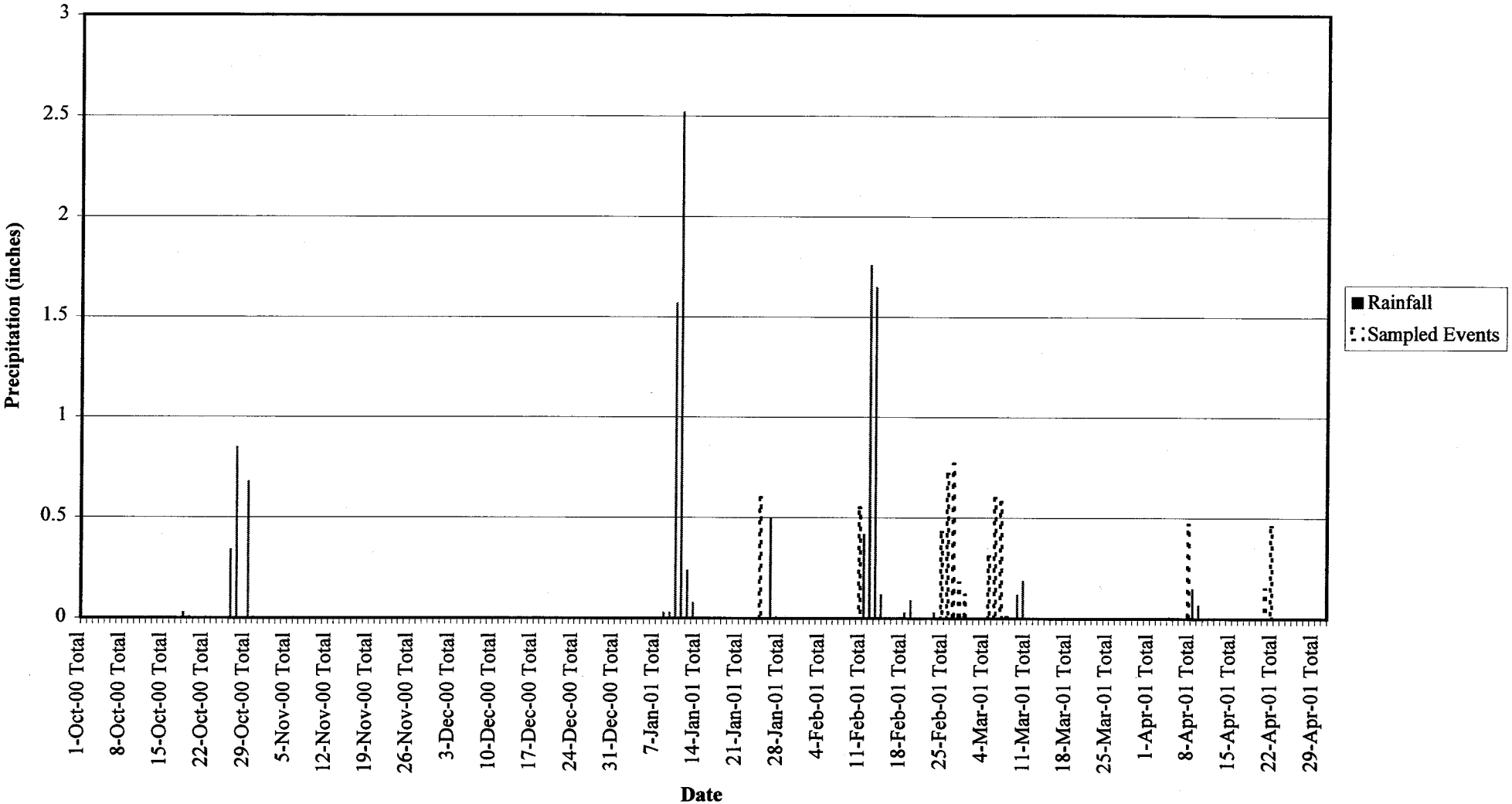


Figure 1-2j: Daily Precipitation Totals for Foothill Maintenance Station Drain Inlet Inserts and Sand Filter - Austin Type

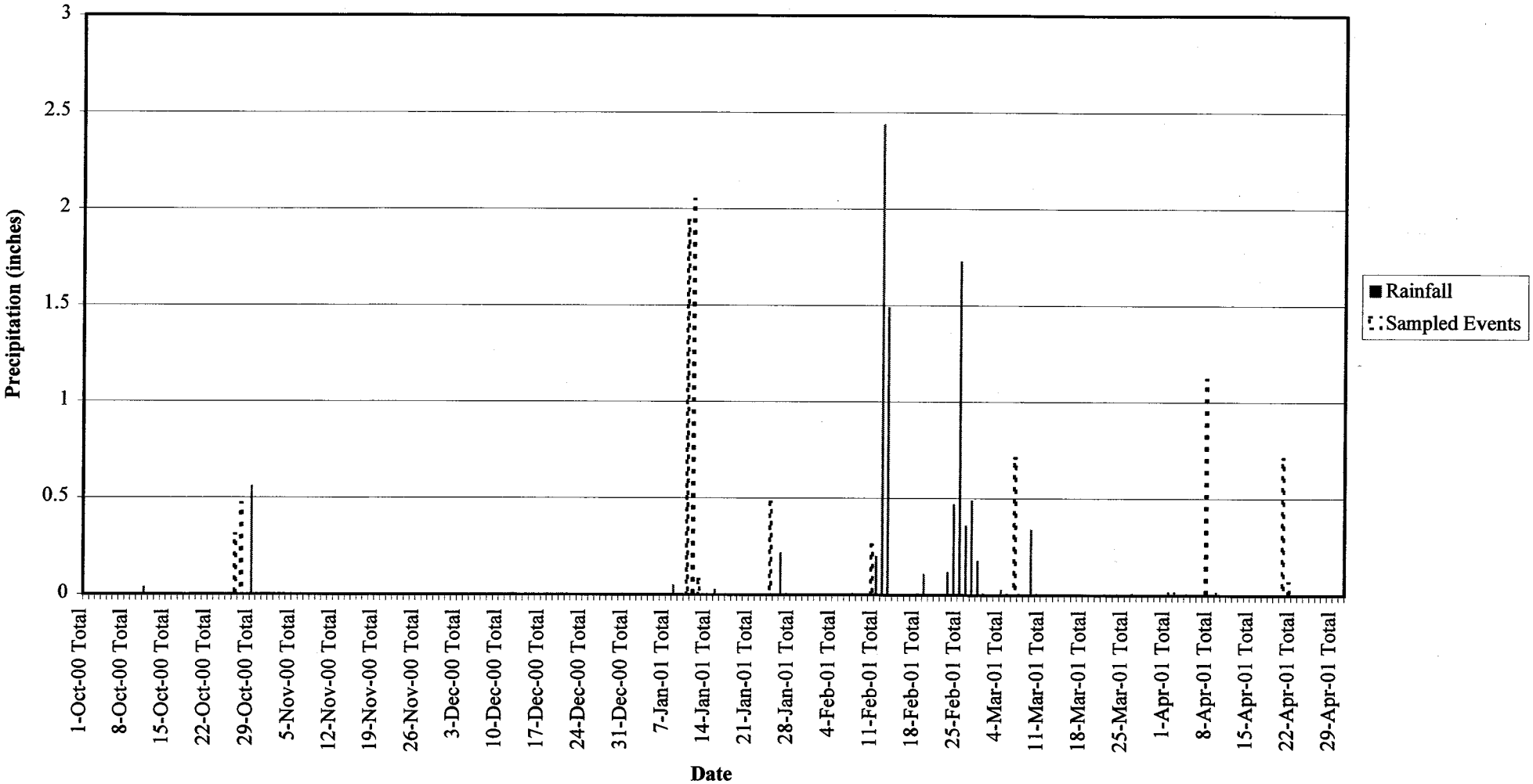


Figure 1-2k: Daily Precipitation Totals for Las Flores Maintenance Station Drain Inlet Inserts

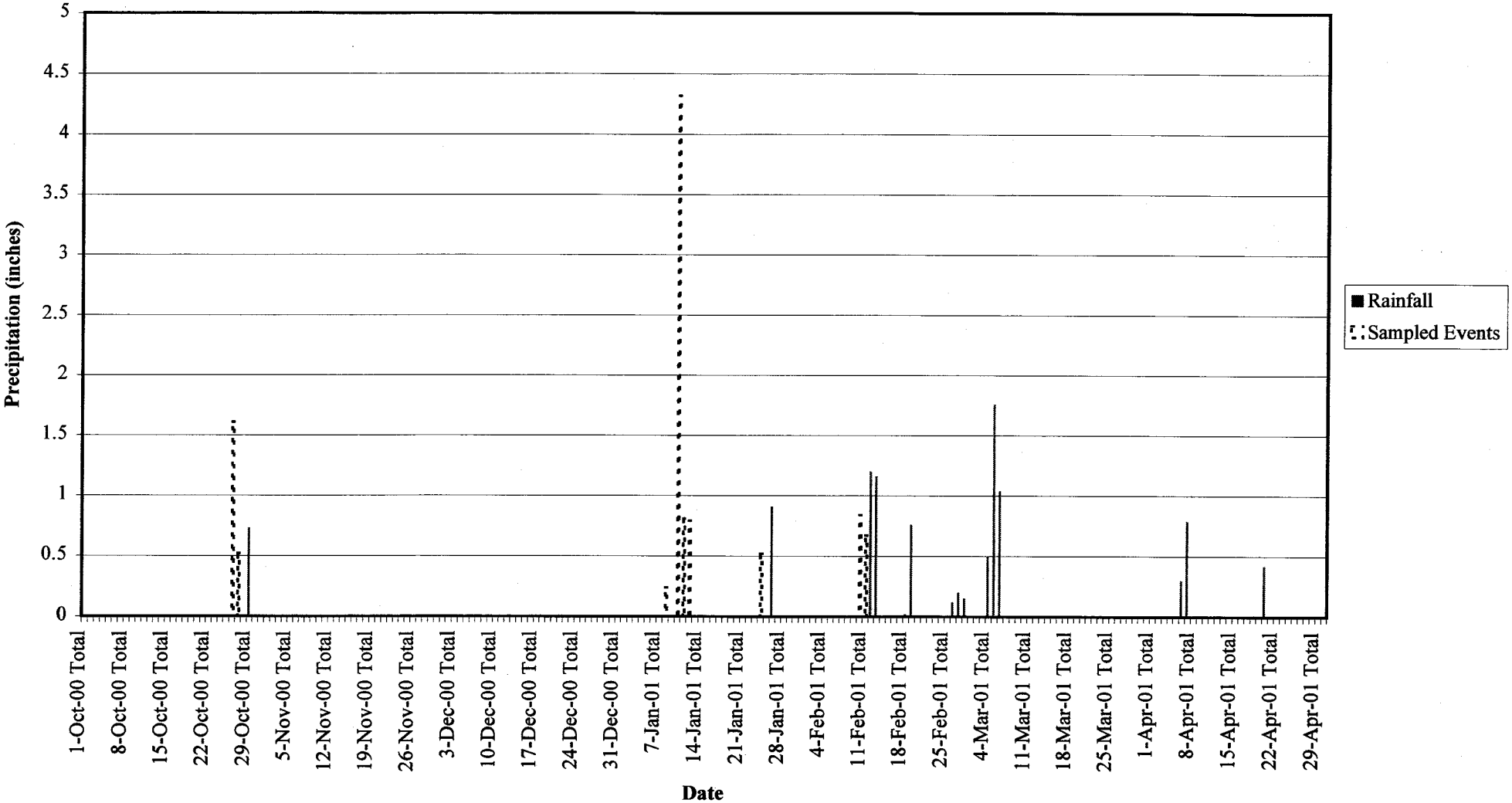


Figure 1-2l: Daily Precipitation Totals for Rosemead Maintenance Station Drain Inlet Inserts

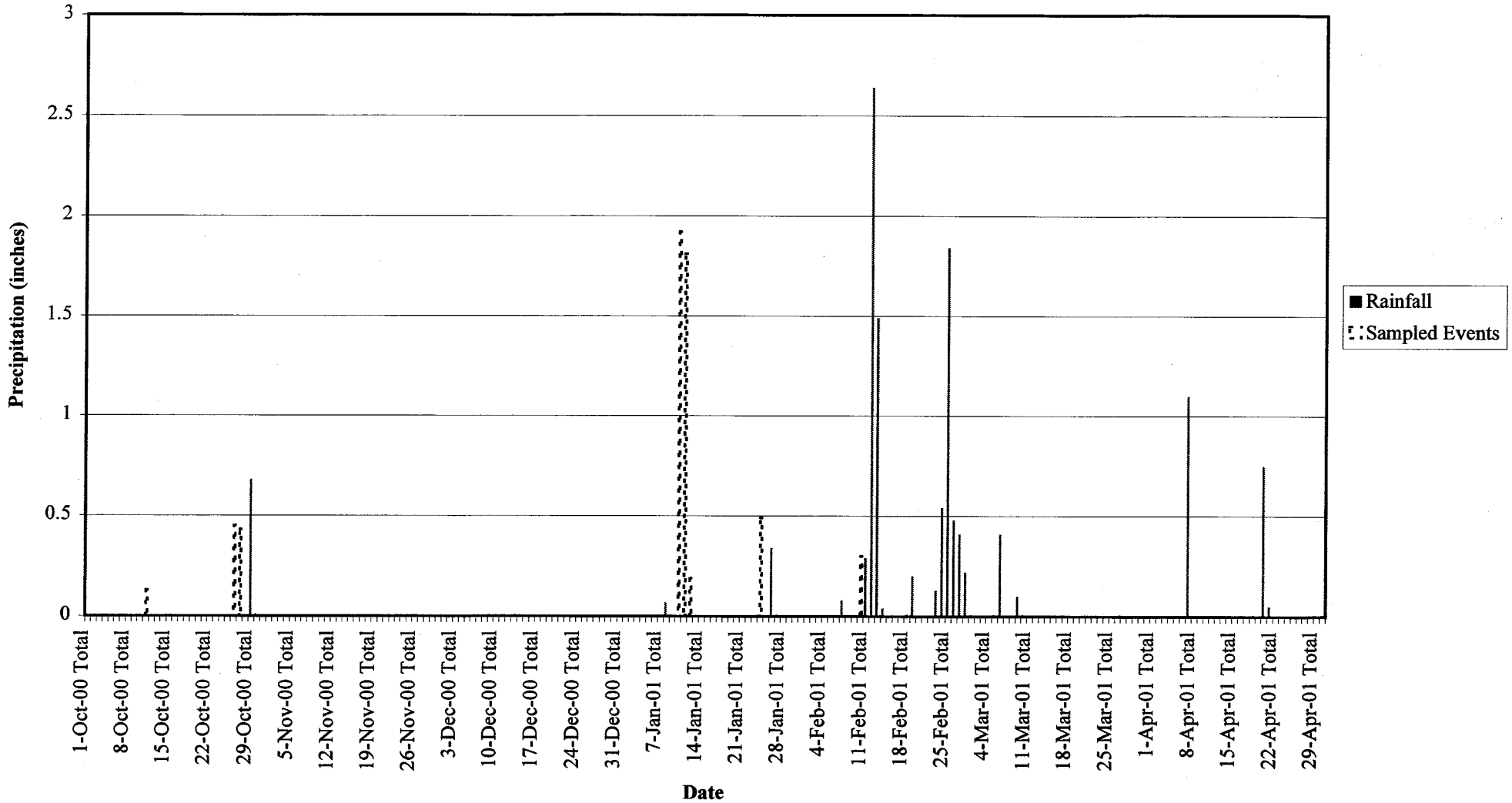


Figure 1-2m: Daily Precipitation Totals for Alameda Maintenance Station Oil/Water Separator

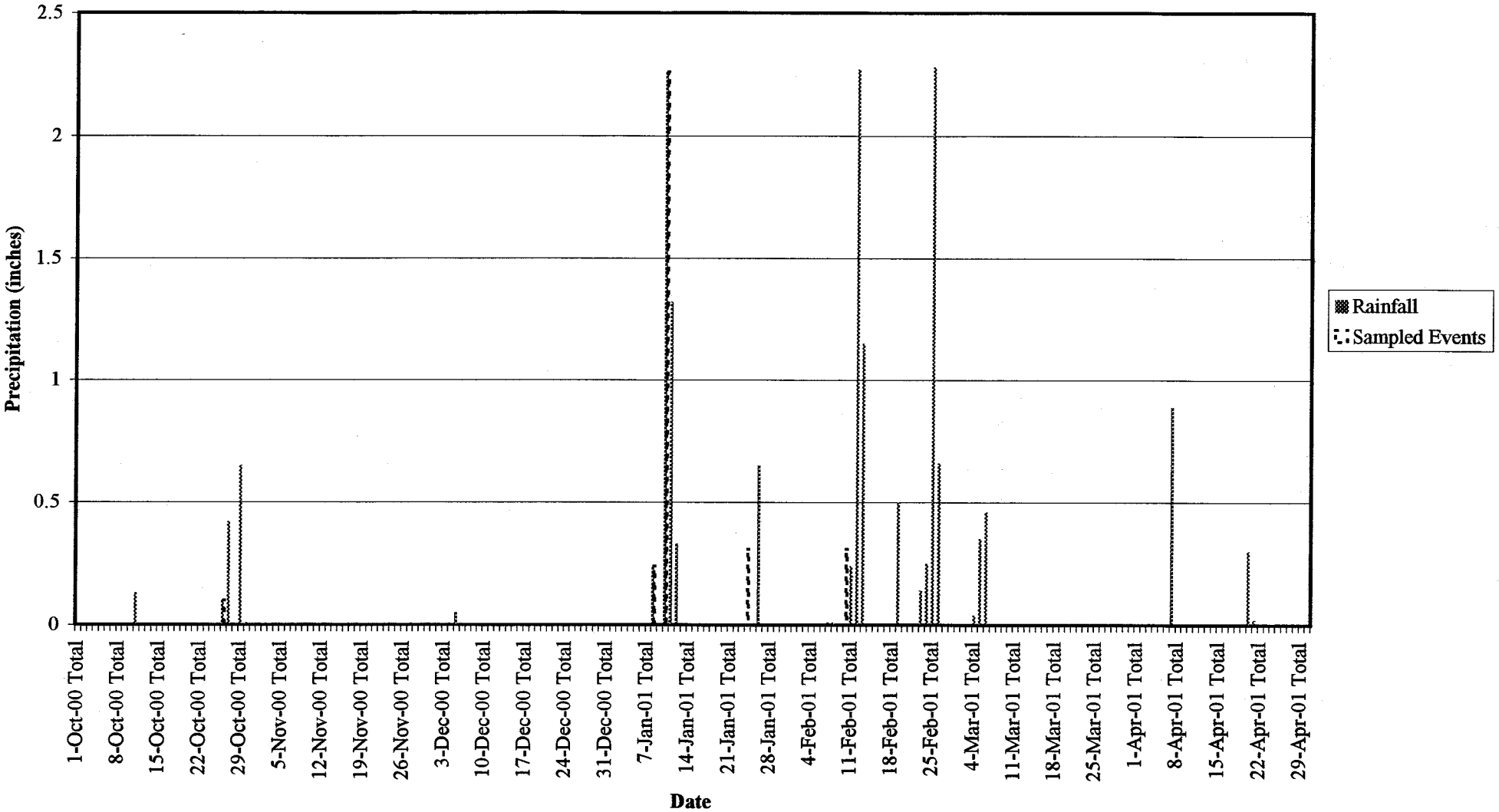
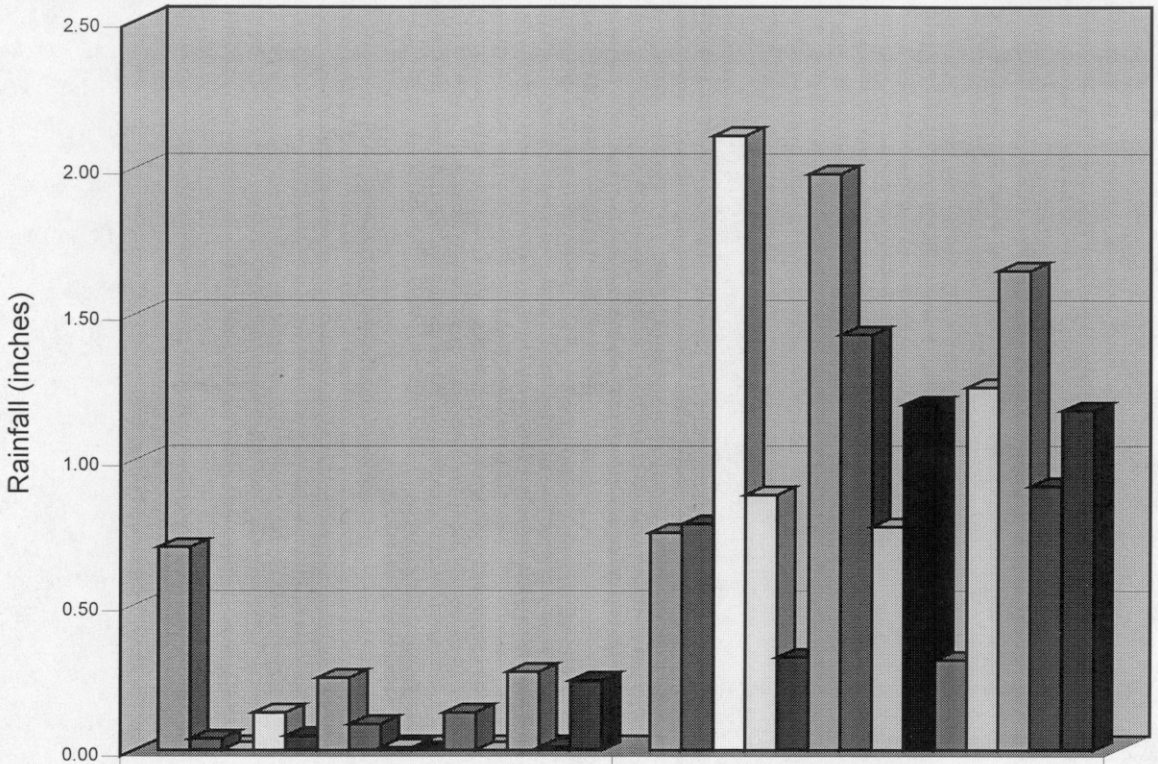
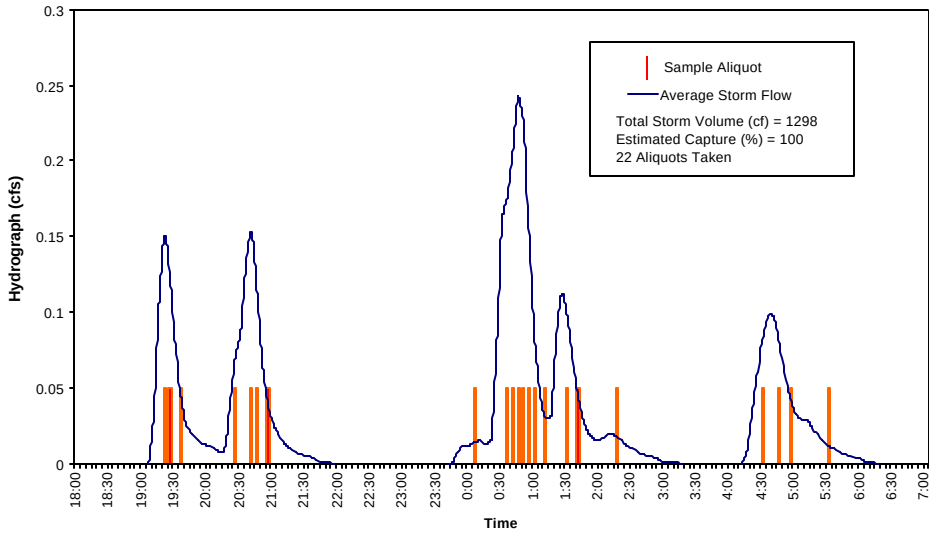


Figure 1-3a: Monitored Event Rainfall Totals - October 2000

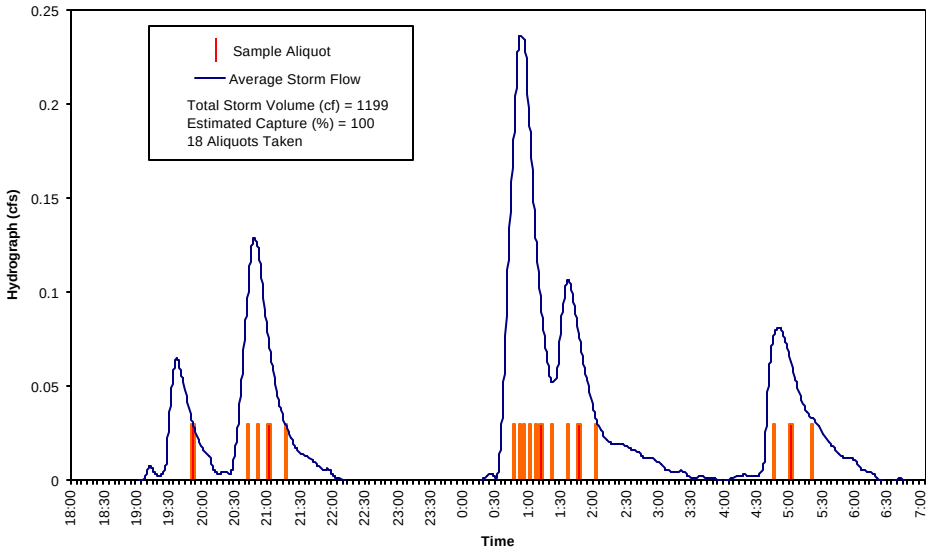


	10/11/00	10/26-27/00
Predicted Rainfall	0.70	0.75
Foothill Maintenance Station (DIIs and SF)	0.04	0.78
Las Flores Maintenance Station (DIIs)	0.00	2.11
Rosemead Maintenance Station (DIIs)	0.13	0.88
Altadena Maintenance Station (Strip/IT)	0.05	0.32
Cerritos MS (Swale), I-605/SR-91 (Swale, Strip, EDB and IB), I-605 @ Carson (Swale)	0.25	1.98
I-5/I-605 (Swale and EDB)	0.09	1.43
I-210/East of Orcas Ave.	0.01	0.77
I-210/East of Filmore St.	0.00	1.19
Alameda Maintenance Station	0.13	0.31
Eastern Regional Maintenance Station	0.00	1.25
Termination Park & Ride	0.27	1.65
Via Verde Park & Ride	0.01	0.91
Lakewood Park & Ride	0.24	1.17

Influent



Effluent



Cumulative Rainfall

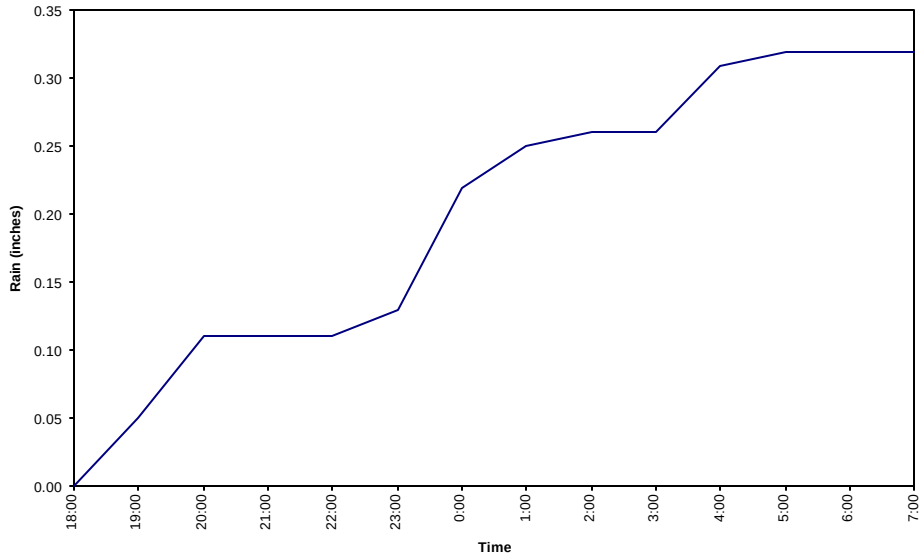
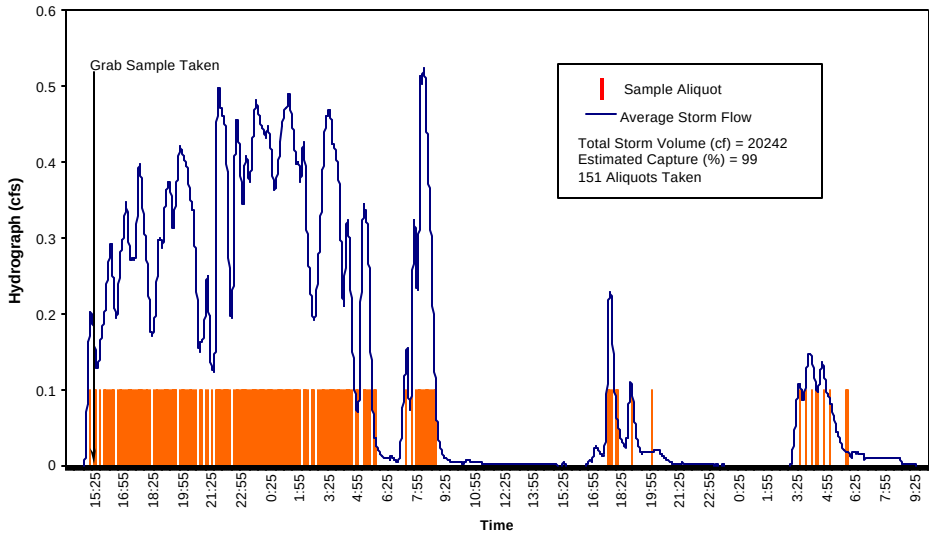
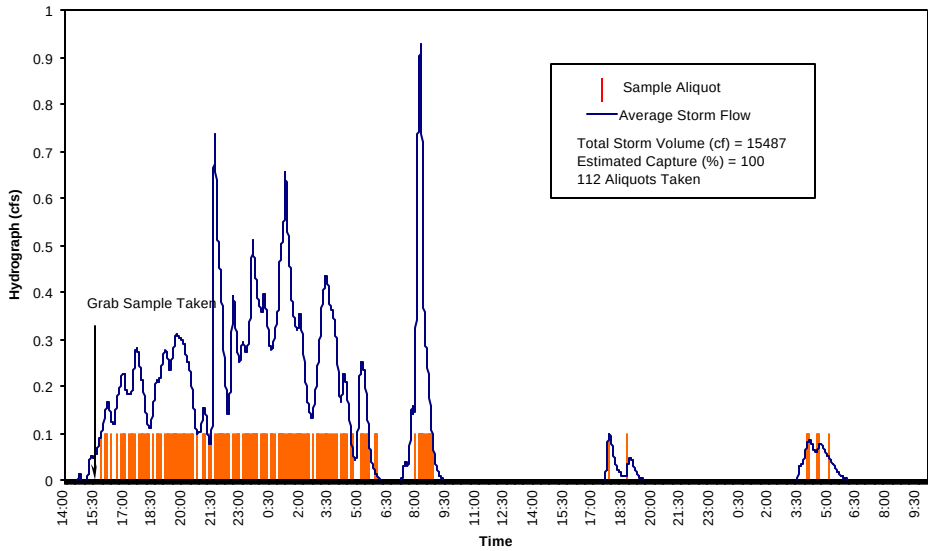


Figure 1-4a: Influent and Effluent Hydrograph, and Cumulative Rainfall at the Altadena MS Biofiltration Strip for Event 2 on October 26-27, 2000

Influent



Effluent



Cumulative Rainfall

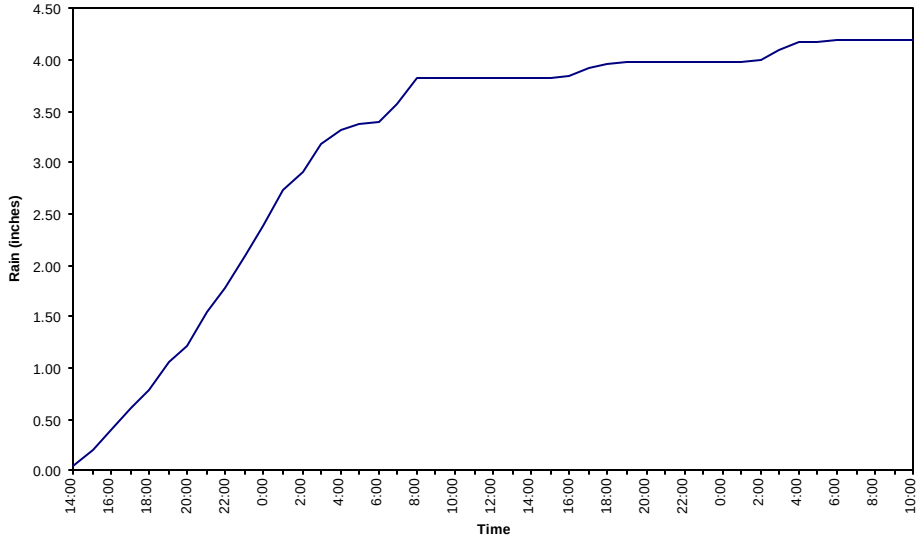
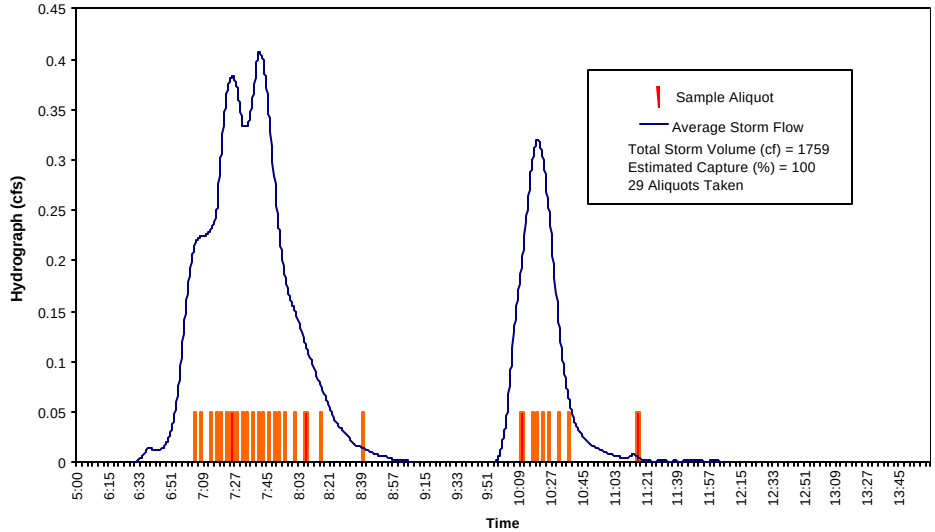
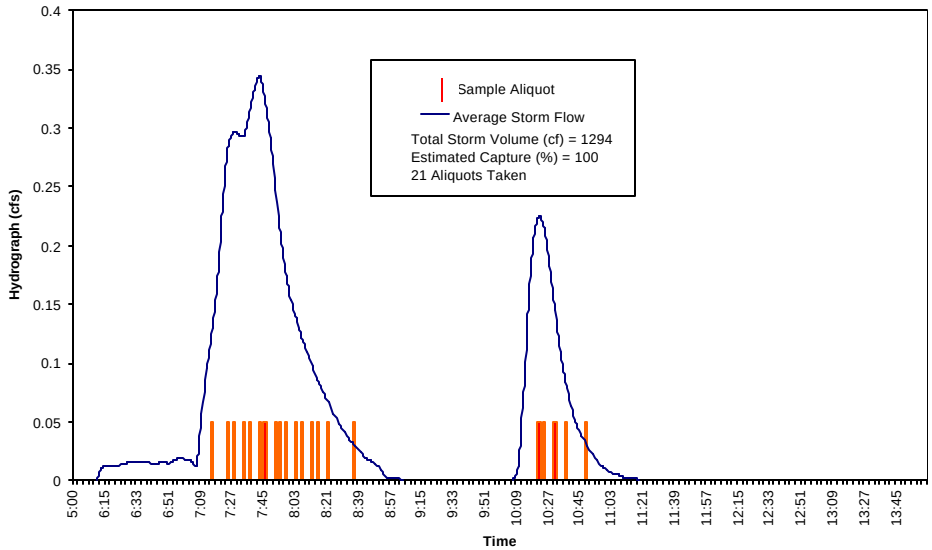


Figure 1-4b: Influent and Effluent Hydrograph, and Cumulative Rainfall at the Altadena MS Biofiltration Strip for Event 4 on January 10-12, 2001

Influent



Effluent



Cumulative Rainfall

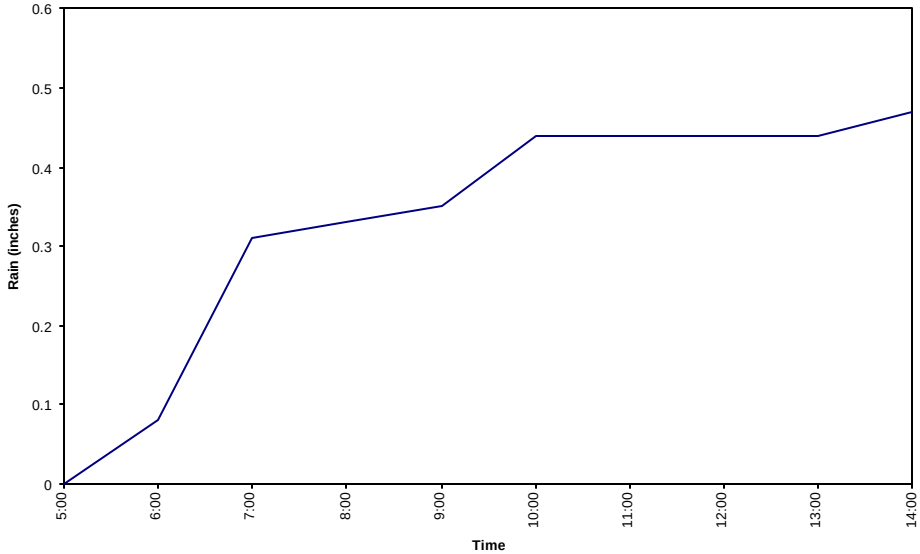
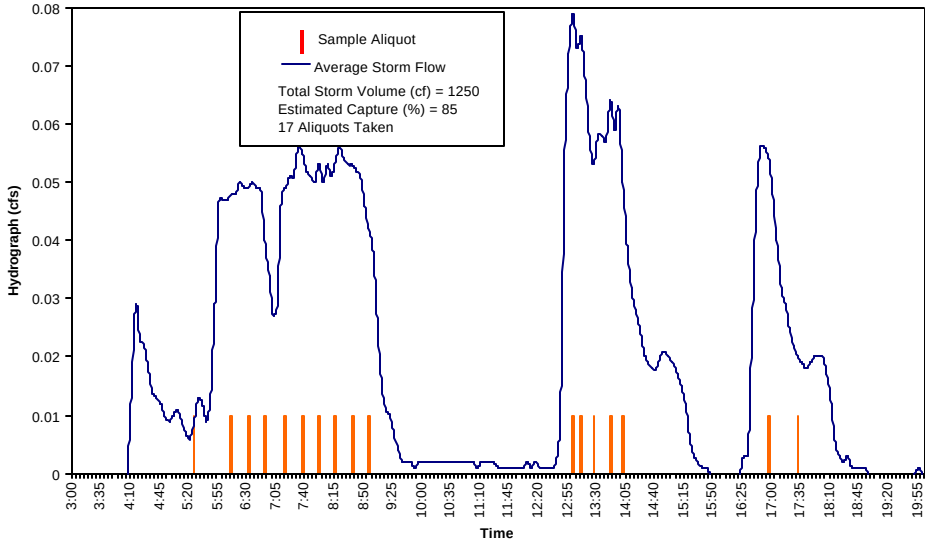
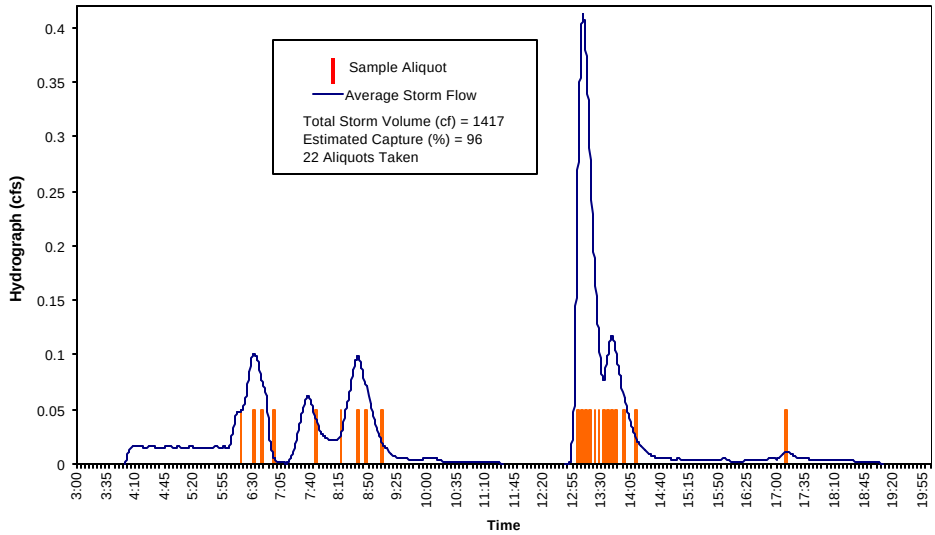


Figure 1-4c: Influent and Effluent Hydrograph, and Cumulative Rainfall at the Altadena MS Biofiltration Strip for Event 5 on January 24, 2001

Influent



Effluent



Cumulative Rainfall

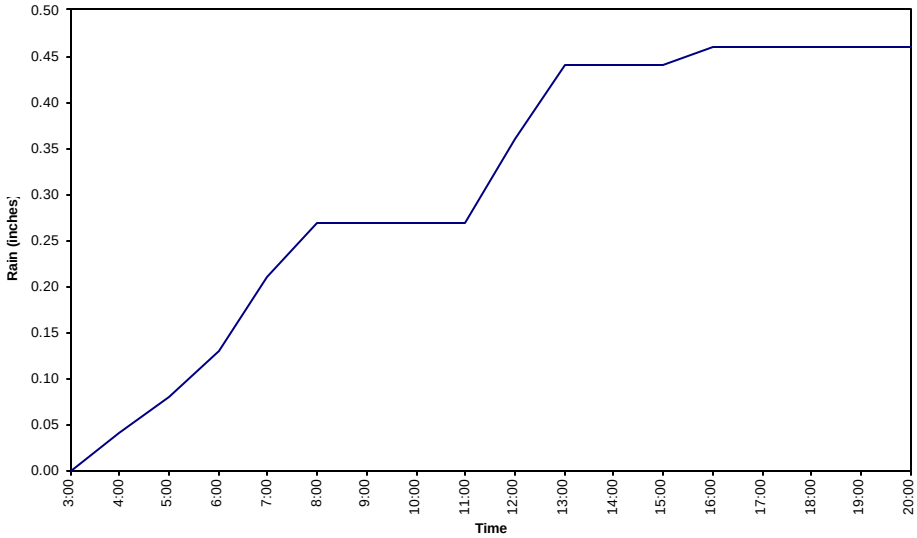
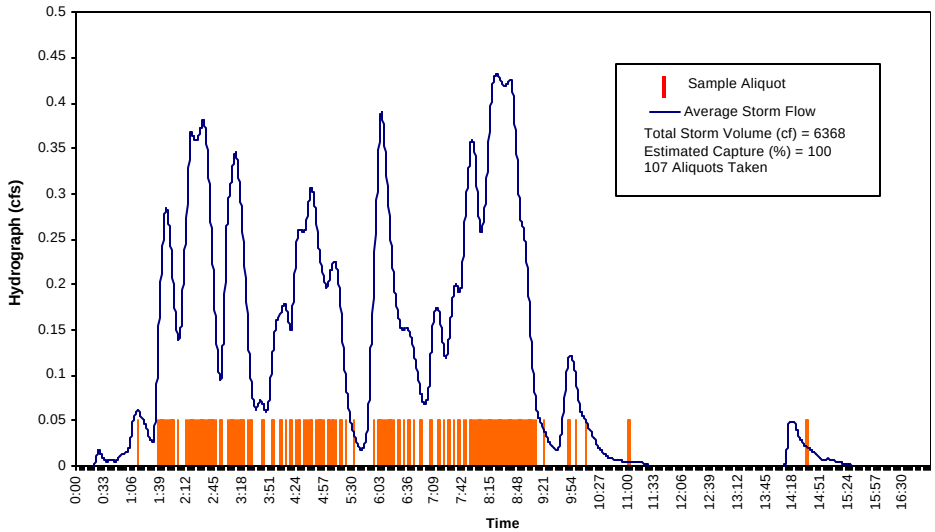
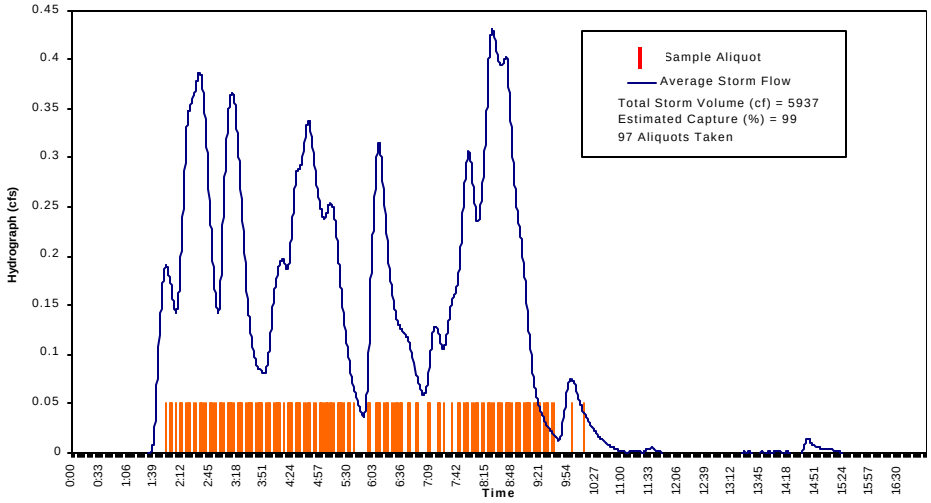


Figure 1-4d: Influent and Effluent Hydrograph, and Cumulative Rainfall at the Altadena MS Biofiltration Strip for Event 6 on February 10, 2001

Influent



Effluent



Cumulative Rainfall

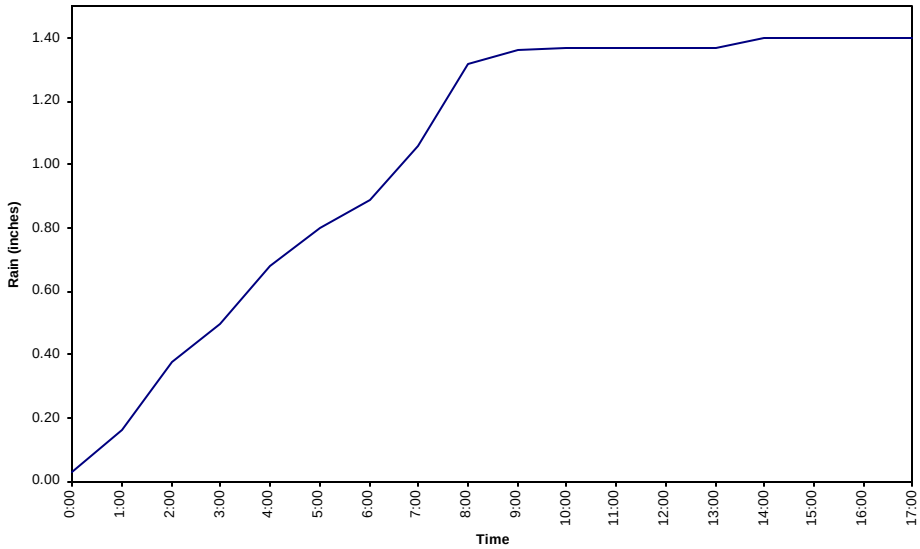
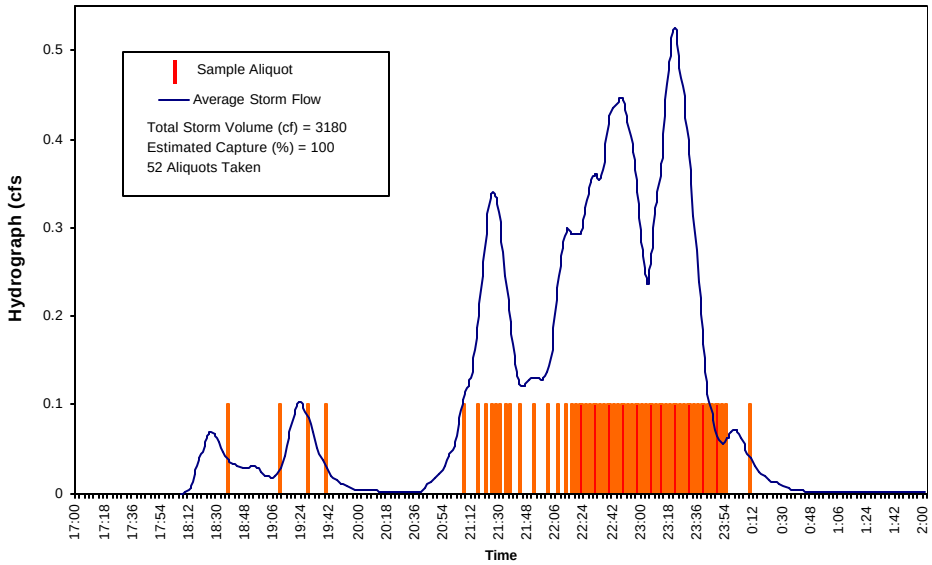
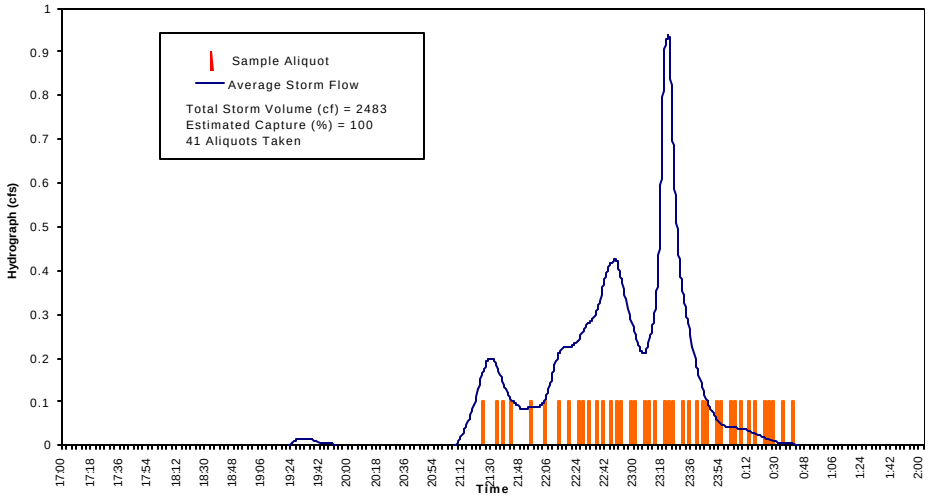


Figure 1-4e: Influent and Effluent Hydrograph, and Cumulative Rainfall at the Altadena MS Biofiltration Strip for Event 9 on April 7, 2001

Influent



Effluent



Cumulative Rainfall

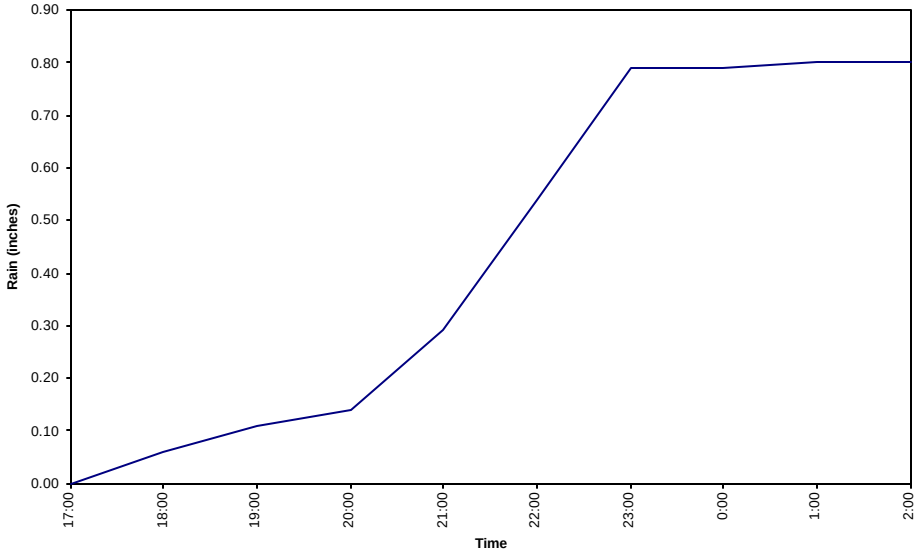
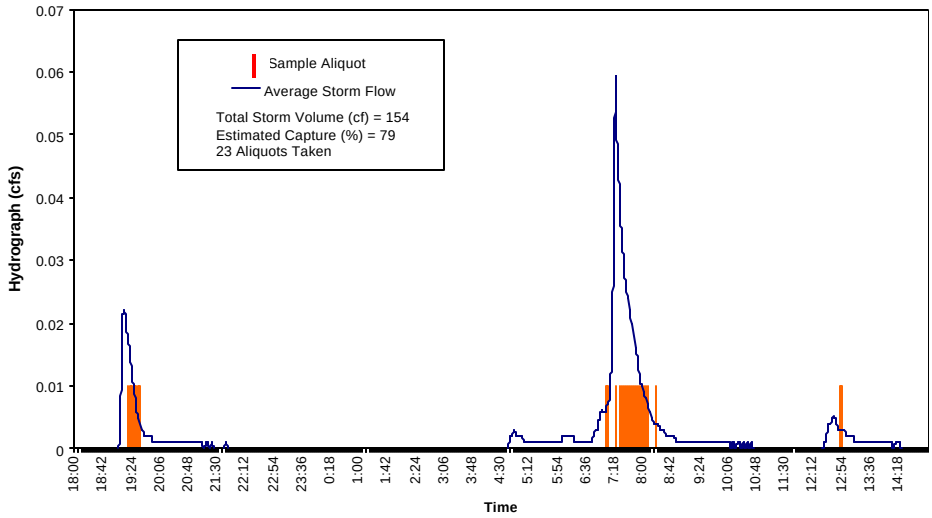
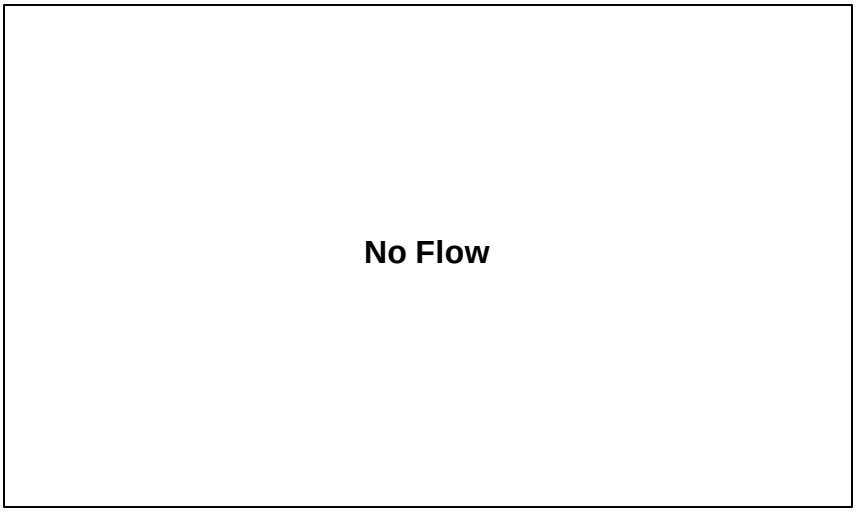


Figure 1-4f: Influent and Effluent Hydrograph, and Cumulative Rainfall at the Altadena MS Biofiltration Strip for Event 10 on April 20-21, 2001

Influent



Effluent



Cumulative Rainfall

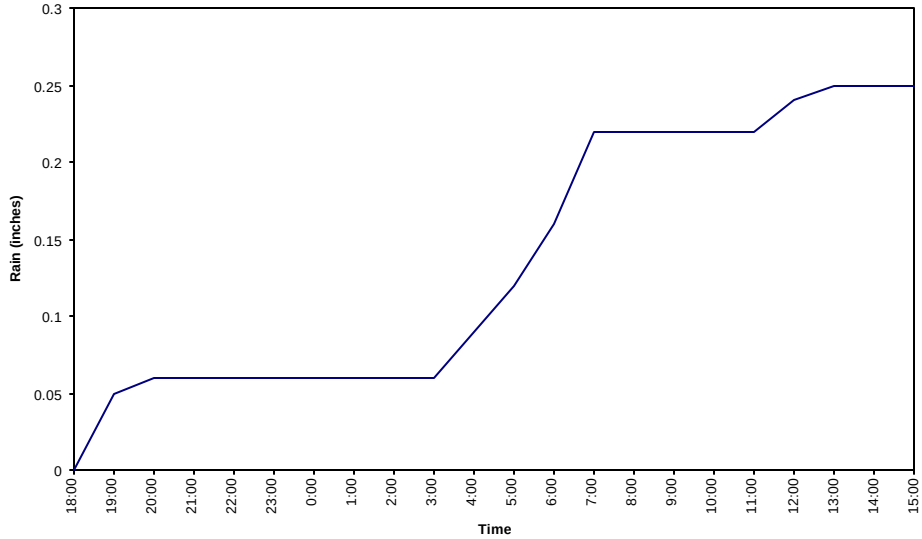
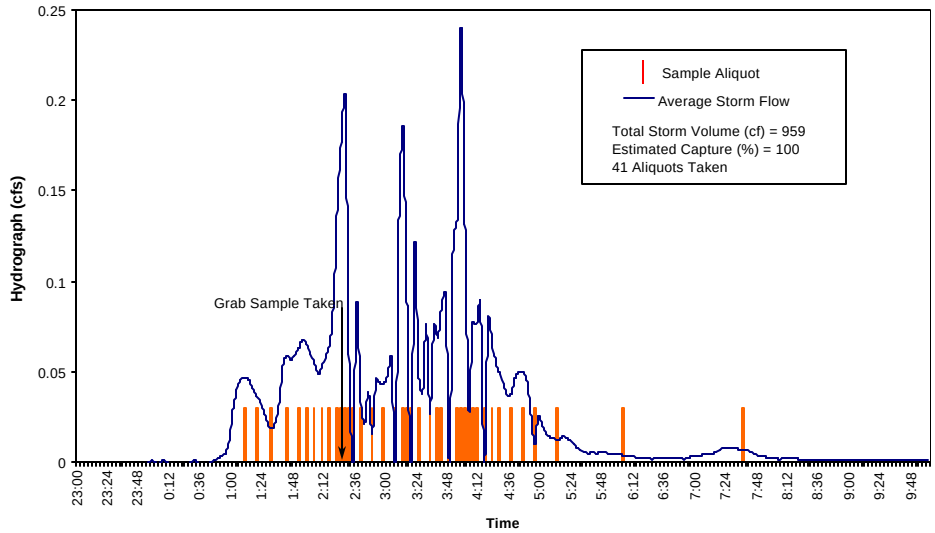
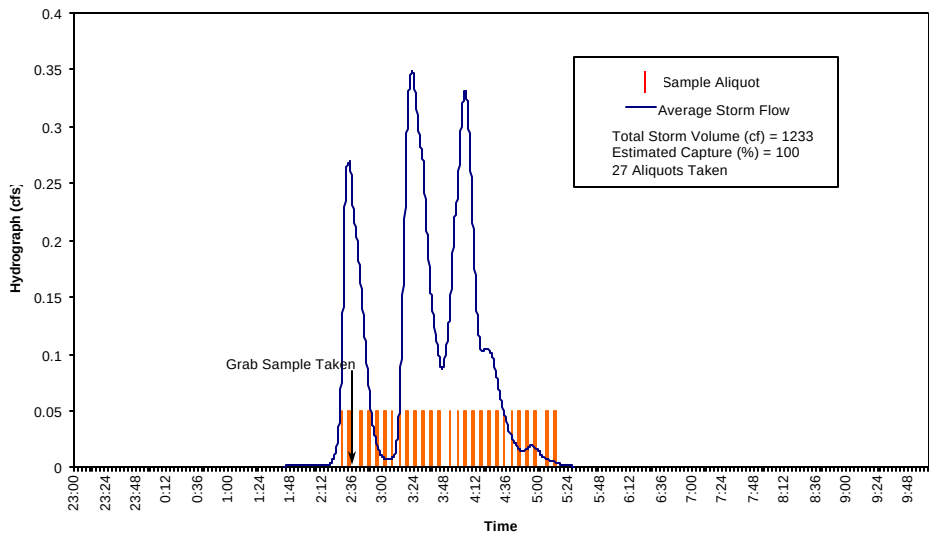


Figure 1-5a: Influent and Effluent Hydrograph, and Cumulative Rainfall at the I-605/SR-91 Biofiltration Strip for Event 1 on October 10-11, 2000

Influent



Effluent



Cumulative Rainfall

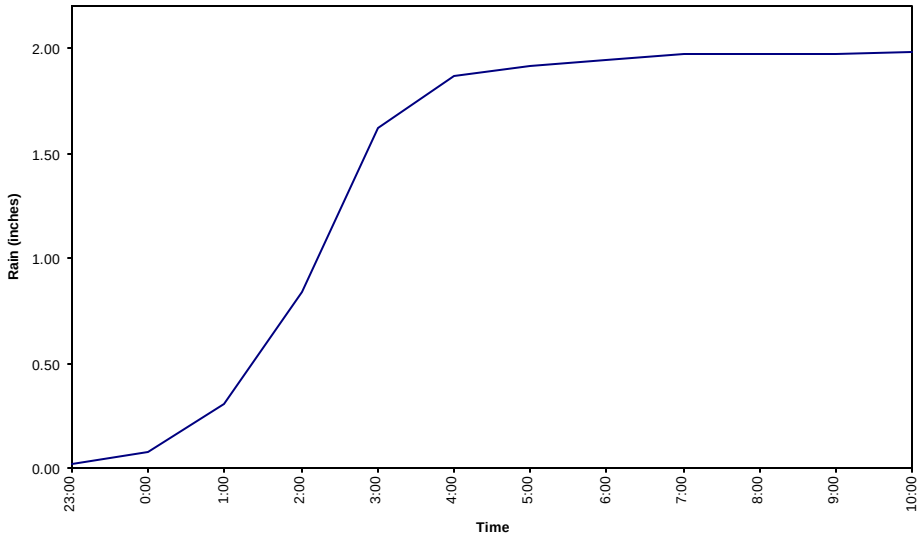
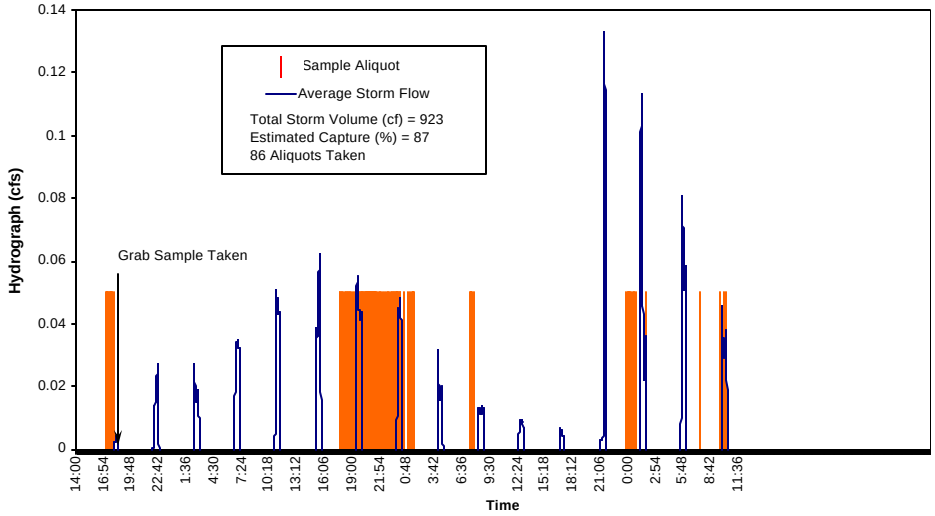
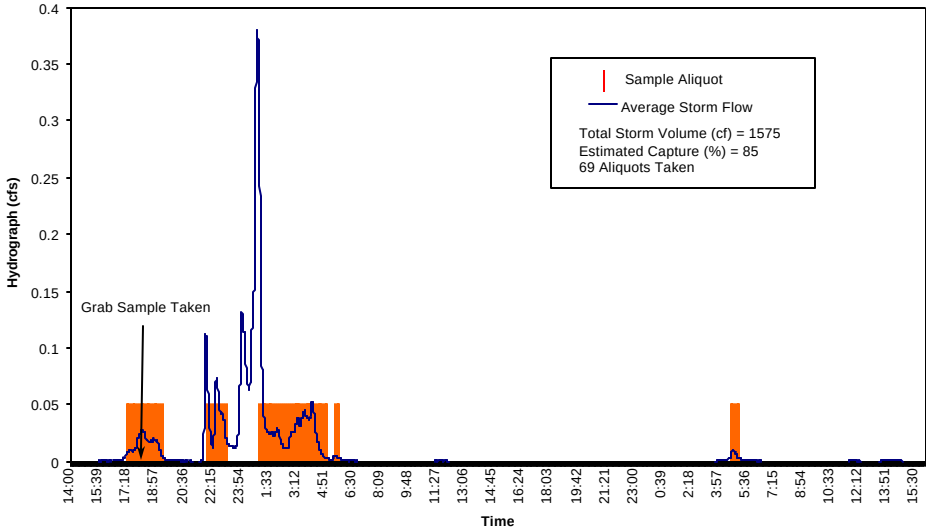


Figure 1-5b: Influent and Effluent Hydrograph, and Cumulative Rainfall at the I-605/SR-91 Biofiltration Strip for Event 2 on October 26-27, 2000

Influent



Effluent



Cumulative Rainfall

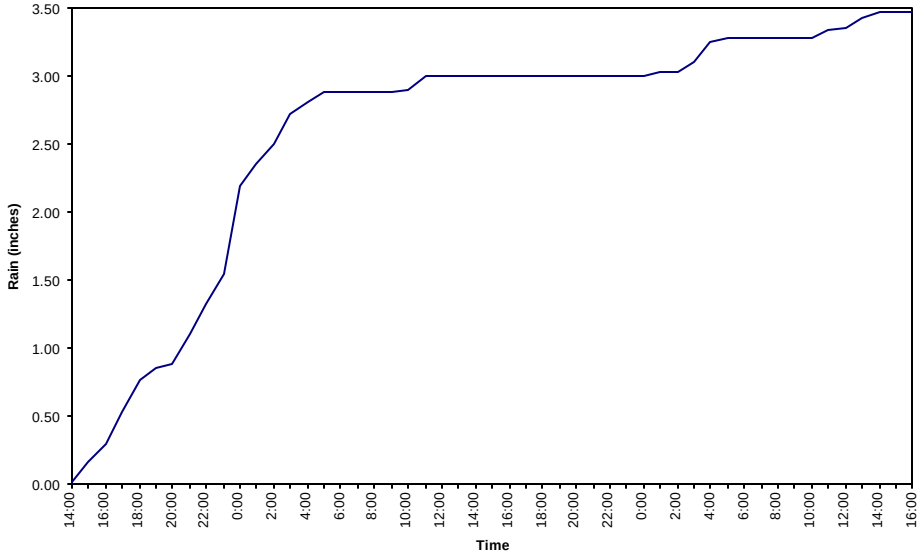
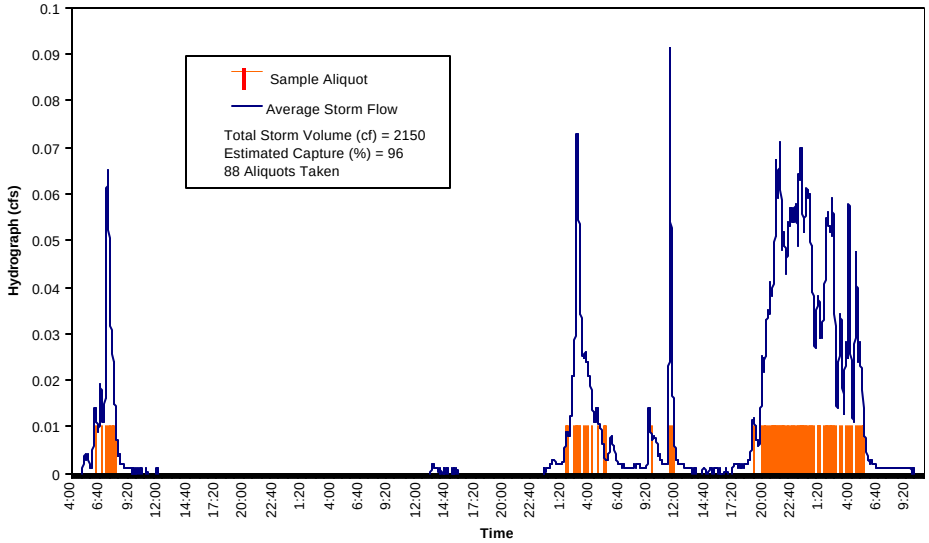
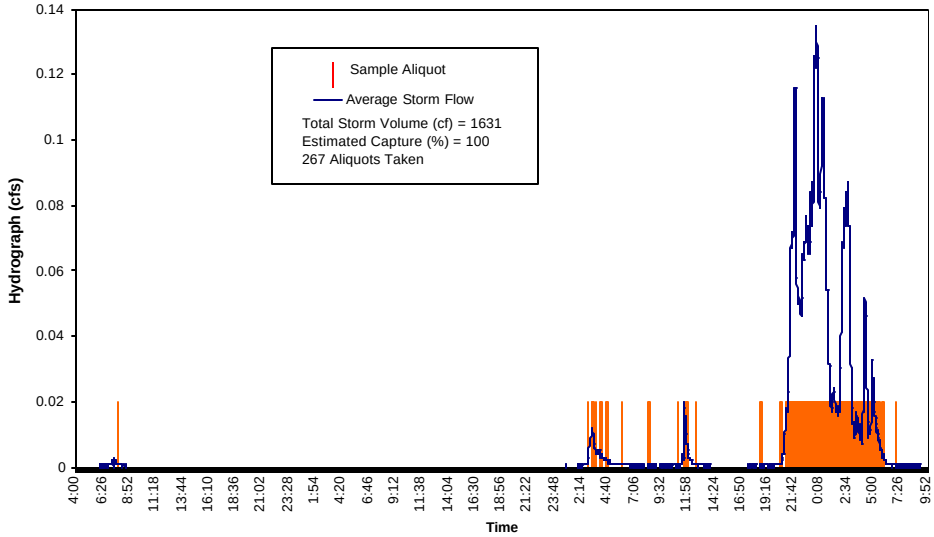


Figure 1-5c: Influent and Effluent Hydrograph, and Cumulative Rainfall at the I-605/SR-91 Biofiltration Strip for Event 4 on January 10-12, 2001

Influent



Effluent



Cumulative Rainfall

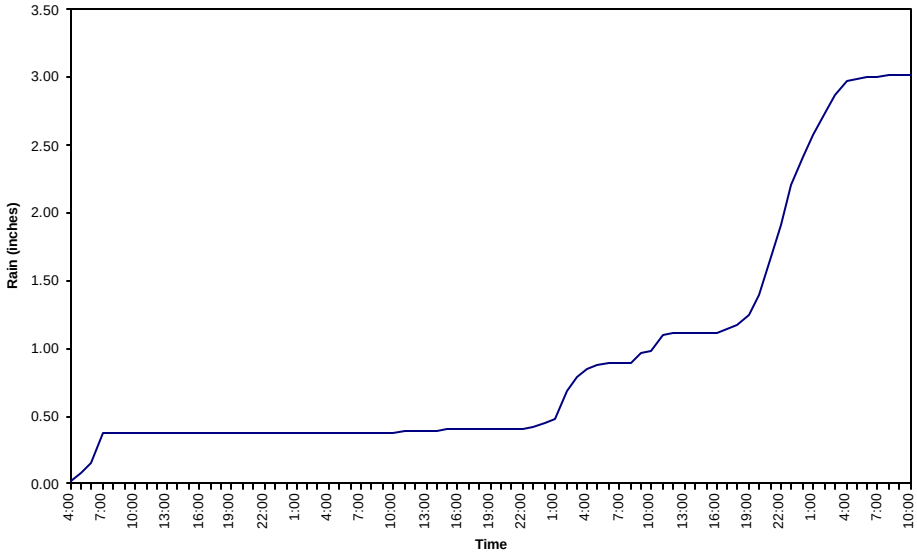
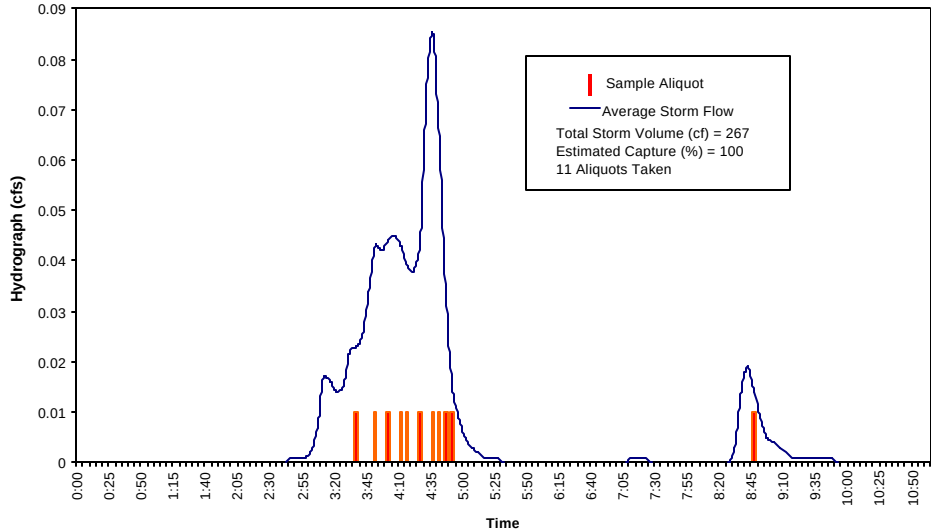
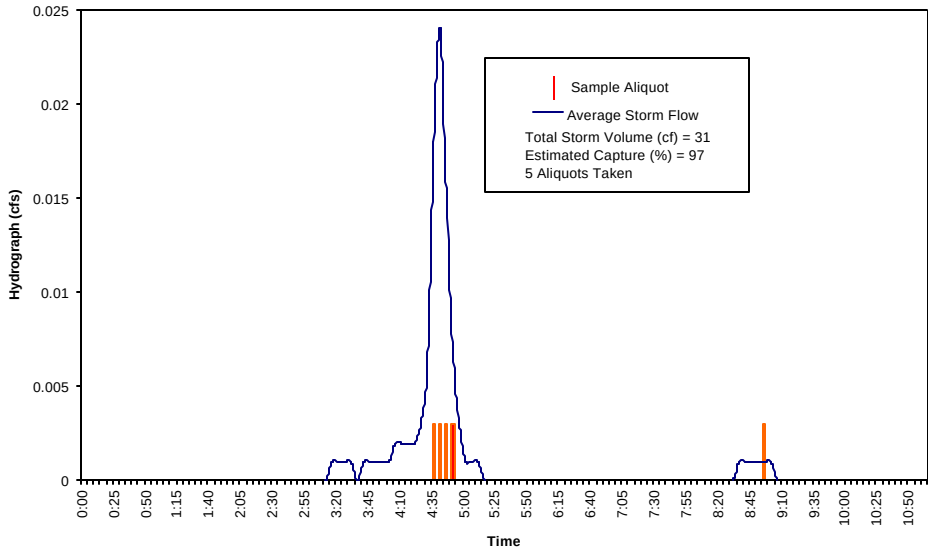


Figure 1-5d: Influent and Effluent Hydrograph, and Cumulative Rainfall at the I-605/SR-91 Biofiltration Strip for Event 6 on February 10-13, 2001

Influent



Effluent



Cumulative Rainfall

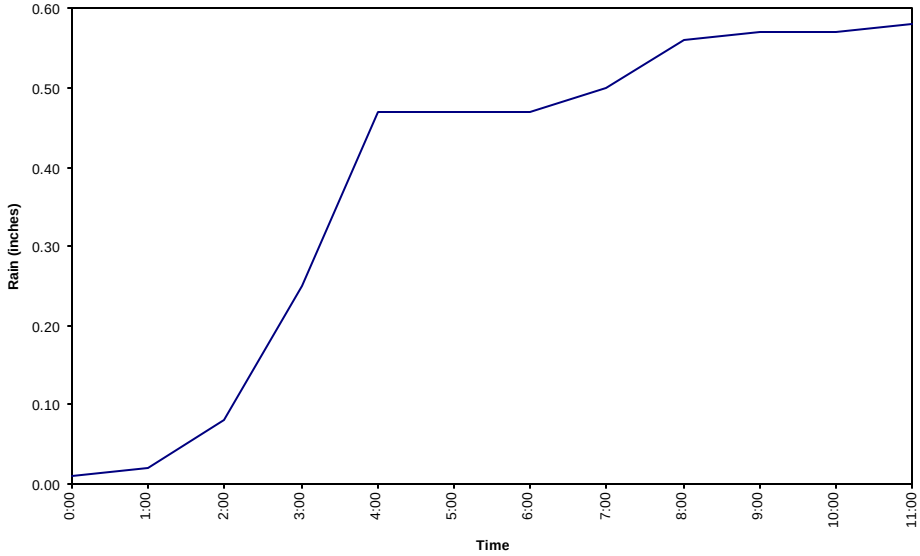
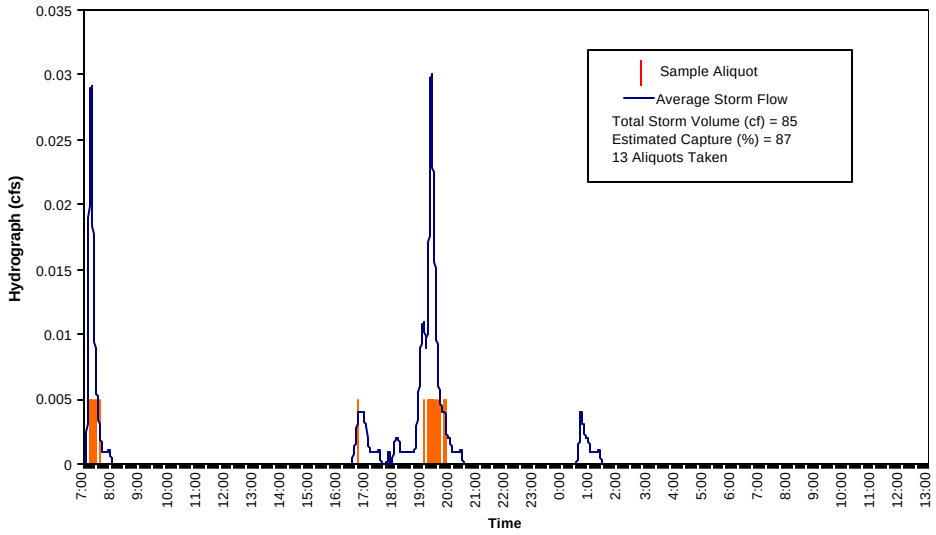
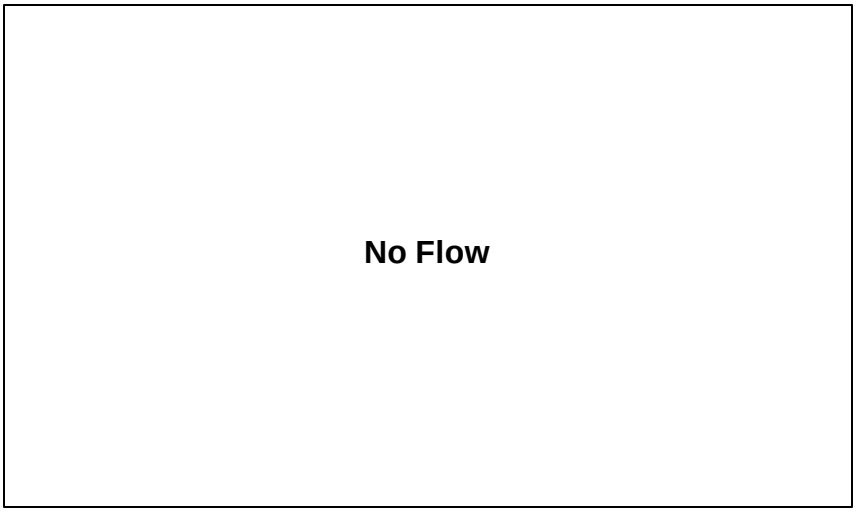


Figure 1-5e: Influent and Effluent Hydrograph, and Cumulative Rainfall at the I-605/SR-91 Biofiltration Strip for Event 9 on April 7, 2001

Influent



Effluent



Cumulative Rainfall

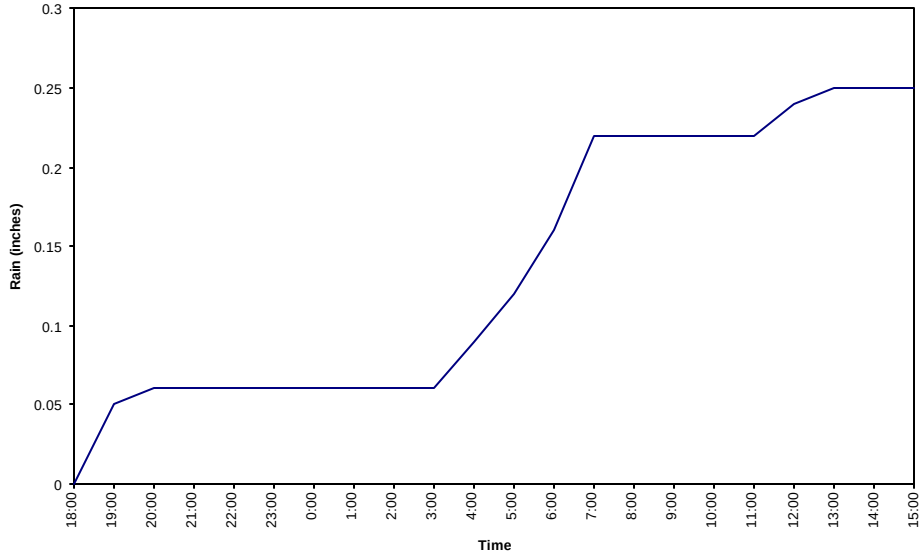
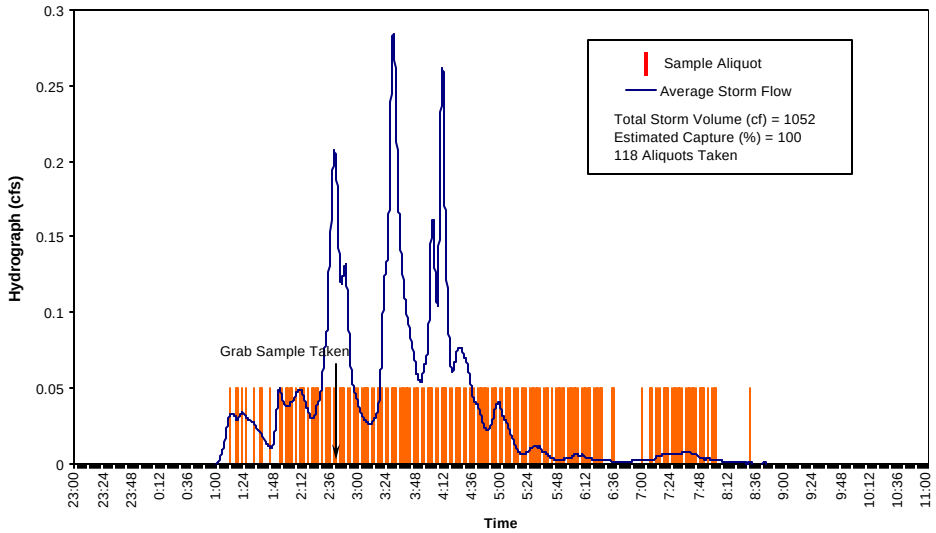
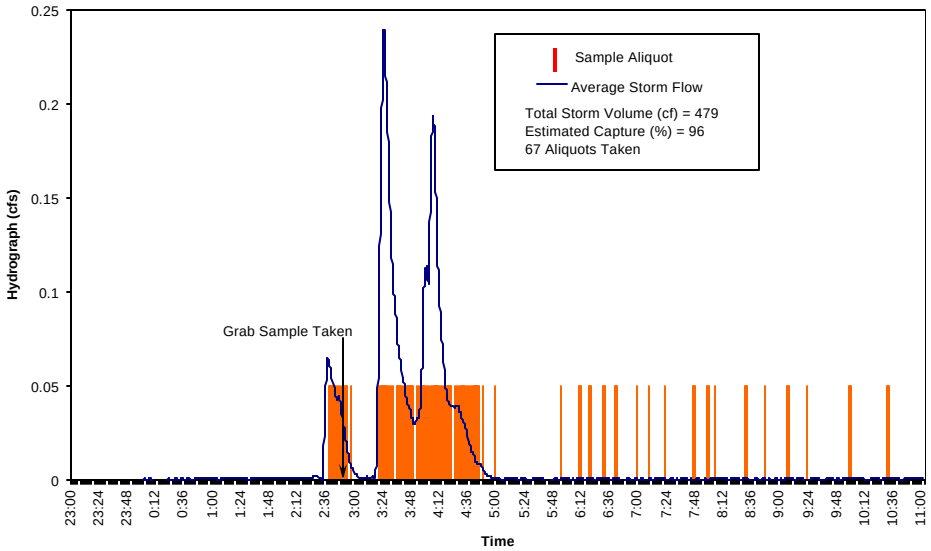


Figure 1-6a: Influent and Effluent Hydrograph, and Cumulative Rainfall at the I-605/SR-91 Biofiltration Swale for Event 1 on October 10-11, 2000

Influent



Effluent



Cumulative Rainfall

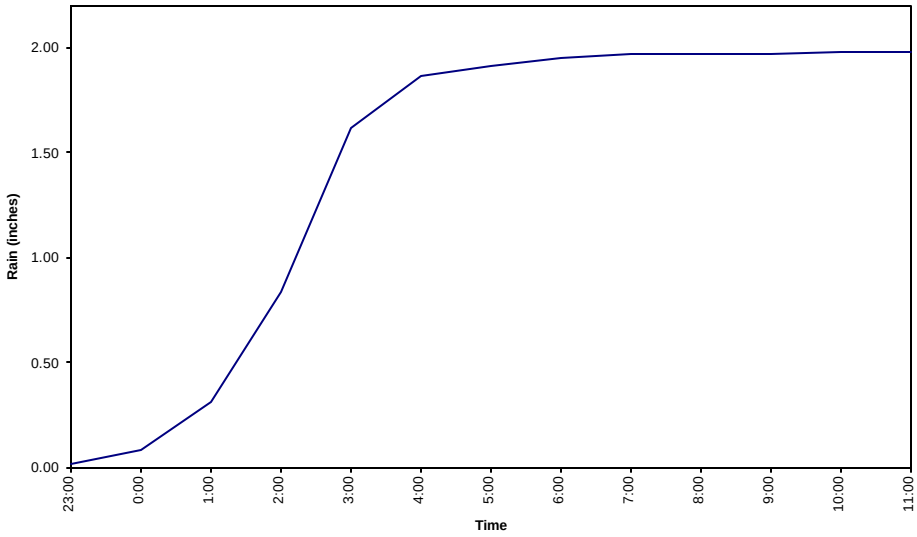
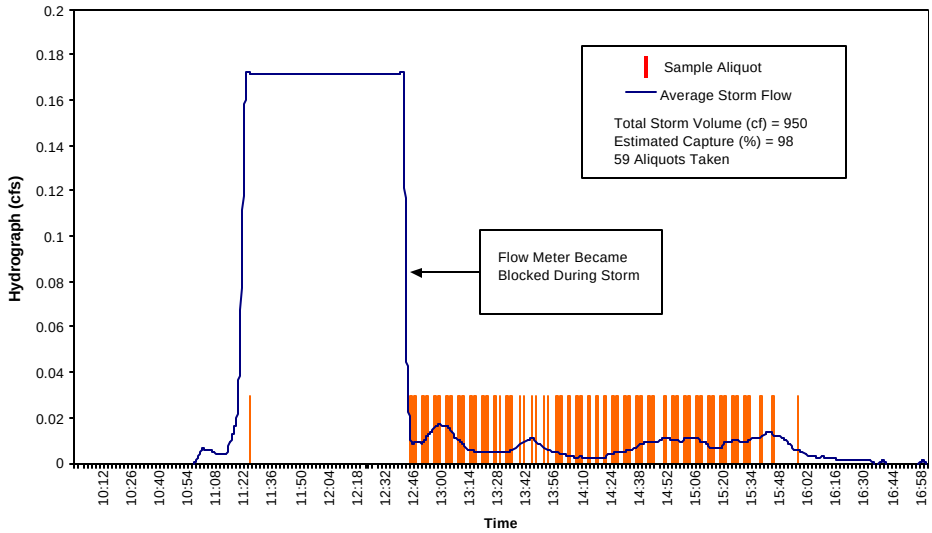
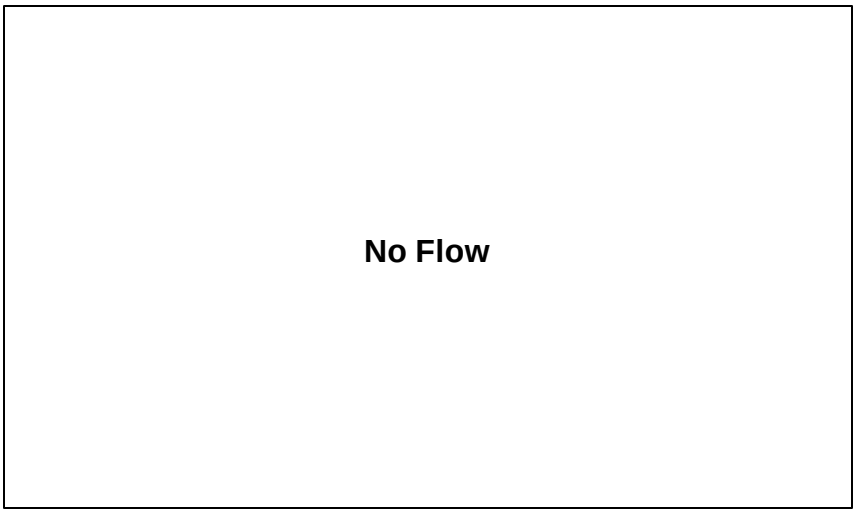


Figure 1-6b: Influent and Effluent Hydrograph, and Cumulative Rainfall at the I-605/SR-91 Biofiltration Swale for Event 2 on October 26-27, 2000

Influent



Effluent



Cumulative Rainfall

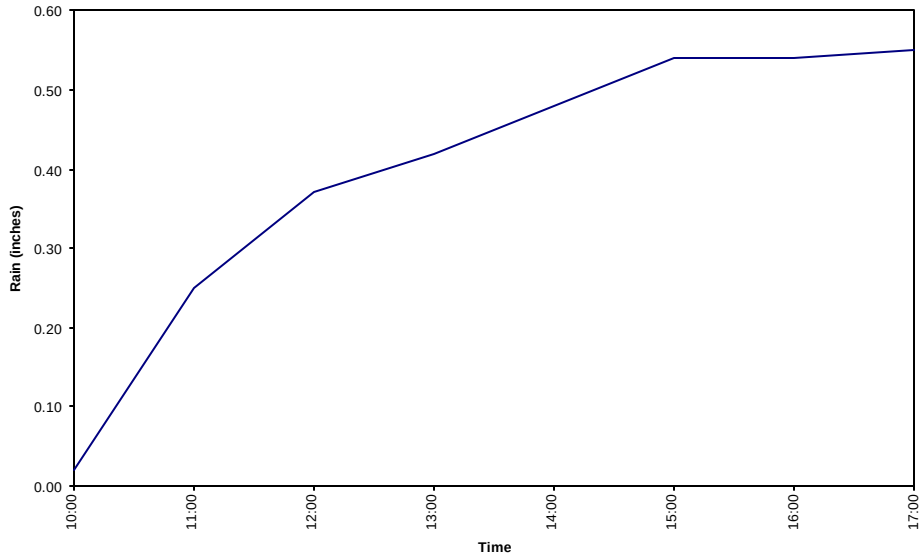
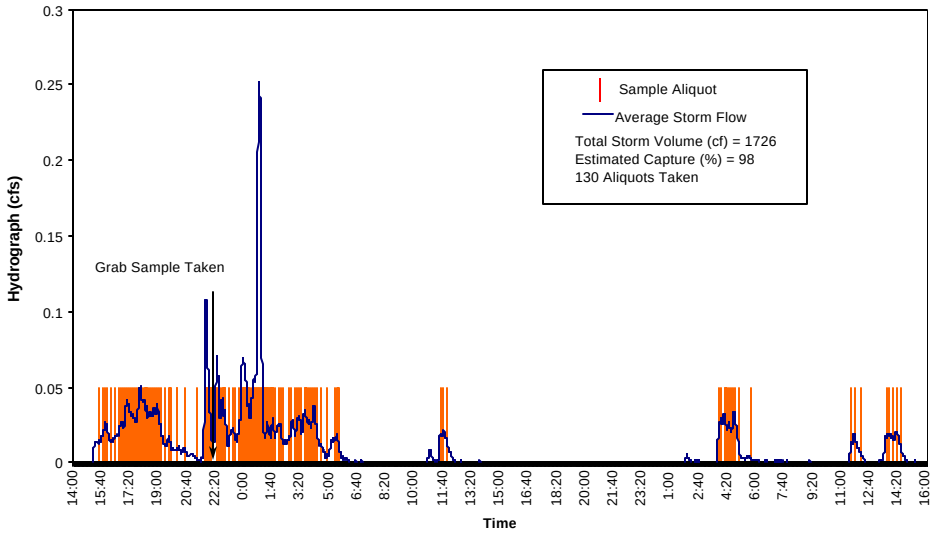
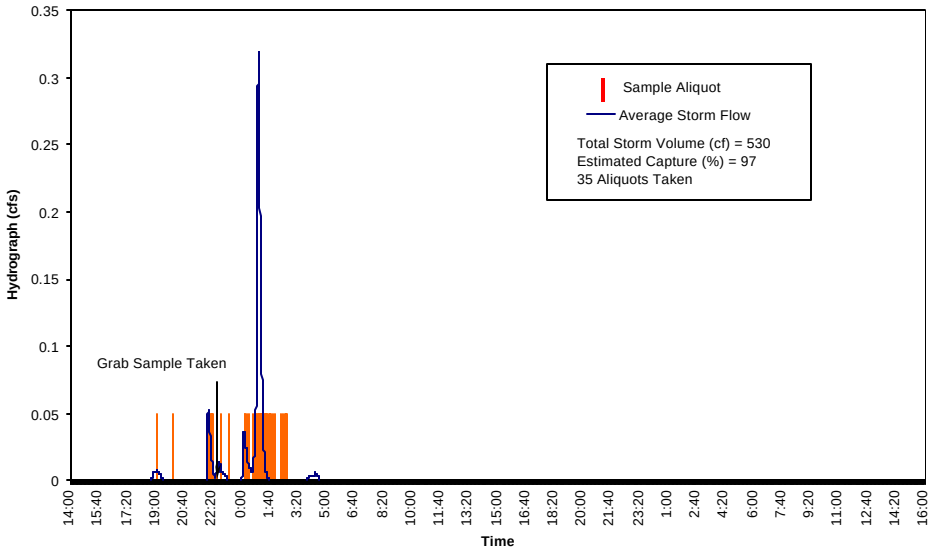


Figure 1-6c: Influent and Effluent Hydrograph, and Cumulative Rainfall at the I-605/SR-91 Biofiltration Swale for Event 3 on January 8, 2001

Influent



Effluent



Cumulative Rainfall

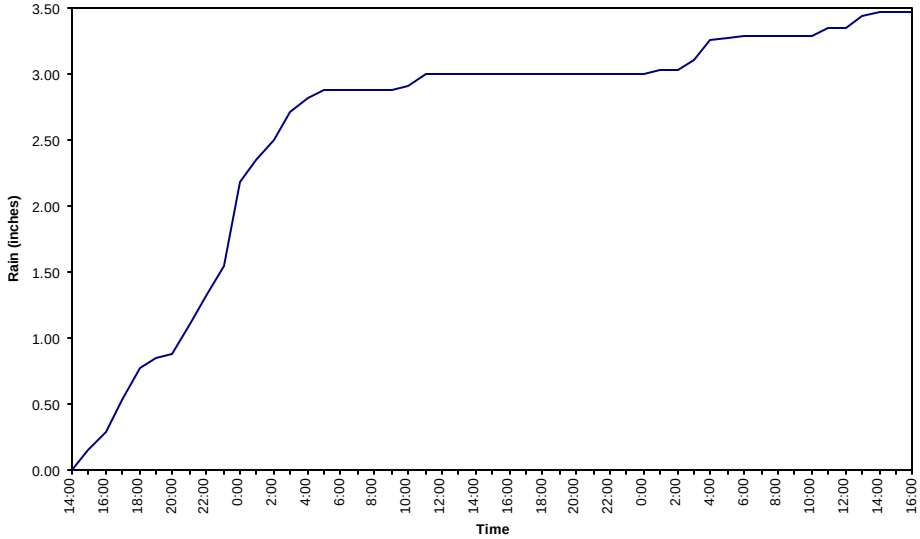
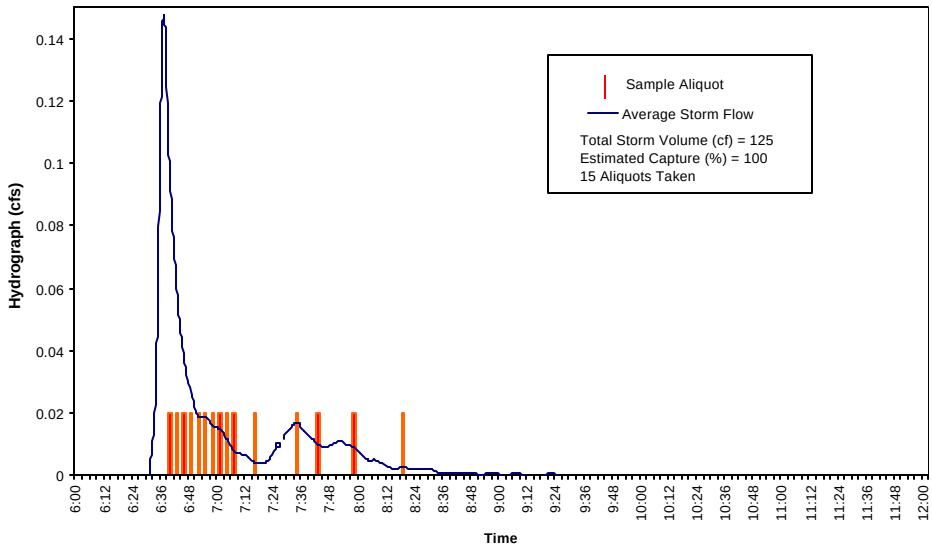
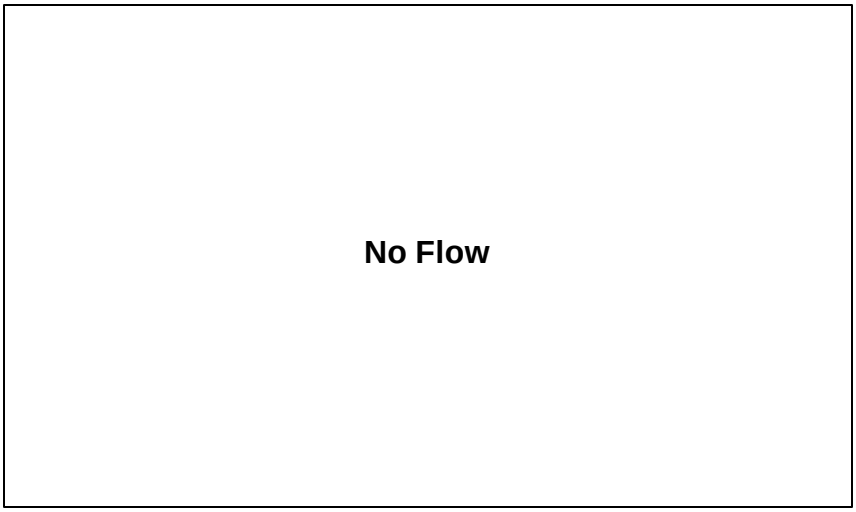


Figure 1-6d: Influent and Effluent Hydrograph, and Cumulative Rainfall at the I-605/SR-91 Biofiltration Swale for Event 4 on January 10-12, 2001

Influent



Effluent



Cumulative Rainfall

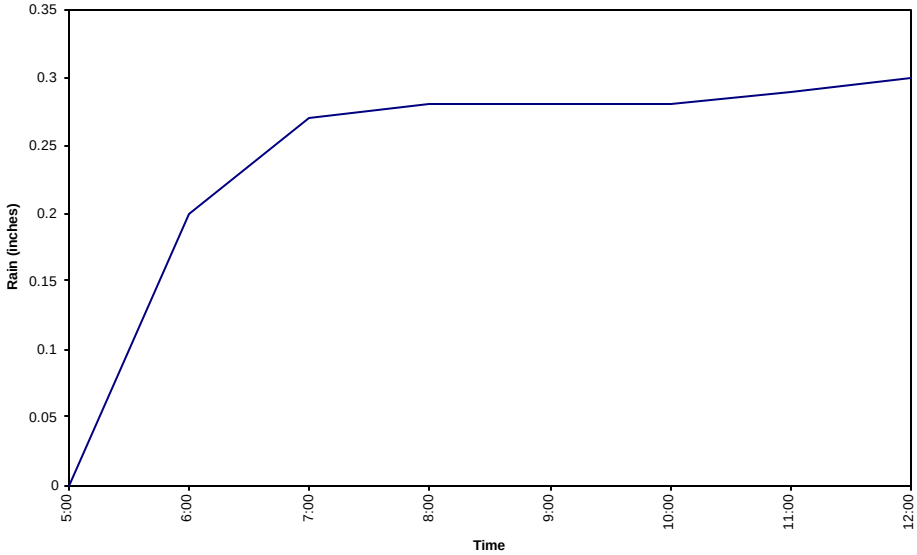
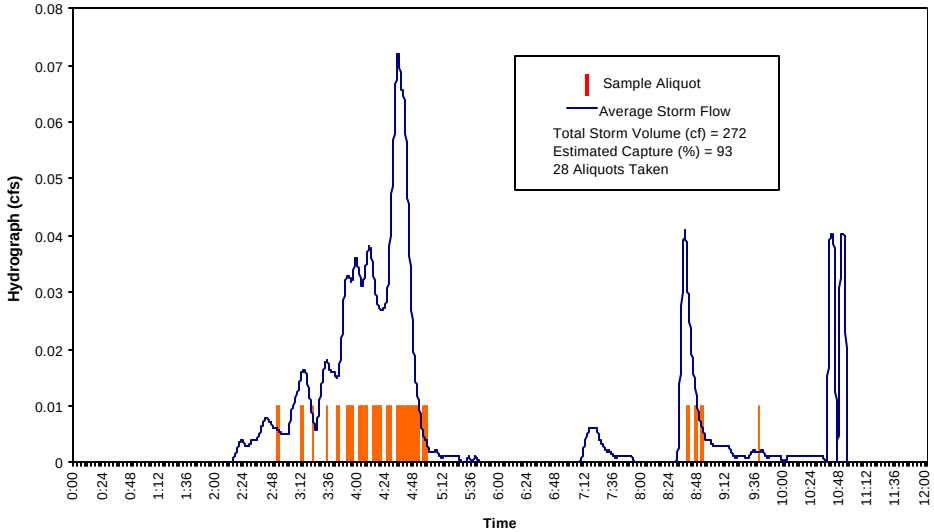
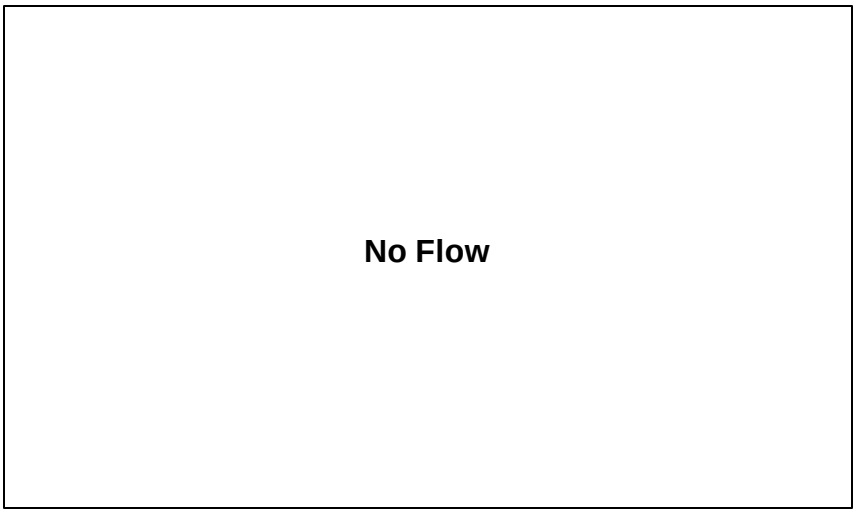


Figure 1-6e: Influent and Effluent Hydrograph, and Cumulative Rainfall at the I-605/SR-91 Biofiltration Swale for Event 5 on January 24, 2001

Influent



Effluent



Cumulative Rainfall

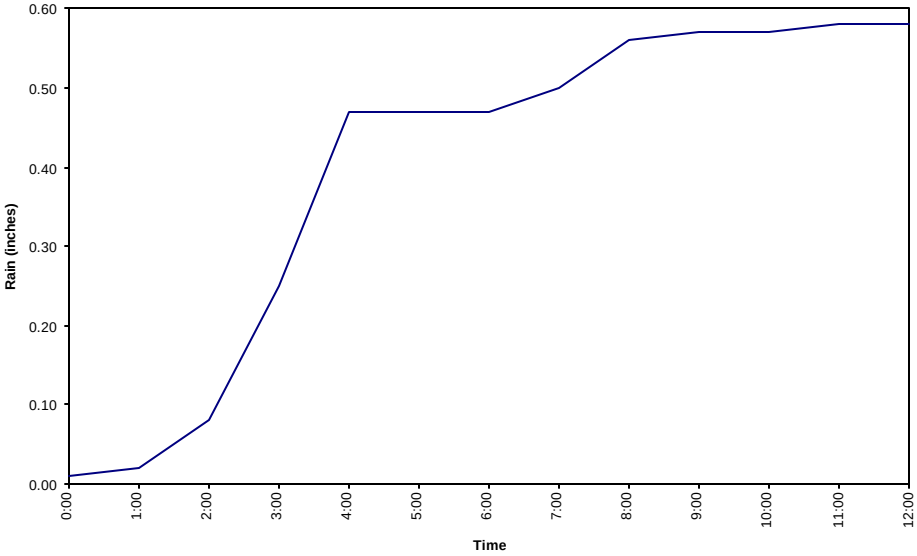
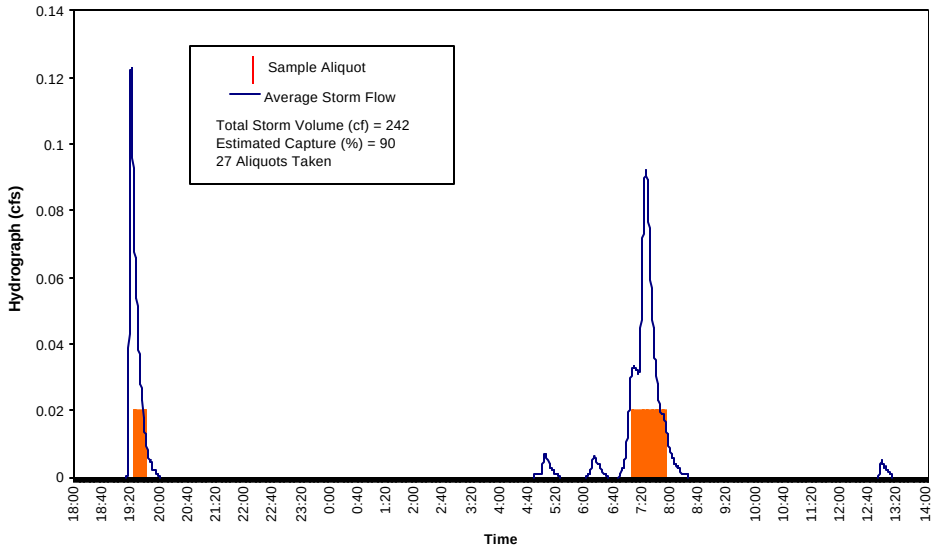
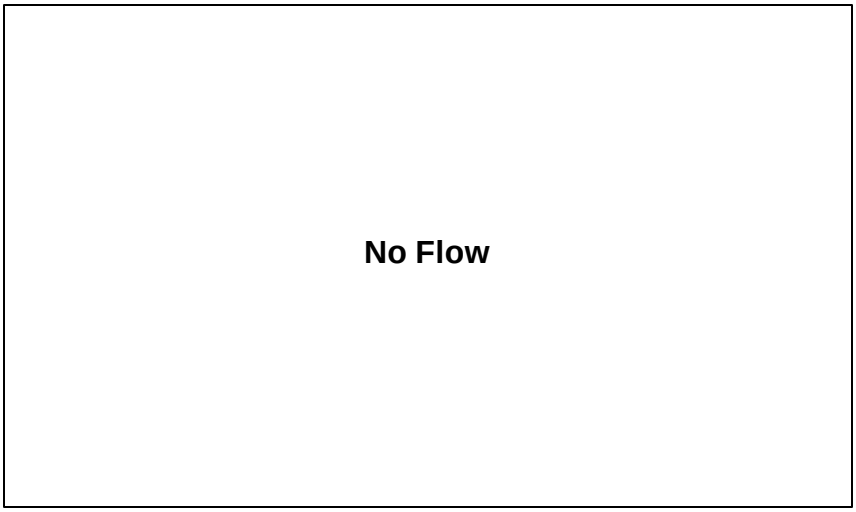


Figure 1-6f: Influent and Effluent Hydrograph, and Cumulative Rainfall at the I-605/SR-91 Biofiltration Swale for Event 9 on April 7, 2001

Influent



Effluent



Cumulative Rainfall

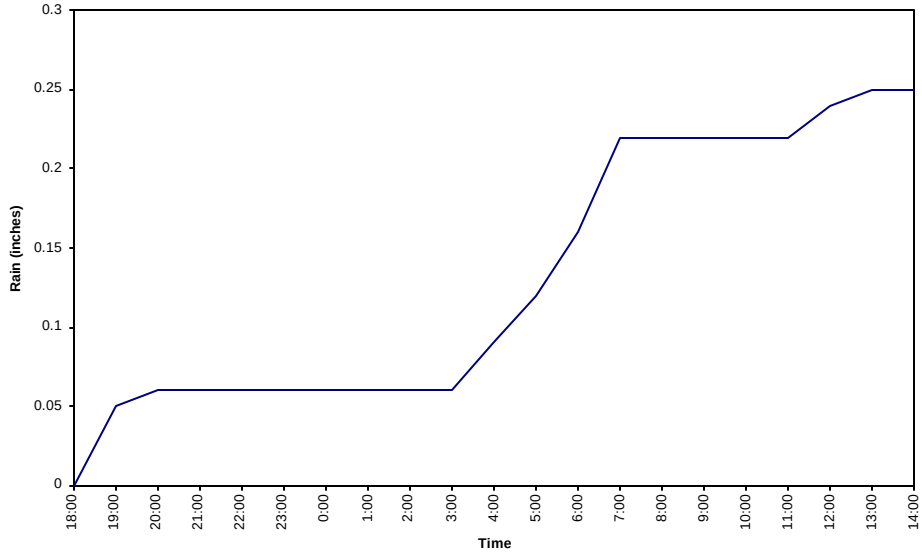
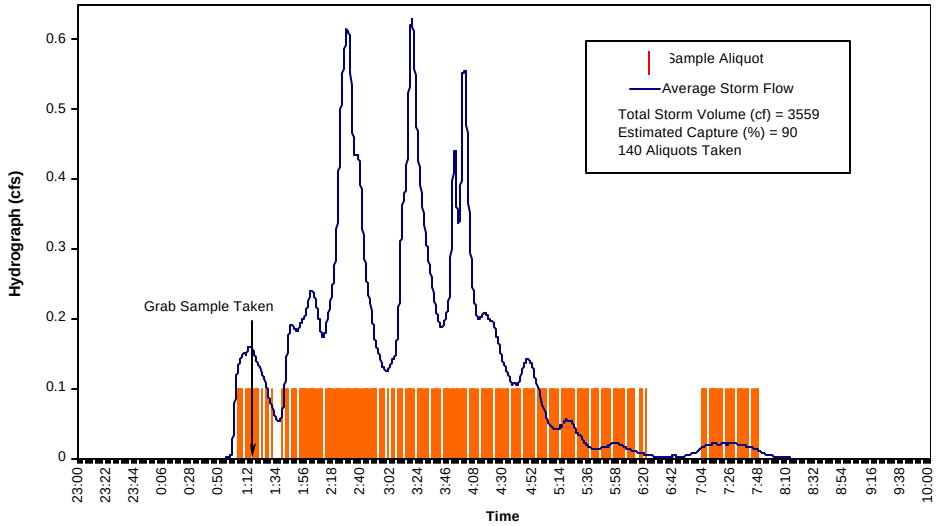
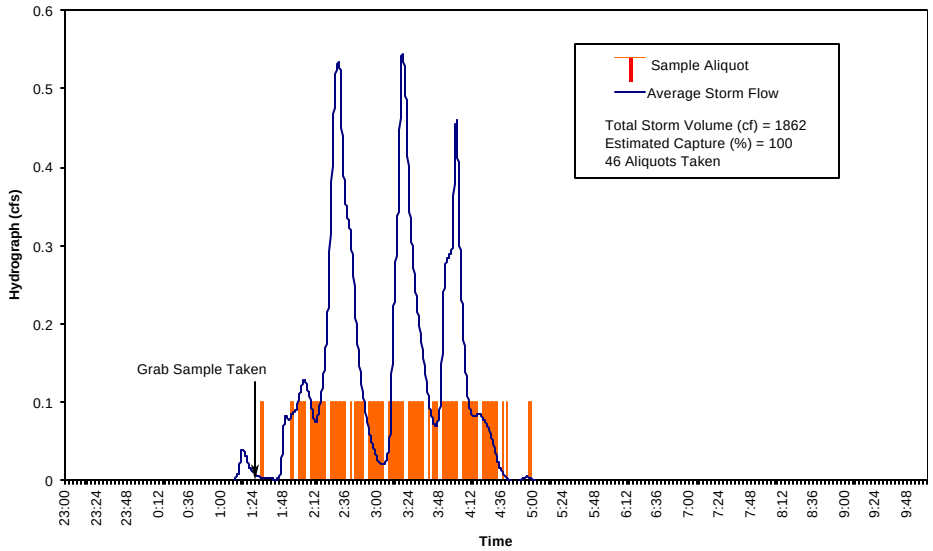


Figure 1-7a: Influent and Effluent Hydrograph, and Cumulative Rainfall at the Cerritos MS Biofiltration Swale for Event 1 on October 10-11, 2000

Influent



Effluent



Cumulative Rainfall

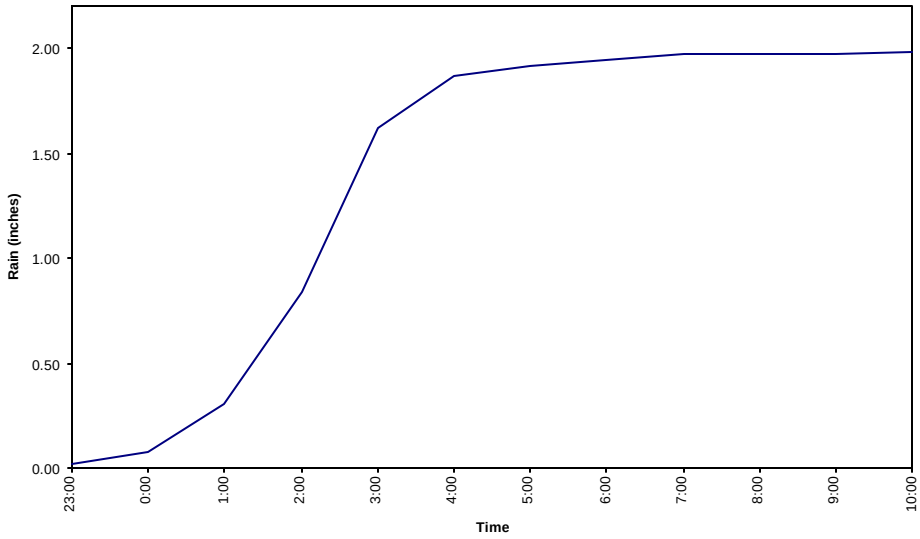
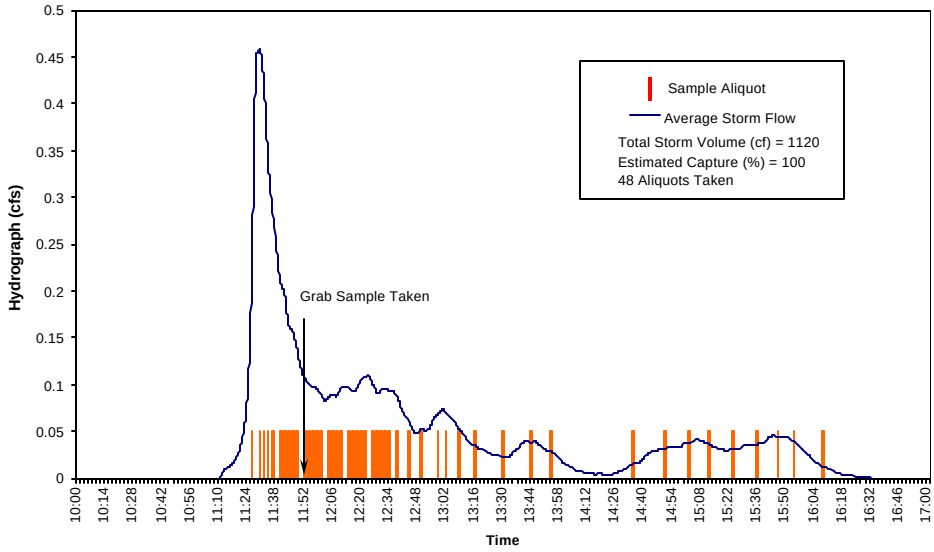
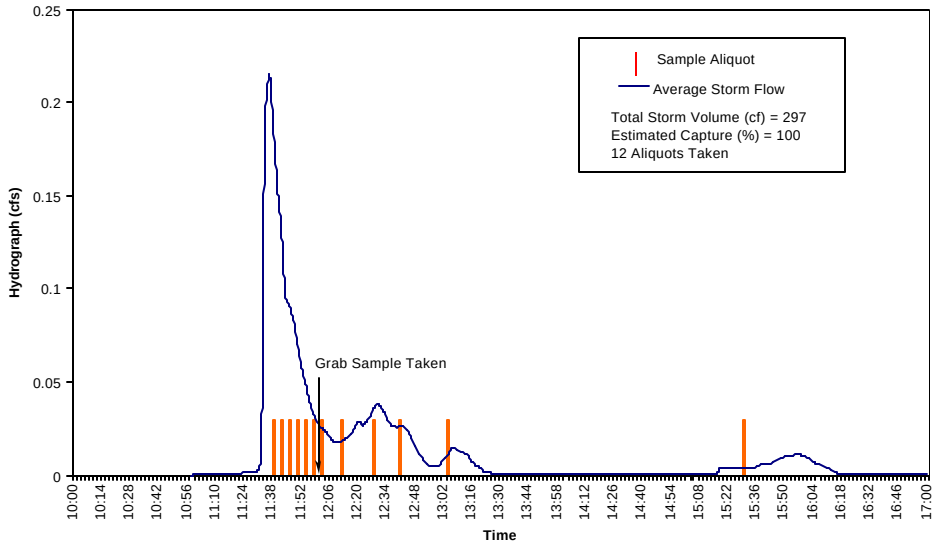


Figure 1-7b: Influent and Effluent Hydrograph, and Cumulative Rainfall at the Cerritos MS Biofiltration Swale for Event 2 on October 26-27, 2000

Influent



Effluent



Cumulative Rainfall

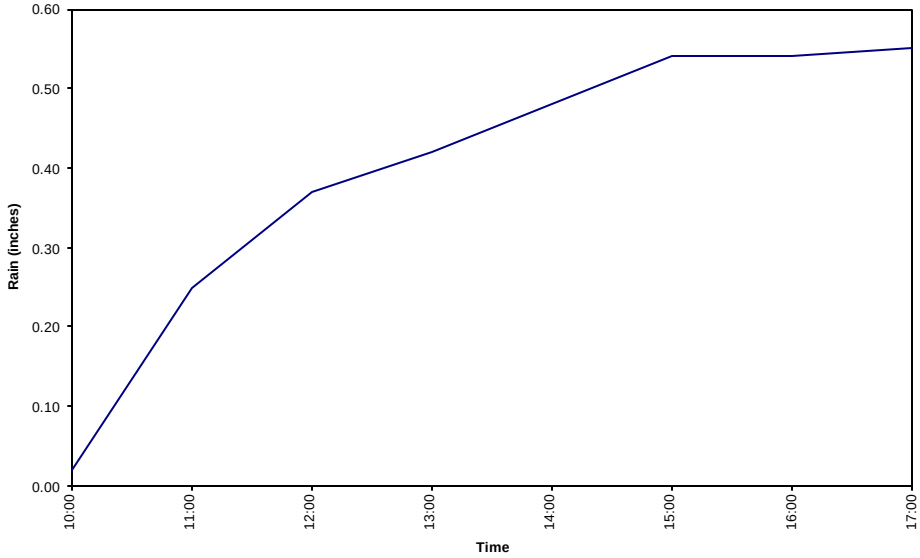
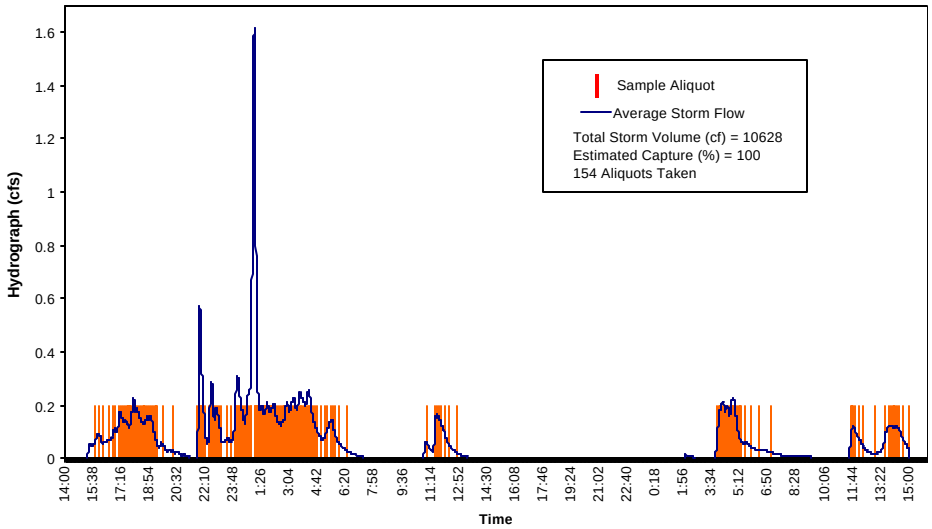
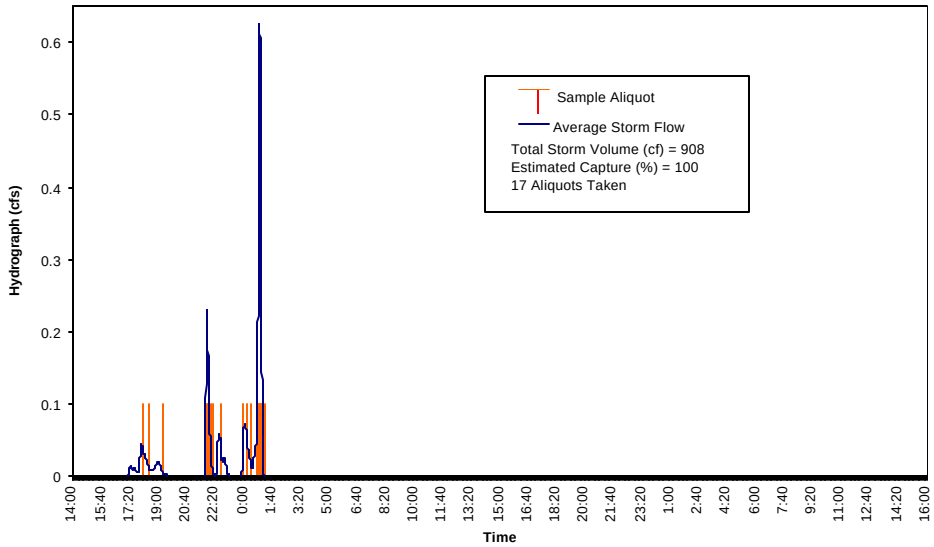


Figure 1-7c: Influent and Effluent Hydrograph, and Cumulative Rainfall at the Cerritos MS Biofiltration Swale for Event 3 on January 8, 2001

Influent



Effluent



Cumulative Rainfall

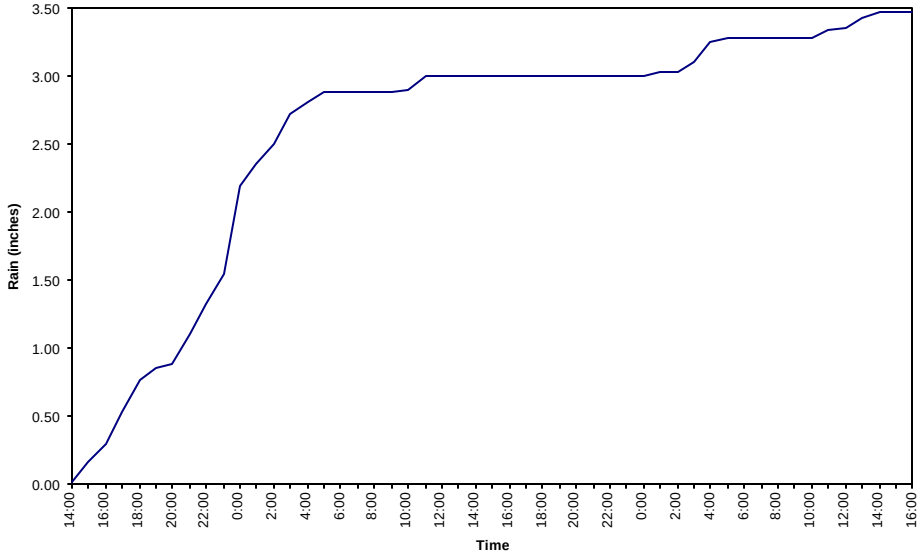
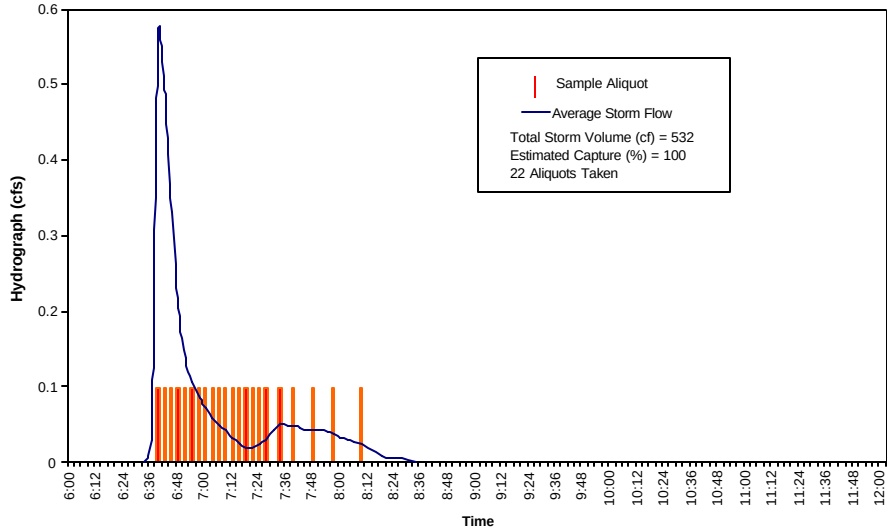
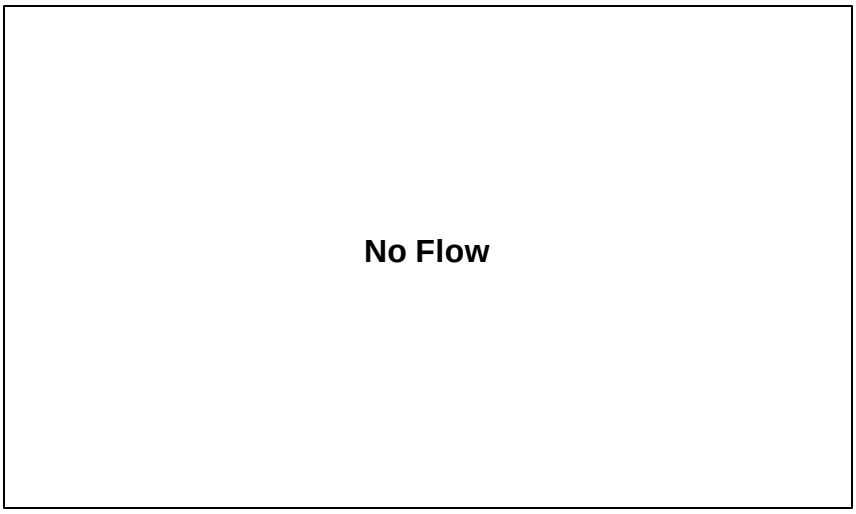


Figure 1-7d: Influent and Effluent Hydrograph, and Cumulative Rainfall at the Cerritos MS Biofiltration Swale for Event 4 on January 10-12, 2001

Influent



Effluent



Cumulative Rainfall

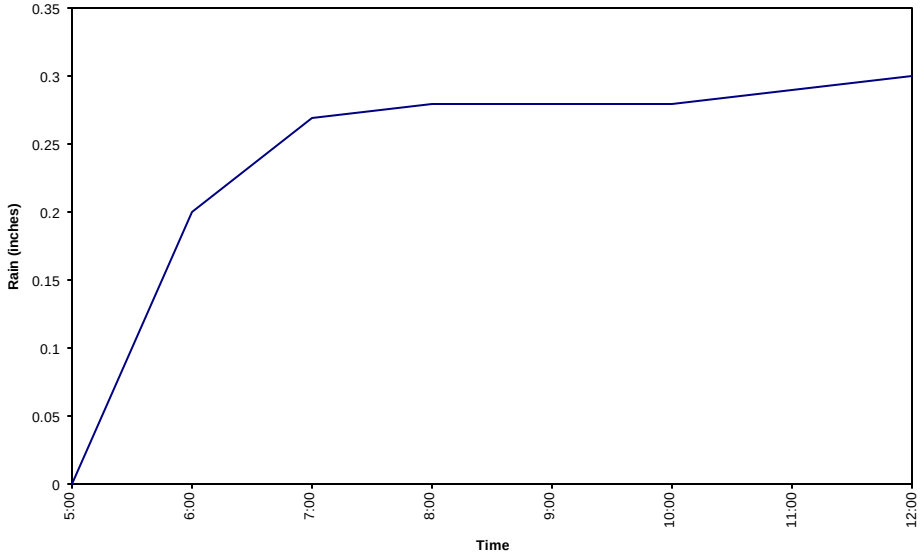
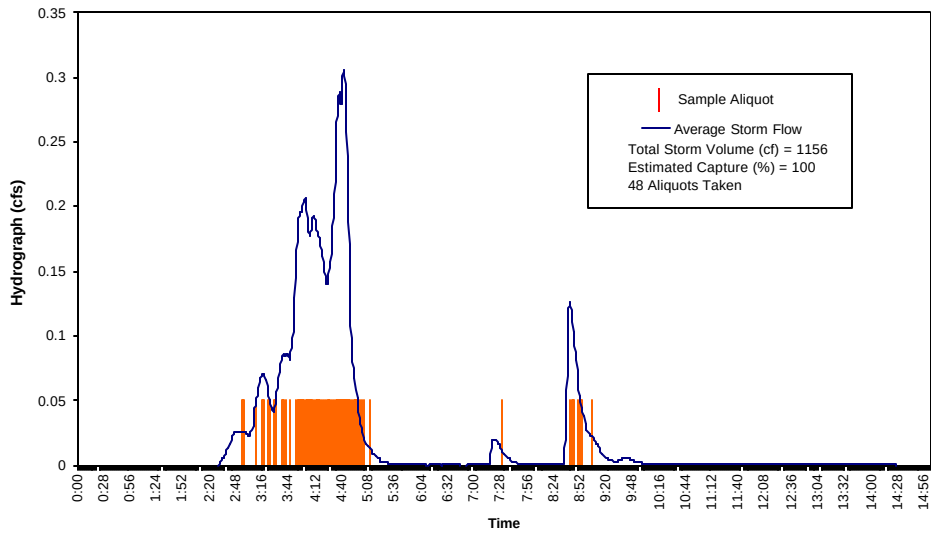
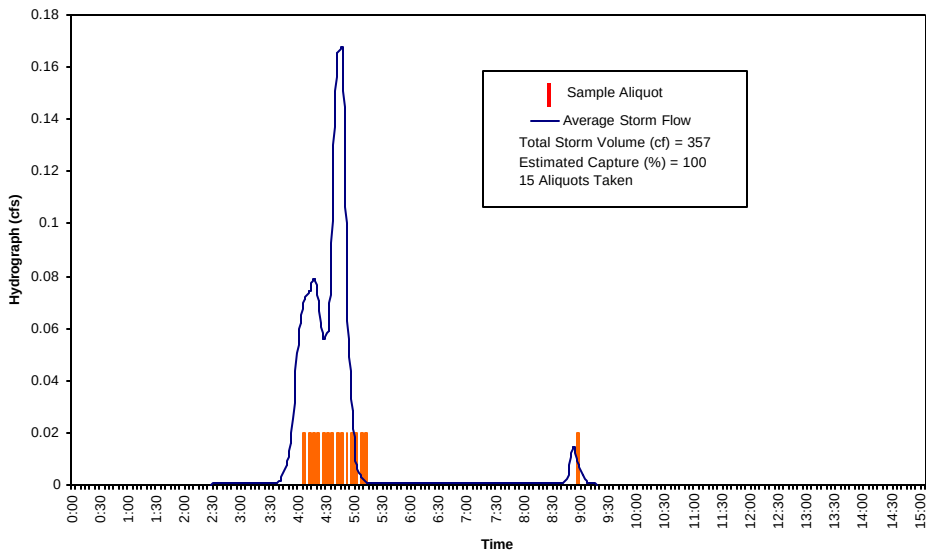


Figure 1-7e: Influent and Effluent Hydrograph, and Cumulative Rainfall at the Cerritos MS Biofiltration Swale for Event 5 on January 24, 2001

Influent



Effluent



Cumulative Rainfall

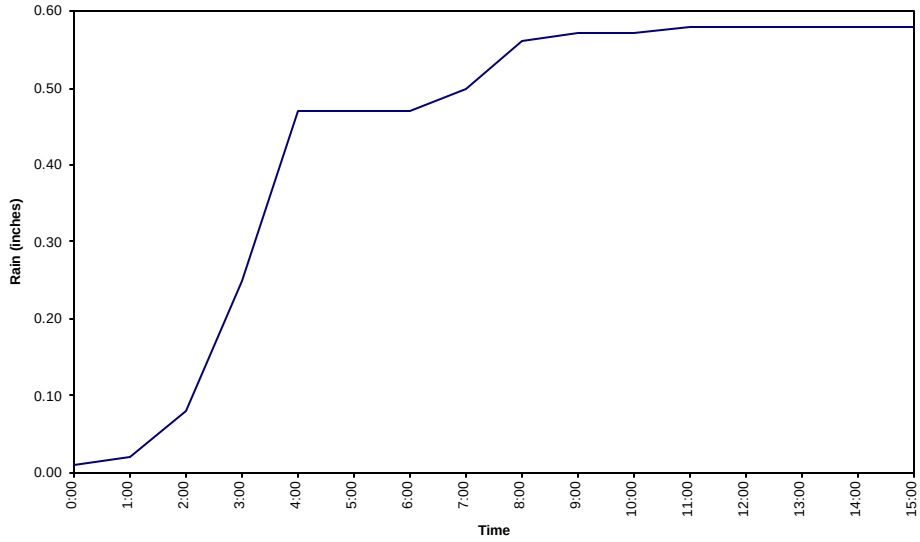
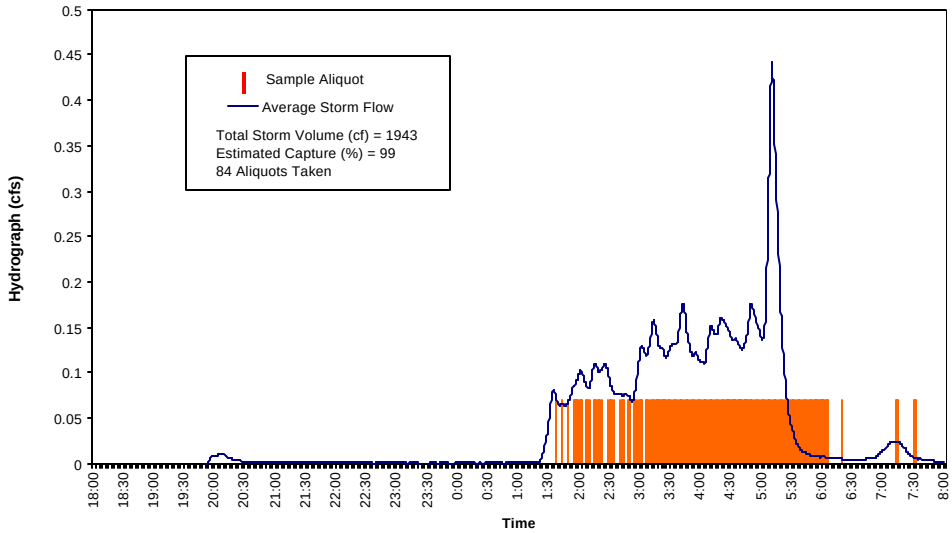
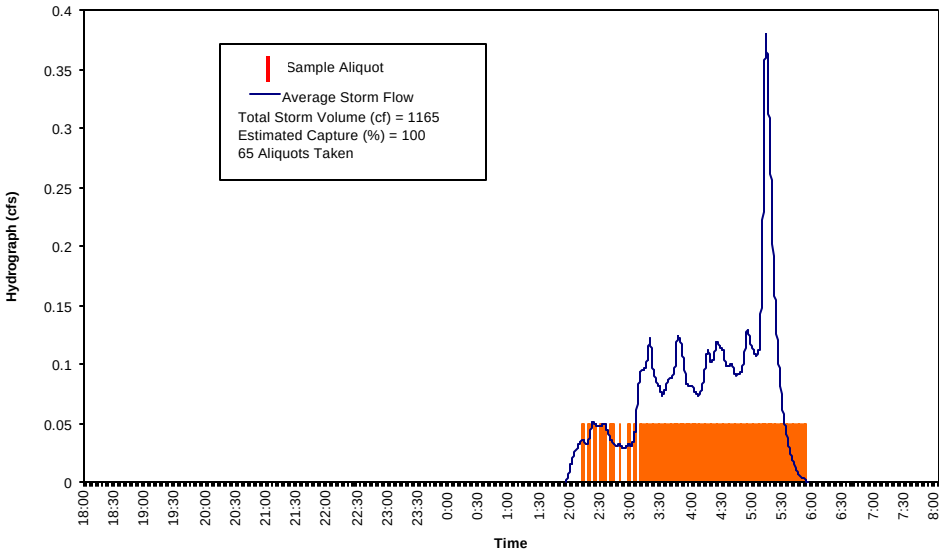


Figure 1-7f: Influent and Effluent Hydrograph, and Cumulative Rainfall at the Cerritos MS Biofiltration Swale for Event 9 on April 7, 2001

Influent



Effluent



Cumulative Rainfall

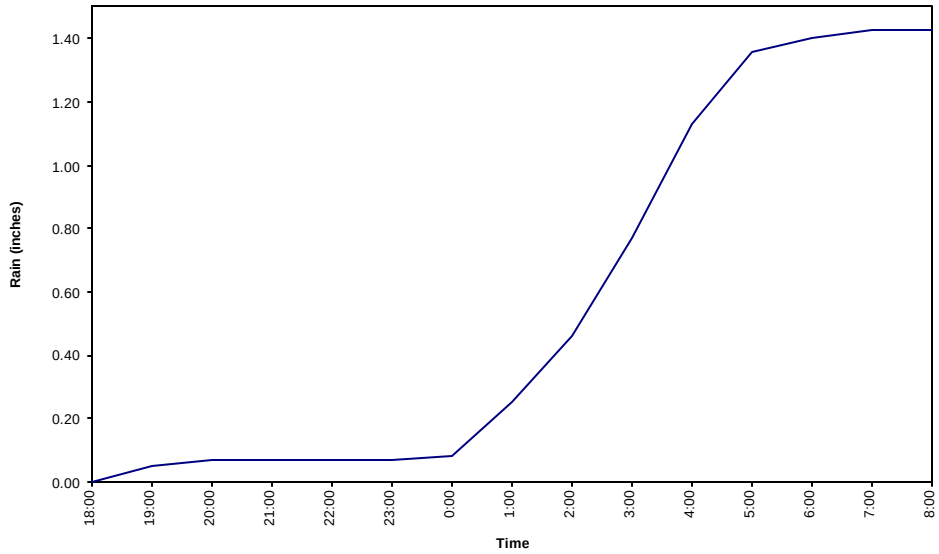
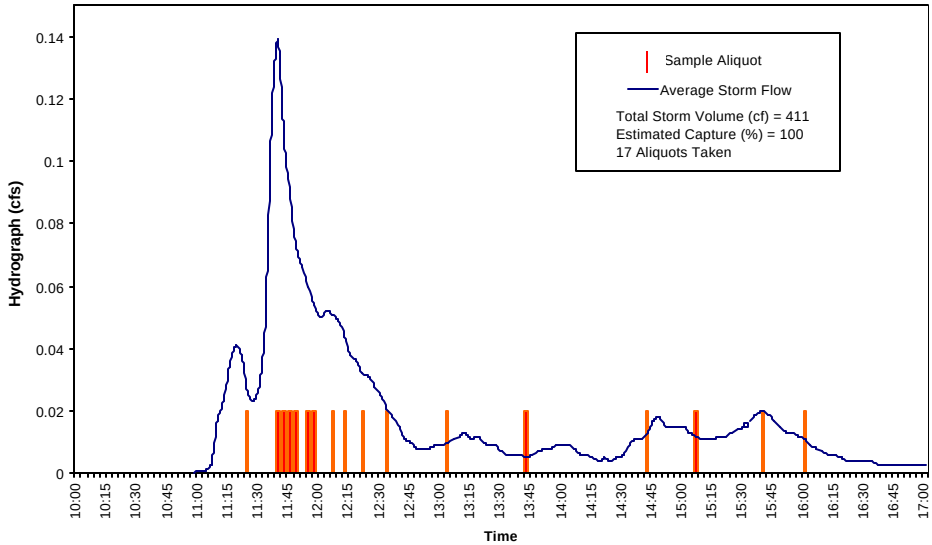
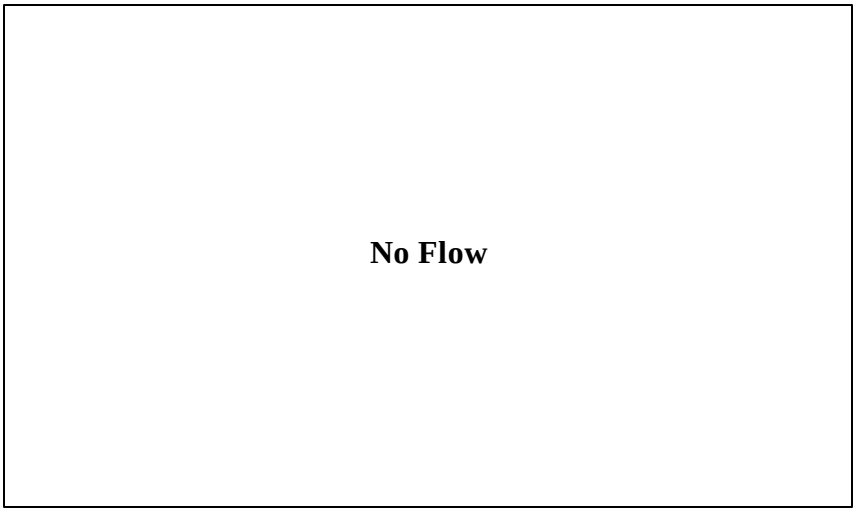


Figure 1-8a: Influent and Effluent Hydrograph, and Cumulative Rainfall at the I-5/I-605 Biofiltration Swale for Event 2 on October 26-27, 2000

Influent



Effluent



Cumulative Rainfall

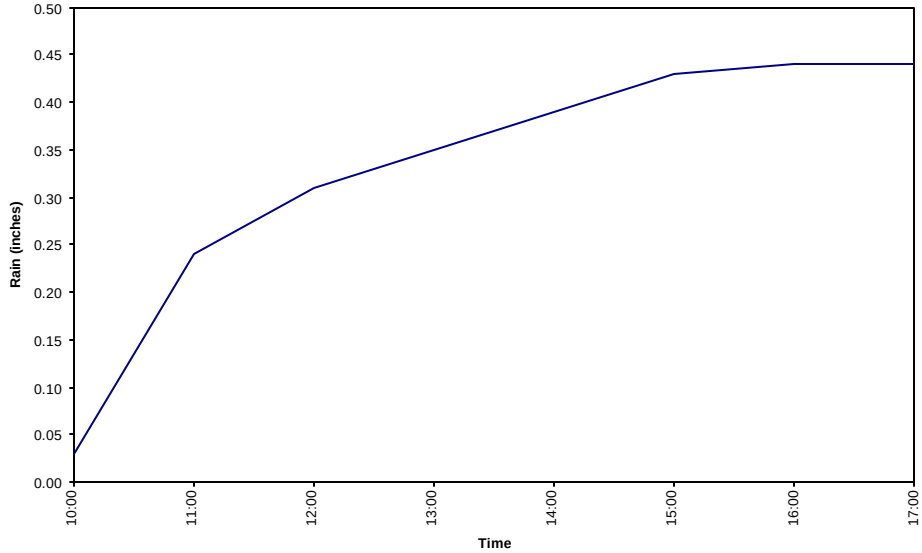
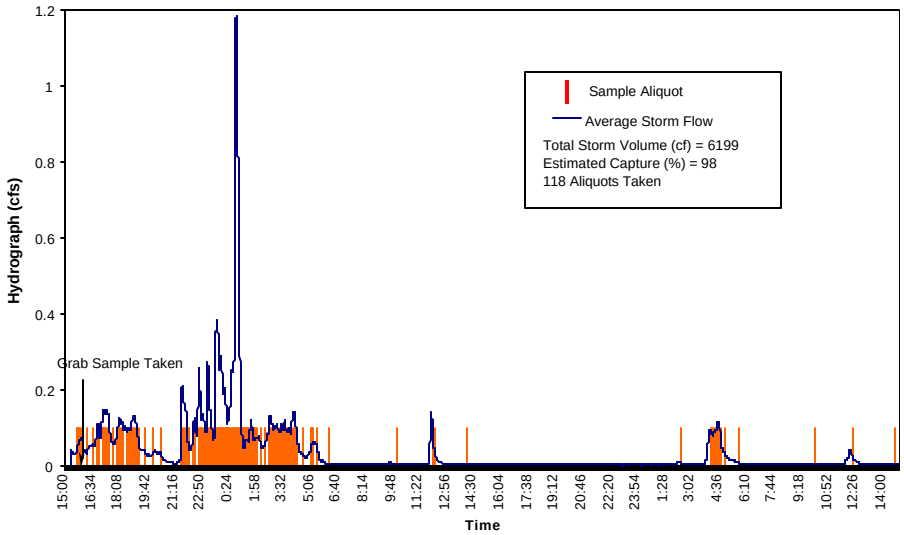
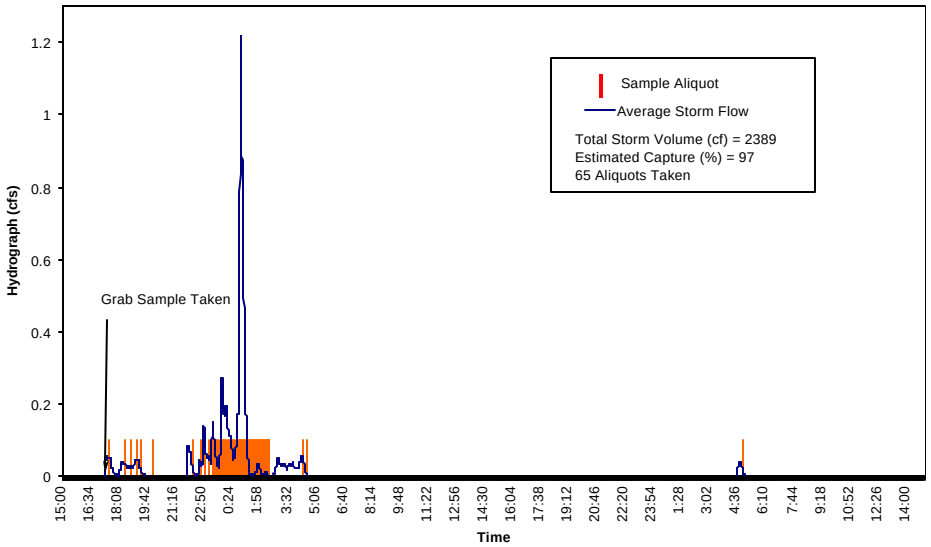


Figure 1-8b: Influent and Effluent Hydrograph, and Cumulative Rainfall at the I-5/I-605 Biofiltration Swale for Event 3 on January 8, 2001

Influent



Effluent



Cumulative Rainfall

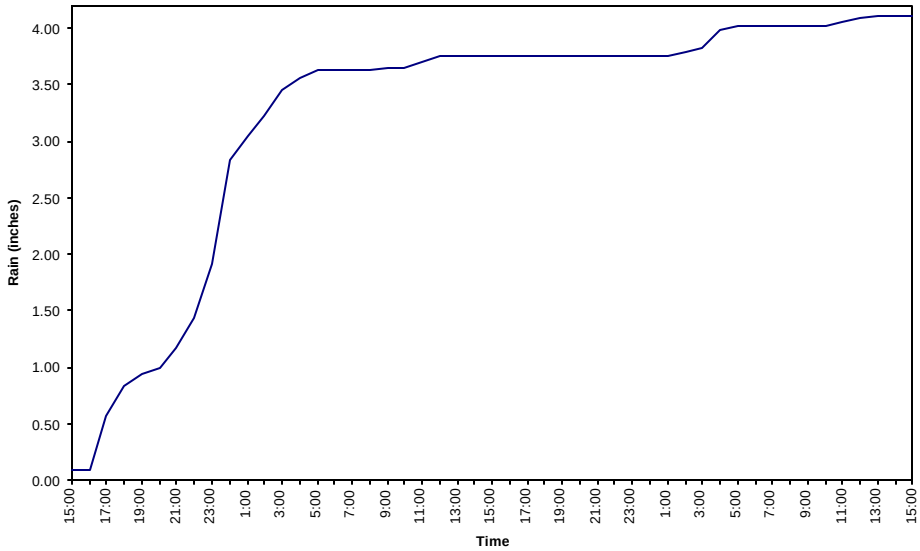
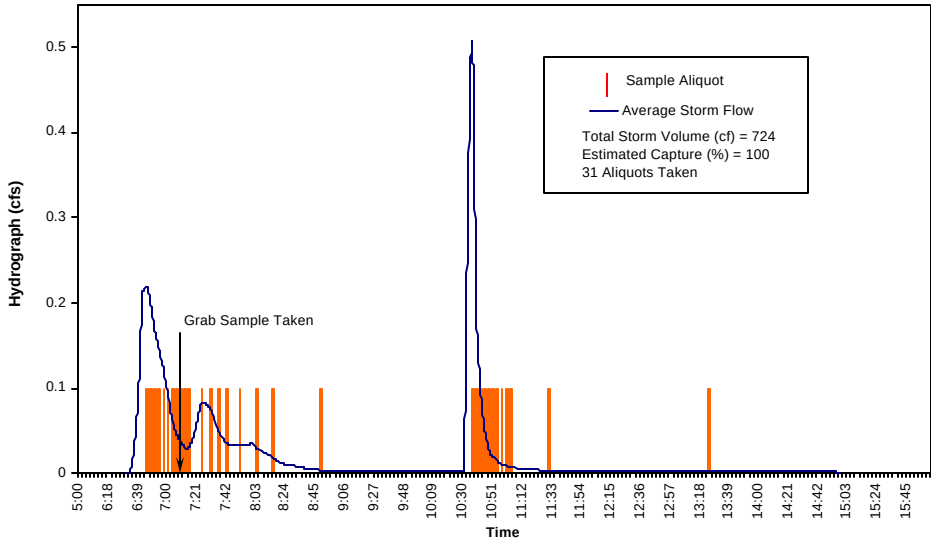
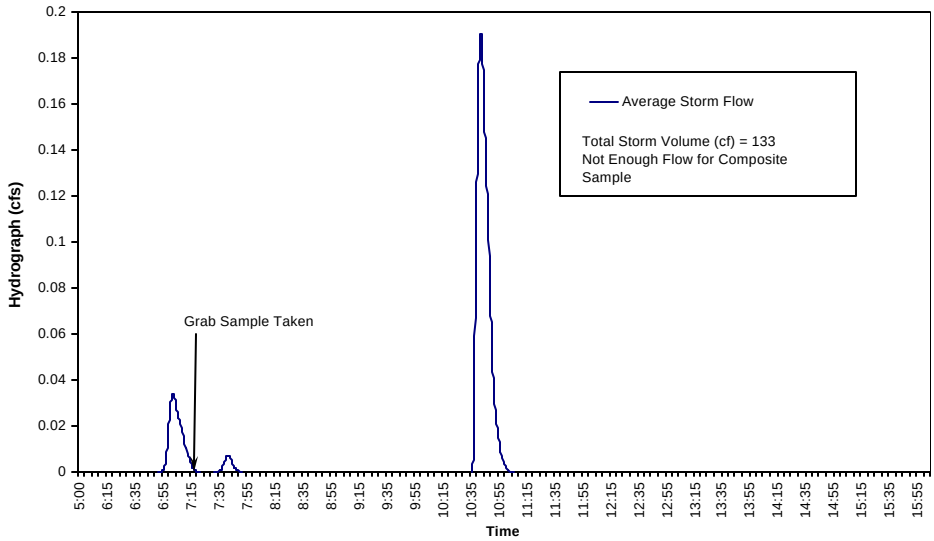


Figure 1-8c: Influent and Effluent Hydrograph, and Cumulative Rainfall at the I-5/I-605 Biofiltration Swale for Event 4 on January 10-12, 2001

Influent



Effluent



Cumulative Rainfall

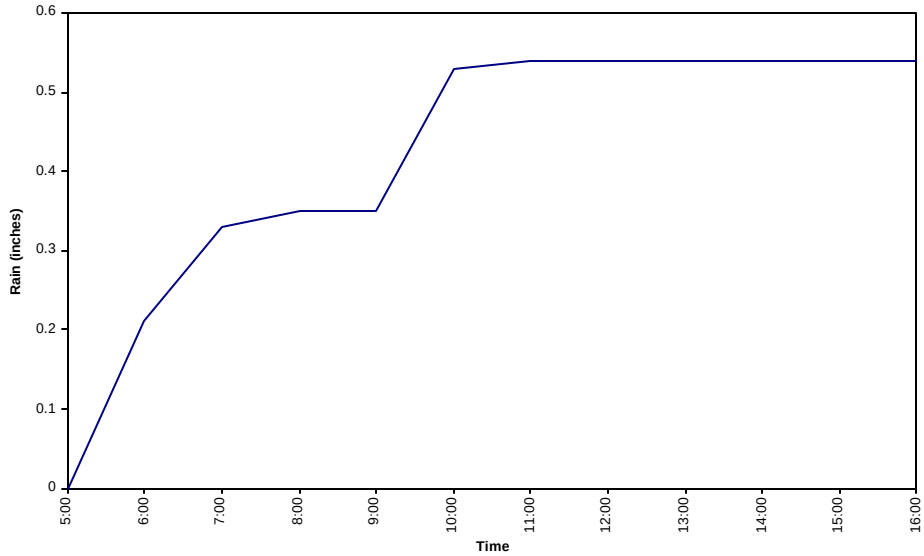
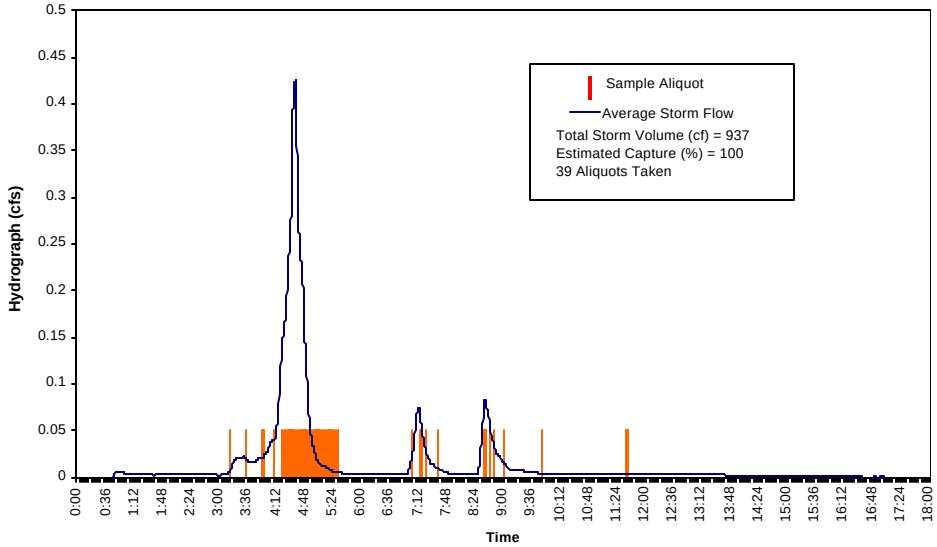
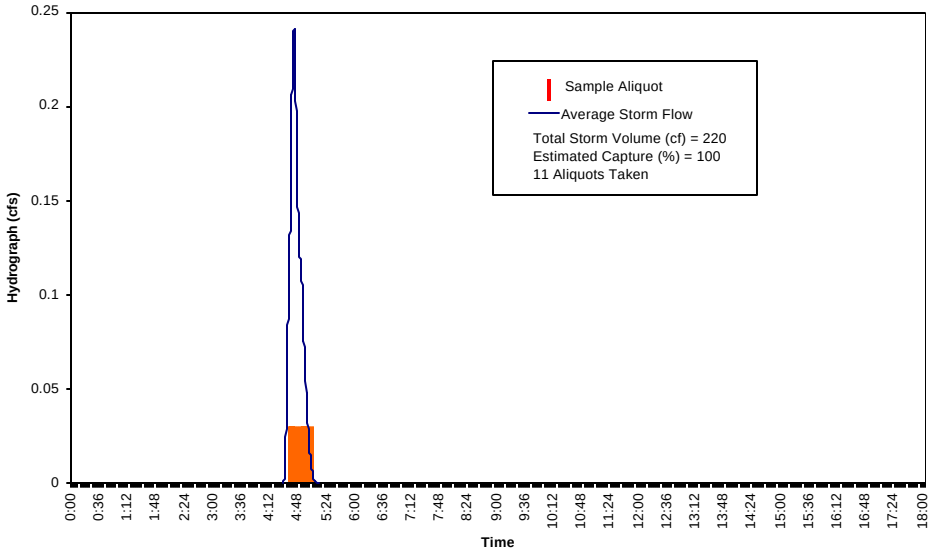


Figure 1-8d: Influent and Effluent Hydrograph, and Cumulative Rainfall at the I-5/I-605 Biofiltration Swale for Event 5 on January 24, 2001

Influent



Effluent



Cumulative Rainfall

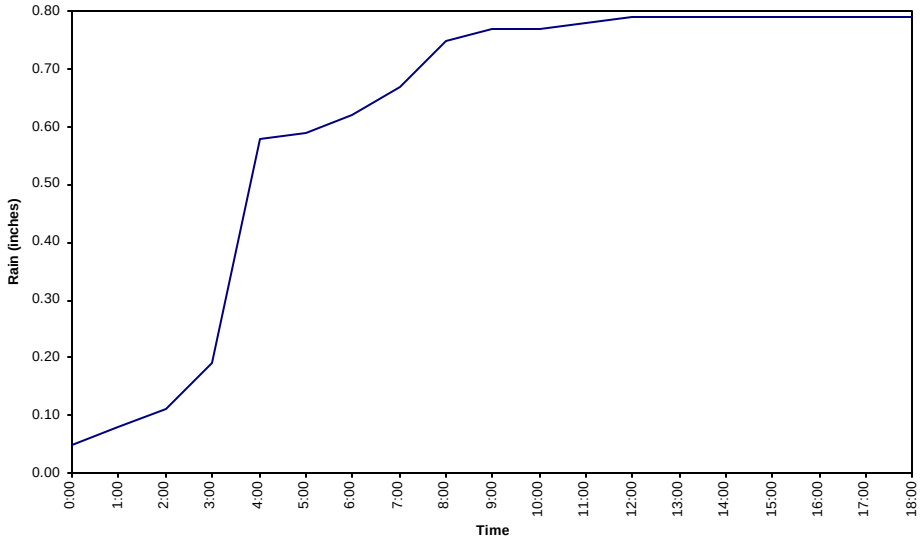
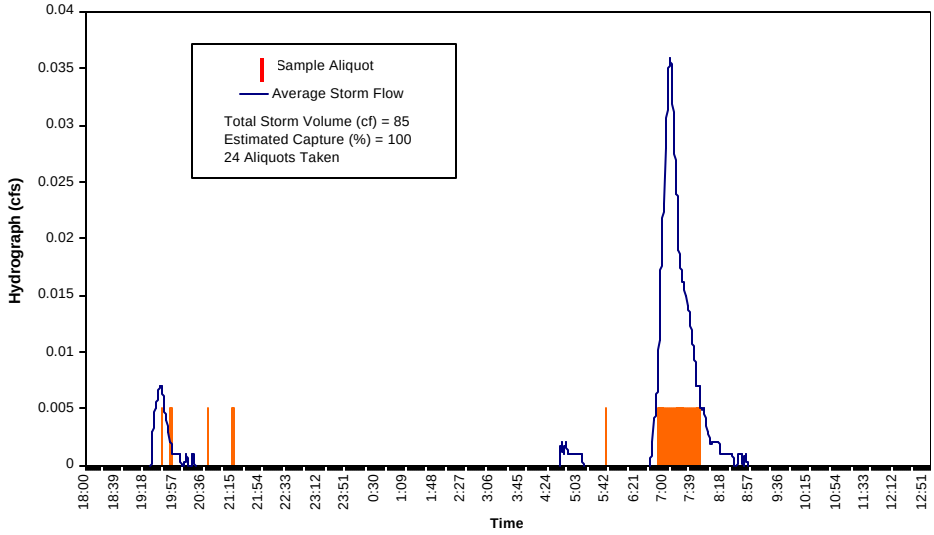
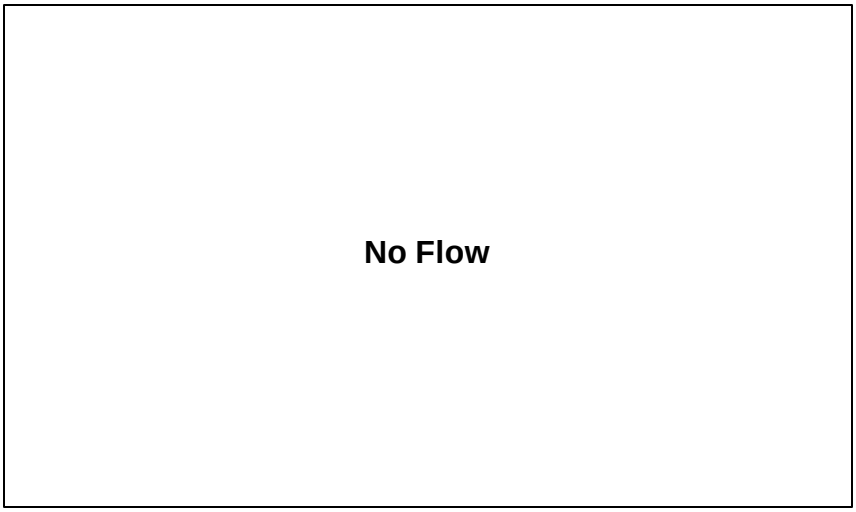


Figure 1-8e: Influent and Effluent Hydrograph, and Cumulative Rainfall at the I-5/I-605 Biofiltration Swale for Event 9 on April 7, 2001

Influent



Effluent



Cumulative Rainfall

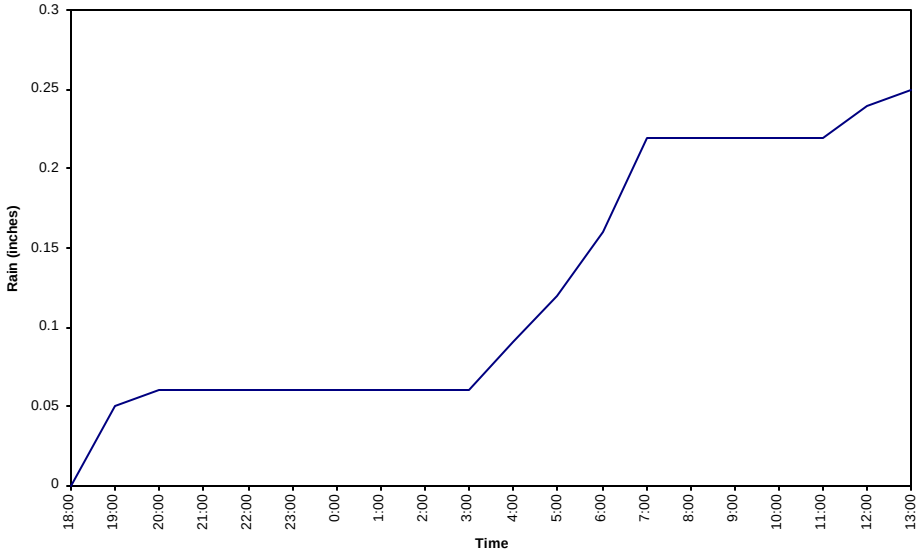
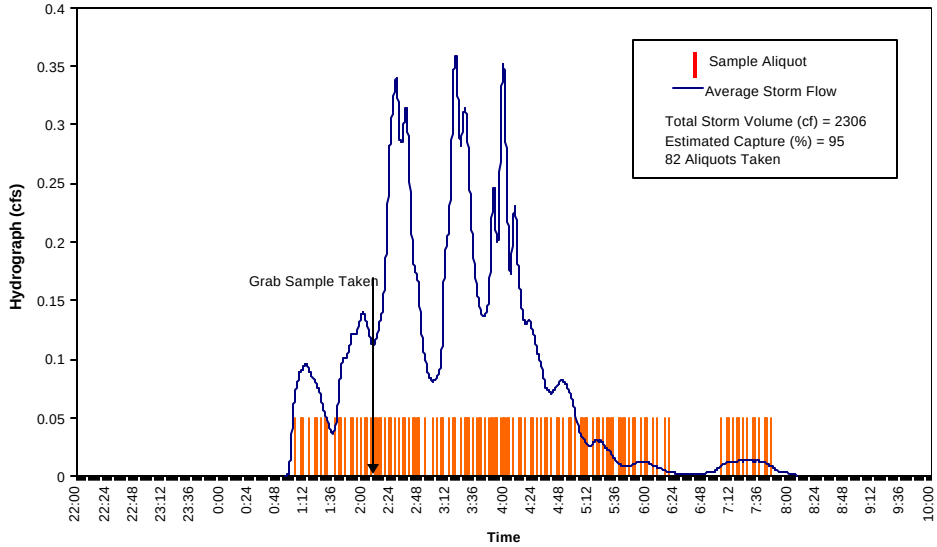
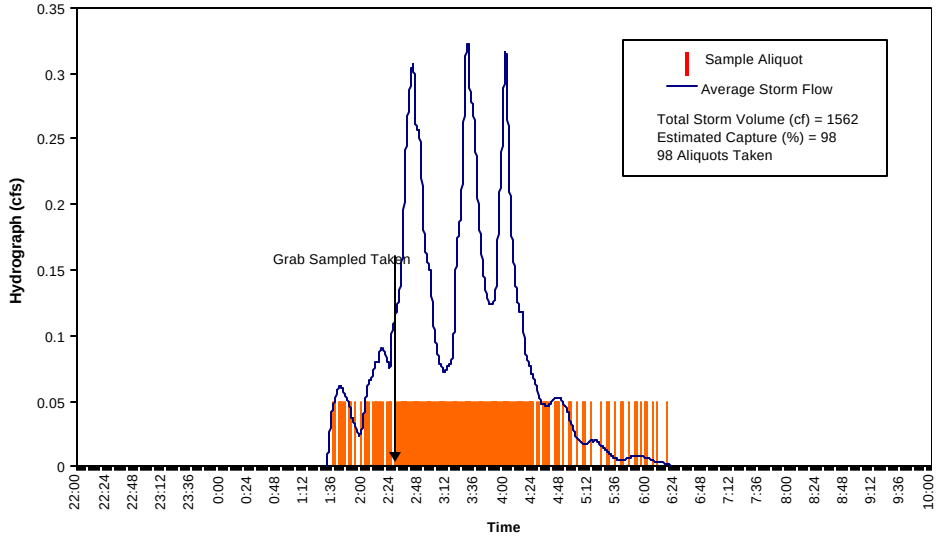


Figure 1-9a: Influent and Effluent Hydrograph, and Cumulative Rainfall at the I-605 at Carson Biofiltration Swale for Event 1 on October 10-11, 2000

Influent



Effluent



Cumulative Rainfall

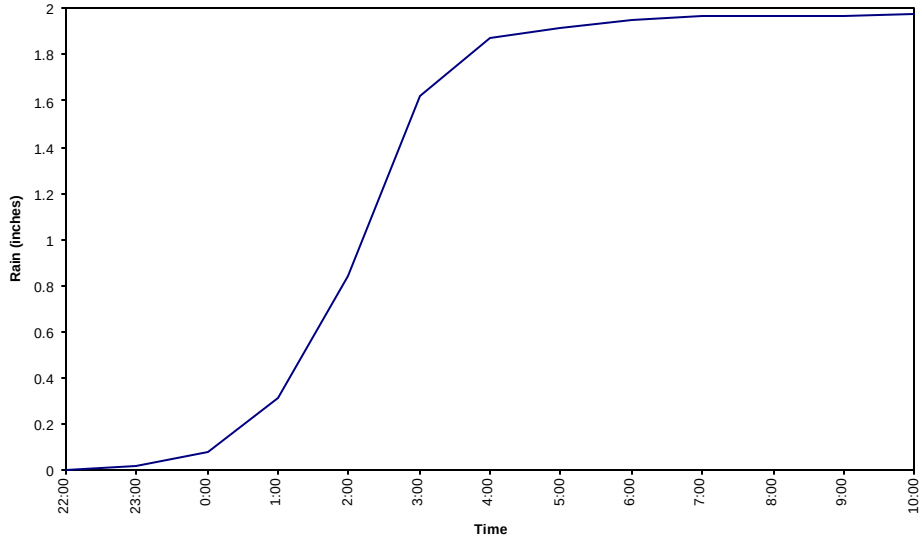
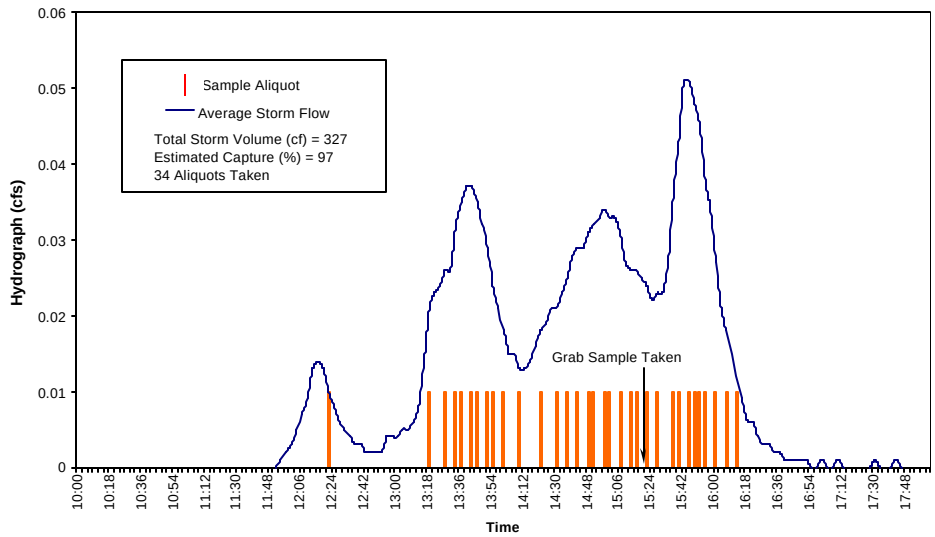
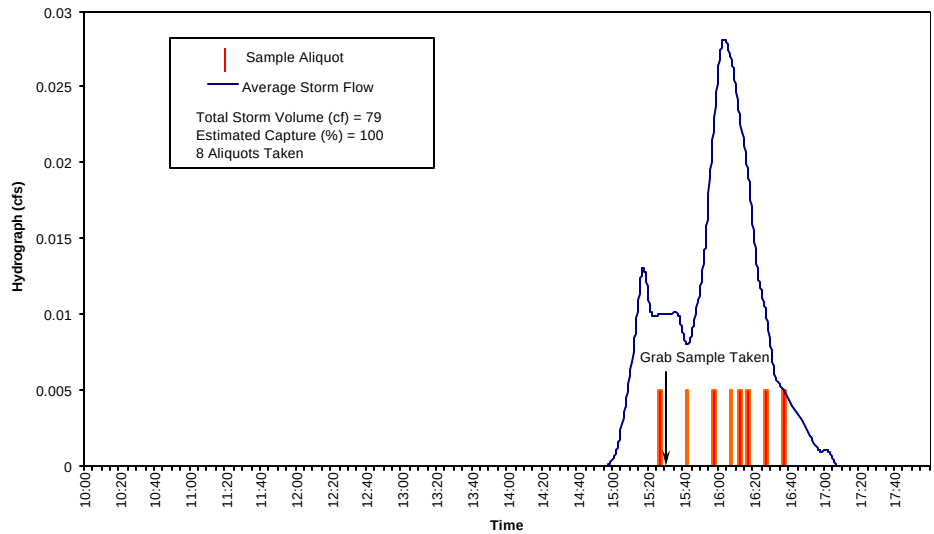


Figure 1-9b: Influent and Effluent Hydrograph, and Cumulative Rainfall at the I-605 at Carson Biofiltration Swale for Event 2 on October 26-27, 2000

Influent



Effluent



Cumulative Rainfall

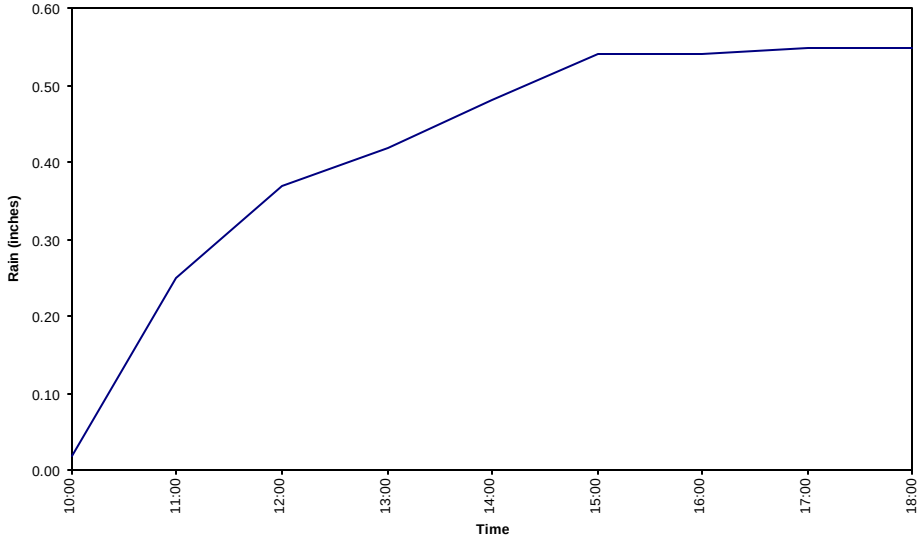
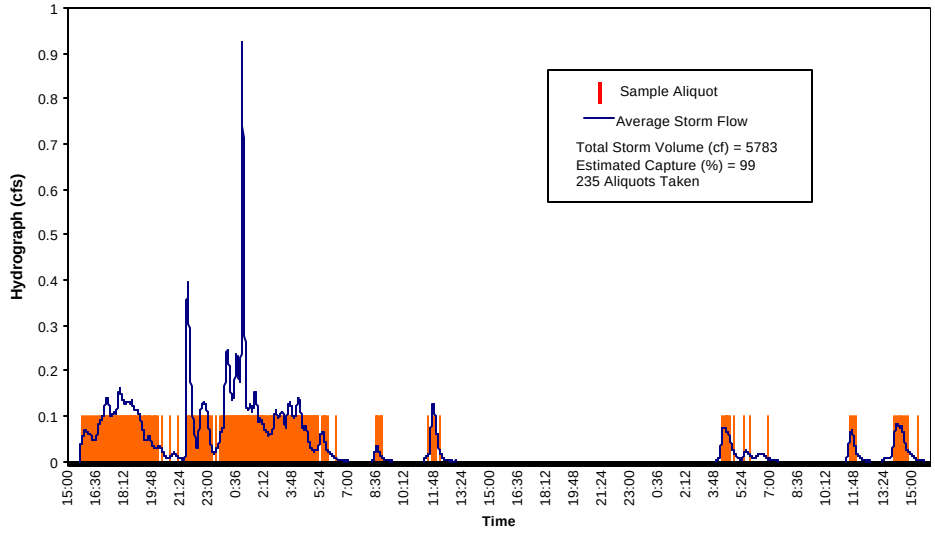
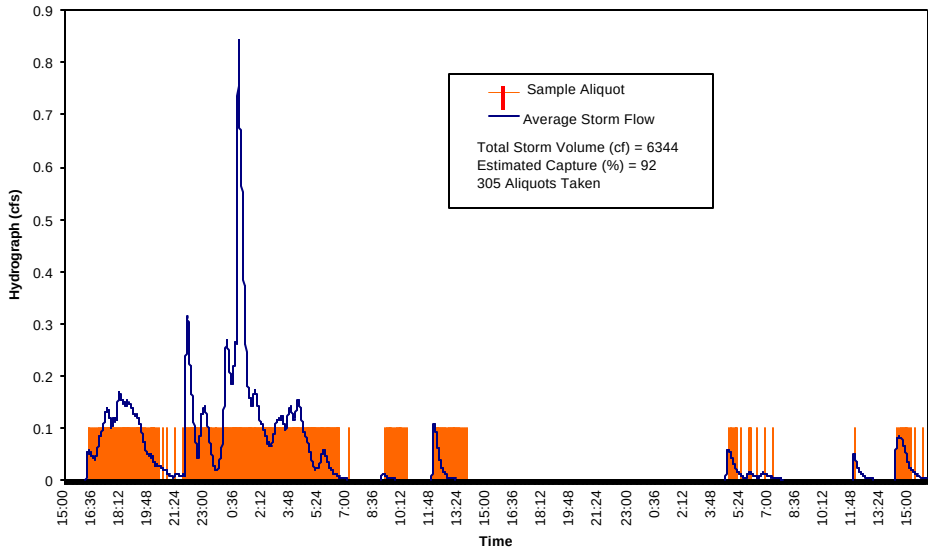


Figure 1-9c: Influent and Effluent Hydrograph, and Cumulative Rainfall at the I-605 at Carson Biofiltration Swale for Event 3 on January 8, 2001

Influent



Effluent



Cumulative Rainfall

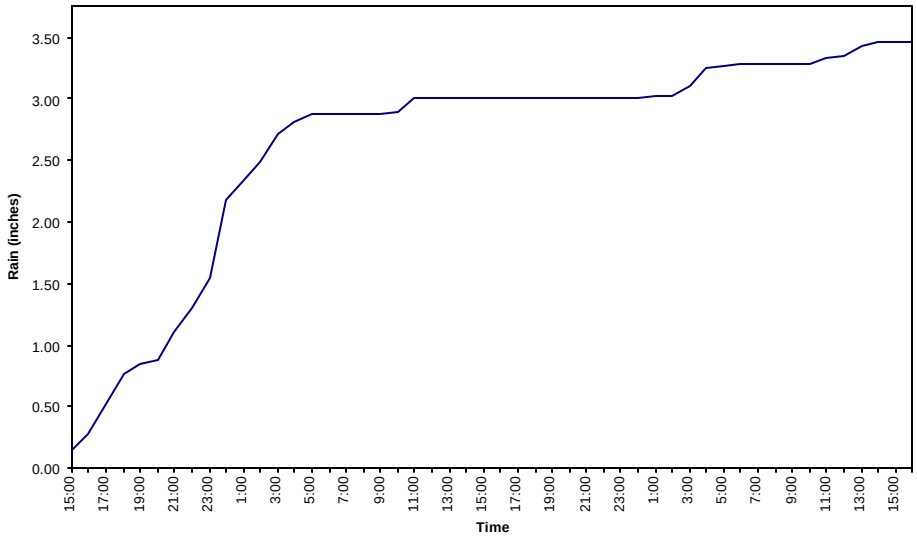
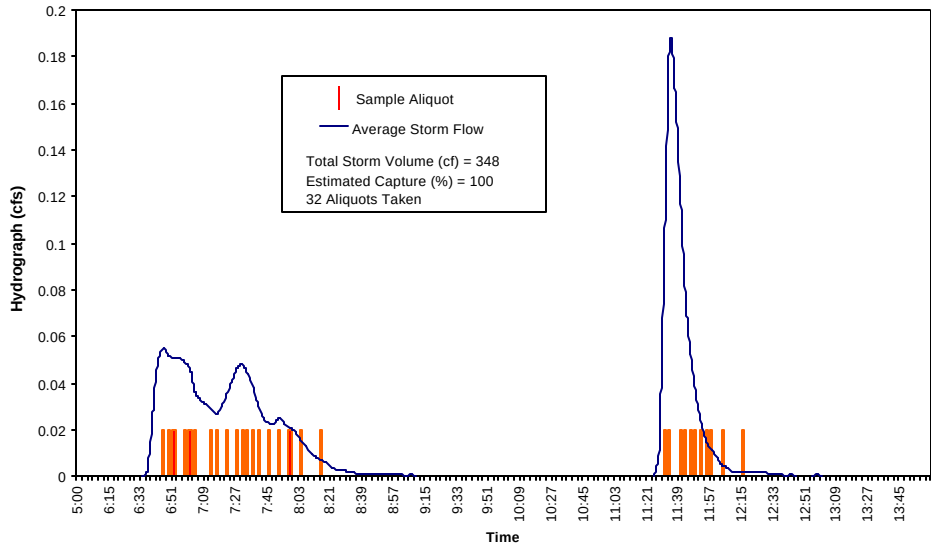
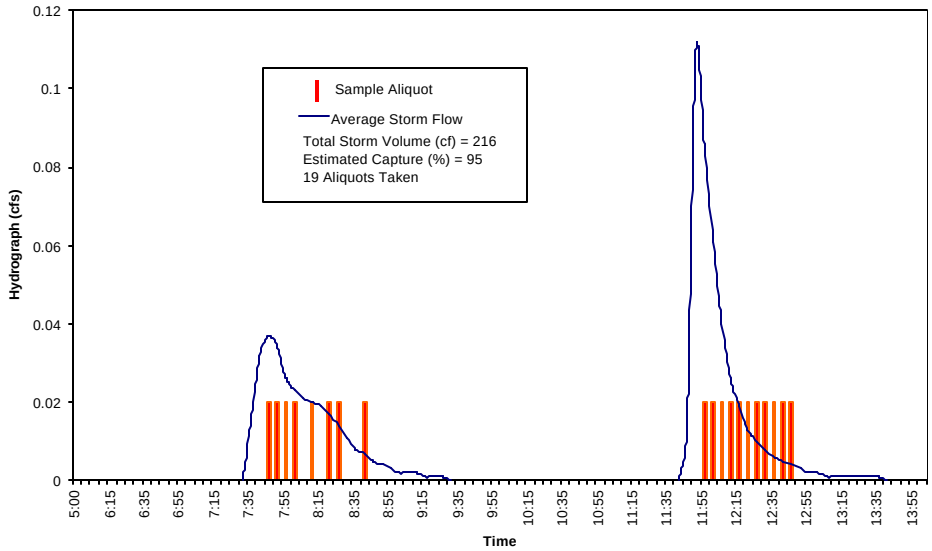


Figure 1-9d: Influent and Effluent Hydrograph, and Cumulative Rainfall at the I-605 at Carson Biofiltration Swale for Event 4 on January 10-12, 2001

Influent



Effluent



Cumulative Rainfall

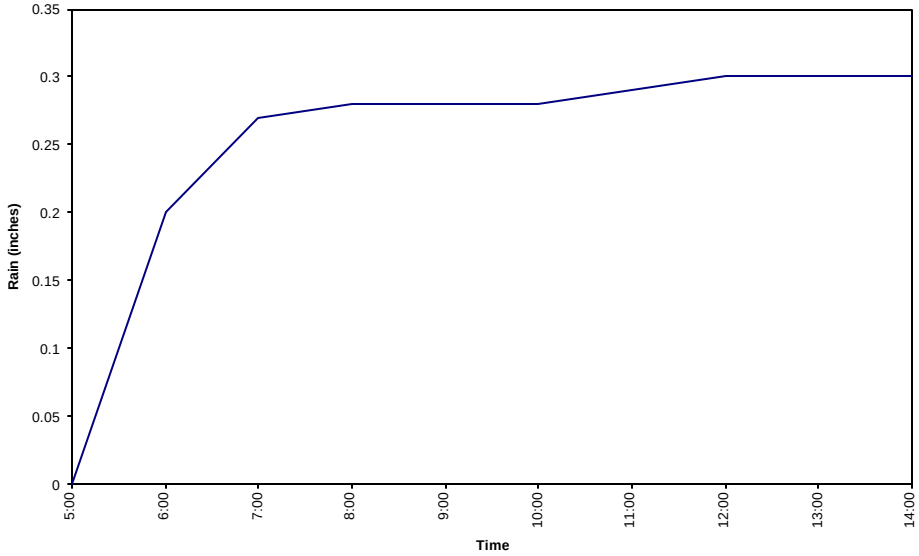
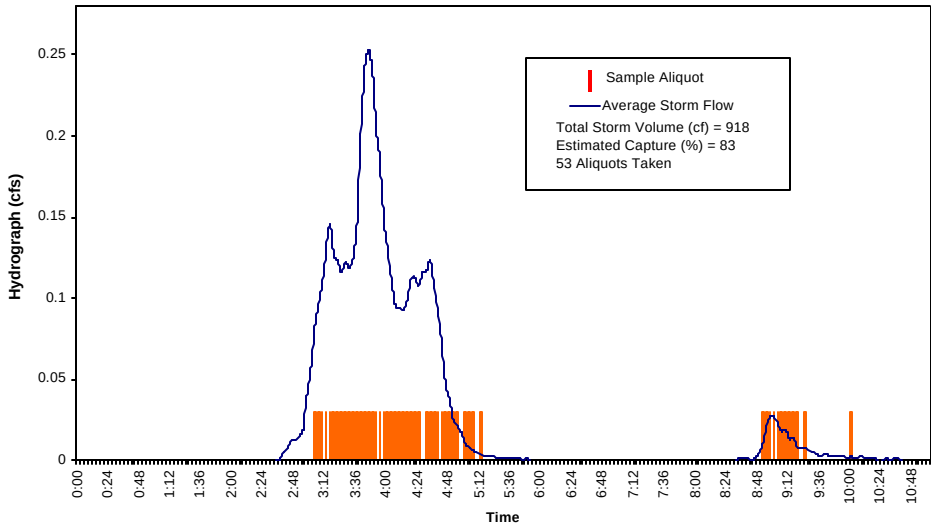
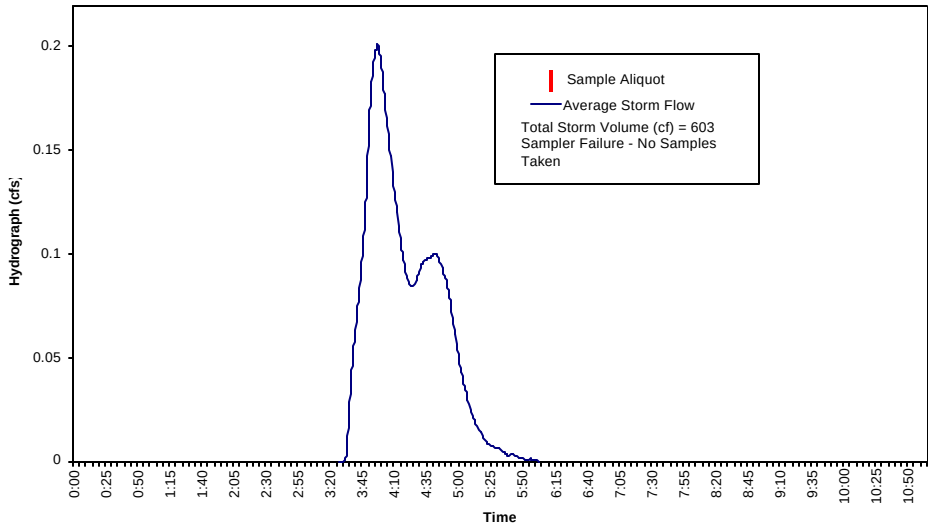


Figure 1-9e: Influent and Effluent Hydrograph, and Cumulative Rainfall at the I-605 at Carson Biofiltration Swale for Event 5 on January 24, 2001

Influent



Effluent



Cumulative Rainfall

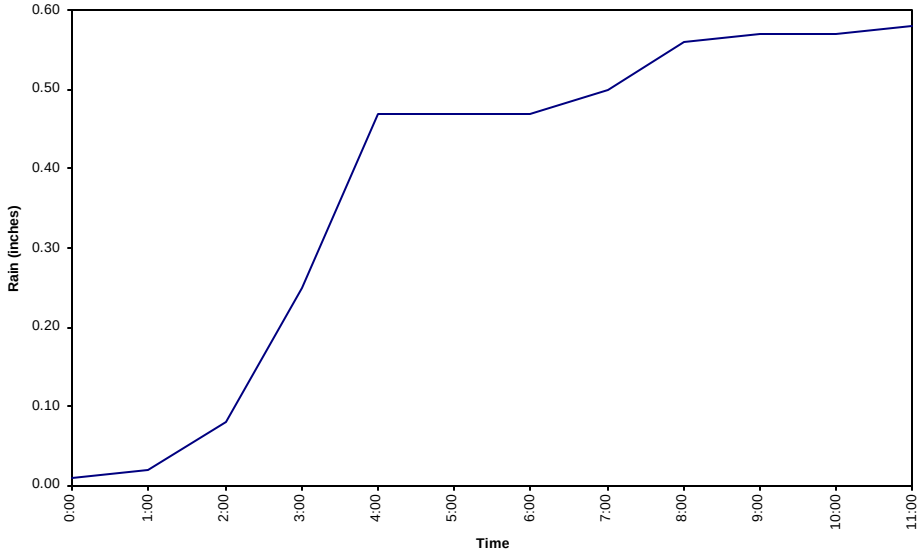
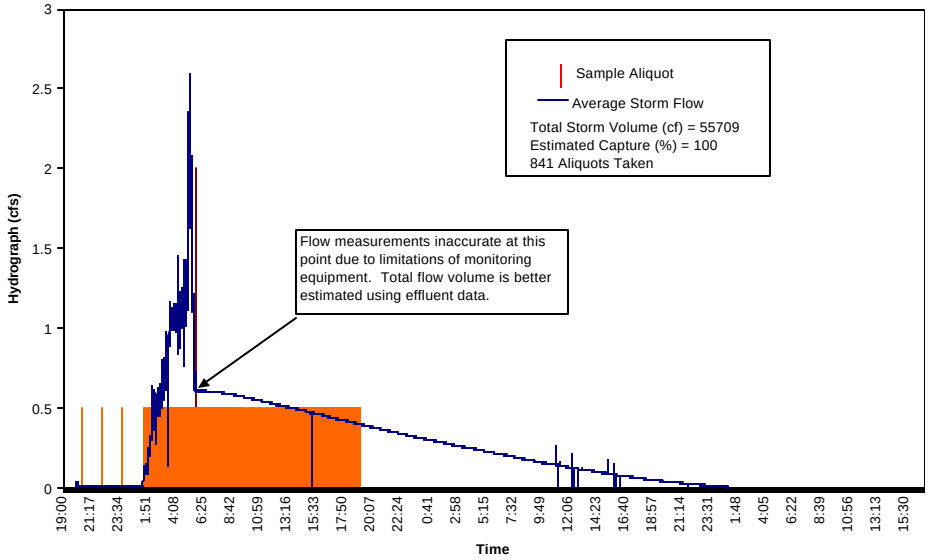
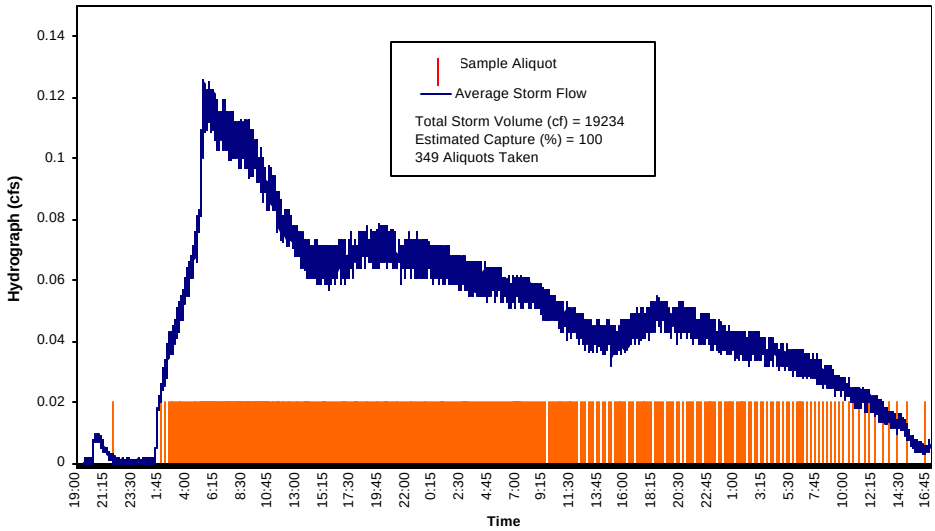


Figure 1-9f: Influent and Effluent Hydrograph, and Cumulative Rainfall at the I-605 at Carson Biofiltration Swale for Event 9 on April 7, 2001

Influent



Effluent



Cumulative Rainfall

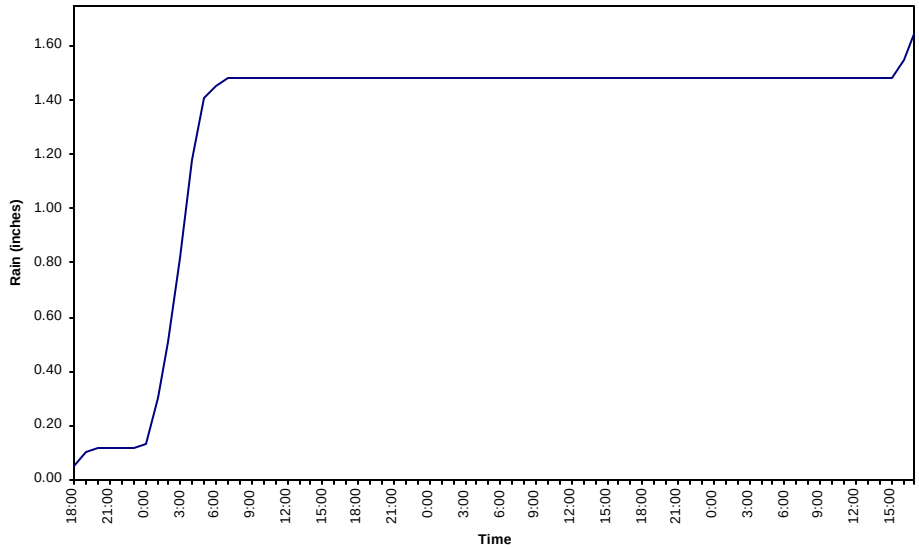
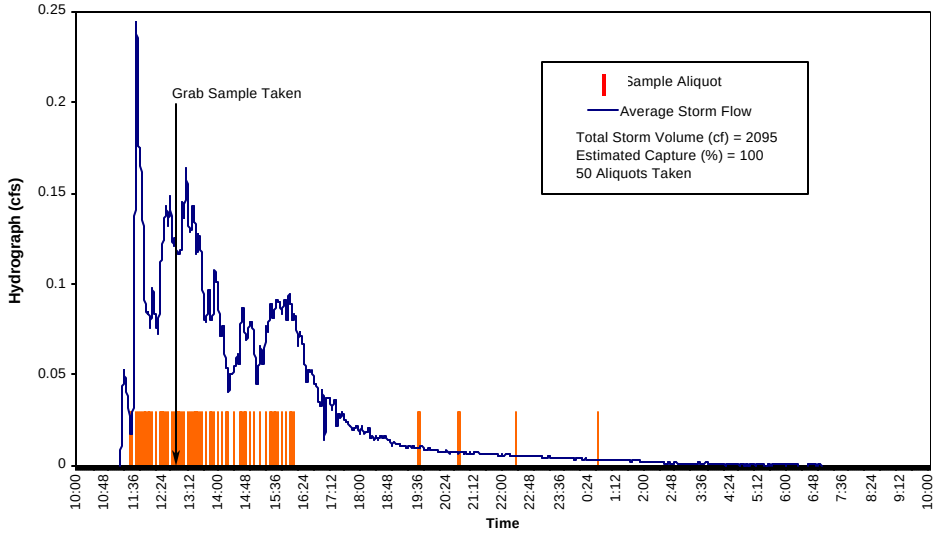
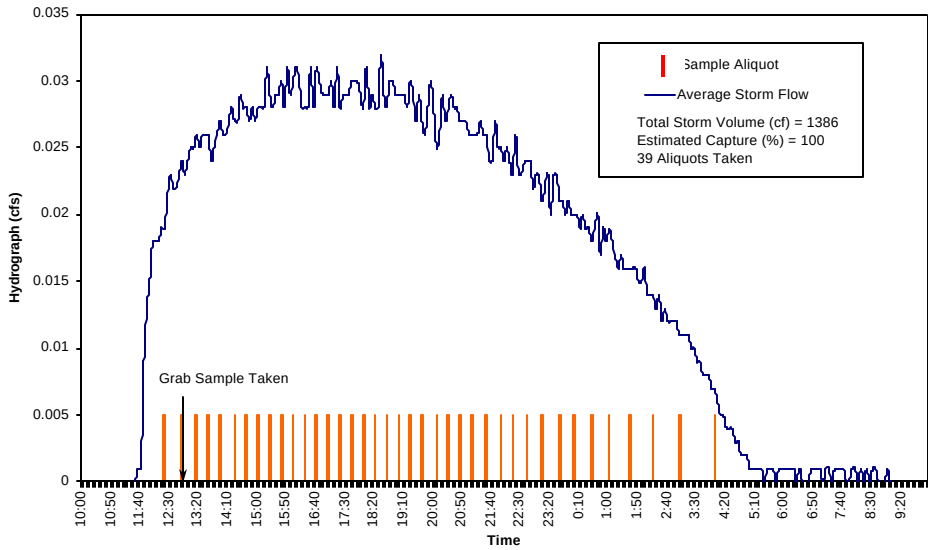


Figure 1-10a: Influent and Effluent Hydrograph, and Cumulative Rainfall at the I-5/I-605 Extended Detention Basin for Event 2 on October 26-29, 2000

Influent



Effluent



Cumulative Rainfall

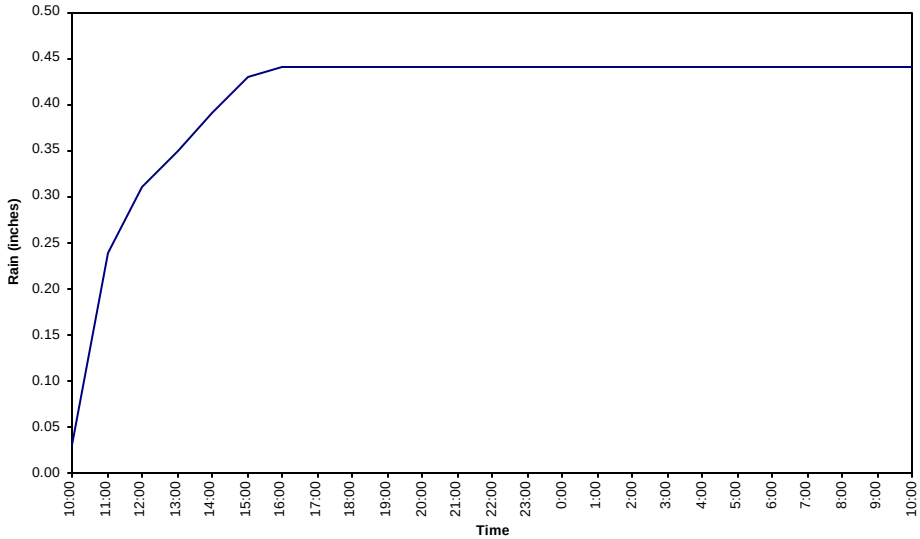
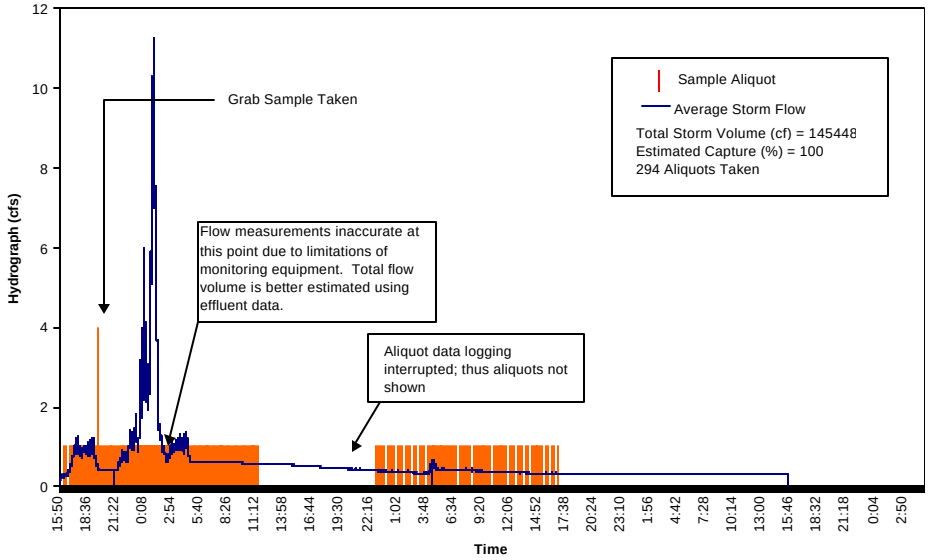
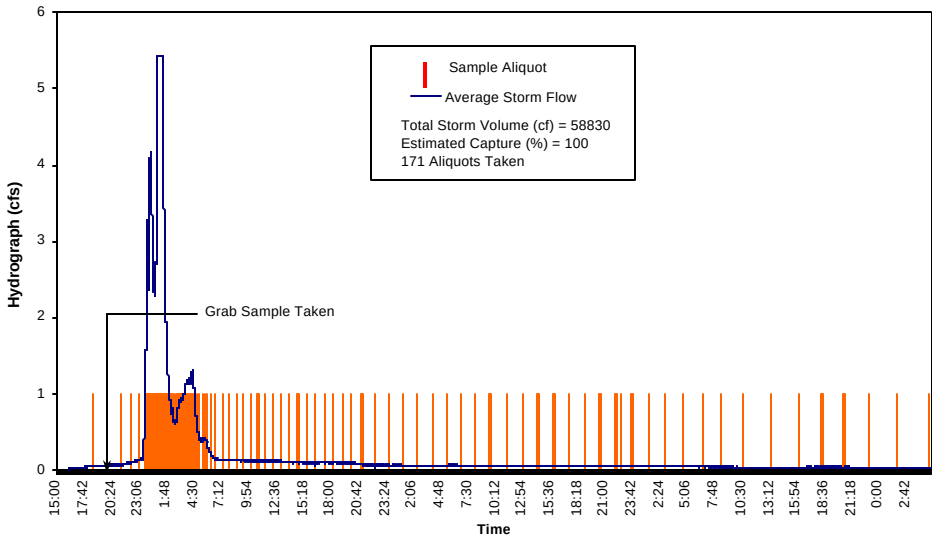


Figure 1-10b: Influent and Effluent Hydrograph, and Cumulative Rainfall at the I-5/I-605 Extended Detention Basin for Event 3 on January 8-9, 2001

Influent



Effluent



Cumulative Rainfall

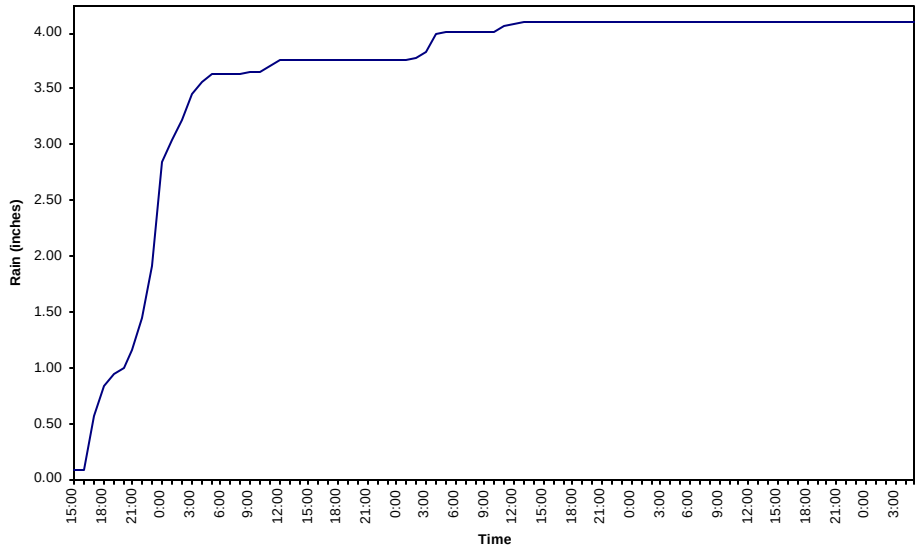
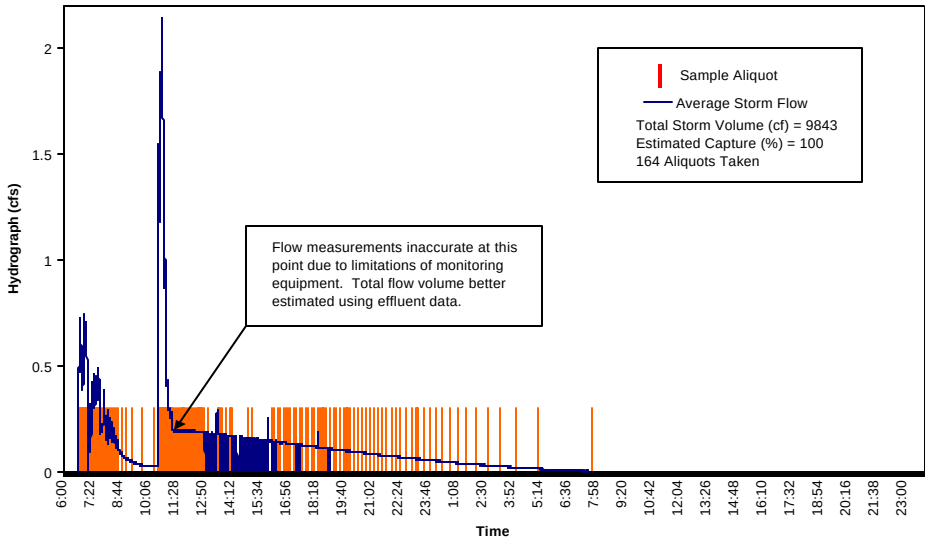
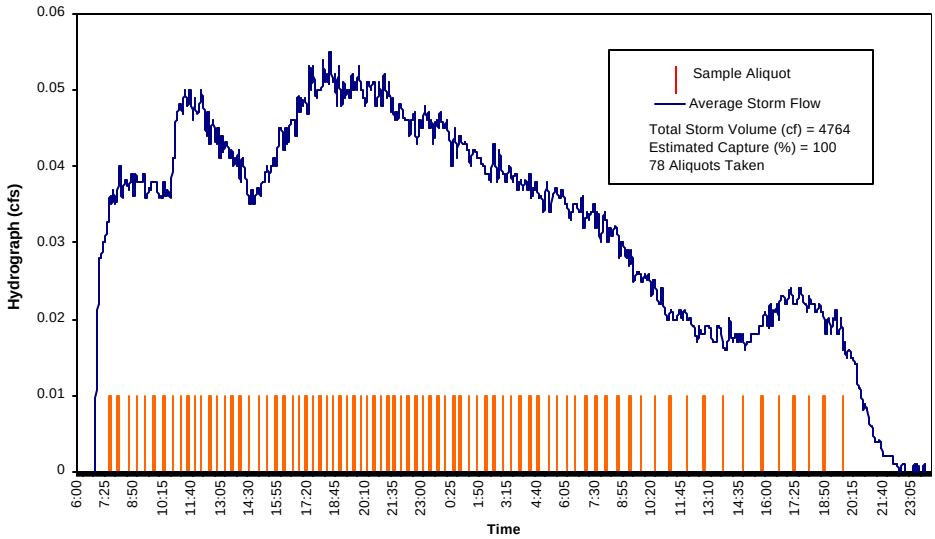


Figure 1-10c: Influent and Effluent Hydrograph, and Cumulative Rainfall at the I-5/I-605 Extended Detention Basin for Event 4 on January 10-14, 2001

Influent



Effluent



Cumulative Rainfall

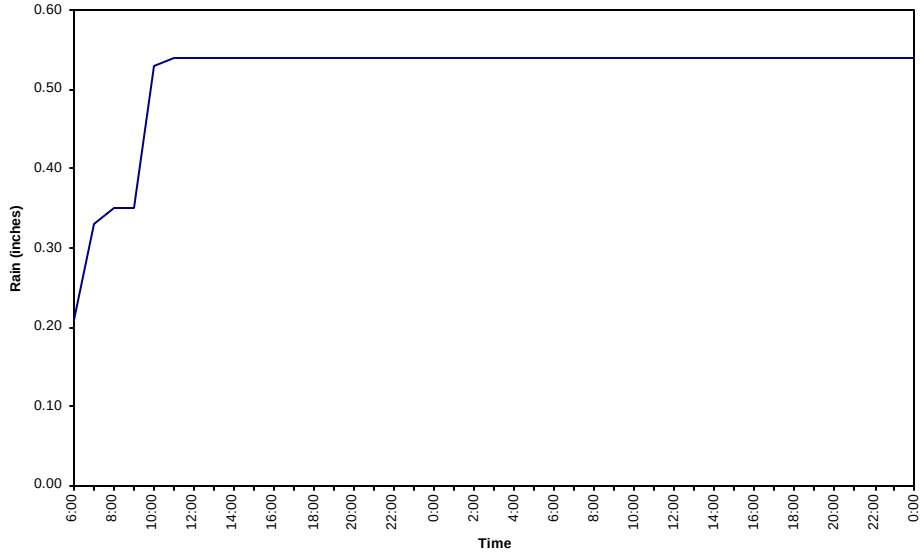
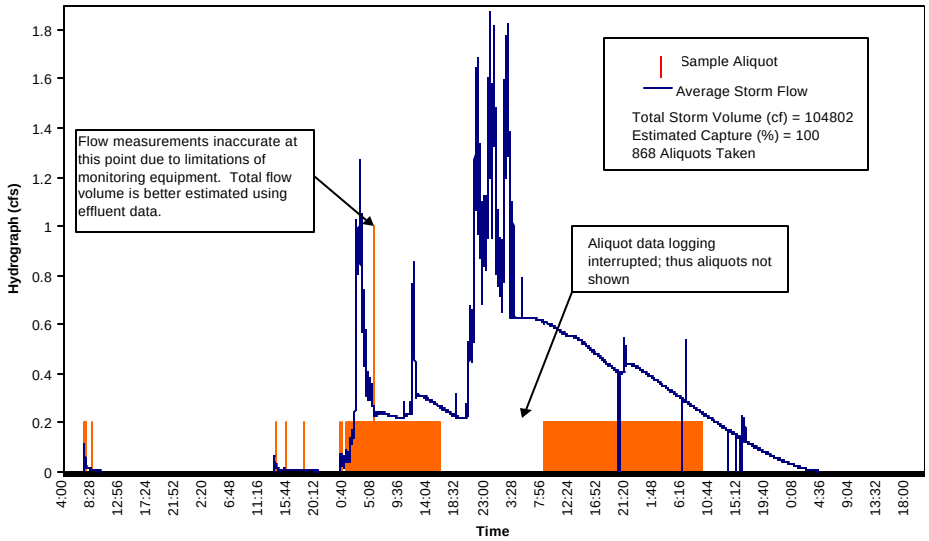
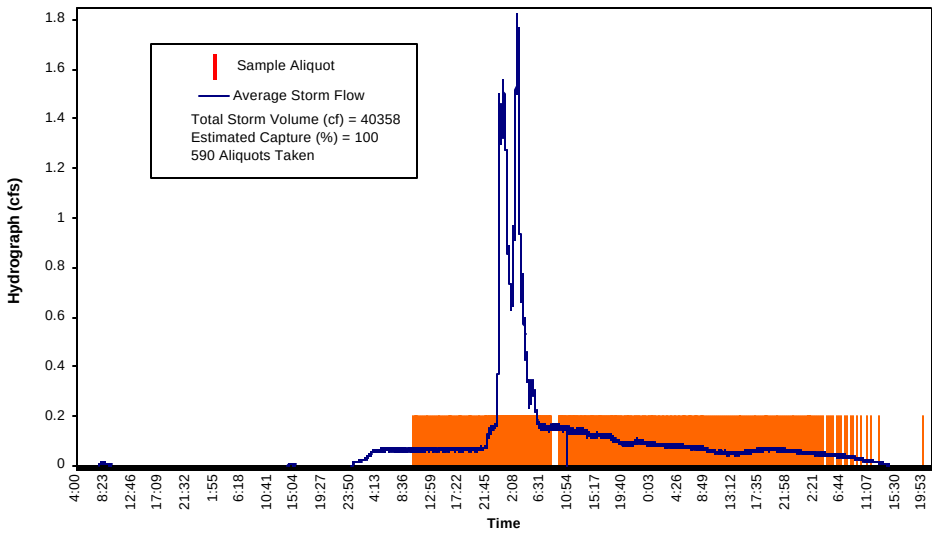


Figure 1-10d: Influent and Effluent Hydrograph, and Cumulative Rainfall at the I-5/I-605 Extended Detention Basin for Event 5 on January 24-25, 2001

Influent



Effluent



Cumulative Rainfall

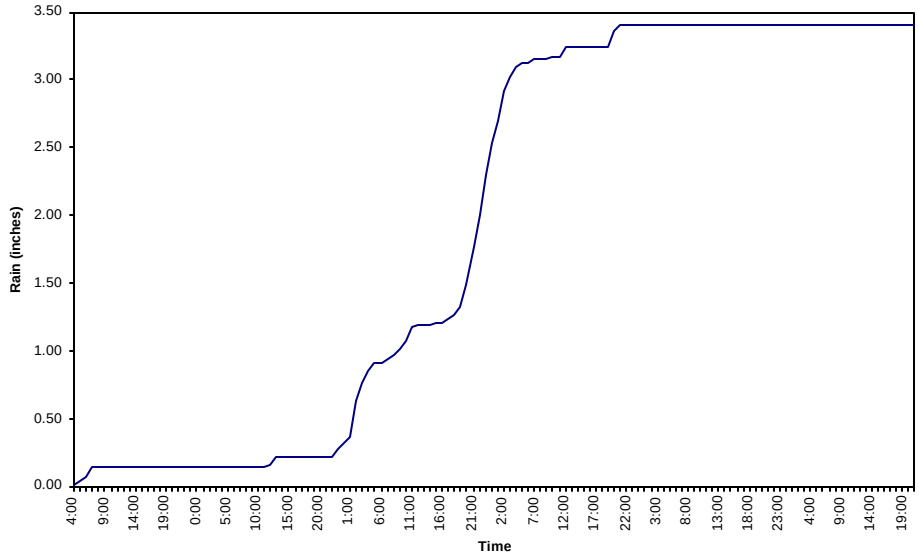
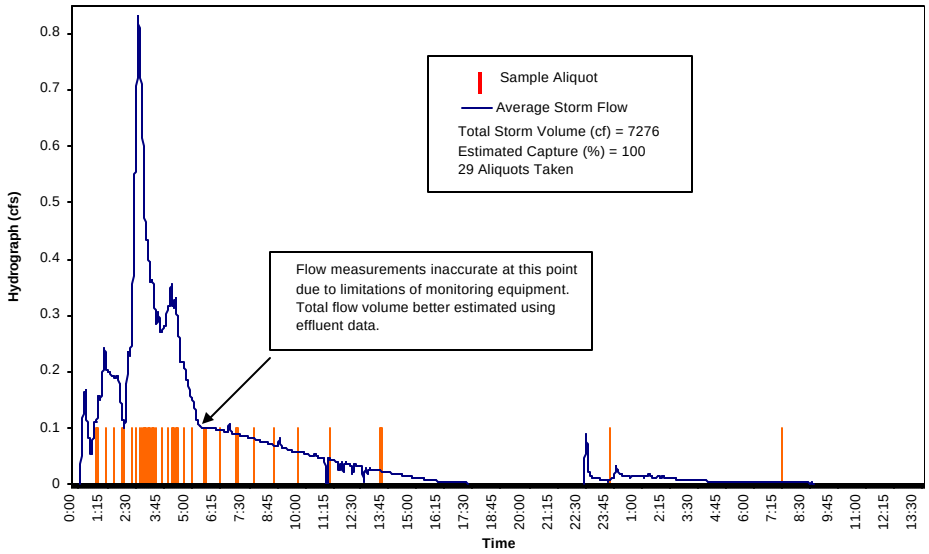
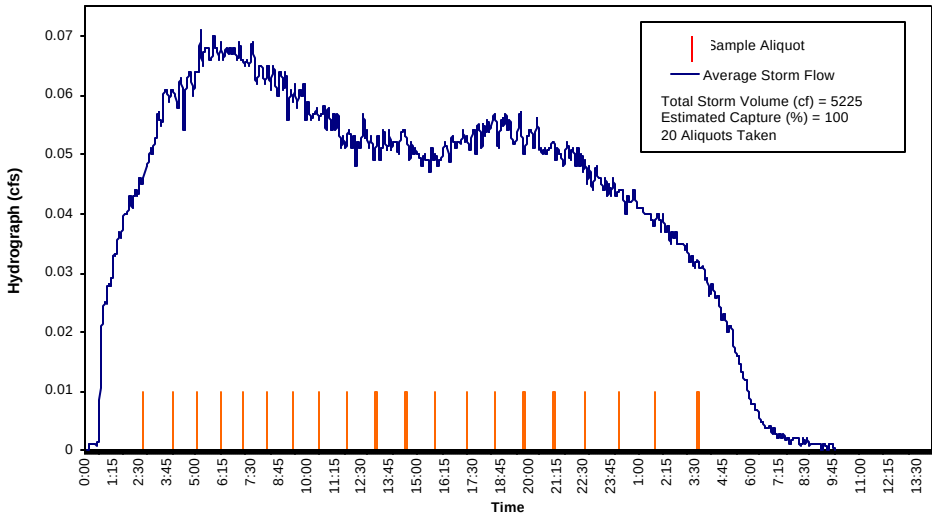


Figure 1-10e: Influent and Effluent Hydrograph, and Cumulative Rainfall at the I-5/I-605 Extended Detention Basin for Event 6 on February 10-15, 2001

Influent



Effluent



Cumulative Rainfall

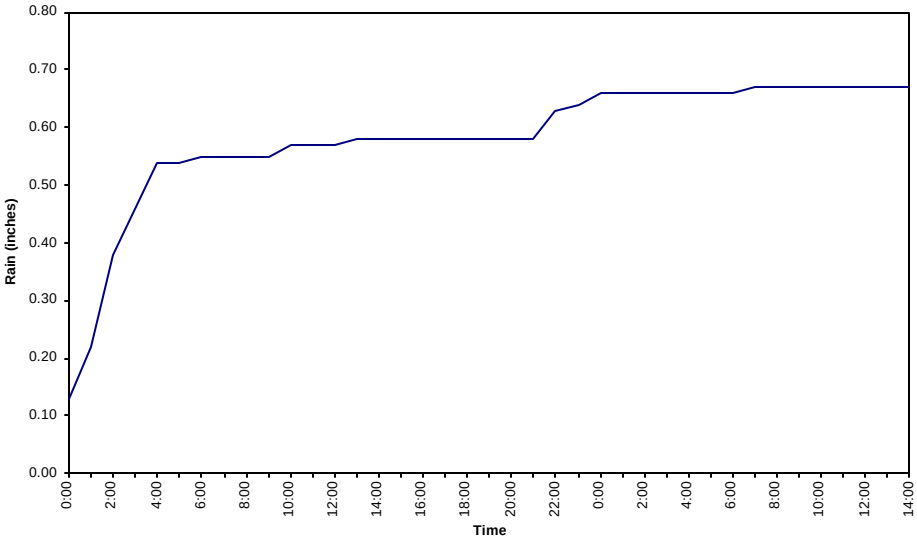
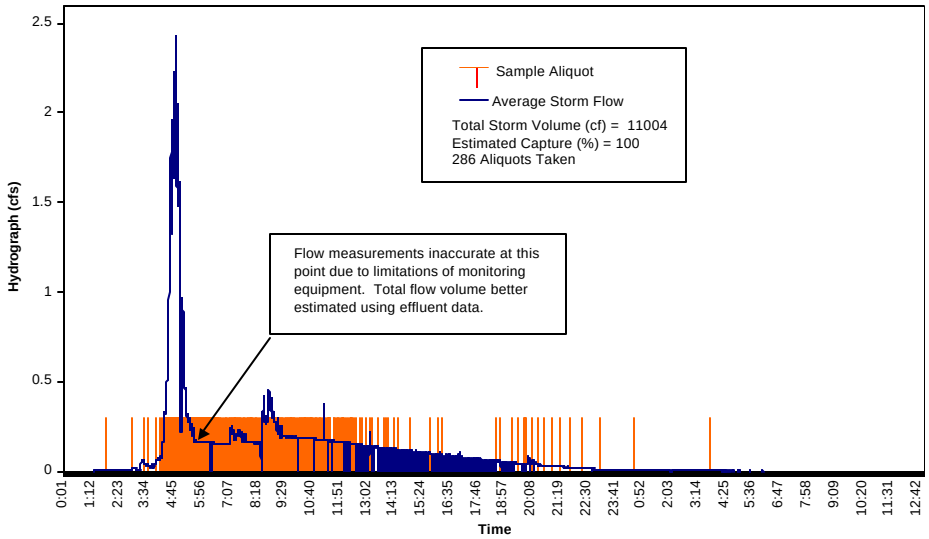
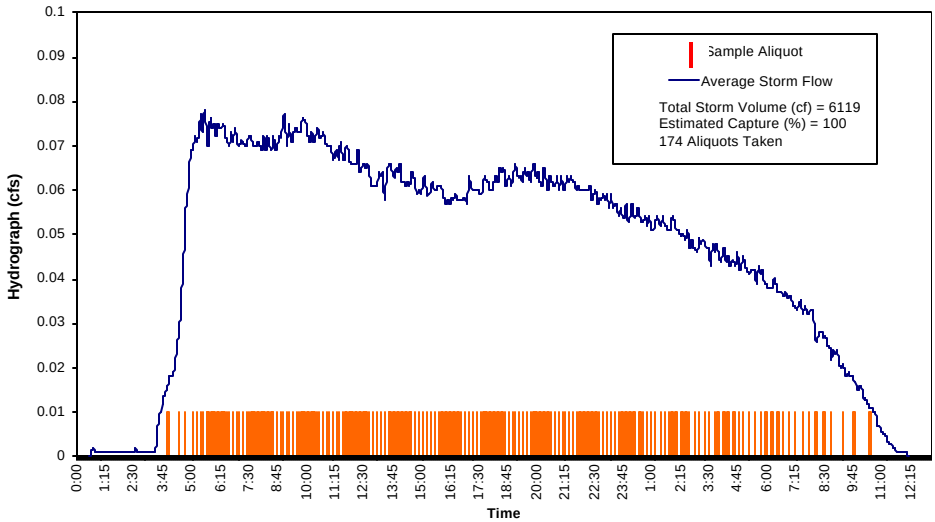


Figure 1-10f: Influent and Effluent Hydrograph, and Cumulative Rainfall at the I-5/I-605 Extended Detention Basin for Event 8 on March 6-7, 2001

Influent



Effluent



Cumulative Rainfall

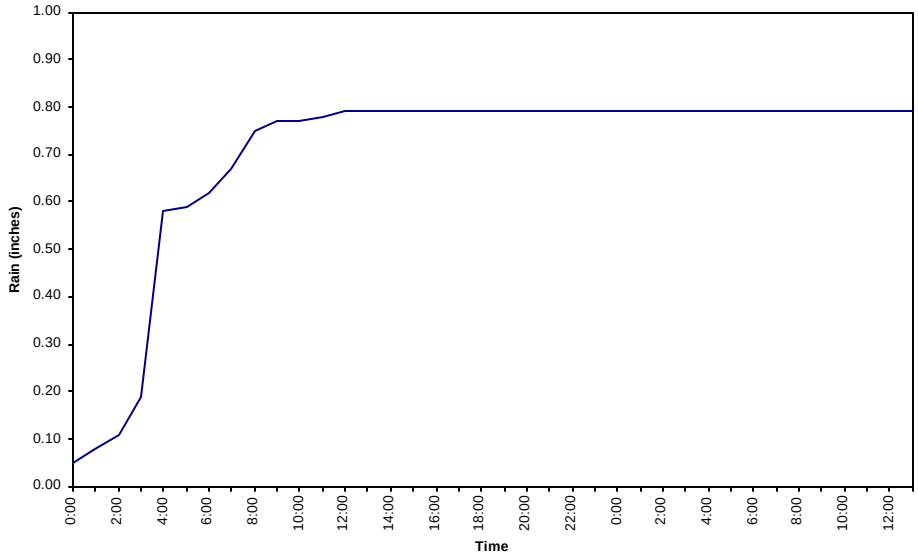
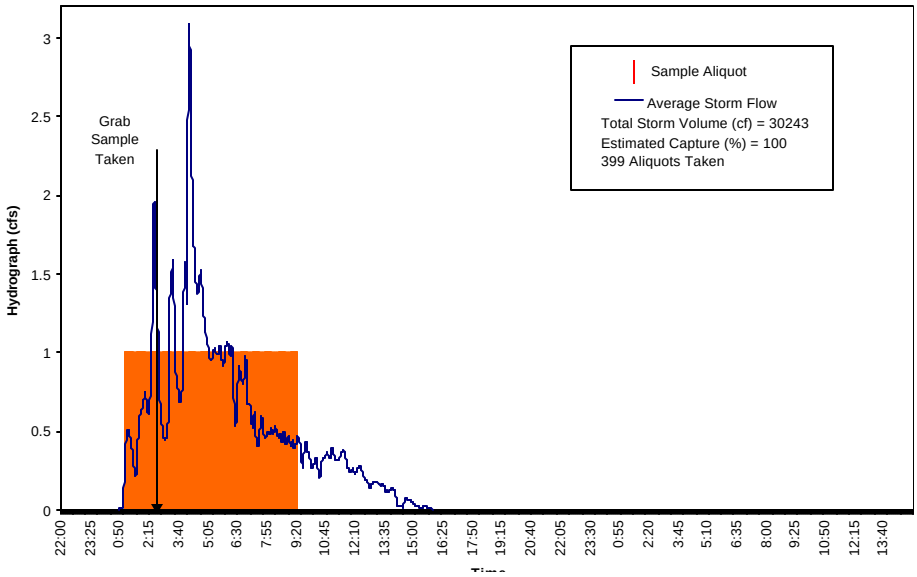
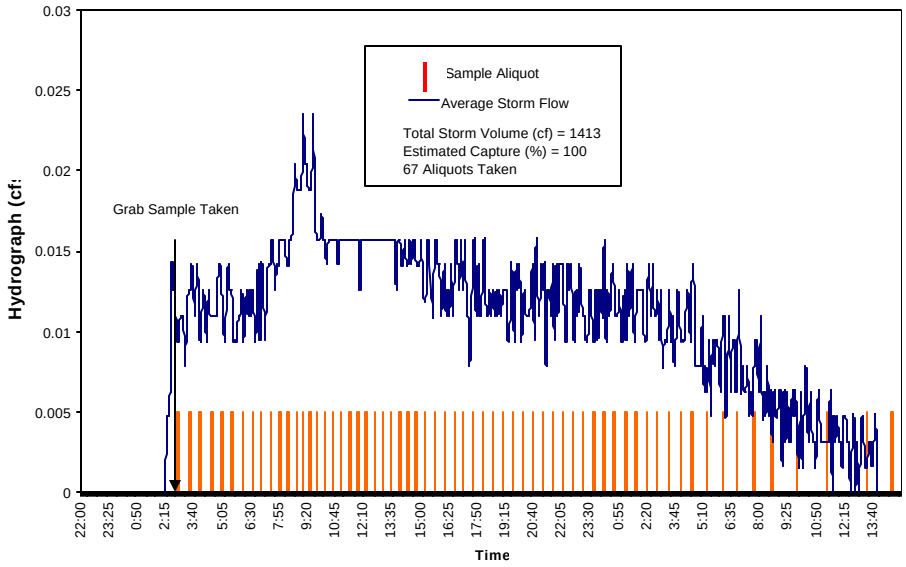


Figure 1-10g: Influent and Effluent Hydrograph, and Cumulative Rainfall at the I-5/I-605 Extended Detention Basin for Event 9 on April 7-8, 2001

Influent



Effluent



Cumulative Rainfall

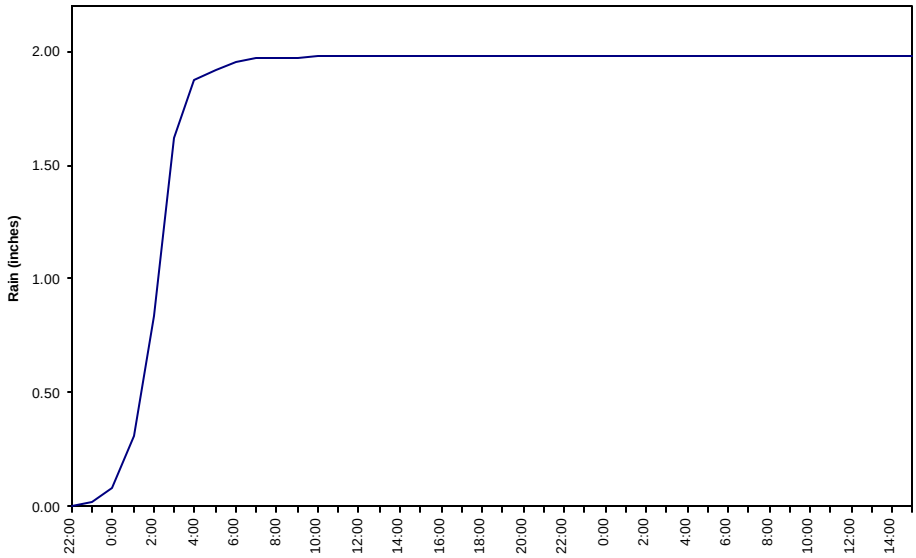
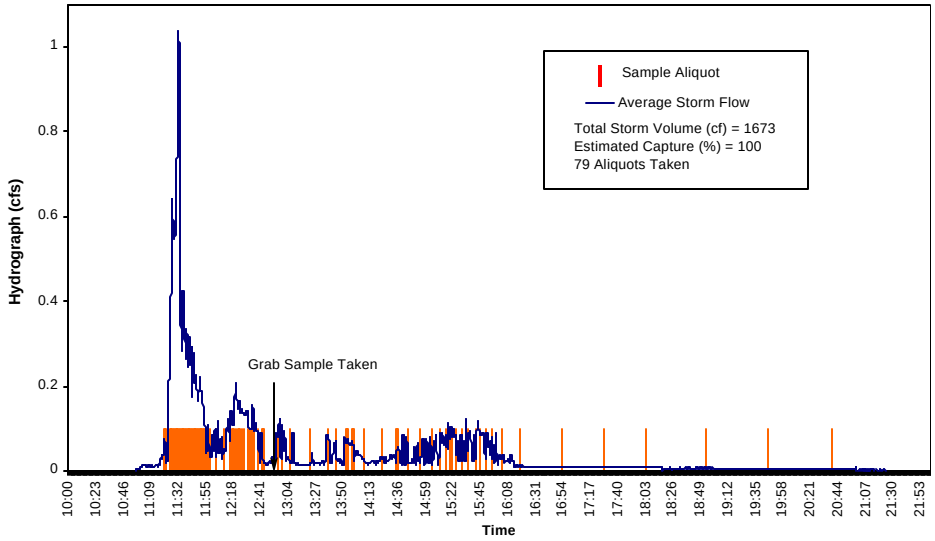
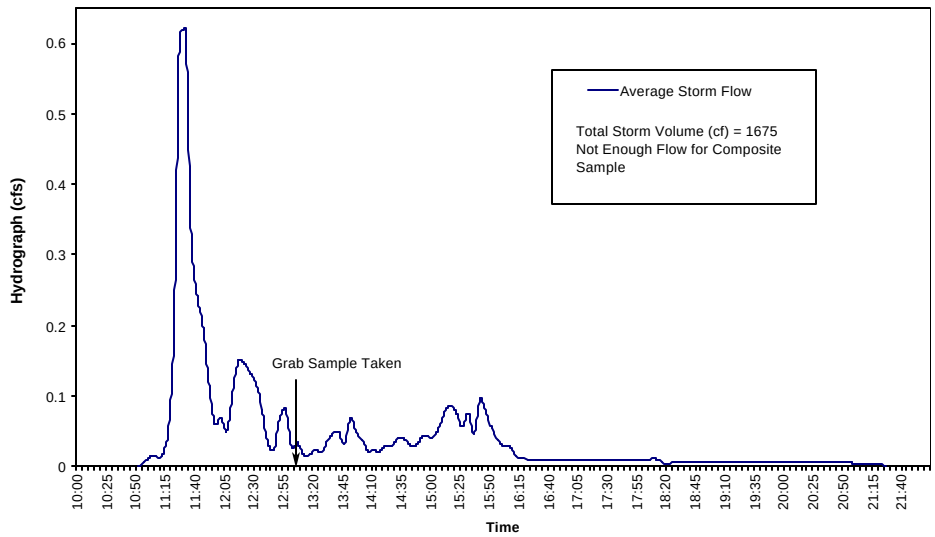


Figure 1-11a: Influent and Effluent Hydrograph, and Cumulative Rainfall at the I-605/SR-91 Extended Detention Basin for Event 2 on October 26-27, 2000

Influent



Effluent



Cumulative Rainfall

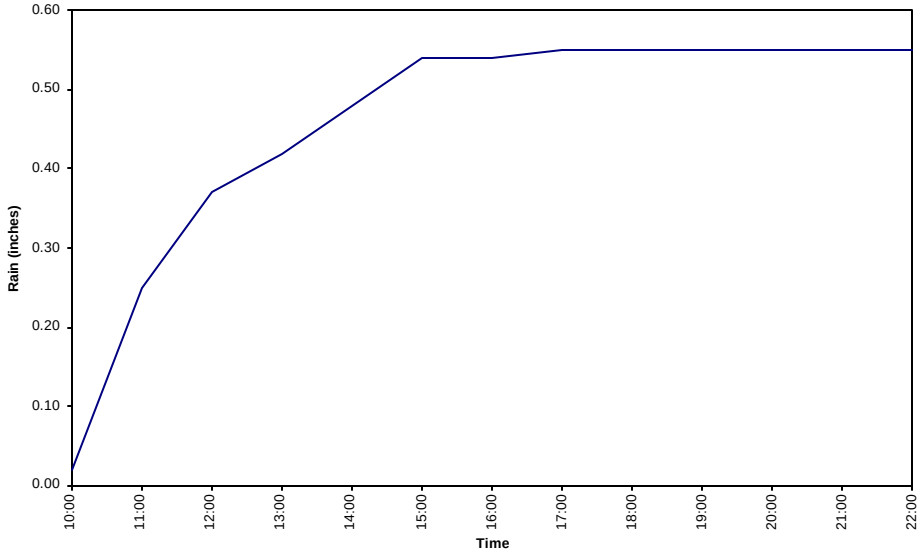
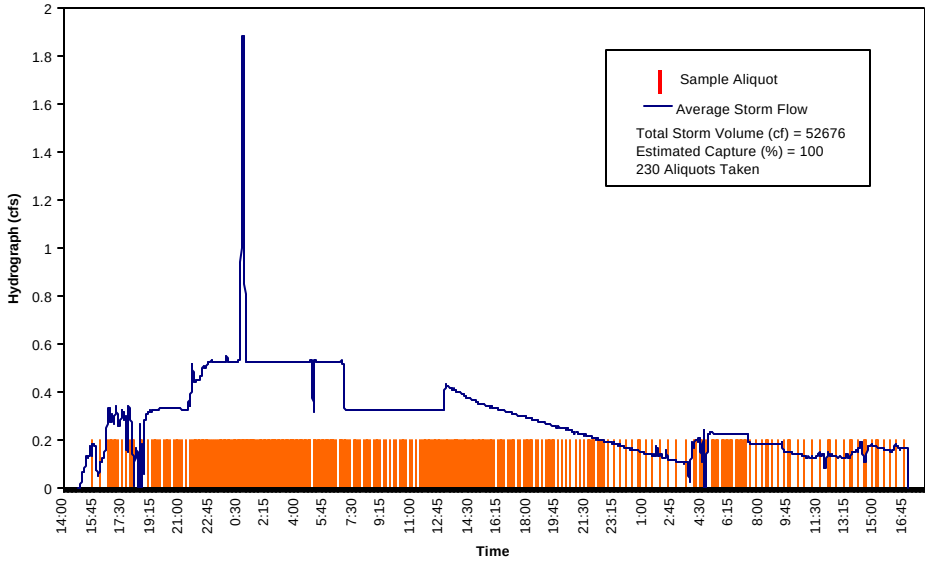
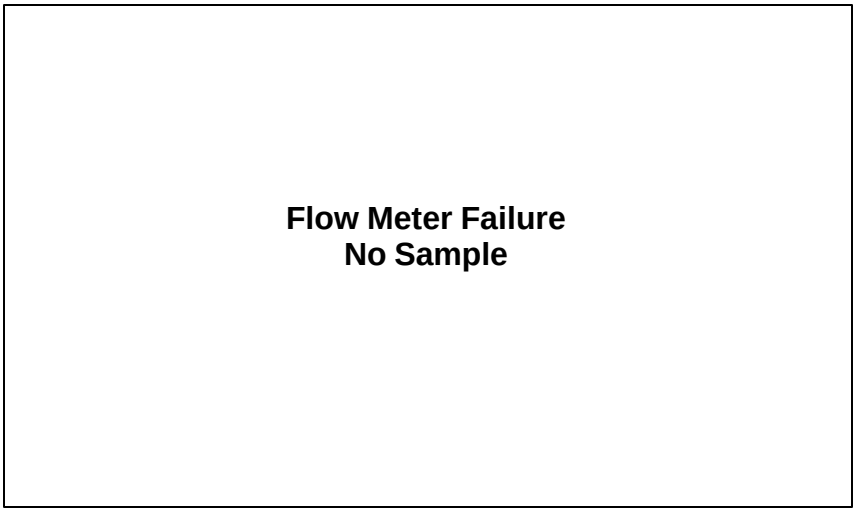


Figure 1-11b: Influent and Effluent Hydrograph, and Cumulative Rainfall at the I-605/SR-91 Extended Detention Basin for Event 3 on January 8, 2001

Influent



Effluent



Cumulative Rainfall

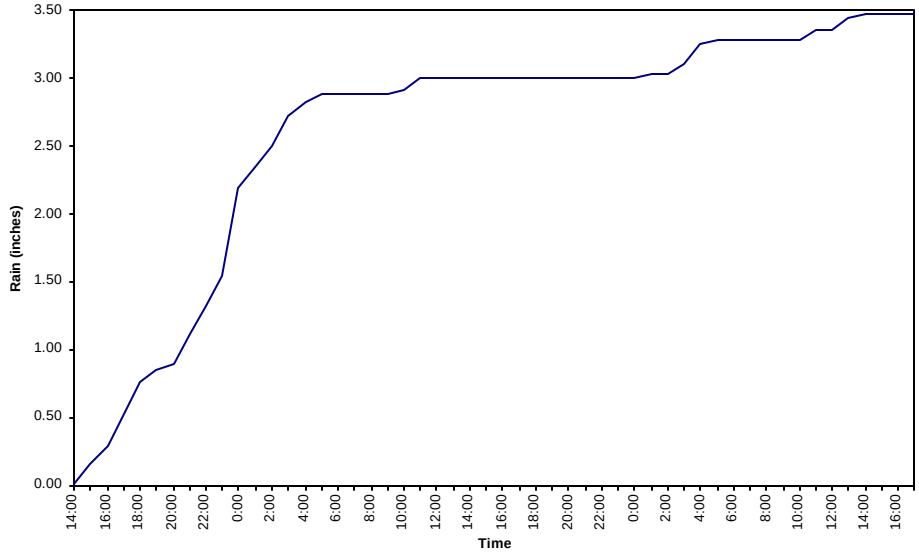
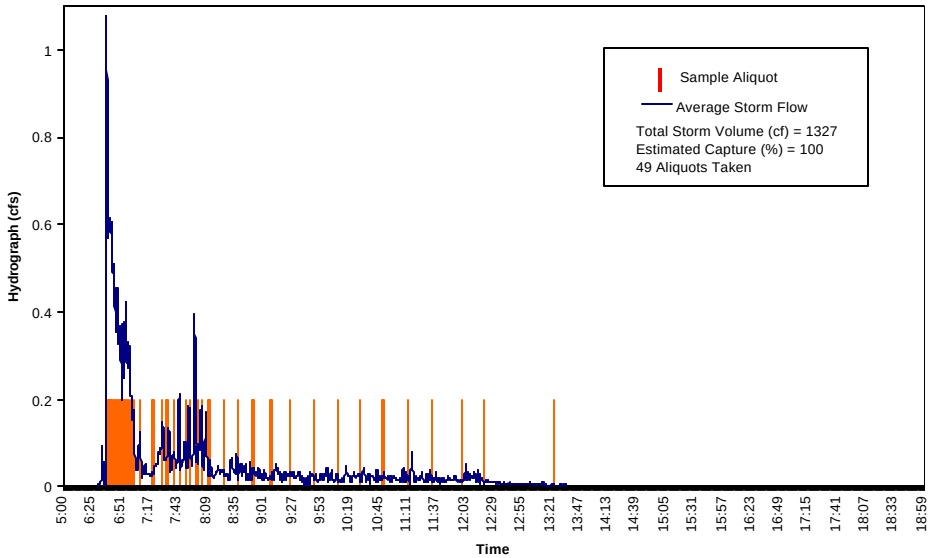
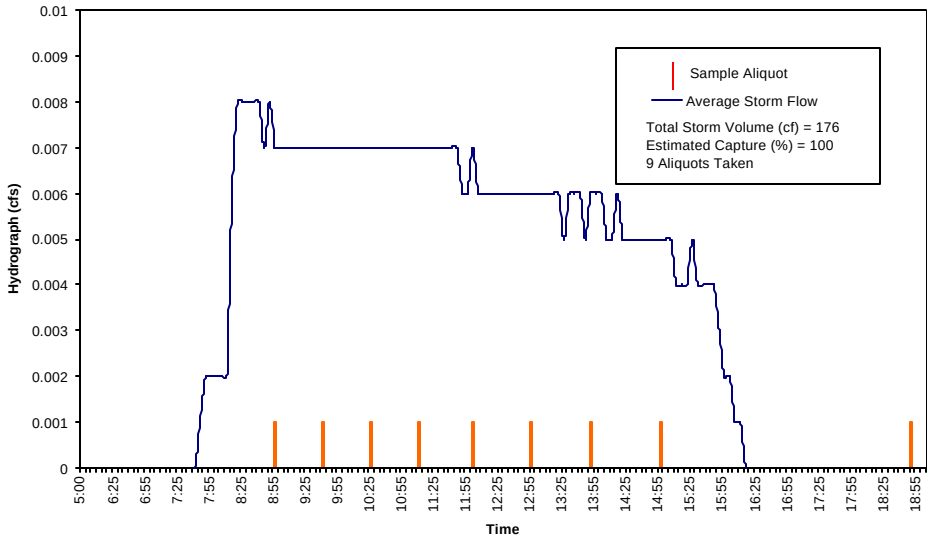


Figure 1-11c: Influent and Effluent Hydrograph, and Cumulative Rainfall at the I-605/SR-91 Extended Detention Basin for Event 4 on January 10-12, 2001

Influent



Effluent



Cumulative Rainfall

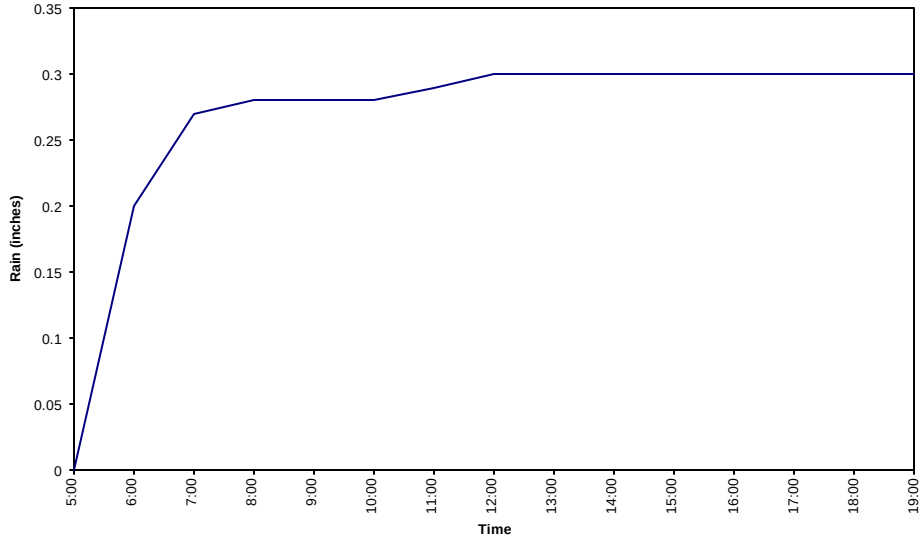
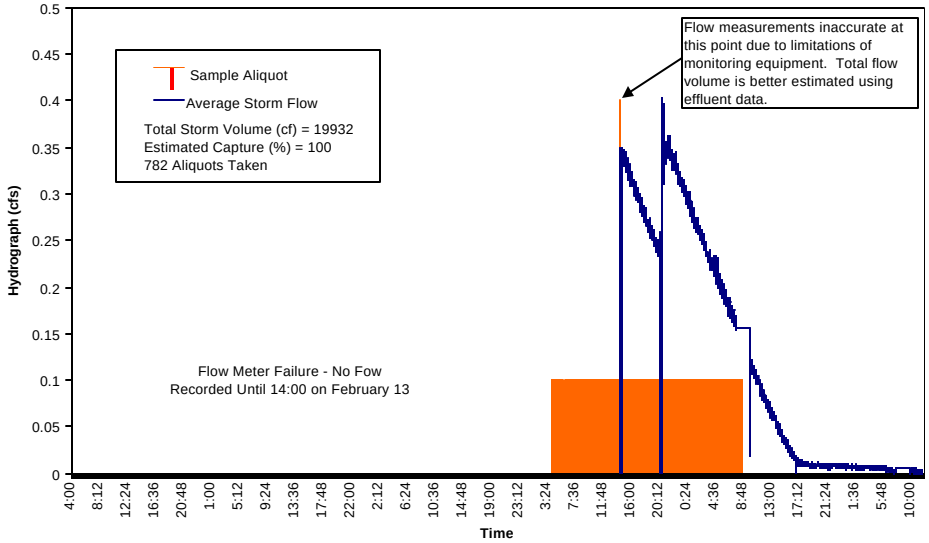
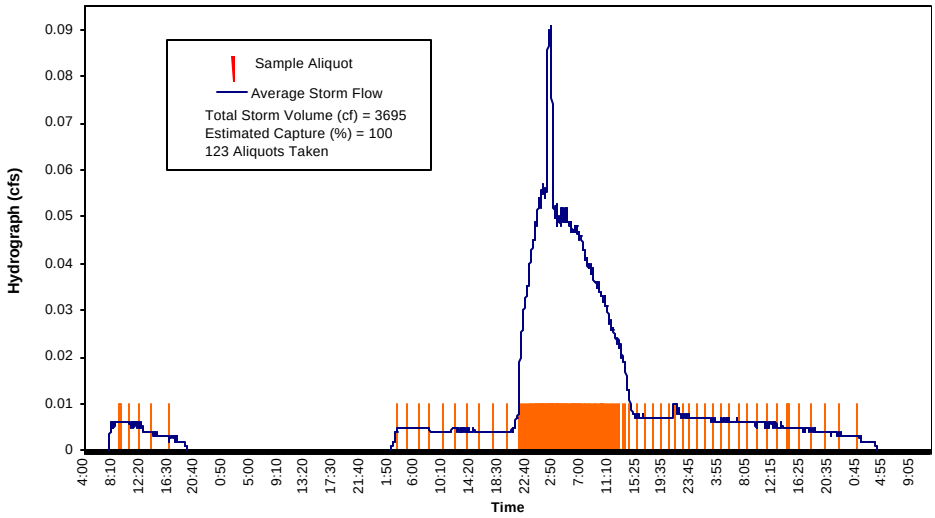


Figure 1-11d: Influent and Effluent Hydrograph, and Cumulative Rainfall at the I-605/SR-91 Extended Detention Basin for Event 5 on January 25, 2001

Influent



Effluent



Cumulative Rainfall

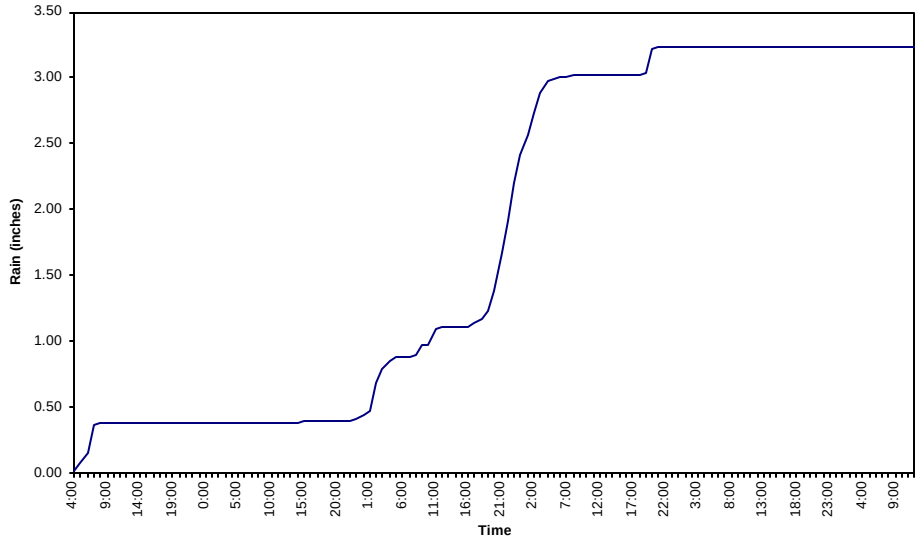
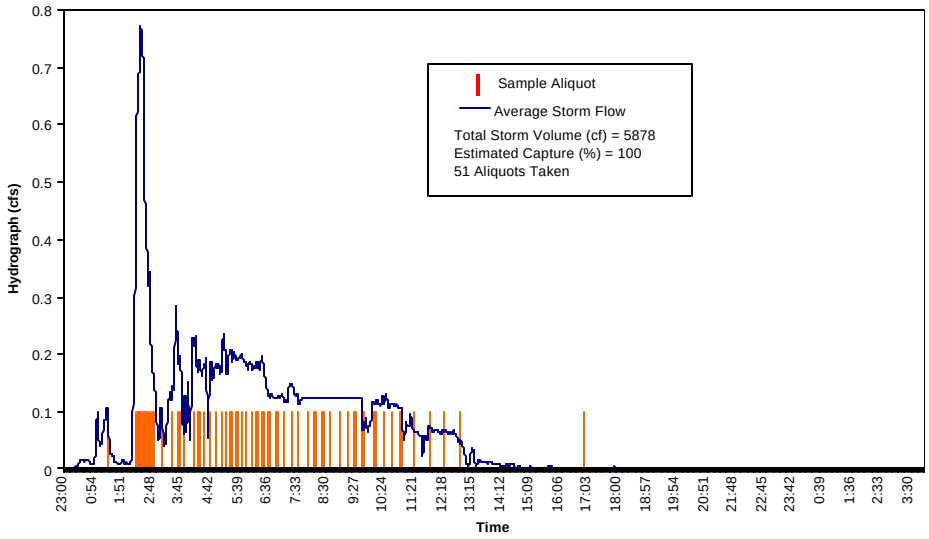
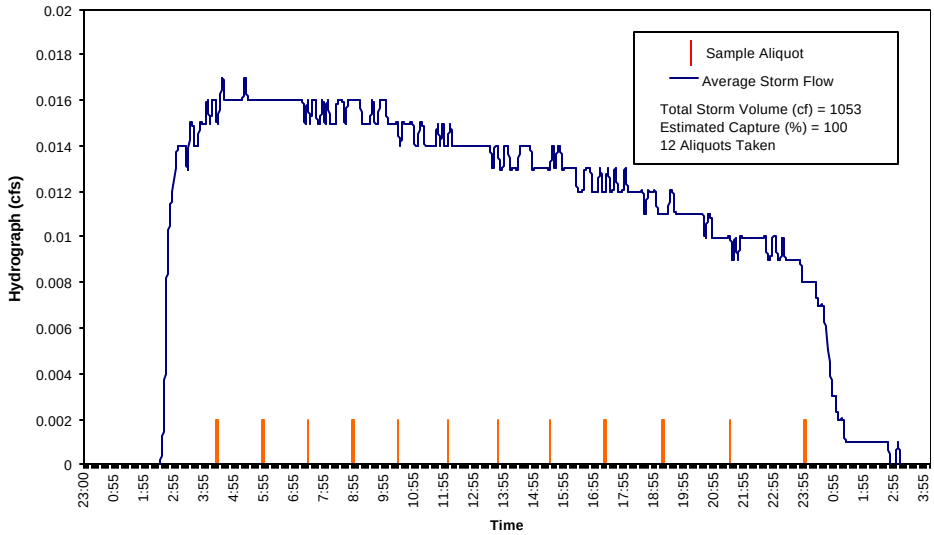


Figure 1-11e: Influent and Effluent Hydrograph, and Cumulative Rainfall at the I-605/SR-91 Extended Detention Basin for Event 6 on February 10-15, 2001

Influent



Effluent



Cumulative Rainfall

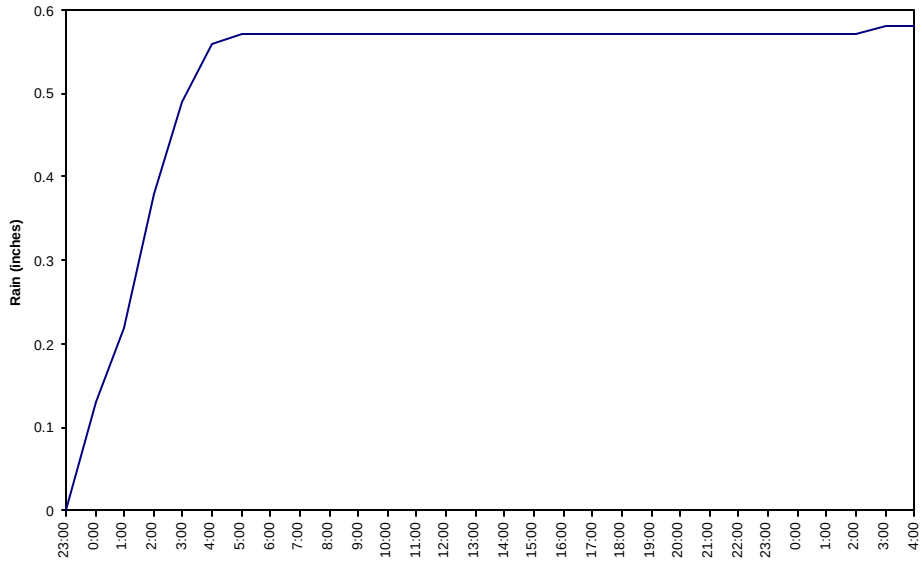
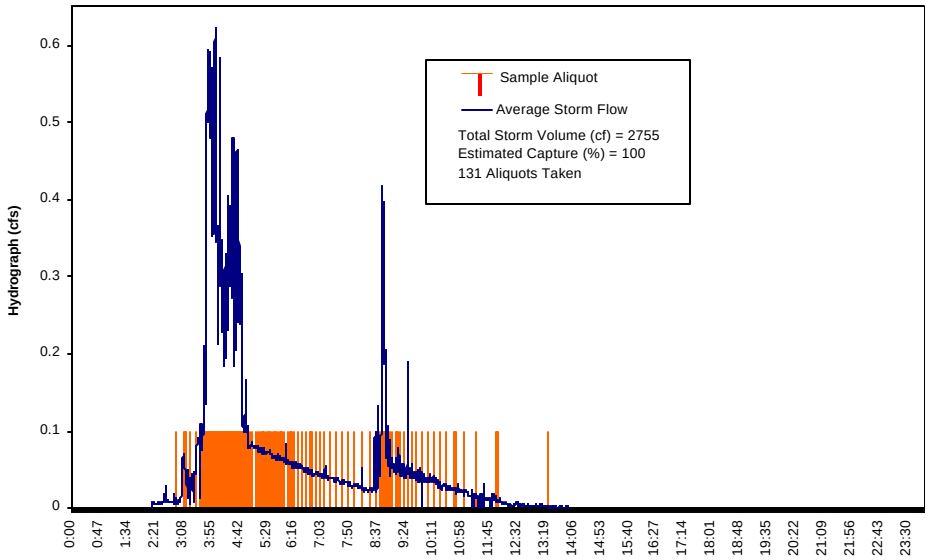
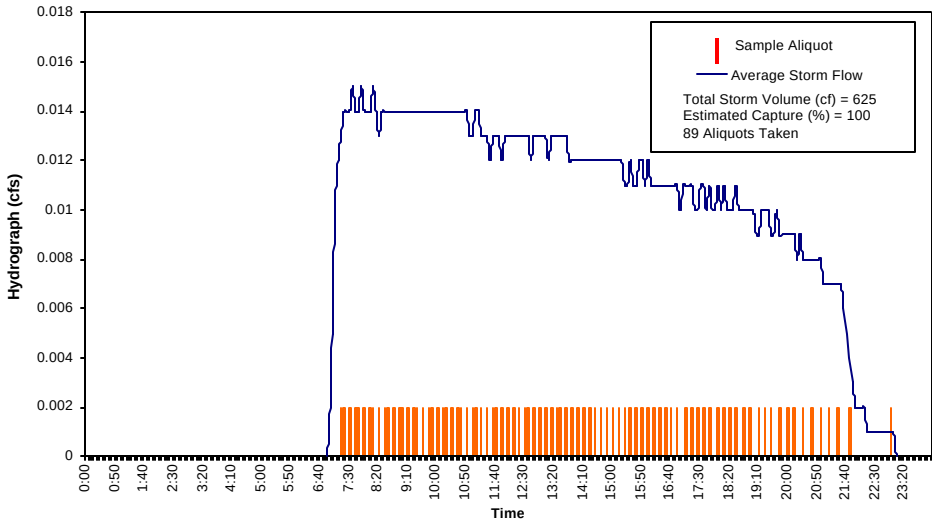


Figure 1-11f: Influent and Effluent Hydrograph, and Cumulative Rainfall at the I-605/SR-91 Extended Detention Basin for Event 8 on March 6, 2001

Influent



Effluent



Cumulative Rainfall

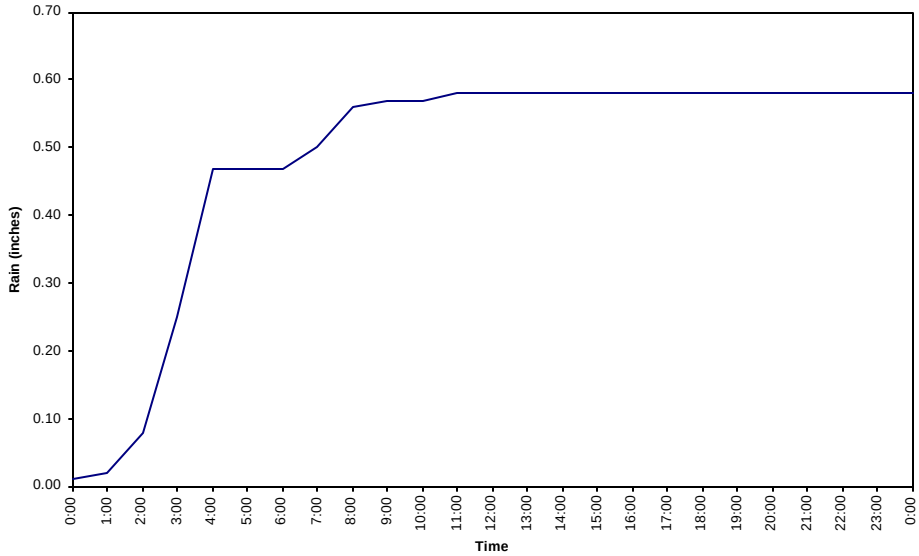
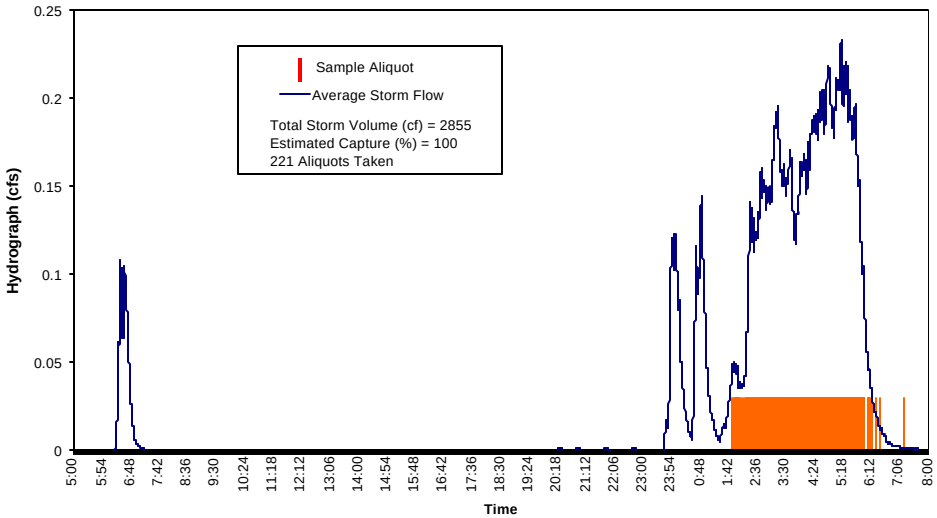
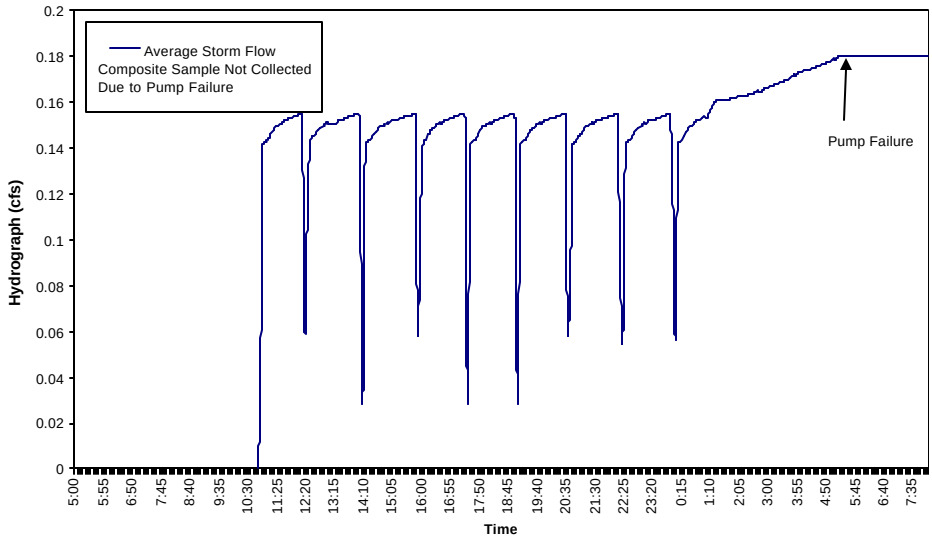


Figure 1-11g: Influent and Effluent Hydrograph, and Cumulative Rainfall at the I-605/SR-91 Extended Detention Basin for Event 9 on April 7, 2001

Influent



Effluent



Cumulative Rainfall

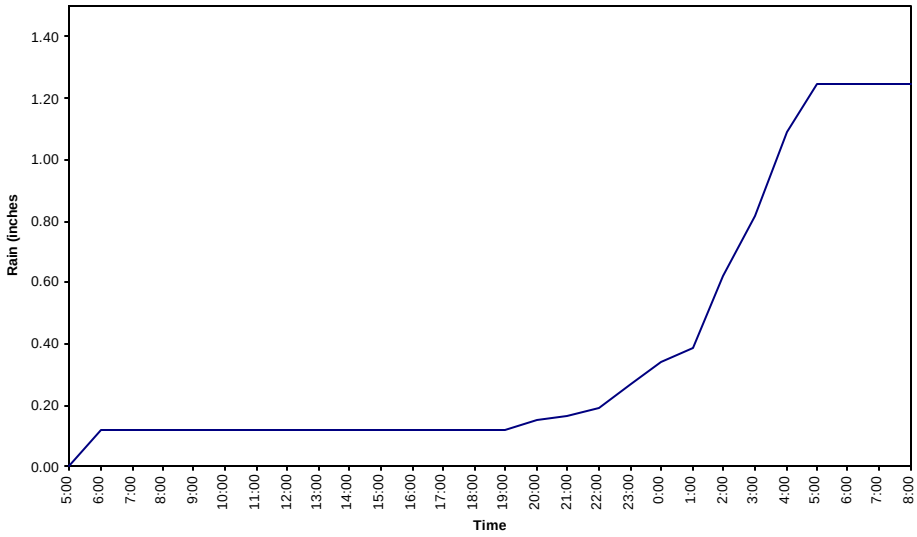
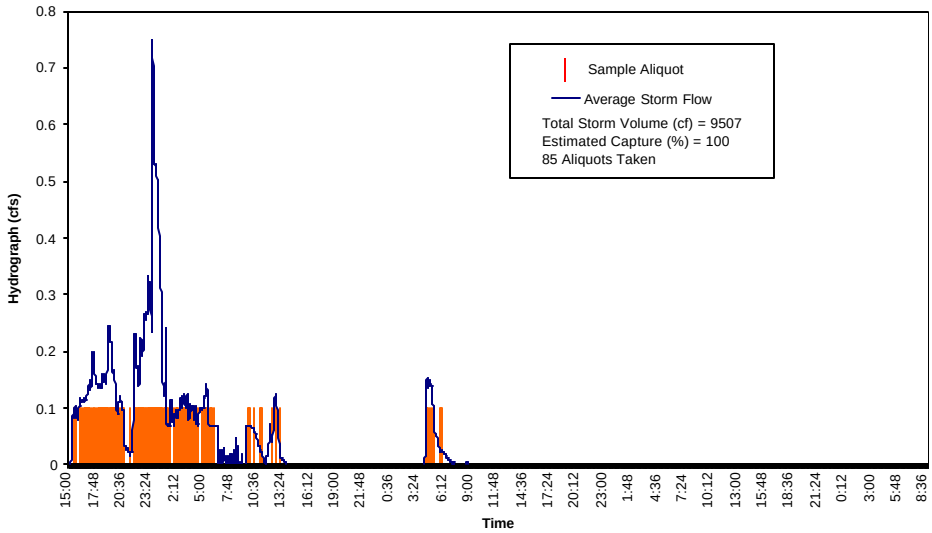
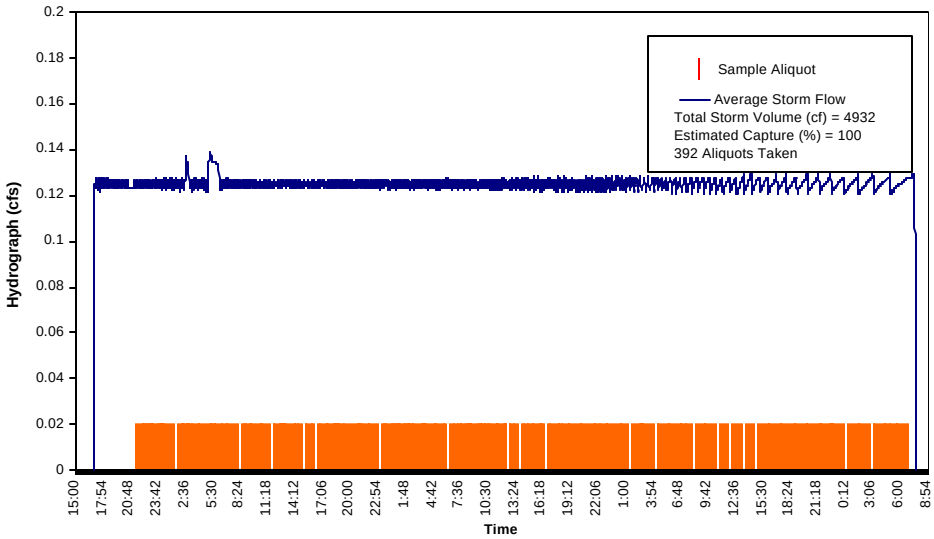


Figure 1-12a: Influent and Effluent Hydrograph, and Cumulative Rainfall at the Eastern Regional Maintenance Station Sand Filter – Austin Type for Event 2 on October 26-27, 2000

Influent



Effluent



Cumulative Rainfall

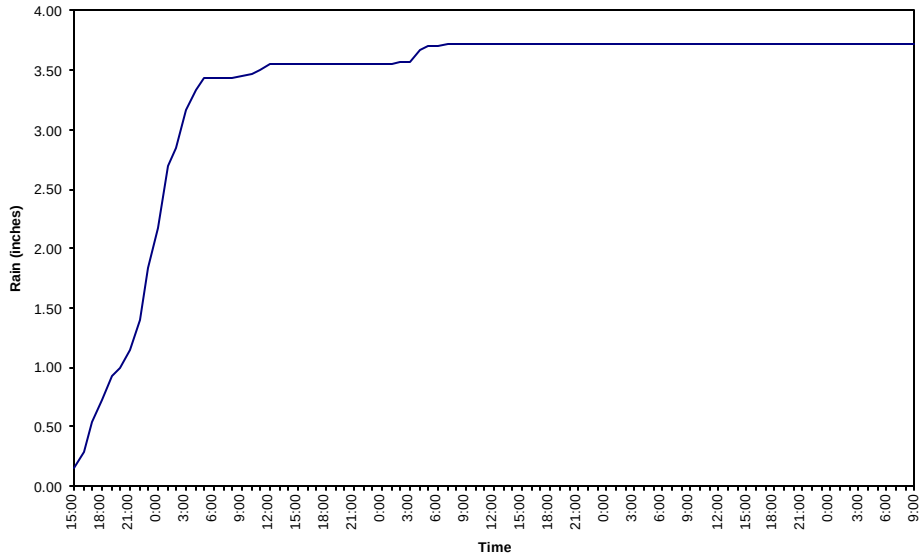
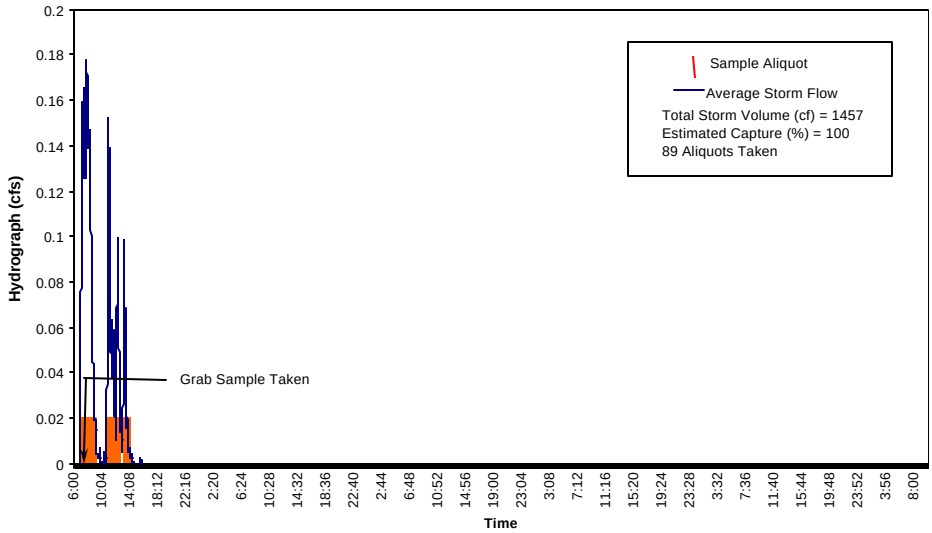
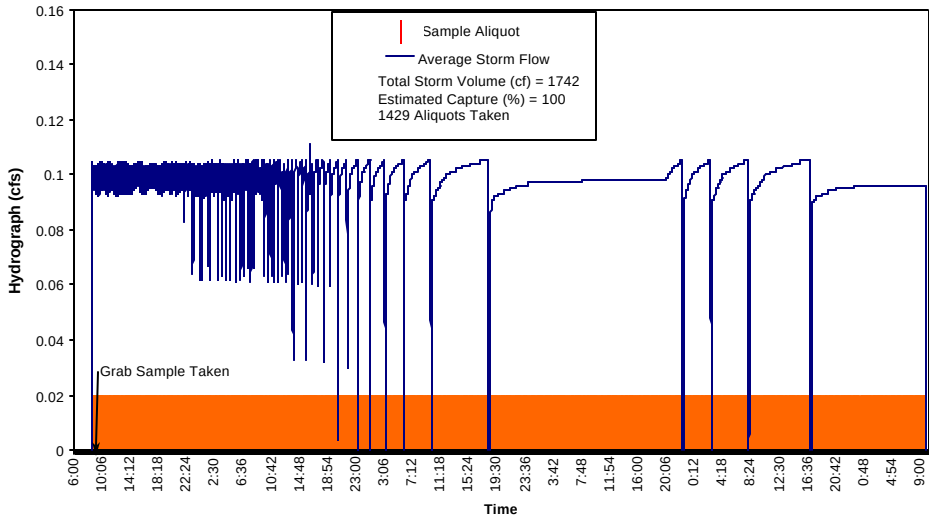


Figure 1-12b: Influent and Effluent Hydrograph, and Cumulative Rainfall at the Eastern Regional Maintenance Station Sand Filter – Austin Type for Event 4 on January 10-12, 2001

Influent



Effluent



Cumulative Rainfall

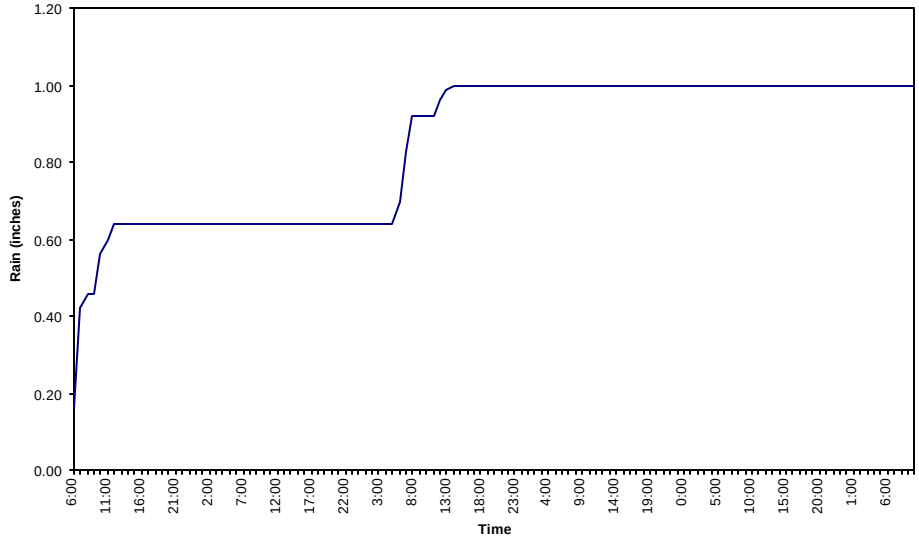
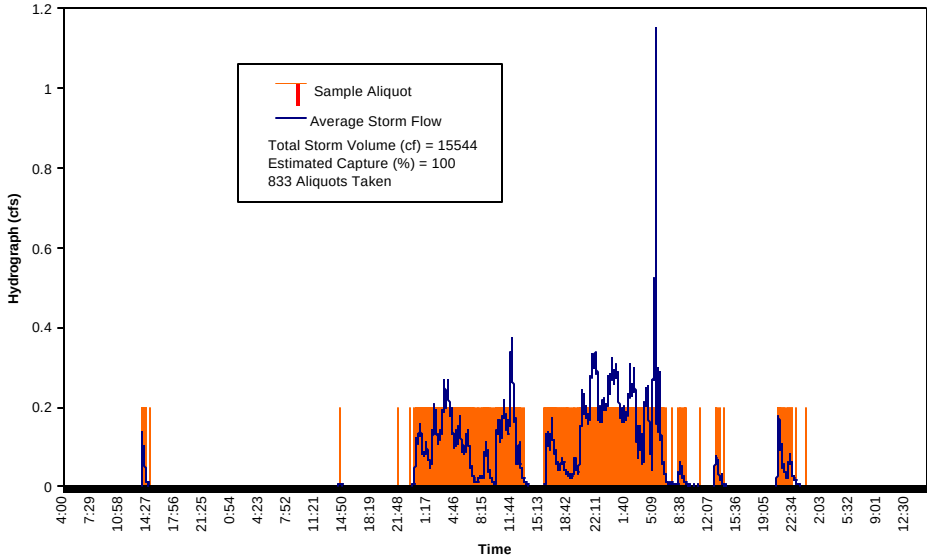
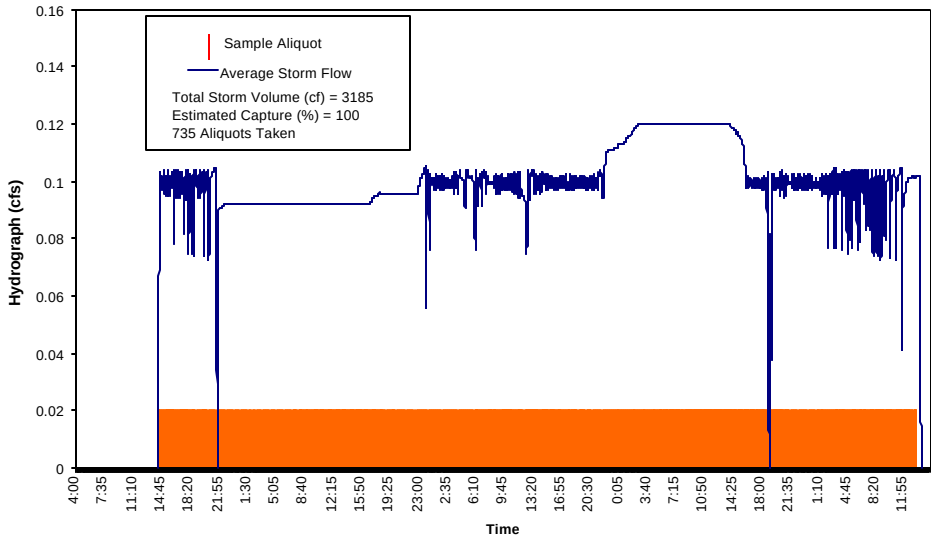


Figure 1-12c: Influent and Effluent Hydrograph, and Cumulative Rainfall at the Eastern Regional Maintenance Station Sand Filter – Austin Type for Event 5 on January 24-29, 2001

Influent



Effluent



Cumulative Rainfall

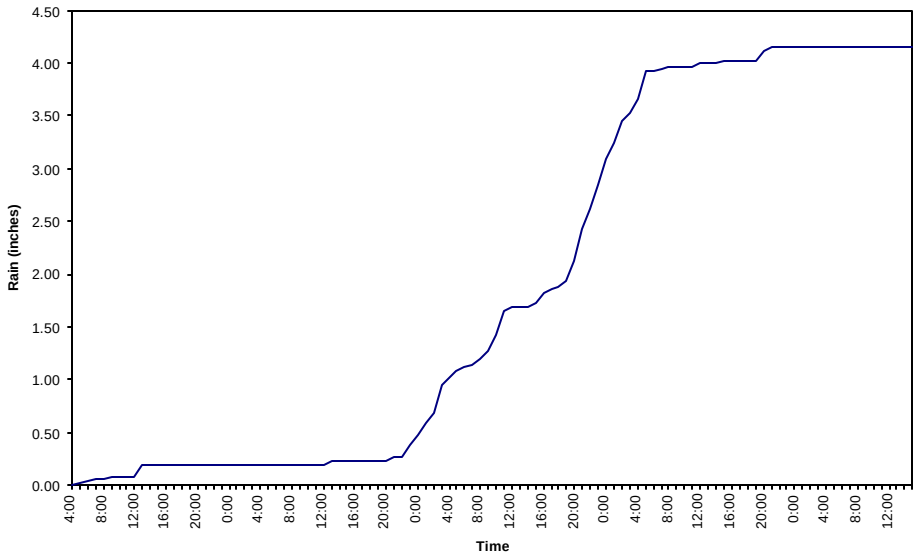
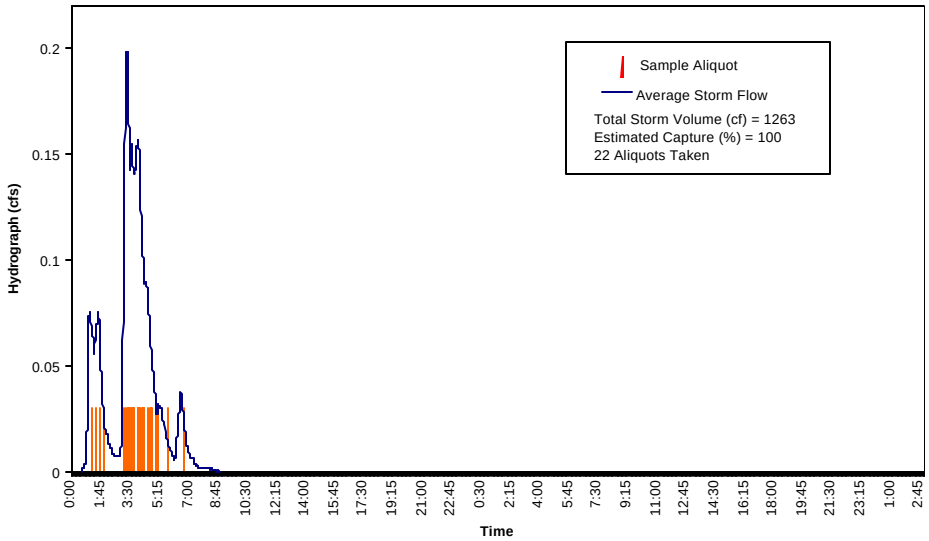
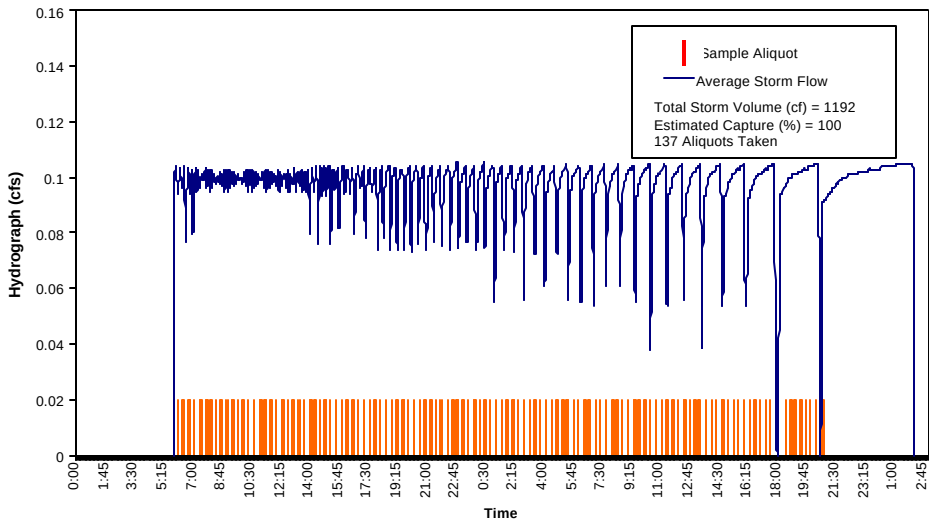


Figure 1-12d: Influent and Effluent Hydrograph, and Cumulative Rainfall at the Eastern Regional Maintenance Station Sand Filter – Austin Type for Event 6 on February 10-14, 2001

Influent



Effluent



Cumulative Rainfall

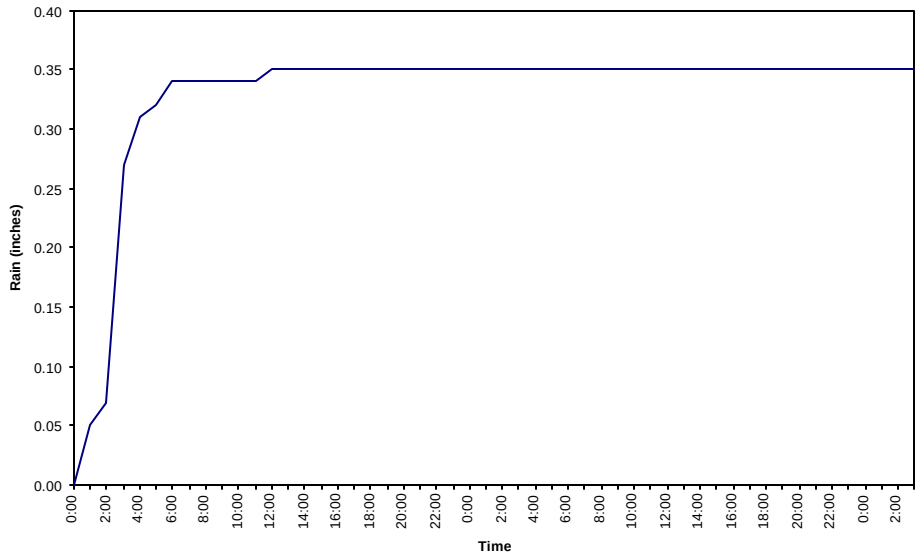
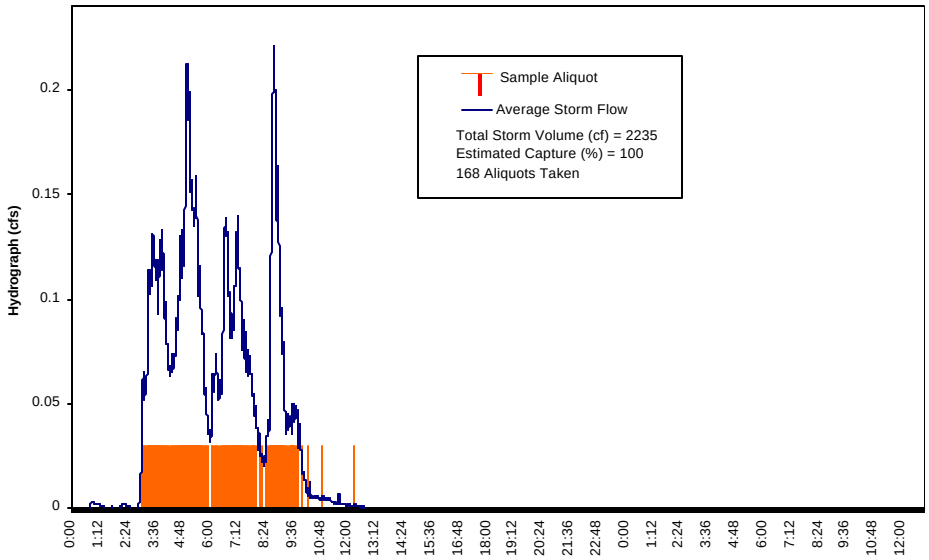
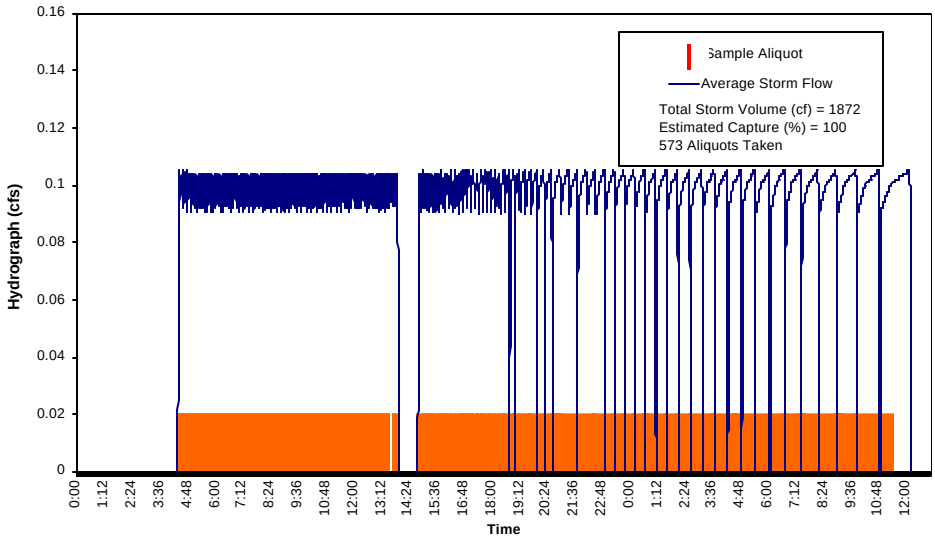


Figure 1-12e: Influent and Effluent Hydrograph, and Cumulative Rainfall at the Eastern Regional Maintenance Station Sand Filter – Austin Type for Event 8 on March 6-8, 2001

Influent



Effluent



Cumulative Rainfall

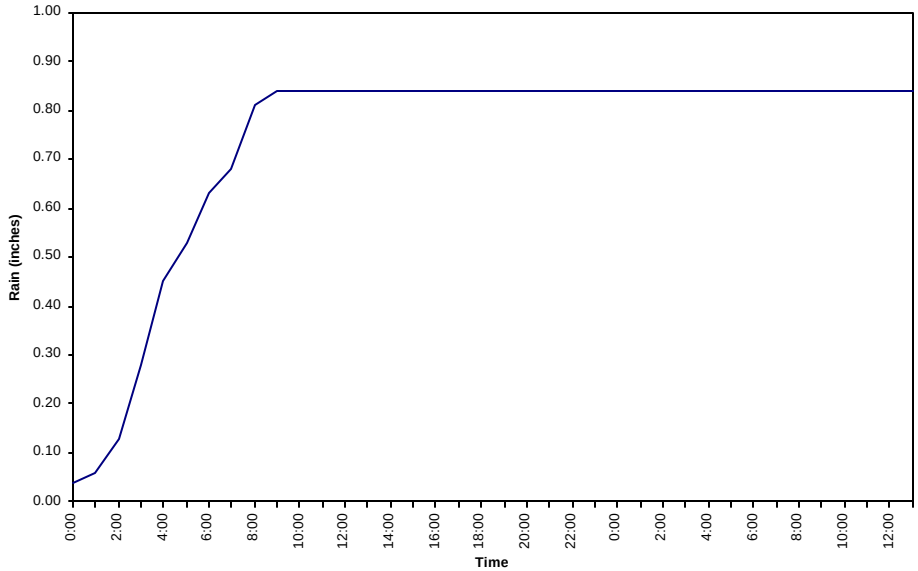
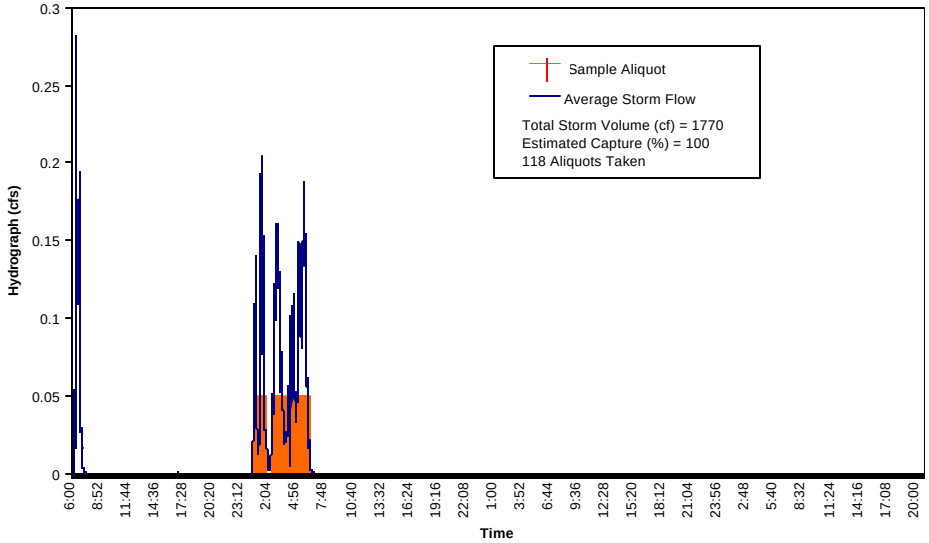
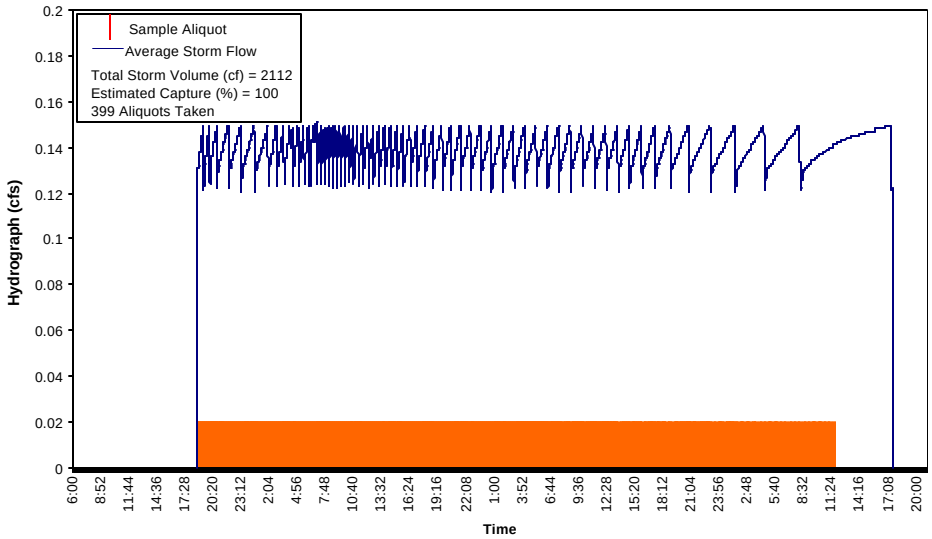


Figure 1-12f: Influent and Effluent Hydrograph, and Cumulative Rainfall at the Eastern Regional Maintenance Station Sand Filter – Austin Type for Event 9 on April 7-8, 2001

Influent



Effluent



Cumulative Rainfall

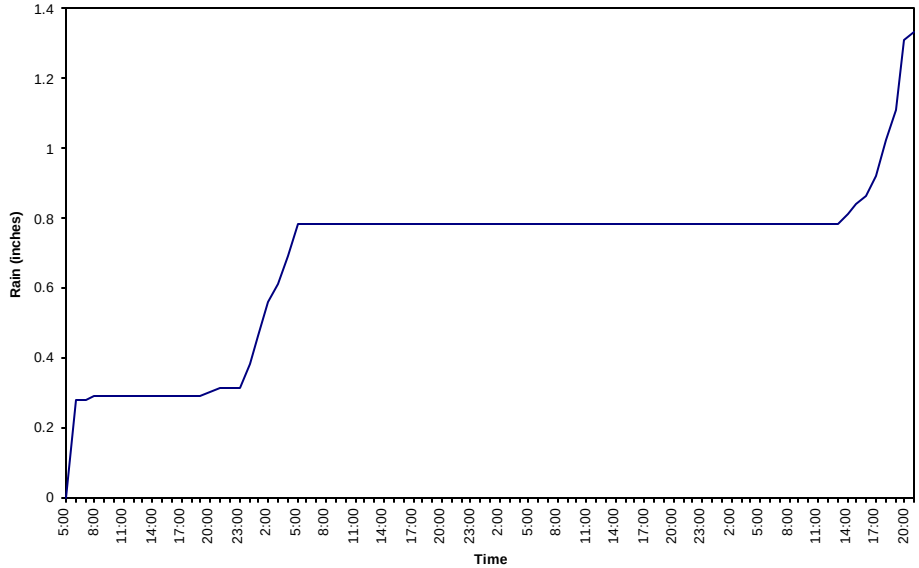
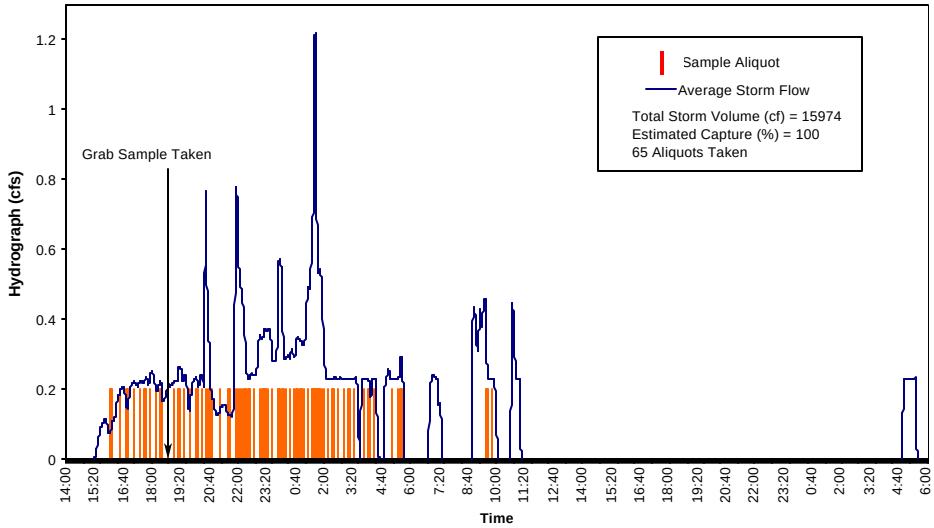
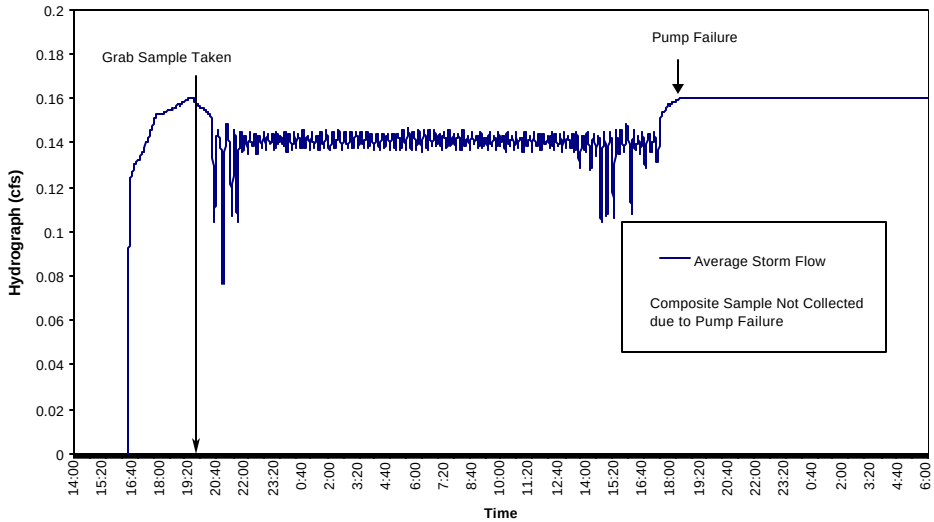


Figure 1-13a: Influent and Effluent Hydrograph, and Cumulative Rainfall at the Foothill Maintenance Station Sand Filter – Austin Type for Event 2 on October 26-29, 2000

Influent



Effluent



Cumulative Rainfall

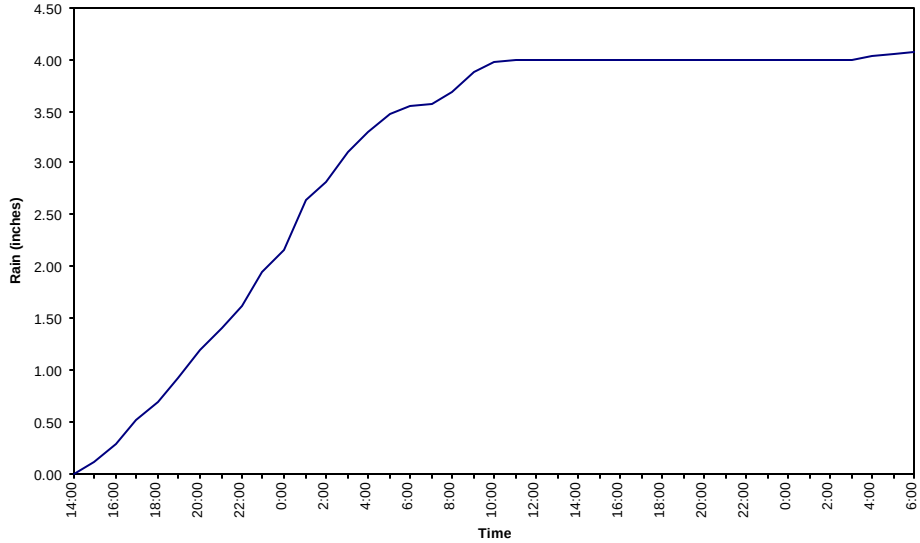
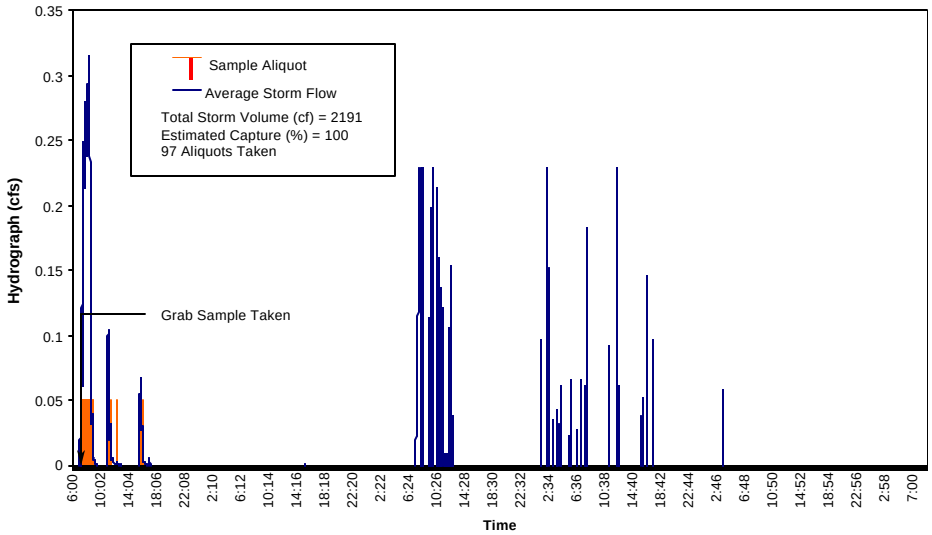
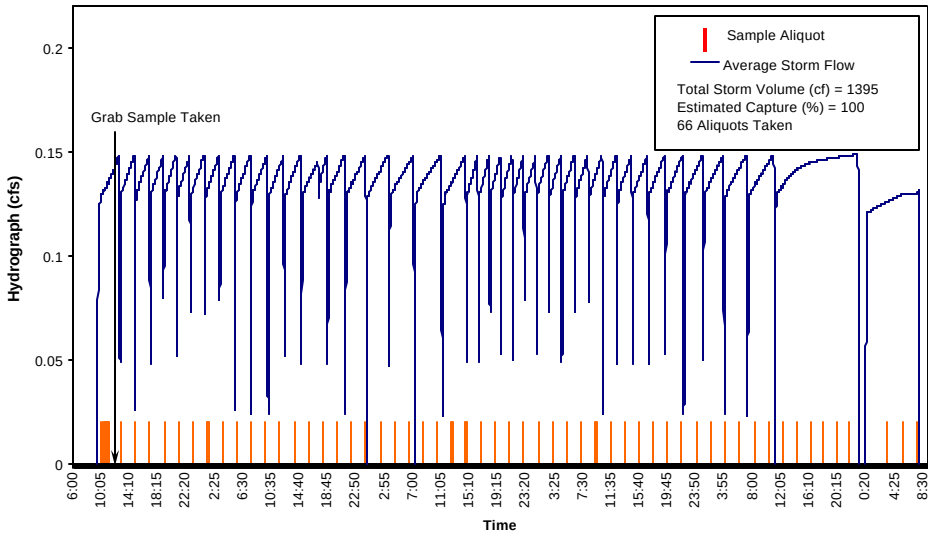


Figure 1-13b: Influent and Effluent Hydrograph, and Cumulative Rainfall at the Foothill Maintenance Station Sand Filter – Austin Type for Event 4 on January 10-12, 2001

Influent



Effluent



Cumulative Rainfall

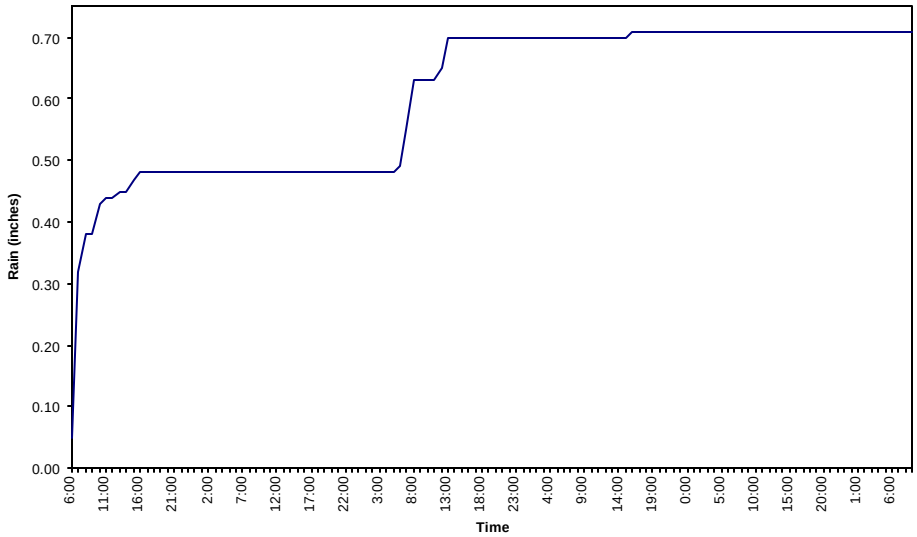
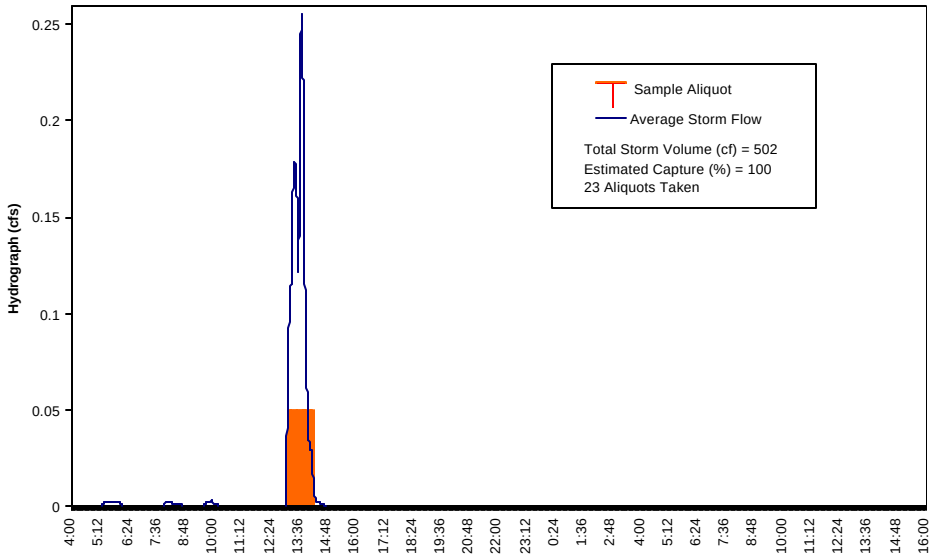
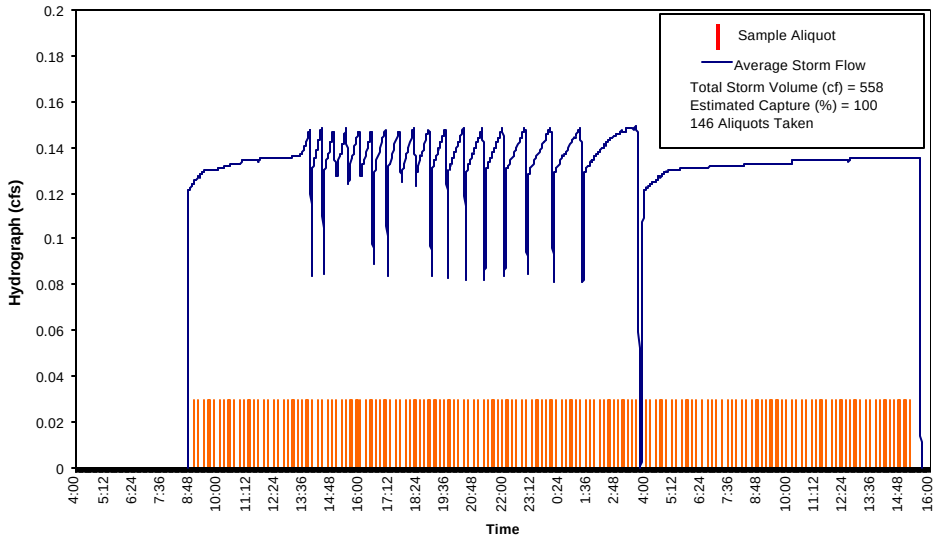


Figure 1-13c: Influent and Effluent Hydrograph, and Cumulative Rainfall at the Foothill Maintenance Station Sand Filter – Austin Type for Event 5 on January 24-29, 2001

Influent



Effluent



Cumulative Rainfall

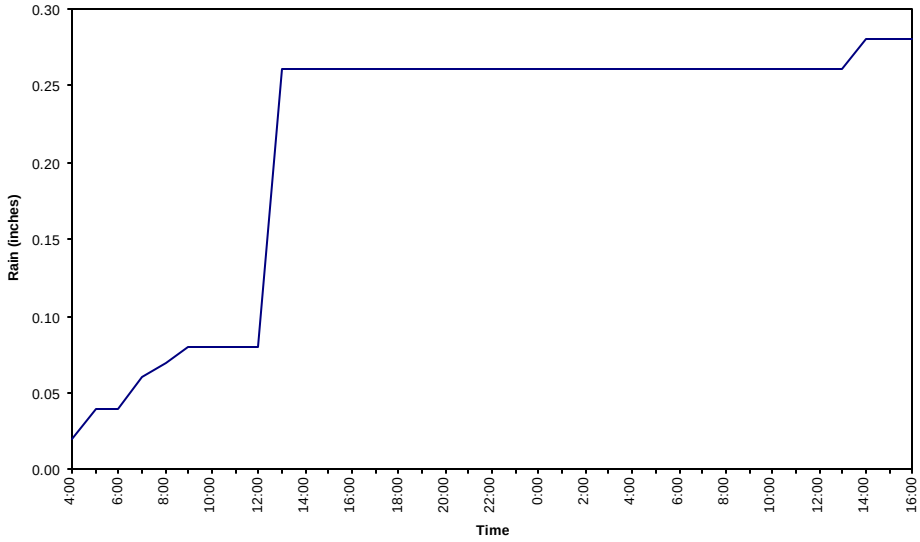
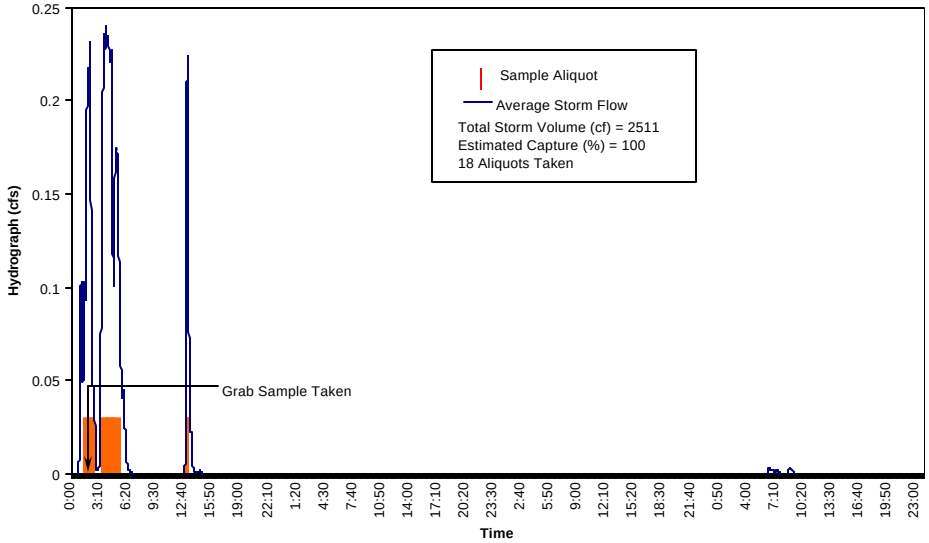
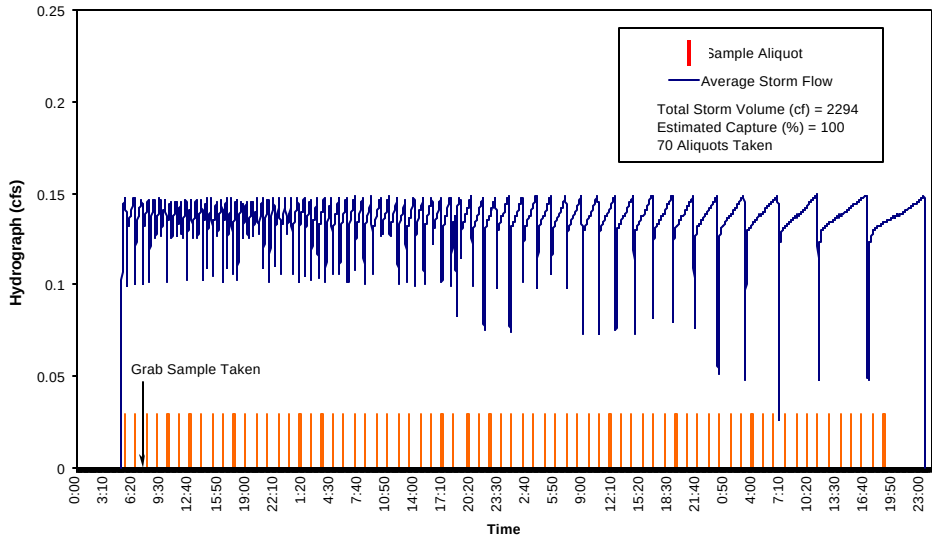


Figure 1-13d: Influent and Effluent Hydrograph, and Cumulative Rainfall at the Foothill Maintenance Station Sand Filter – Austin Type for Event 6 on February 10-11, 2001

Influent



Effluent



Cumulative Rainfall

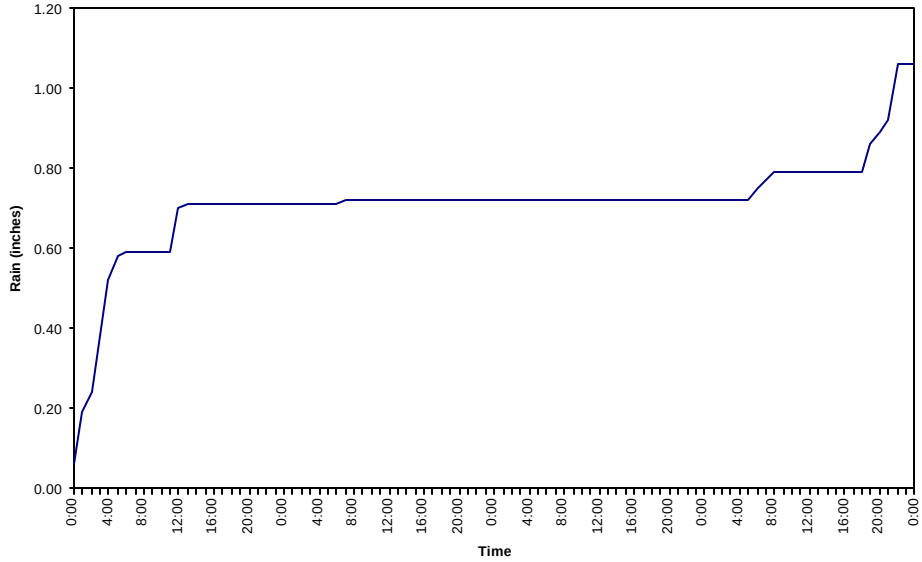
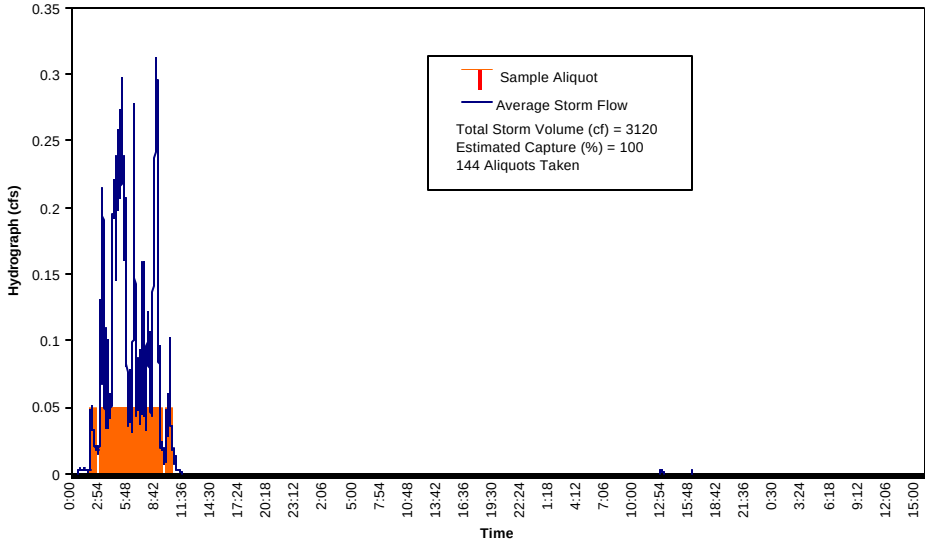
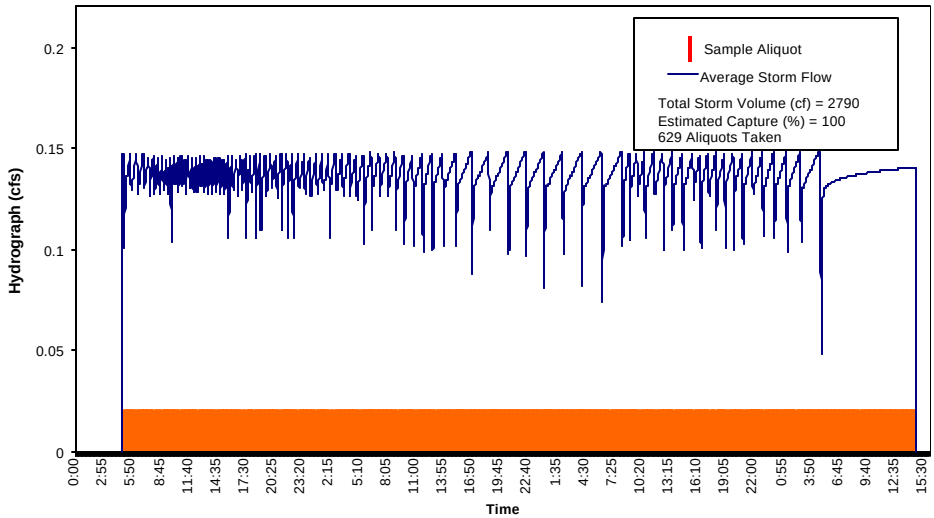


Figure 1-13e: Influent and Effluent Hydrograph, and Cumulative Rainfall at the Foothill Maintenance Station Sand Filter – Austin Type for Event 8 on March 6-9, 2001

Influent



Effluent



Cumulative Rainfall

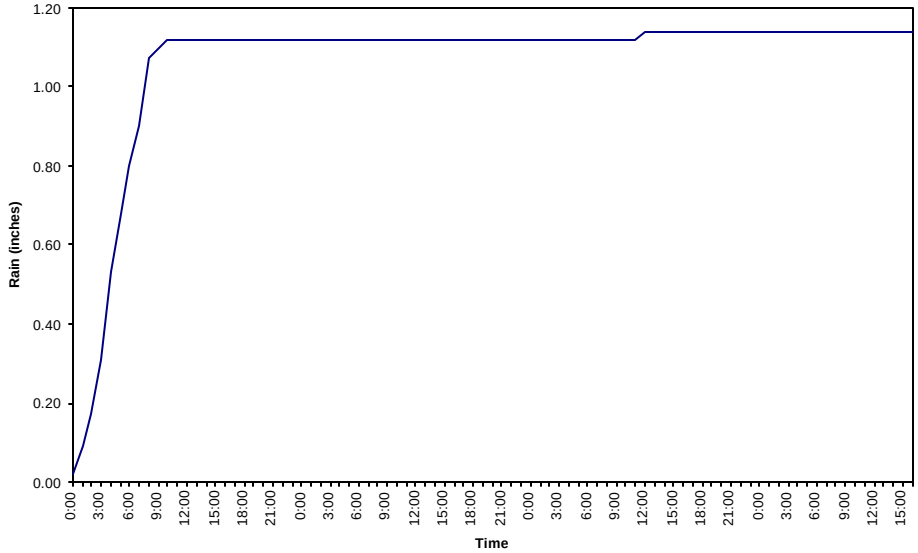
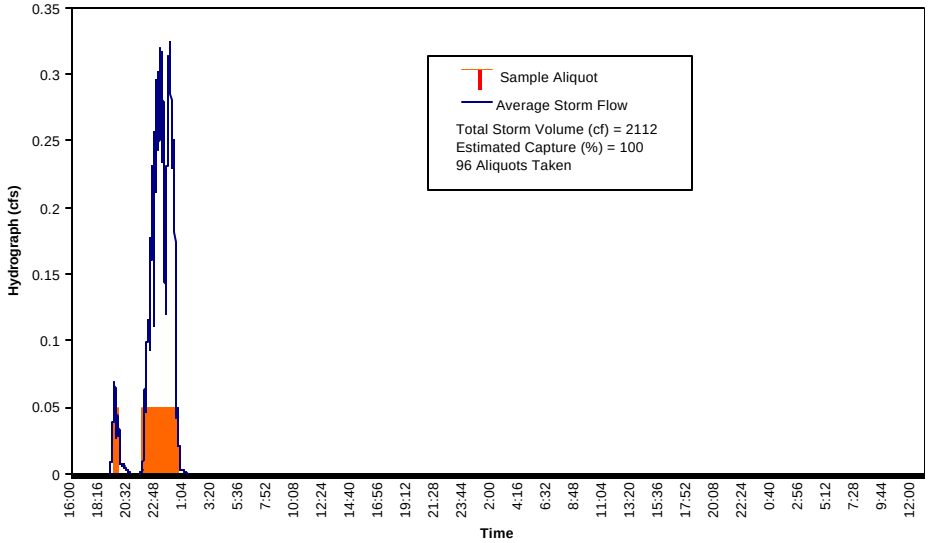
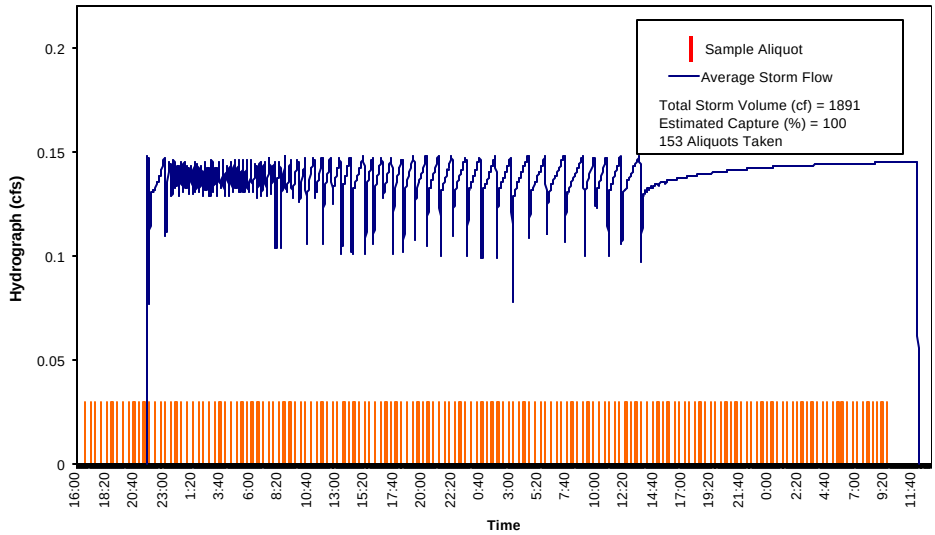


Figure 1-13f: Influent and Effluent Hydrograph, and Cumulative Rainfall at the Foothill Maintenance Station Sand Filter – Austin Type for Event 9 on April 7-10, 2001

Influent



Effluent



Cumulative Rainfall

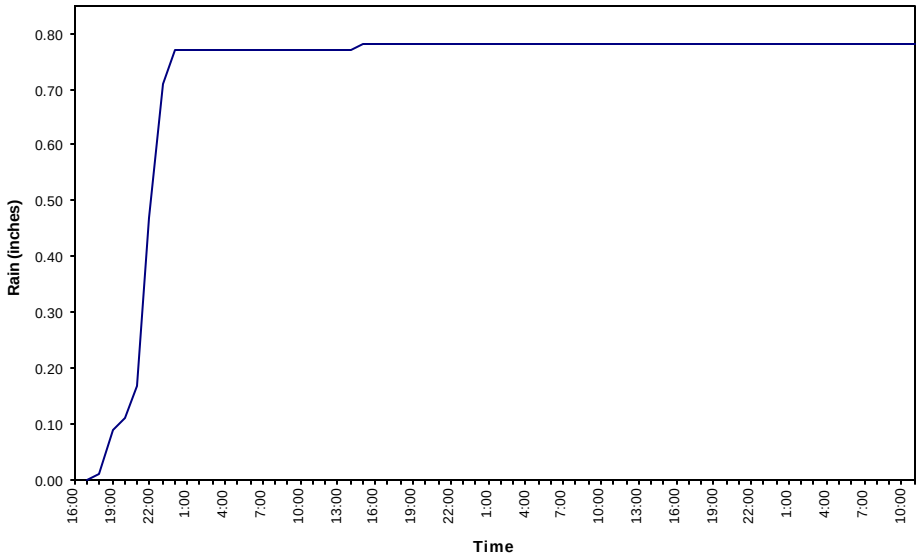
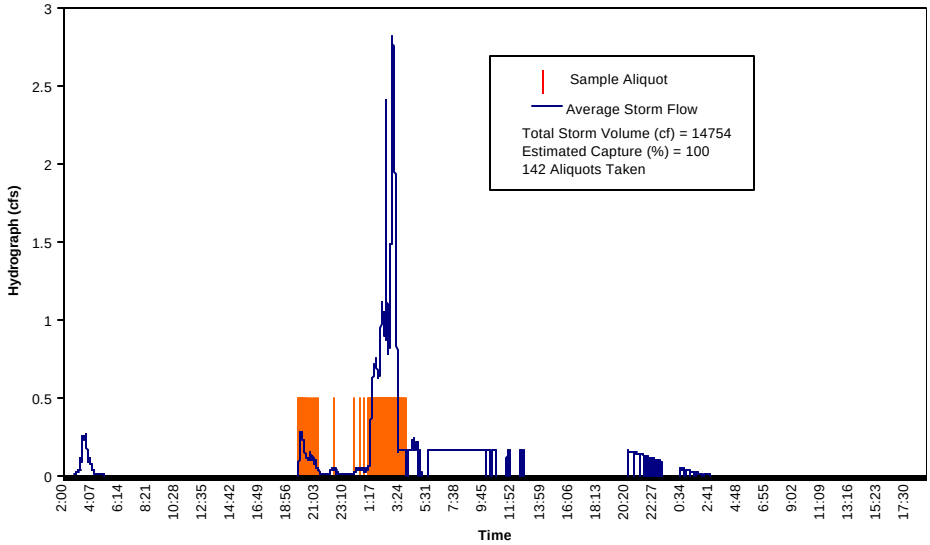
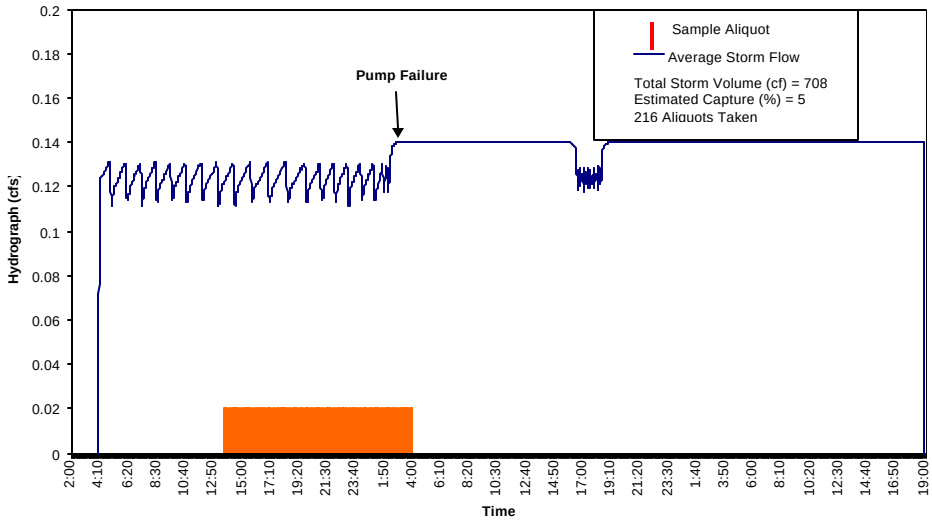


Figure 1-13g: Influent and Effluent Hydrograph, and Cumulative Rainfall at the Foothill Maintenance Station Sand Filter – Austin Type for Event 10 on April 20-23, 2001

Influent



Effluent



Cumulative Rainfall

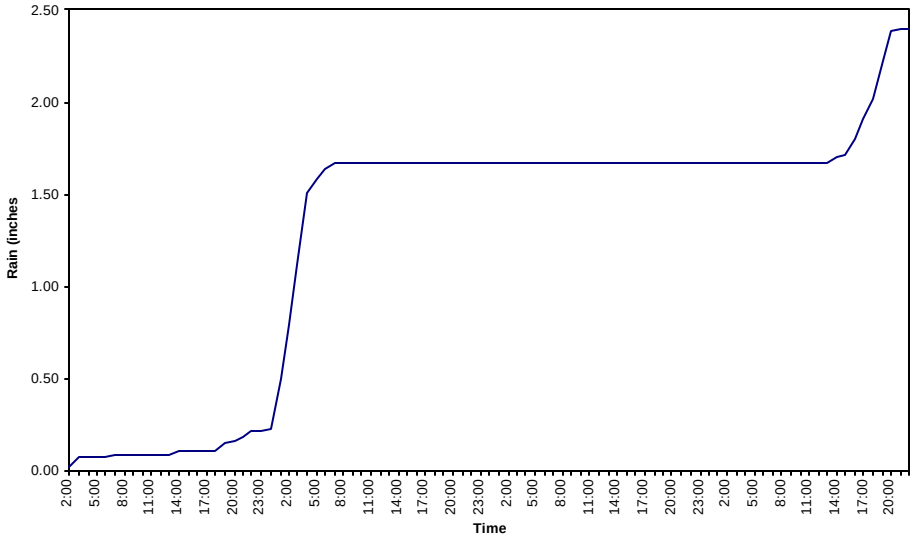
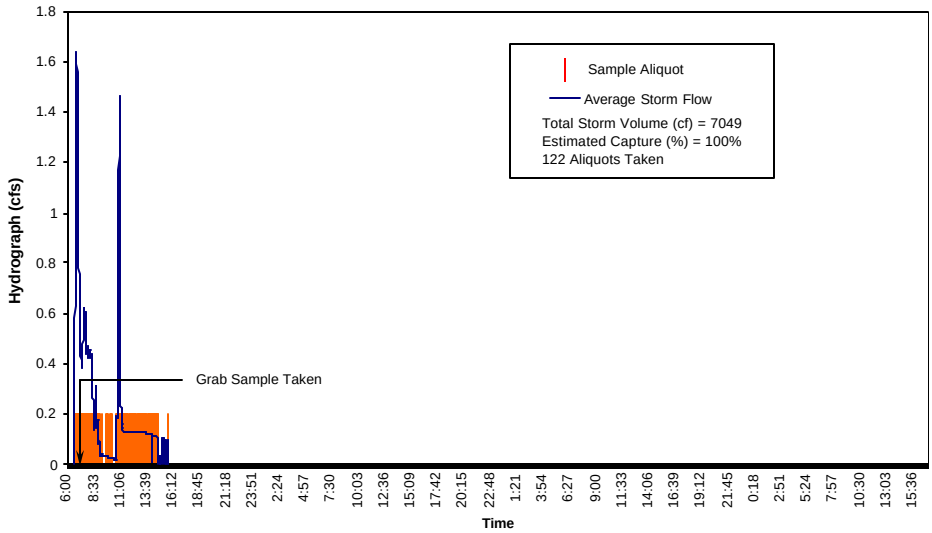
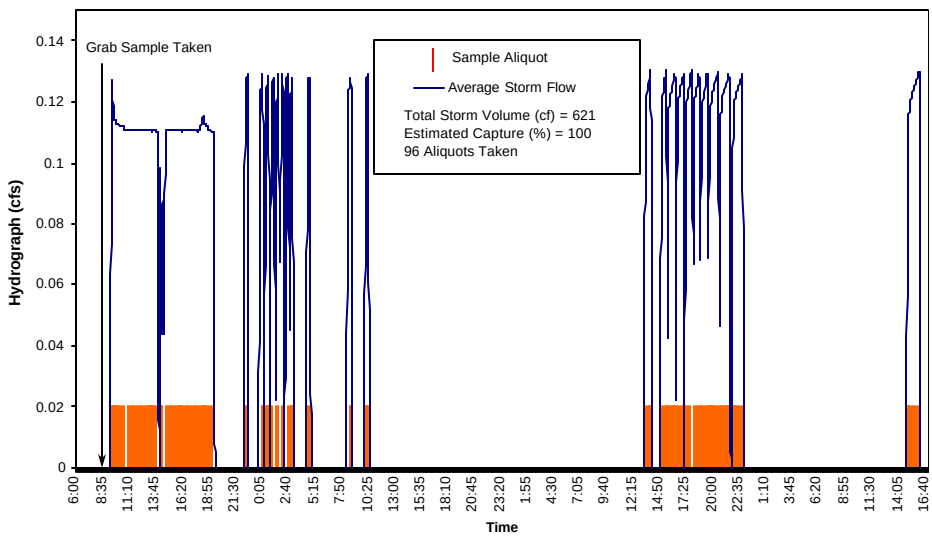


Figure 1-14a: Influent and Effluent Hydrograph, and Cumulative Rainfall at the Termination Park & Ride Sand Filter – Austin Type for Event 2 on October 26-29, 2000

Influent



Effluent



Cumulative Rainfall

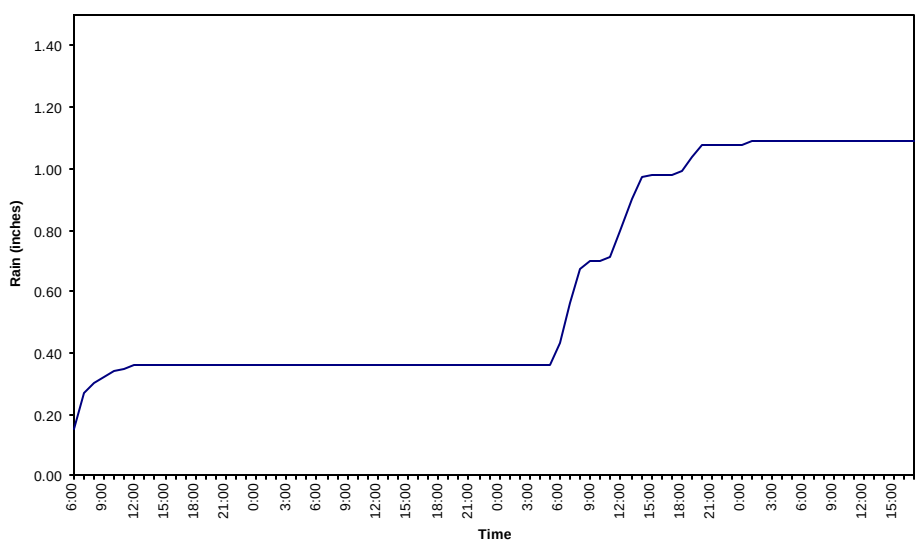
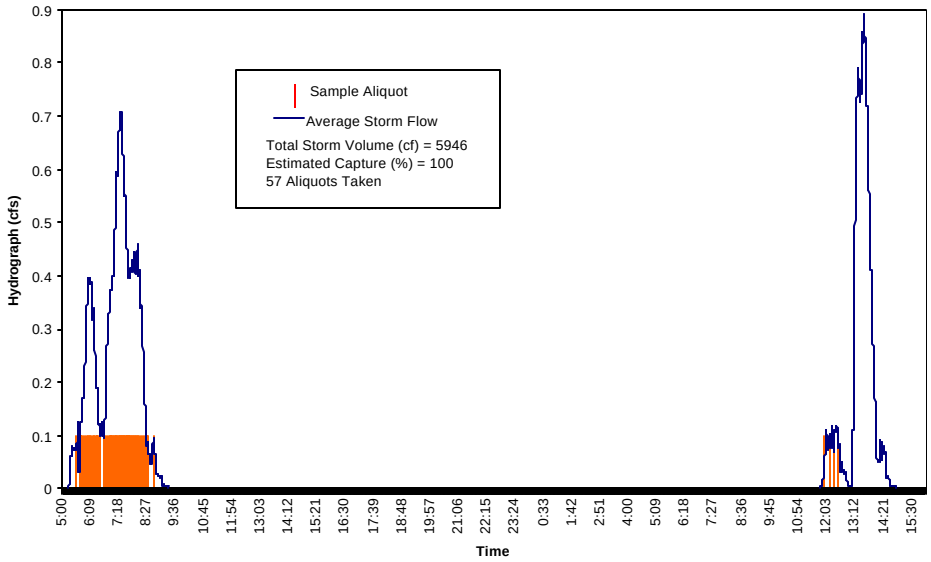
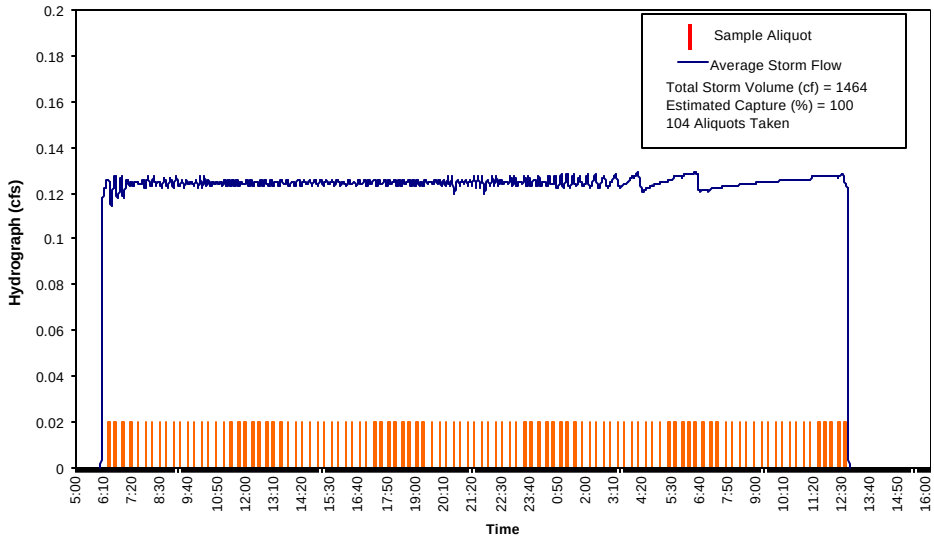


Figure 1-14b: Influent and Effluent Hydrograph, and Cumulative Rainfall at the Termination Park & Ride Sand Filter – Austin Type for Event 5 on January 24-27, 2001

Influent



Effluent



Cumulative Rainfall

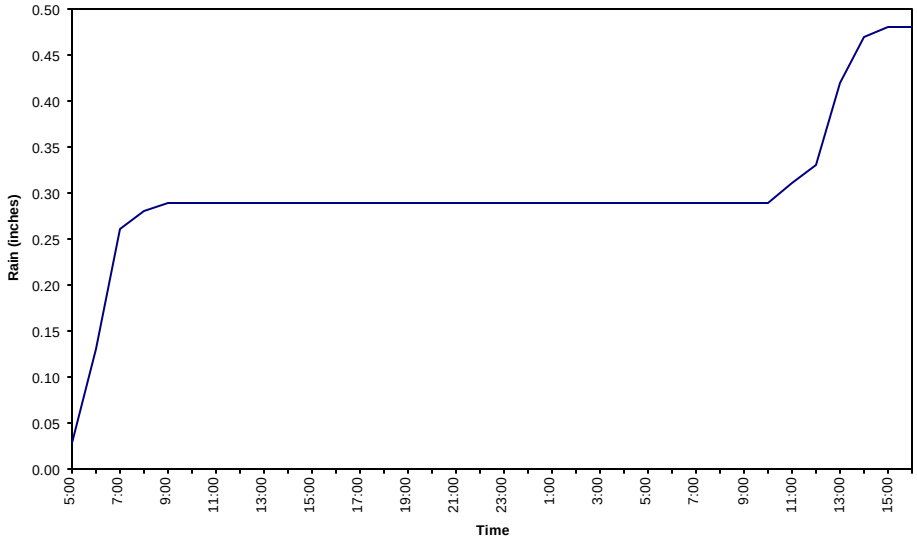
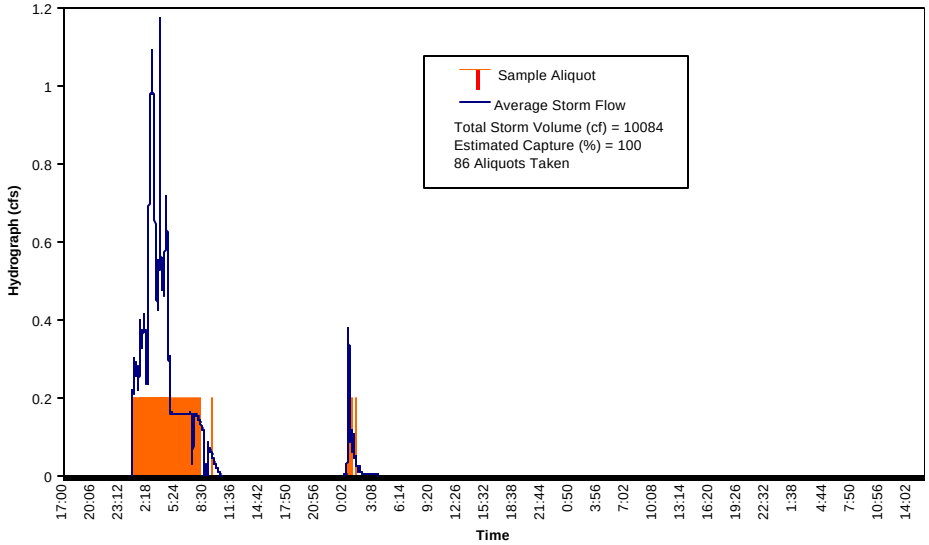
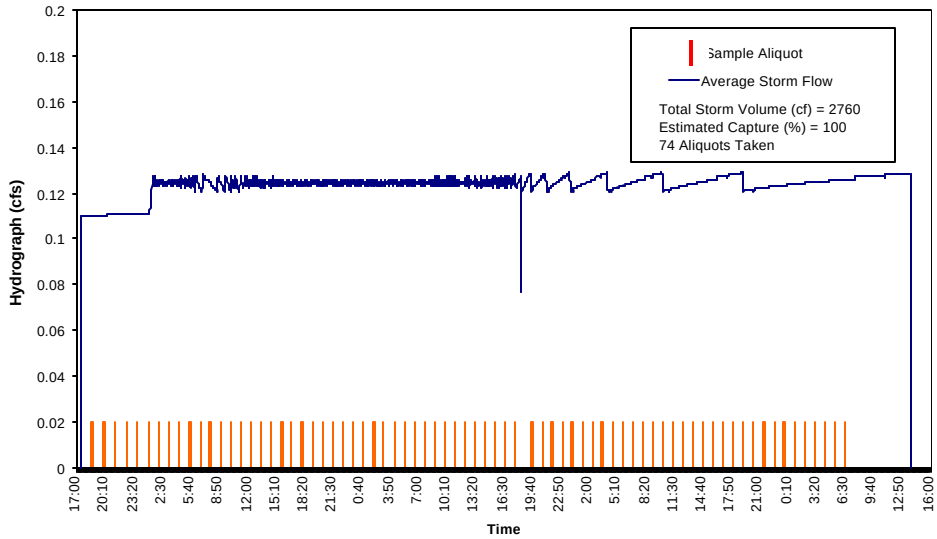


Figure 1-14c: Influent and Effluent Hydrograph, and Cumulative Rainfall at the Termination Park & Ride Sand Filter – Austin Type for Event 6 on February 10-11, 2001

Influent



Effluent



Cumulative Rainfall

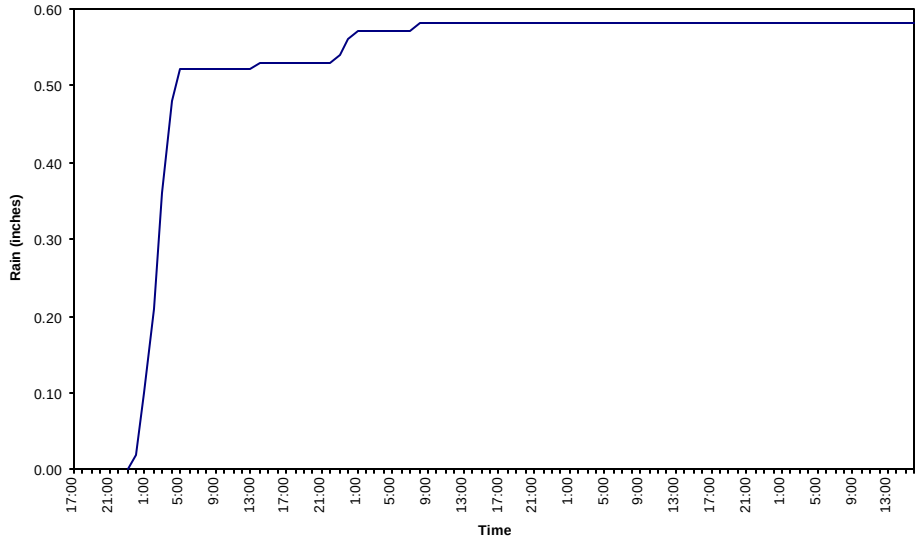
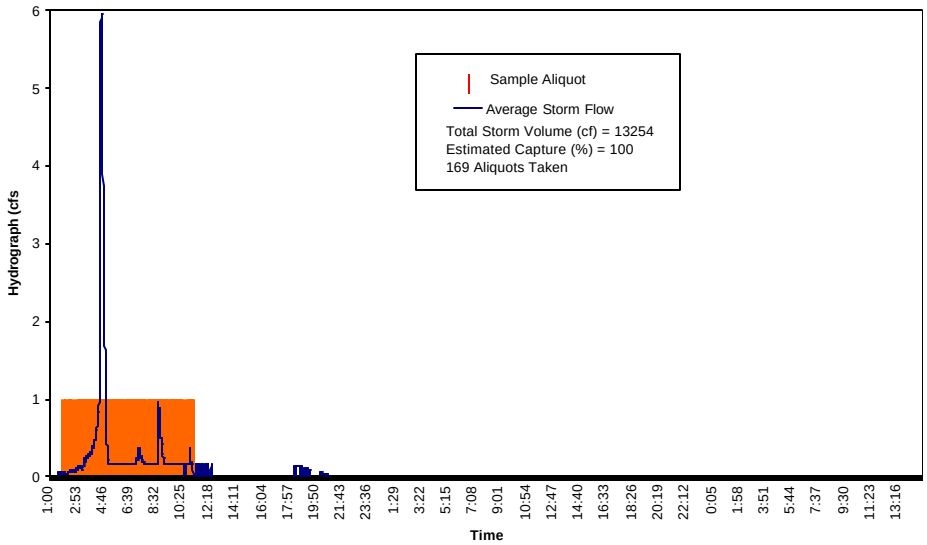
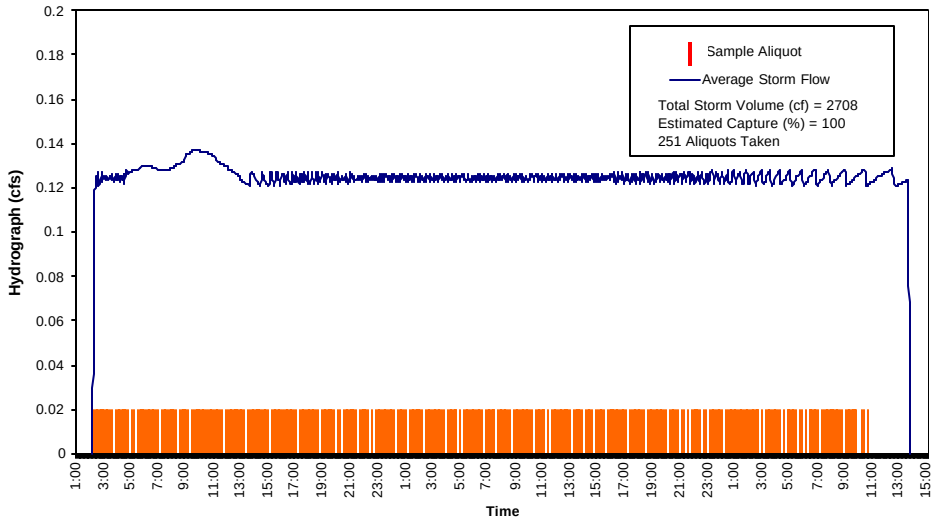


Figure 1-14d: Influent and Effluent Hydrograph, and Cumulative Rainfall at the Termination Park & Ride Sand Filter – Austin Type for Event 8 on March 5-9, 2001

Influent



Effluent



Cumulative Rainfall

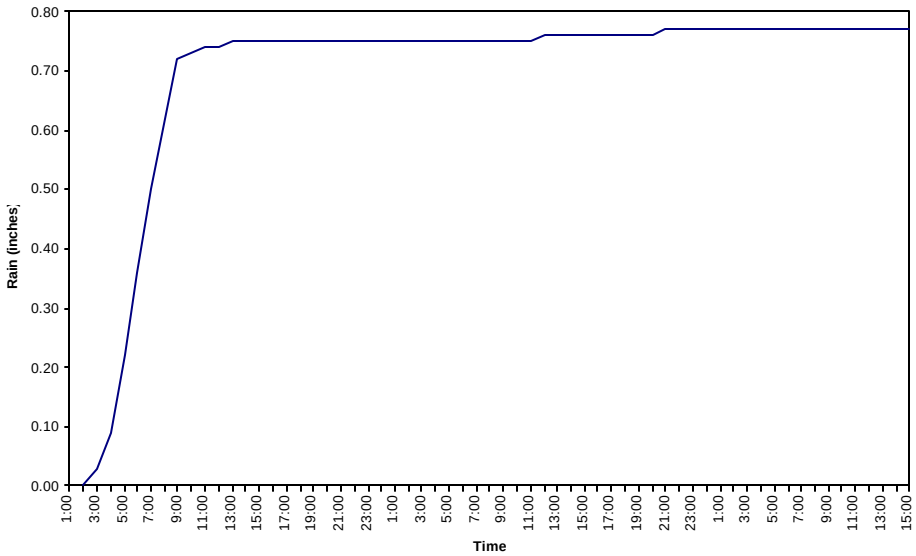
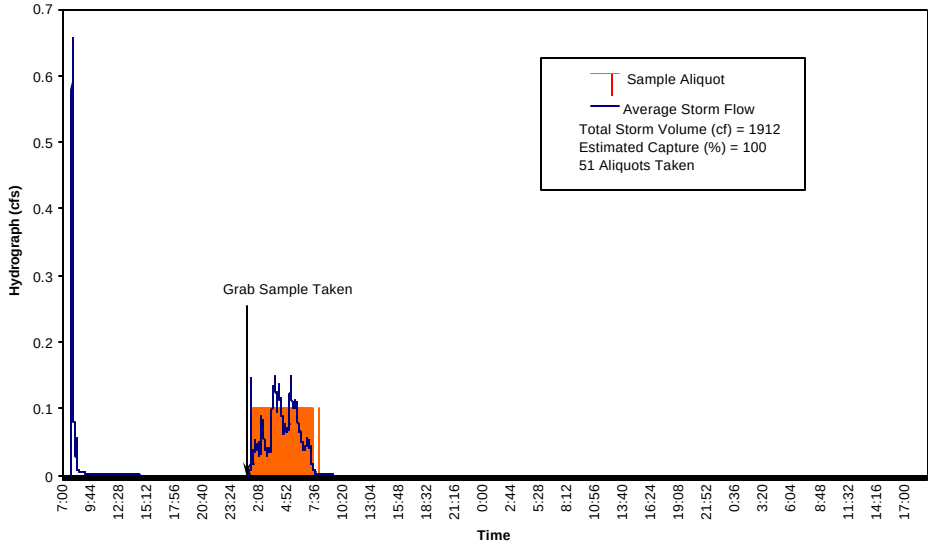
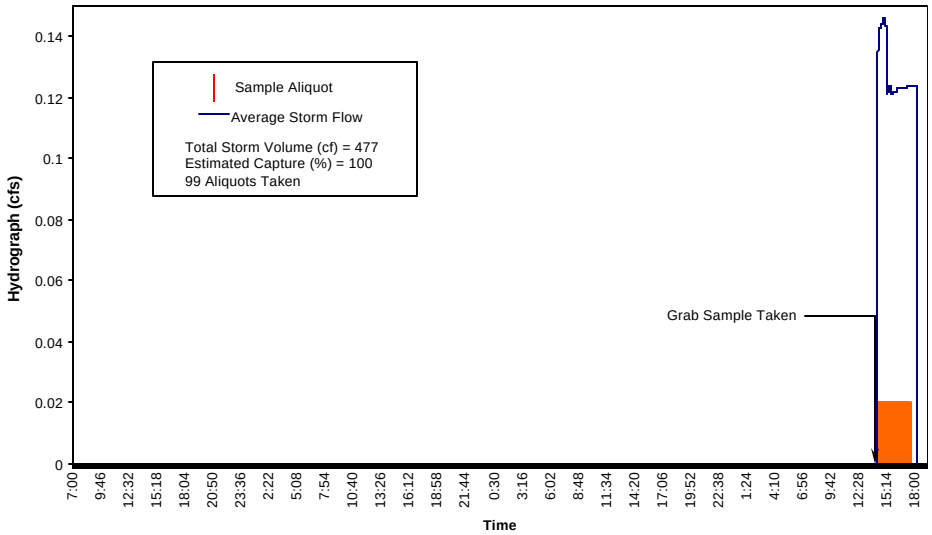


Figure 1-14e: Influent and Effluent Hydrograph, and Cumulative Rainfall at the Termination Park & Ride Sand Filter – Austin Type for Event 9 on April 7-9, 2001

Influent



Effluent



Cumulative Rainfall

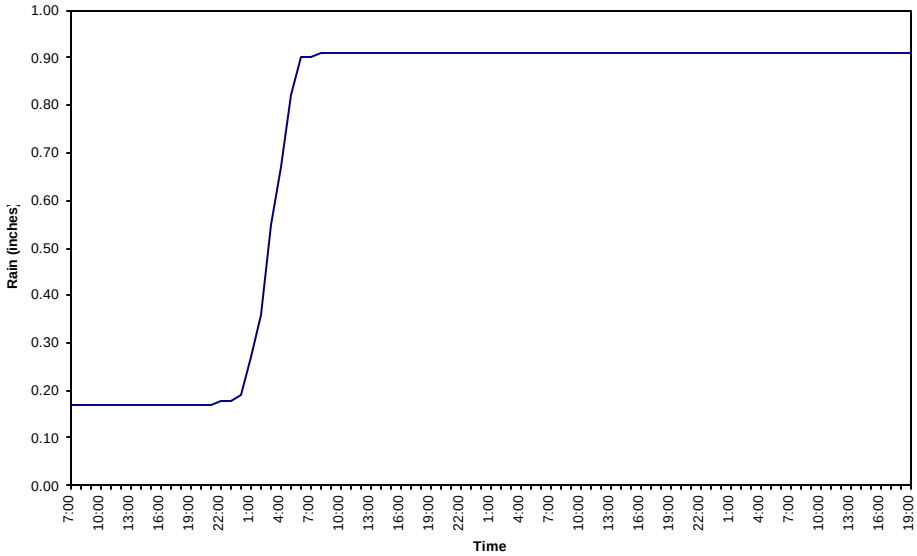
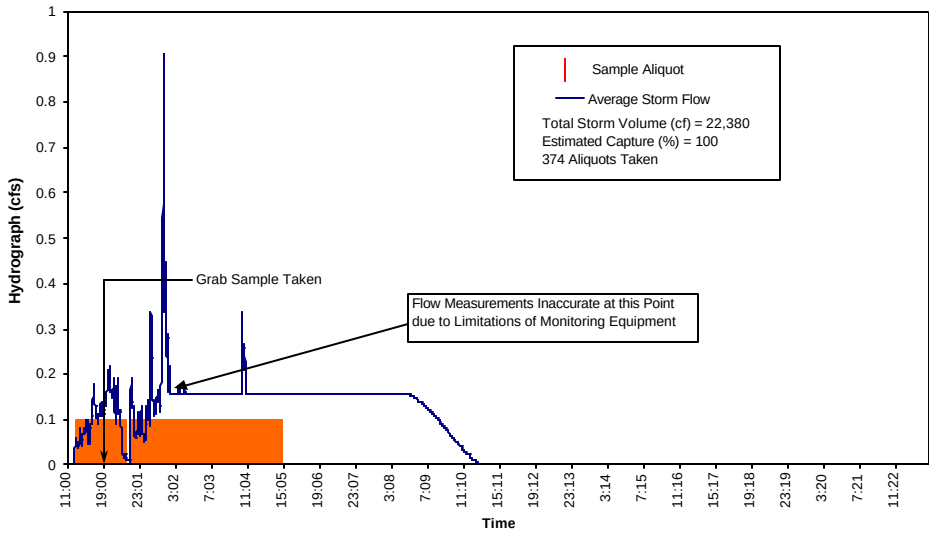
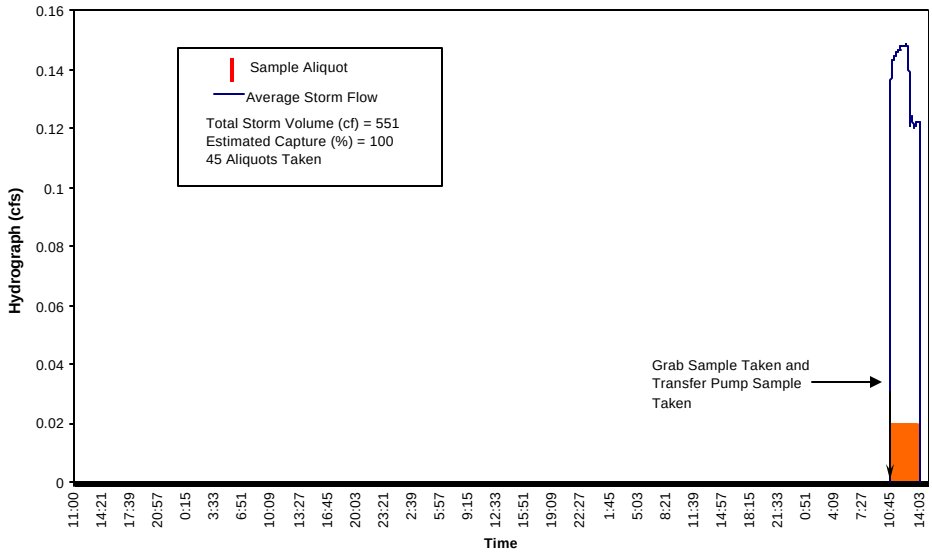


Figure 1-15a: Influent and Effluent Hydrograph, and Cumulative Rainfall at the Via Verde Park & Ride Multi-chambered Treatment Train for Event 2 on October 26-29, 2000

Influent



Effluent



Cumulative Rainfall

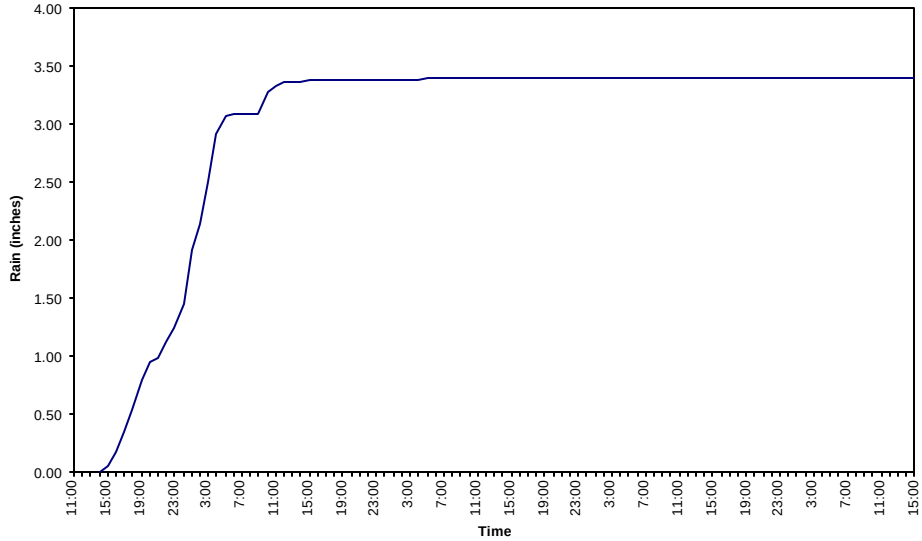
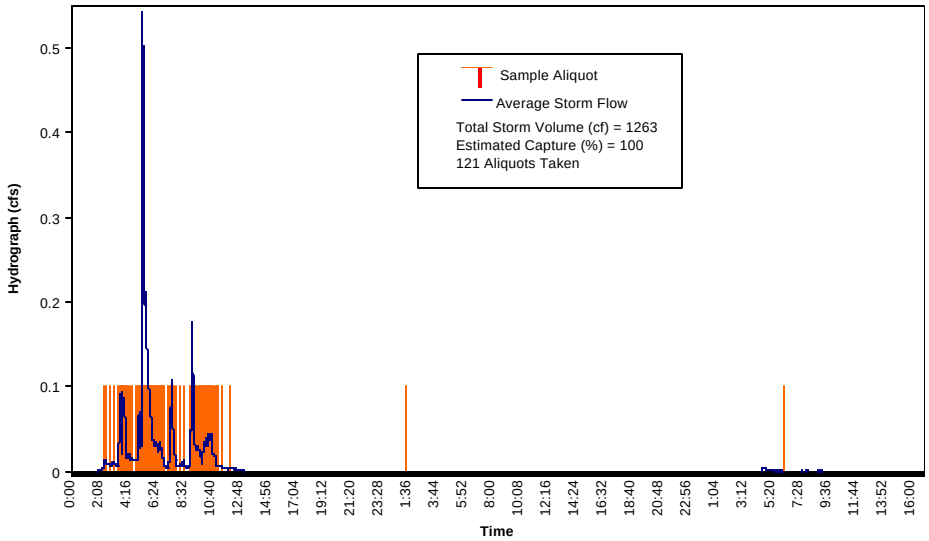
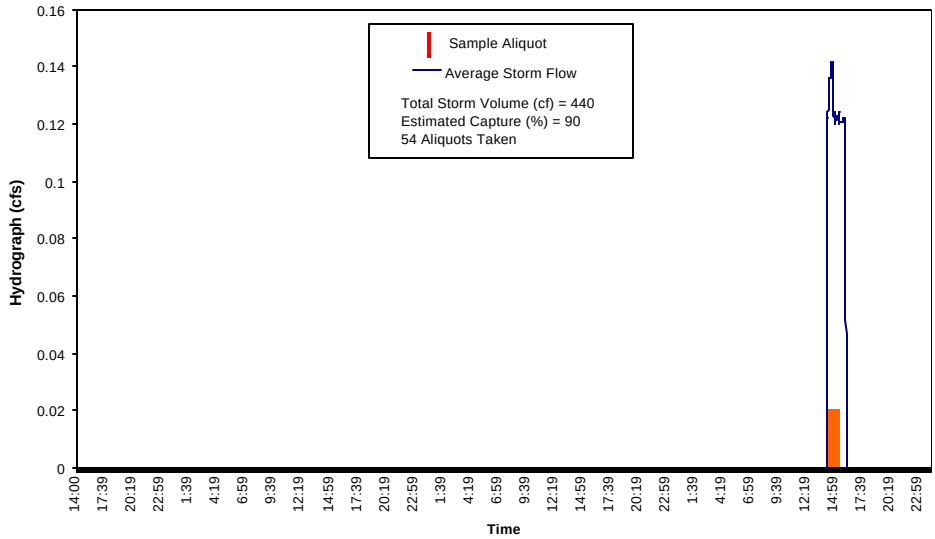


Figure 1-15b: Influent and Effluent Hydrograph, and Cumulative Rainfall at the Via Verde Park & Ride Multi-chambered Treatment Train for Event 4 on January 10-14, 2001

Influent



Effluent



Cumulative Rainfall

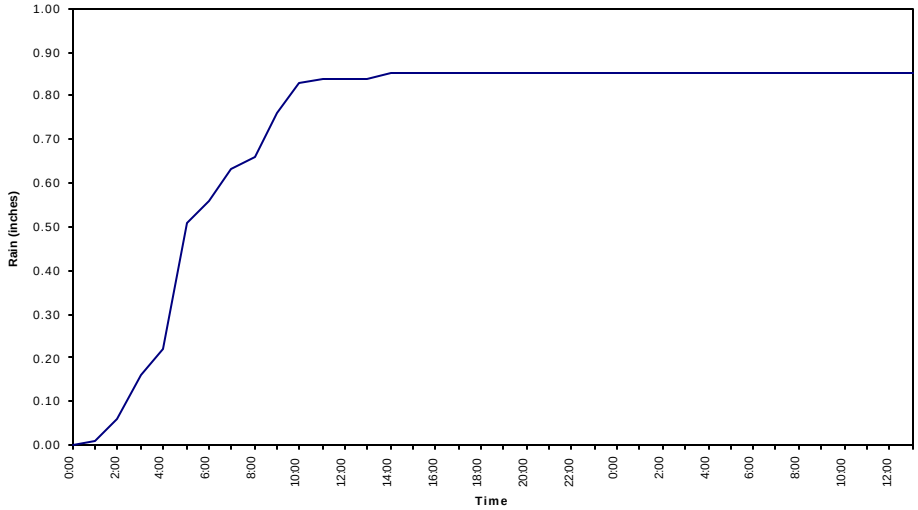
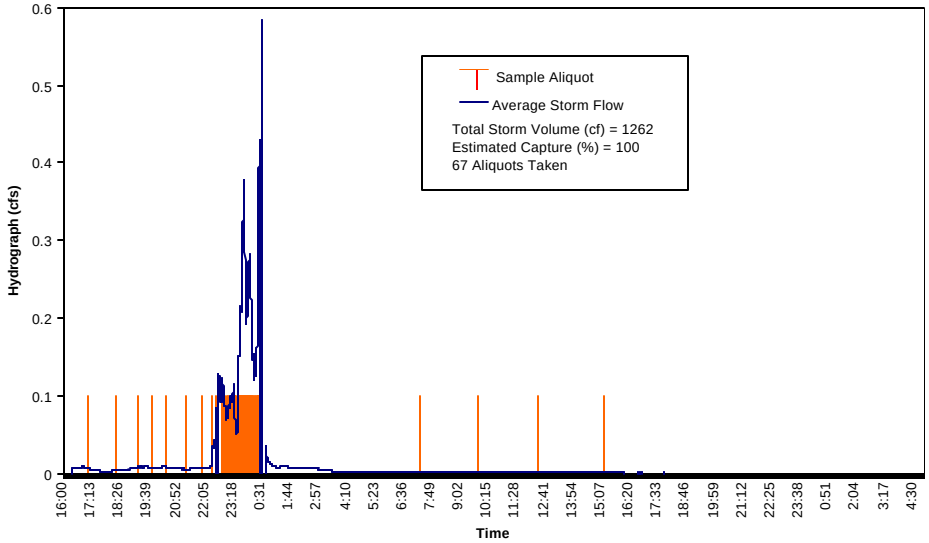
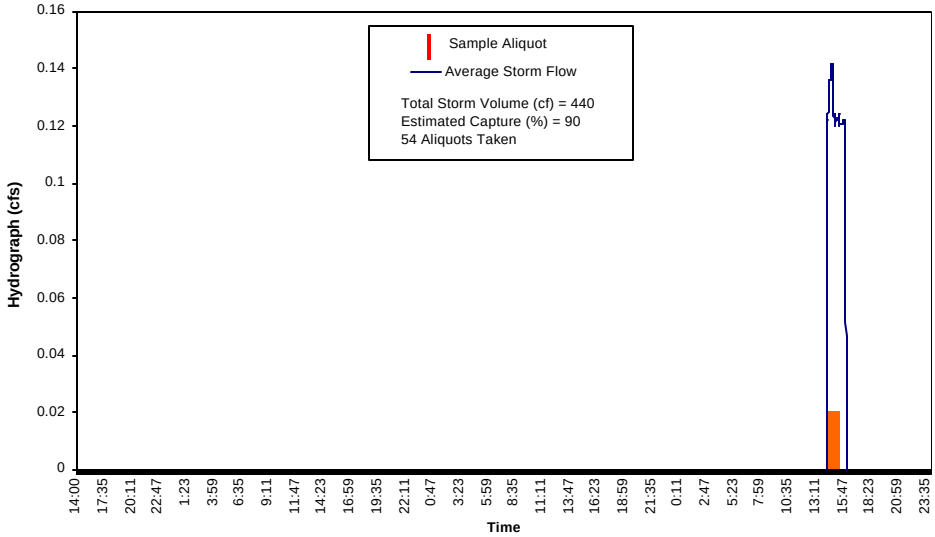


Figure 1-15c: Influent and Effluent Hydrograph, and Cumulative Rainfall at the Via Verde Park & Ride Multi-chambered Treatment Train for Event 9 on April 7-9, 2001

Influent



Effluent



Cumulative Rainfall

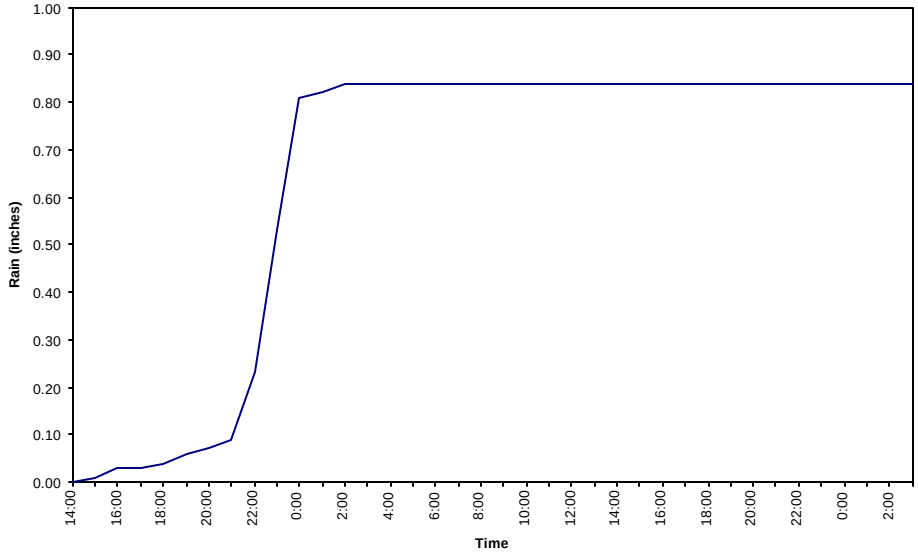
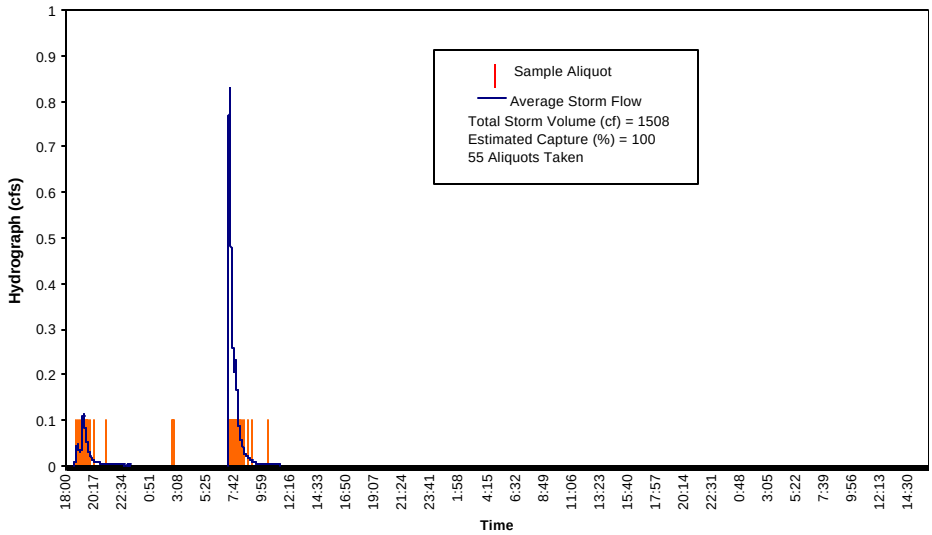
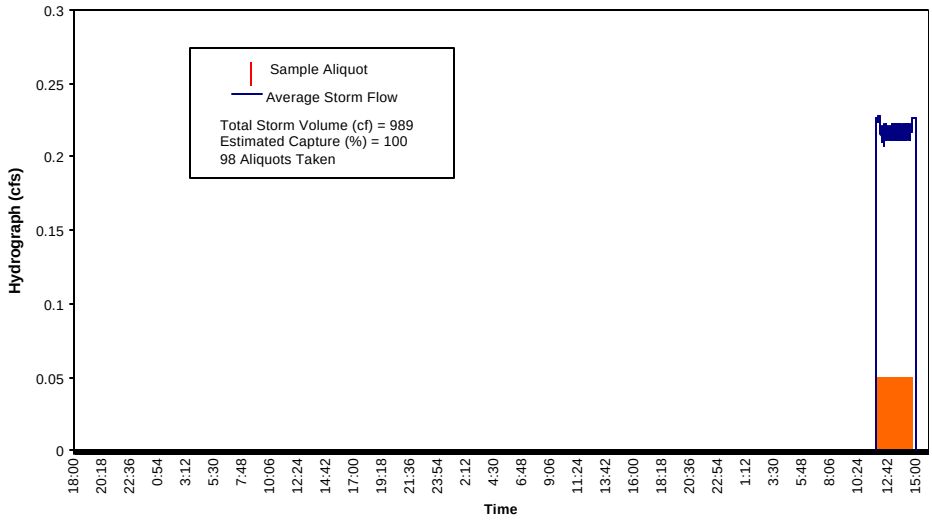


Figure 1-15d: Influent and Effluent Hydrograph, and Cumulative Rainfall at the Via Verde Park & Ride Multi-chambered Treatment Train for Event 10 on April 20-23, 2001

Influent



Effluent



Cumulative Rainfall

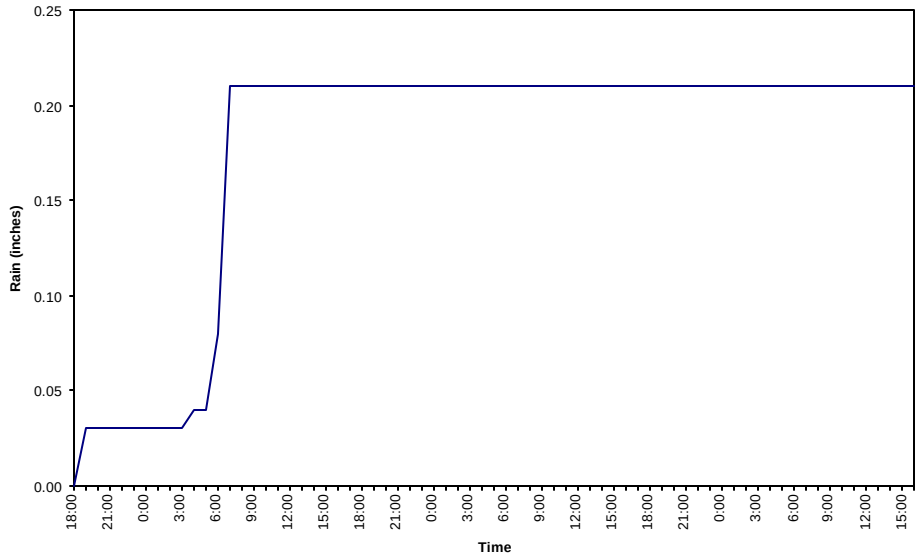
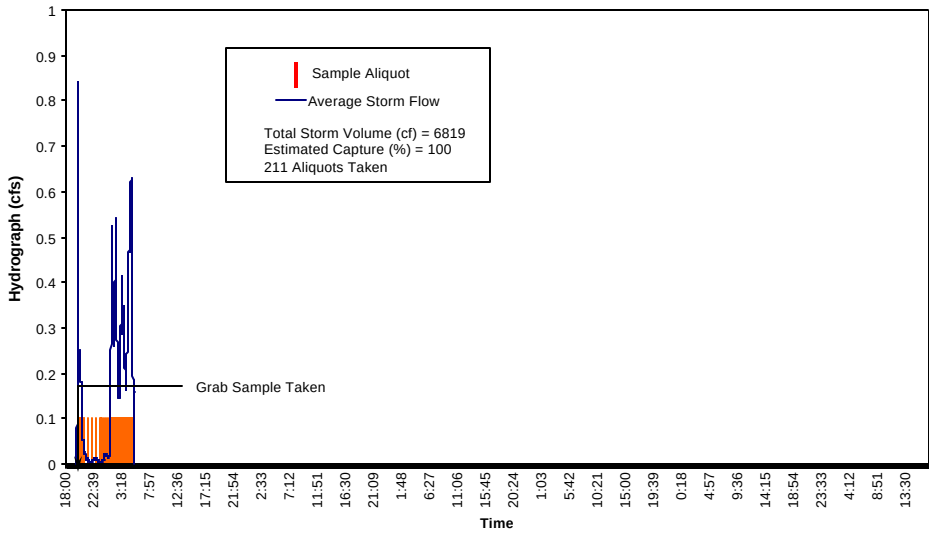
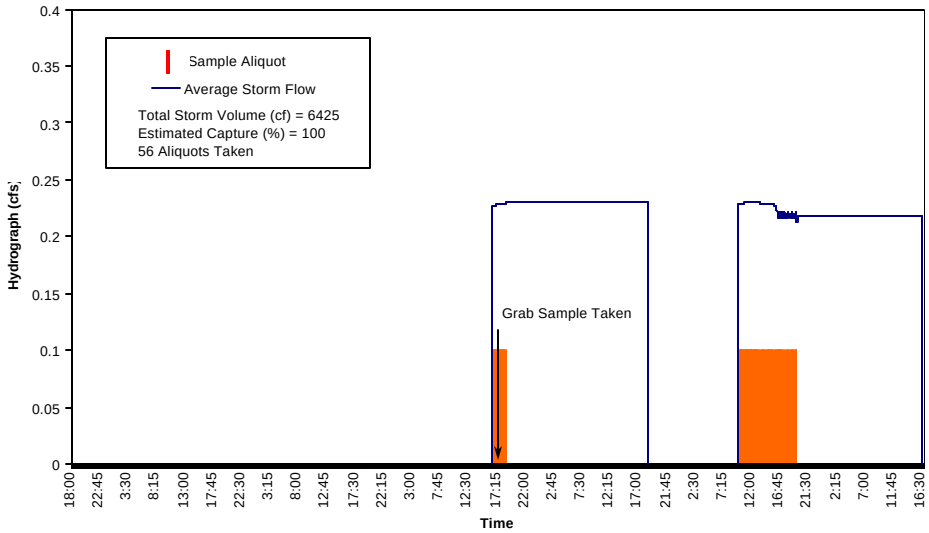


Figure 1-16a: Influent and Effluent Hydrograph, and Cumulative Rainfall at the Lakewood Park & Ride Multi-chambered Treatment Train for Event 1 on October 10-13, 2000

Influent



Effluent



Cumulative Rainfall

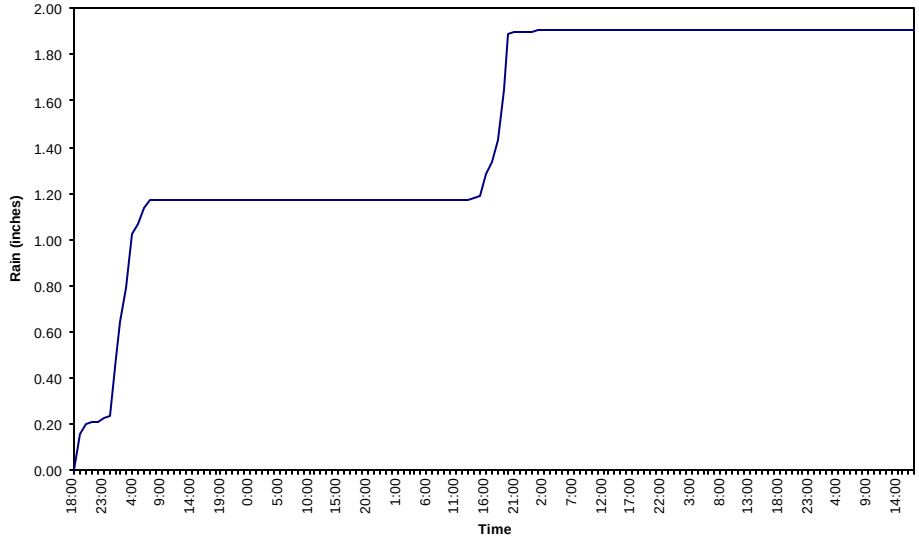
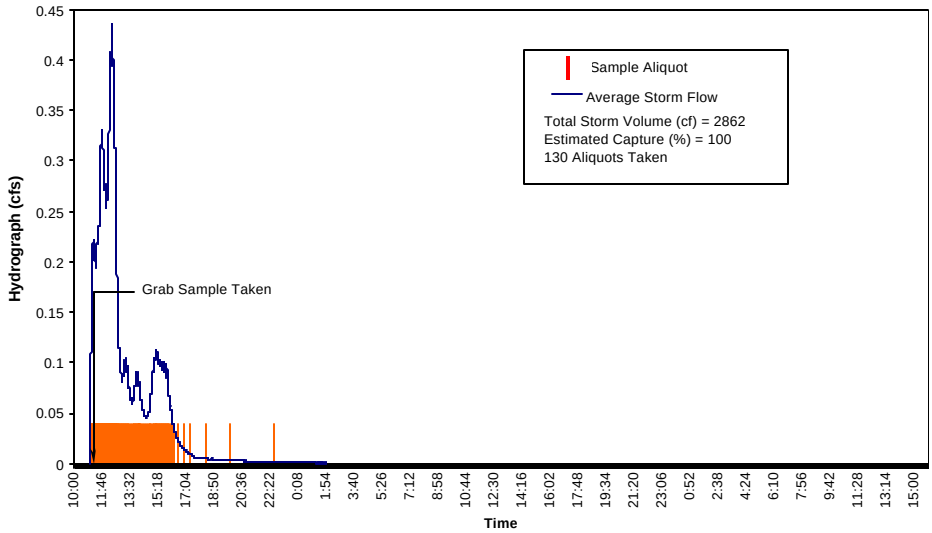
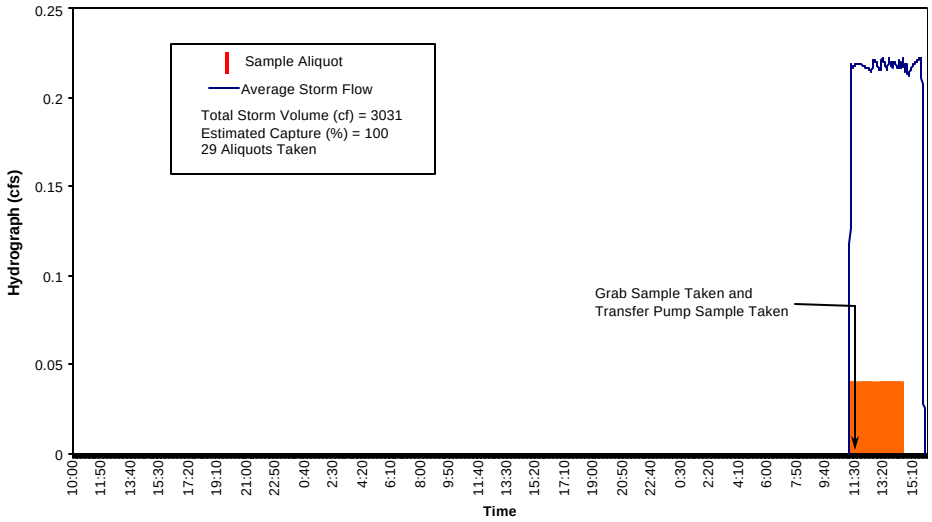


Figure 1-16b: Influent and Effluent Hydrograph, and Cumulative Rainfall at the Lakewood Park & Ride Multi-chambered Treatment Train for Event 2 on October 26-October 31, 2000

Influent



Effluent



Cumulative Rainfall

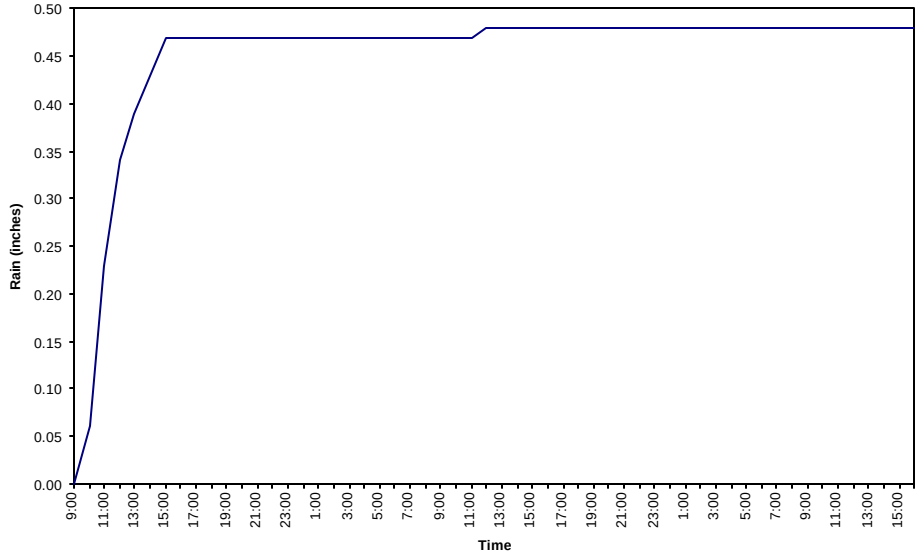
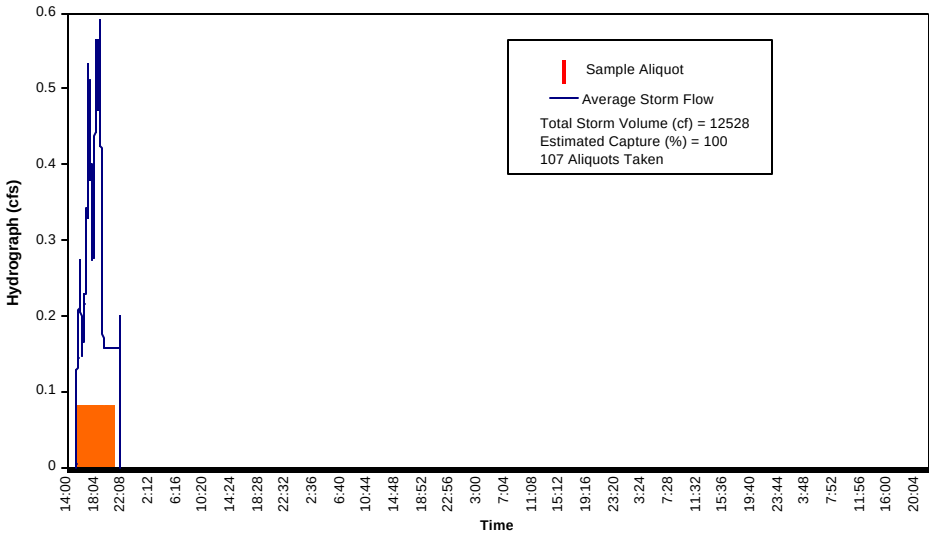
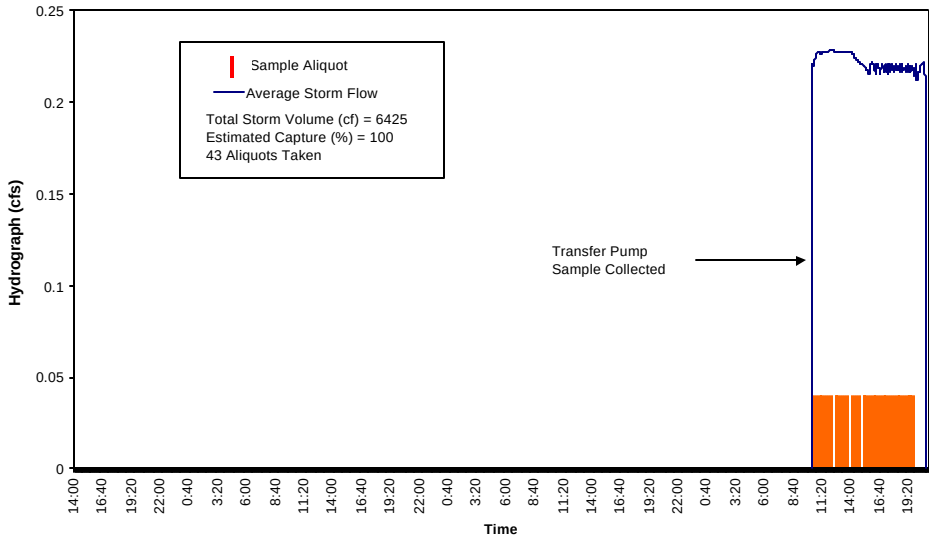


Figure 1-16c: Influent and Effluent Hydrograph, and Cumulative Rainfall at the Lakewood Park & Ride Multi-chambered Treatment Train for Event 3 on January 8-10, 2001

Influent



Effluent



Cumulative Rainfall

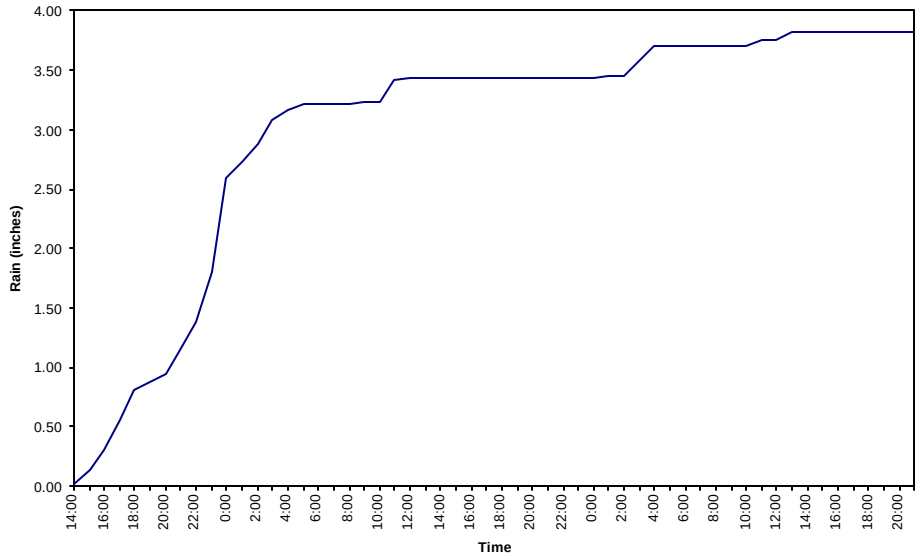
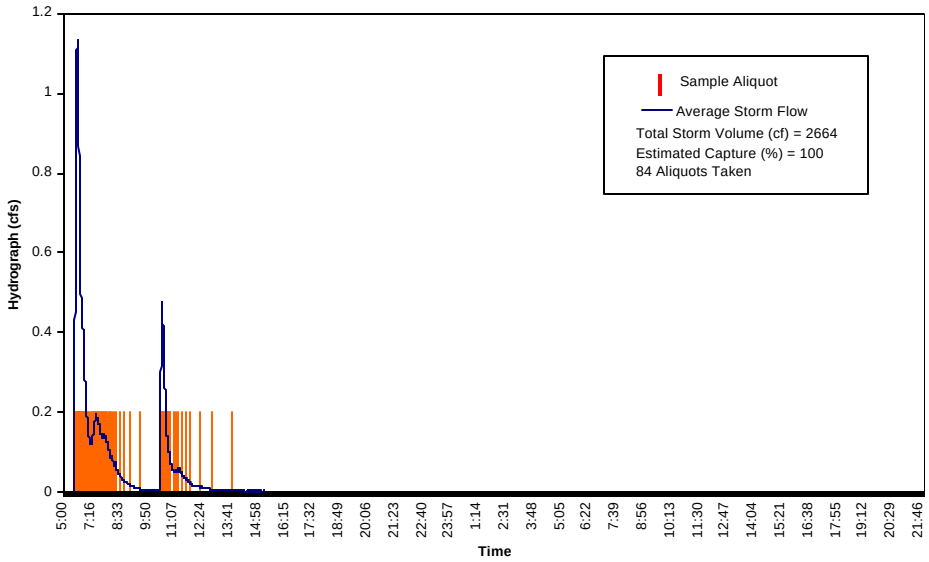
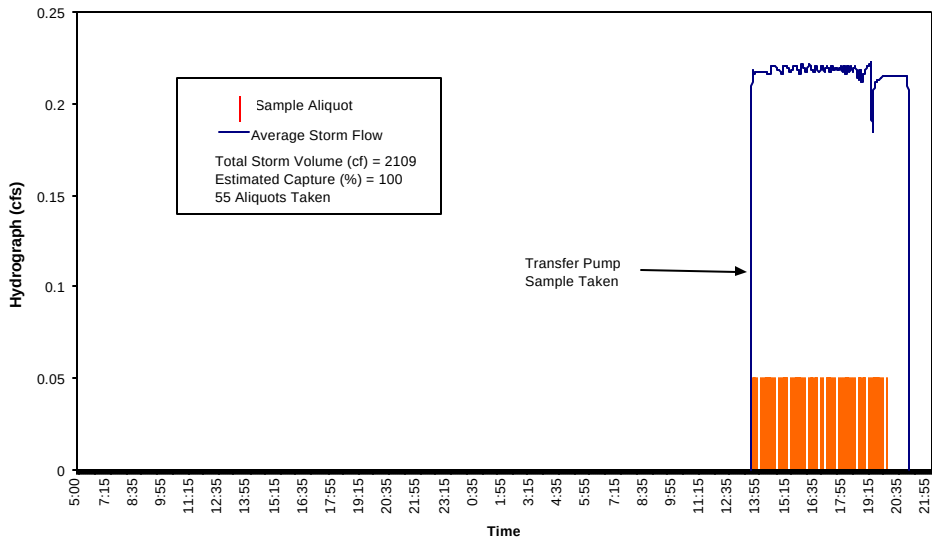


Figure 1-16d: Influent and Effluent Hydrograph, and Cumulative Rainfall at the Lakewood Park & Ride Multi-chambered Treatment Train for Event 4 on January 10-13, 2001

Influent



Effluent



Cumulative Rainfall

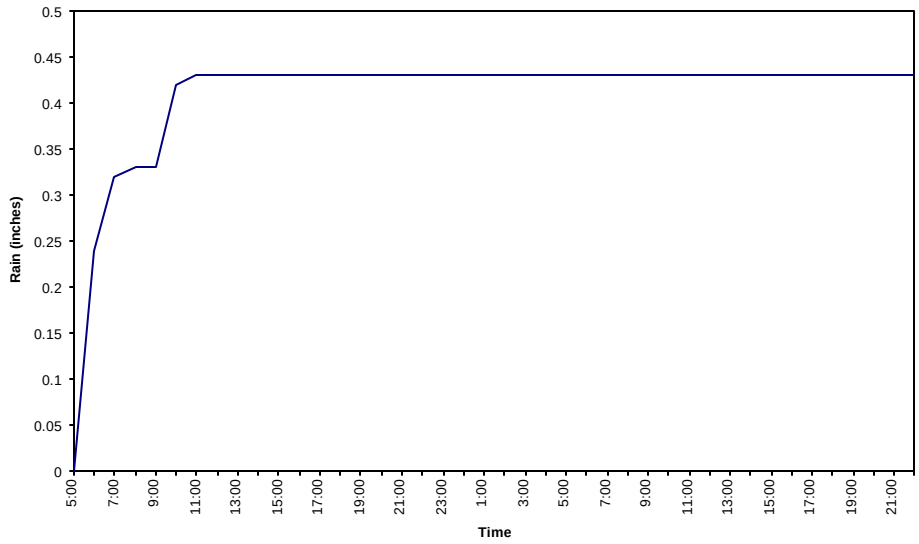
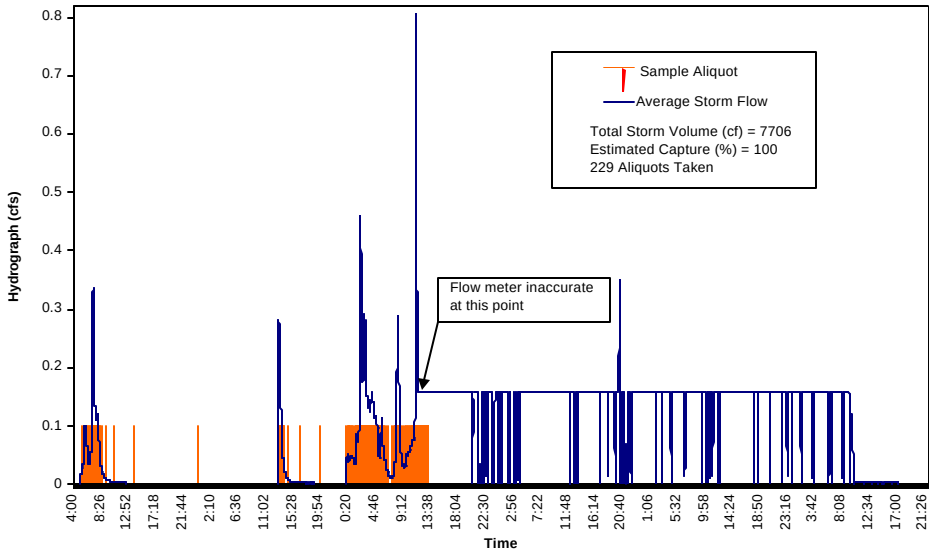
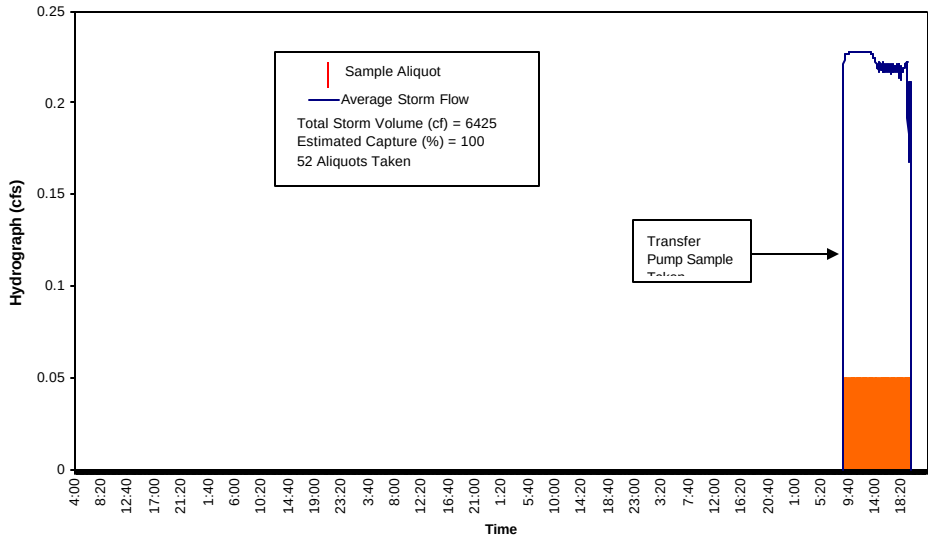


Figure 1-16e: Influent and Effluent Hydrograph, and Cumulative Rainfall at the Lakewood Park & Ride Multi-chambered Treatment Train for Event 5 on January 24-25, 2001

Influent



Effluent



Cumulative Rainfall

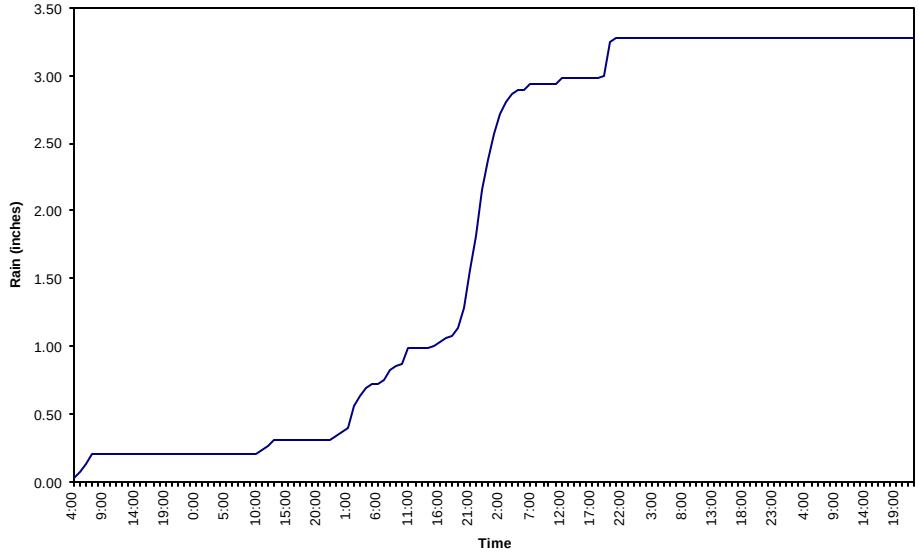
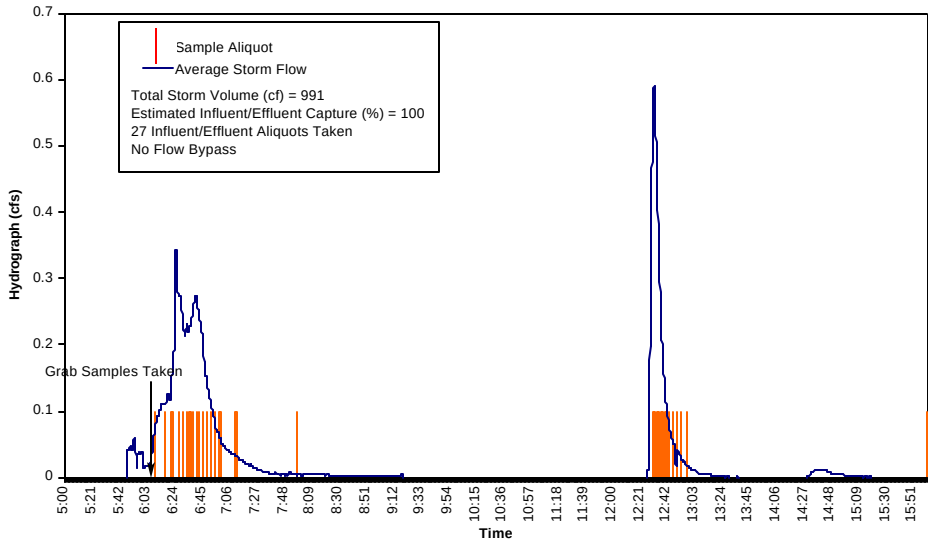
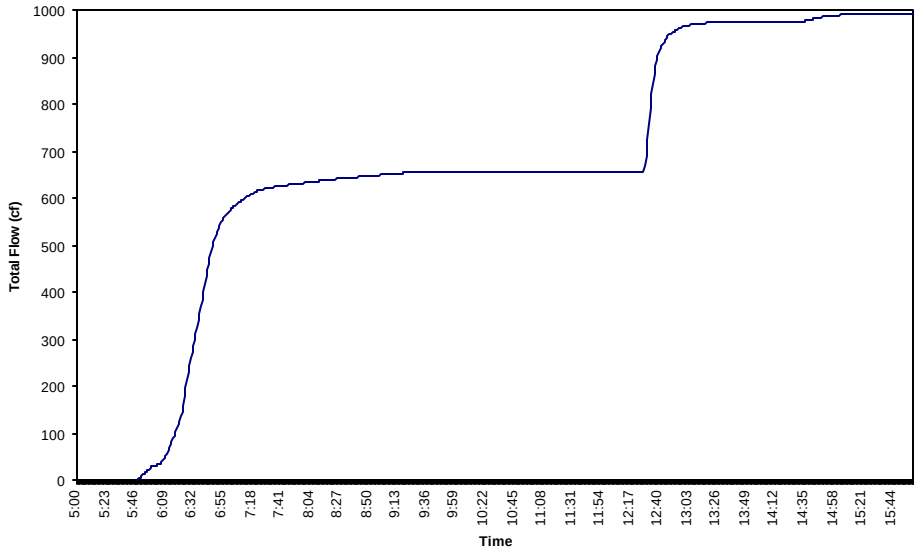


Figure 1-16f: Influent and Effluent Hydrograph, and Cumulative Rainfall at the Lakewood Park & Ride Multi-chambered Treatment Train for Event 6 on February 10-15, 2001

Effluent



Cumulative Flow



Cumulative Rainfall

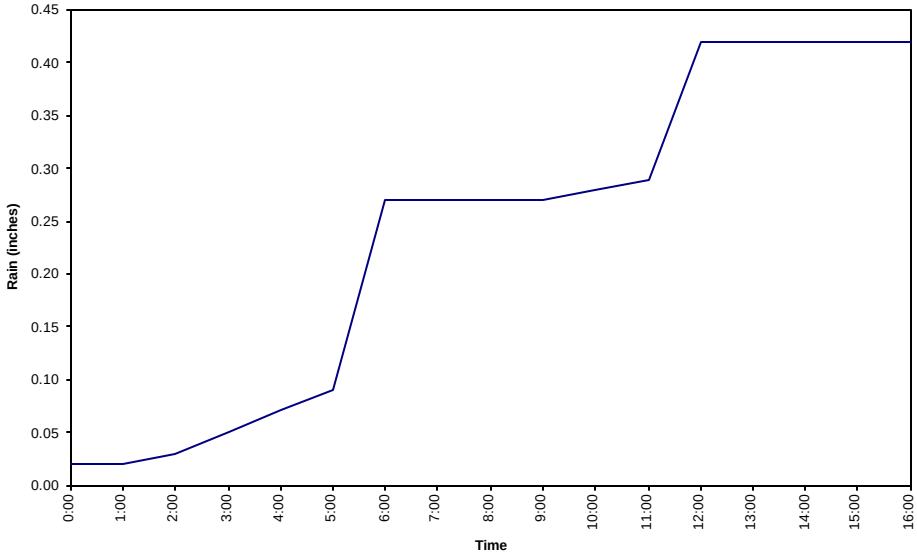
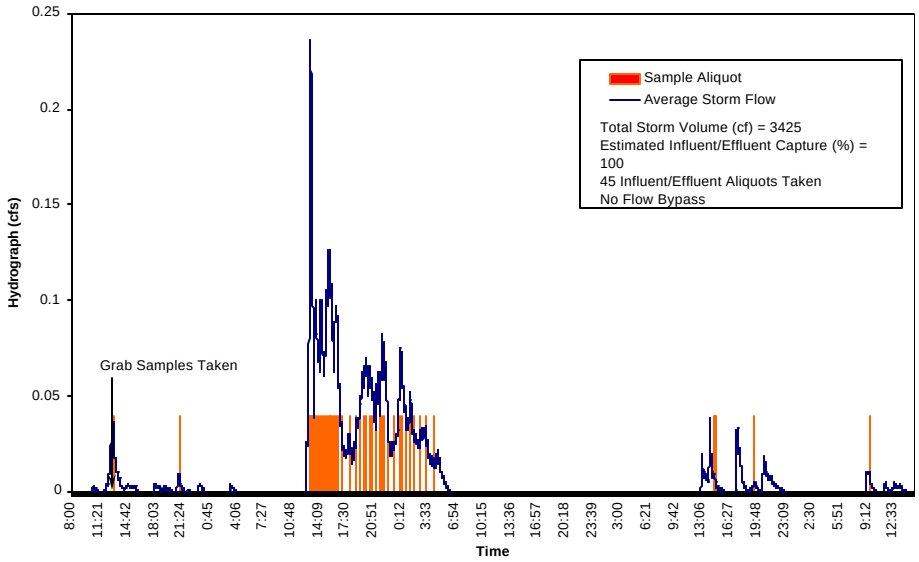
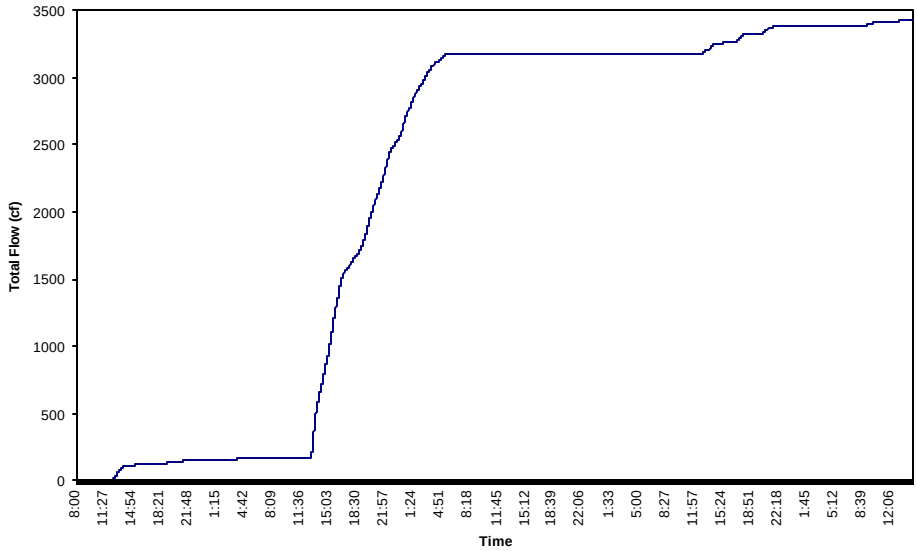


Figure 1-17a: Effluent Hydrograph, Cumulative Flow, and Cumulative Rainfall at the Orcas Avenue CDS Unit for Event 6 on February 10, 2001

Effluent



Cumulative Flow



Cumulative Rainfall

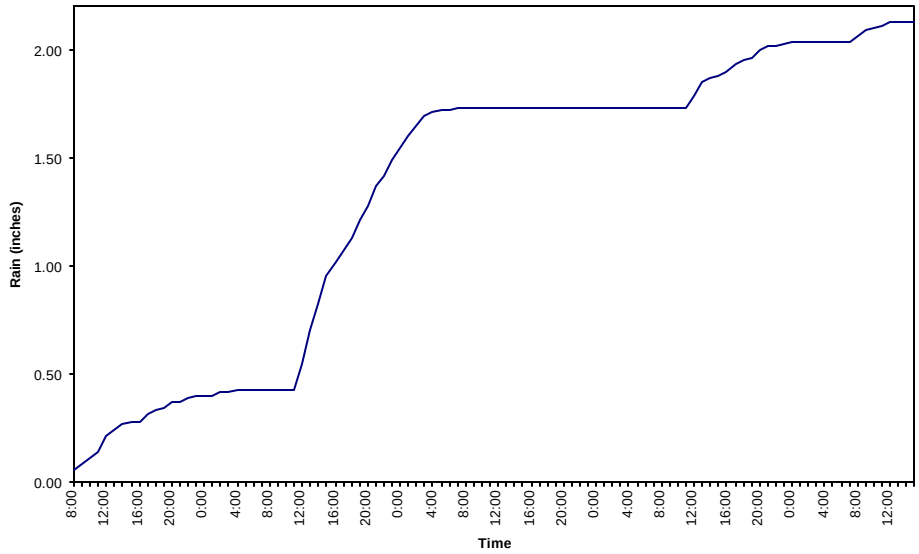
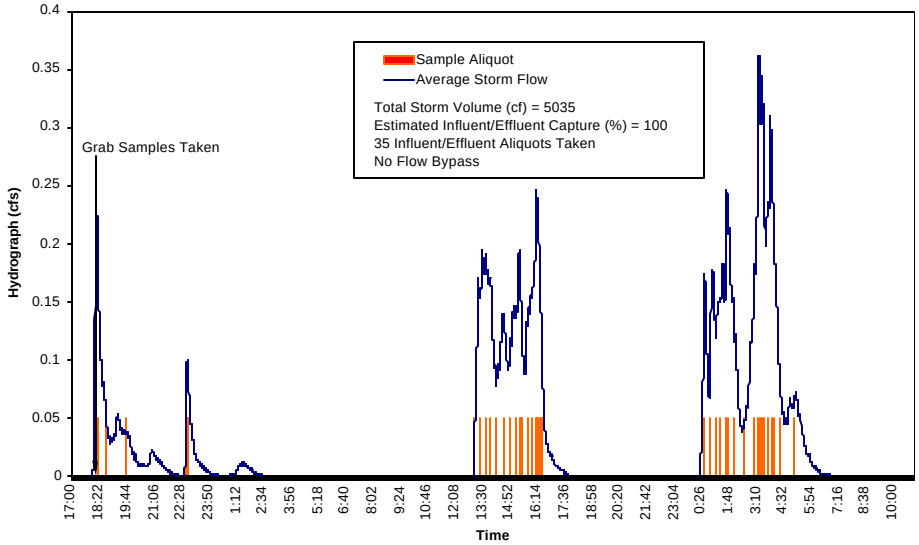
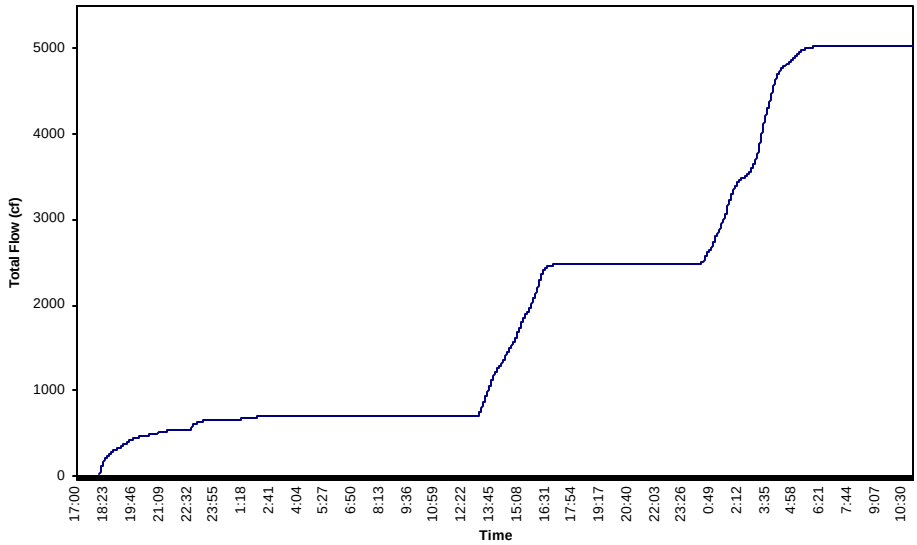


Figure 1-17b: Effluent Hydrograph, Cumulative Flow, and Cumulative Rainfall at the Orcas Avenue CDS Unit for Event 7 on February 24-28, 2001

Effluent



Cumulative Flow



Cumulative Rainfall

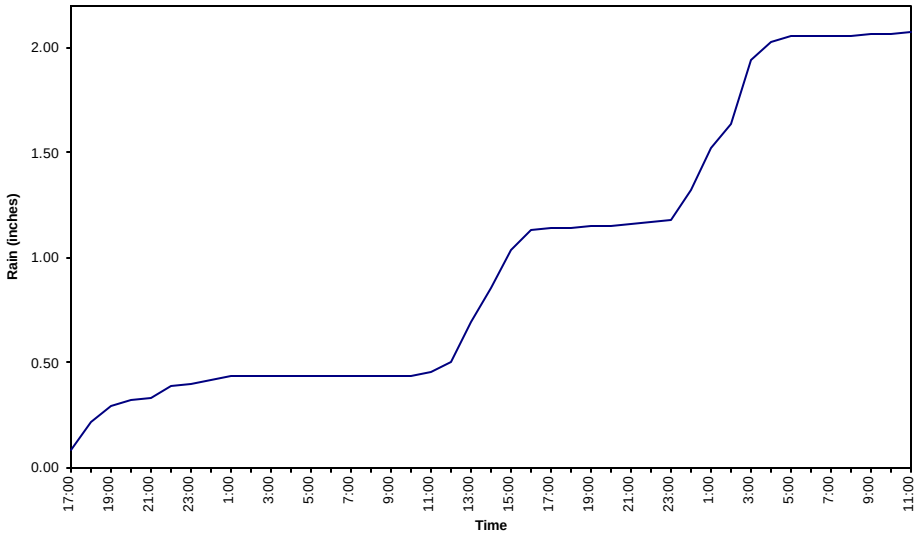
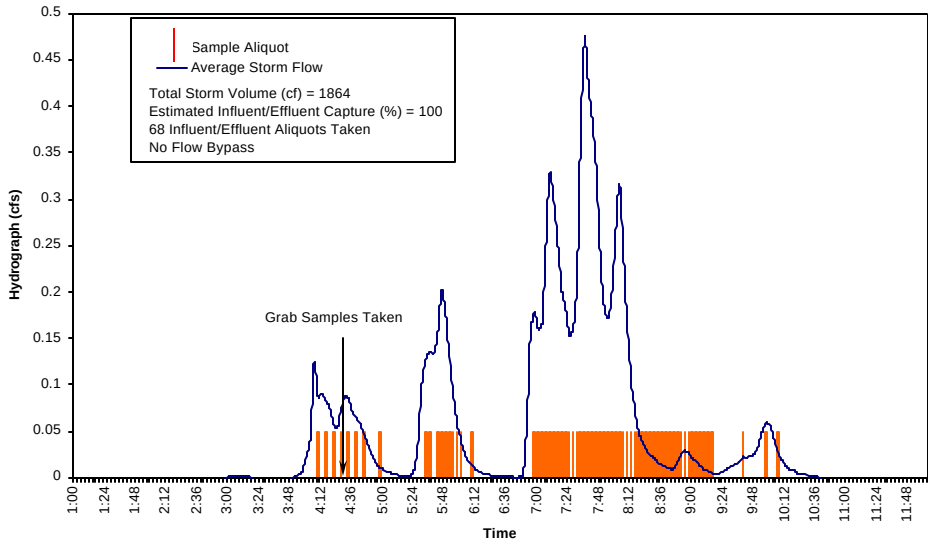
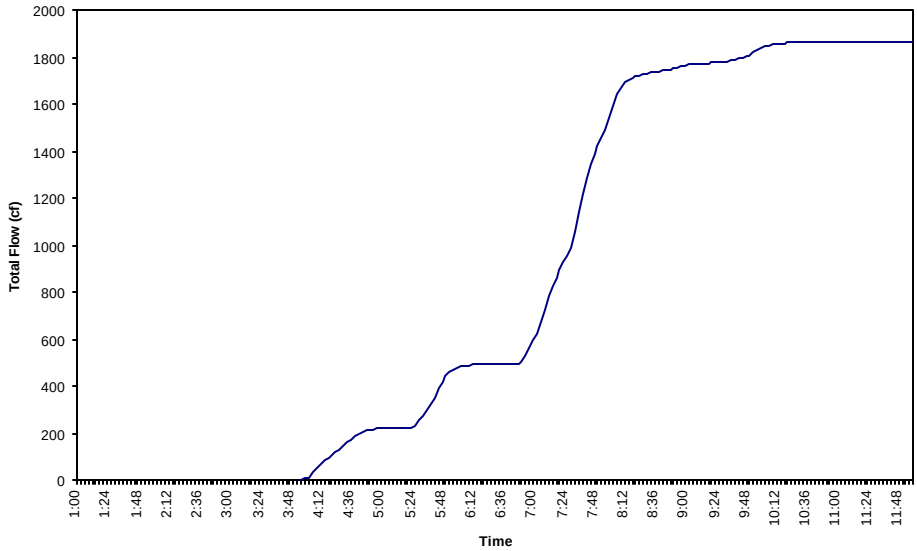


Figure 1-17c: Effluent Hydrograph, Cumulative Flow, and Cumulative Rainfall at the Orcas Avenue CDS Unit for Event 8 on March 4-6, 2001

Effluent



Cumulative Flow



Cumulative Rainfall

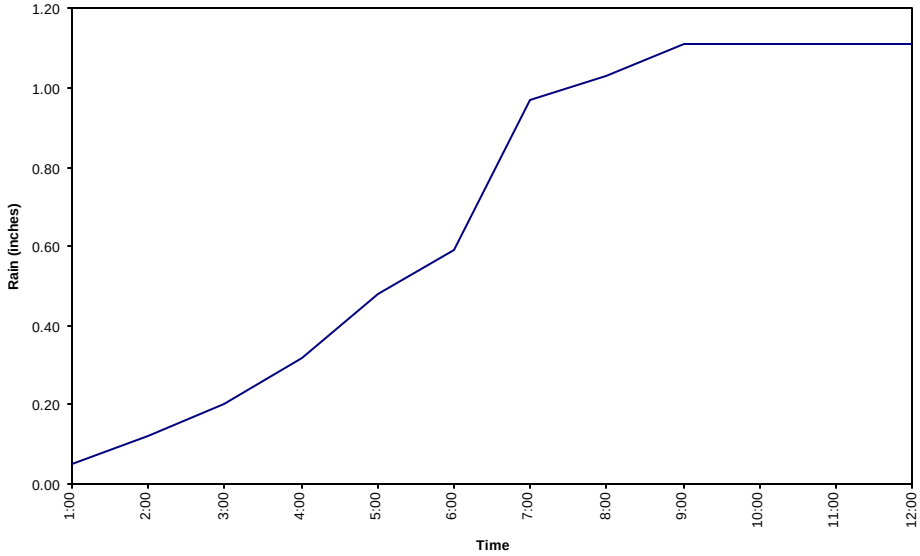
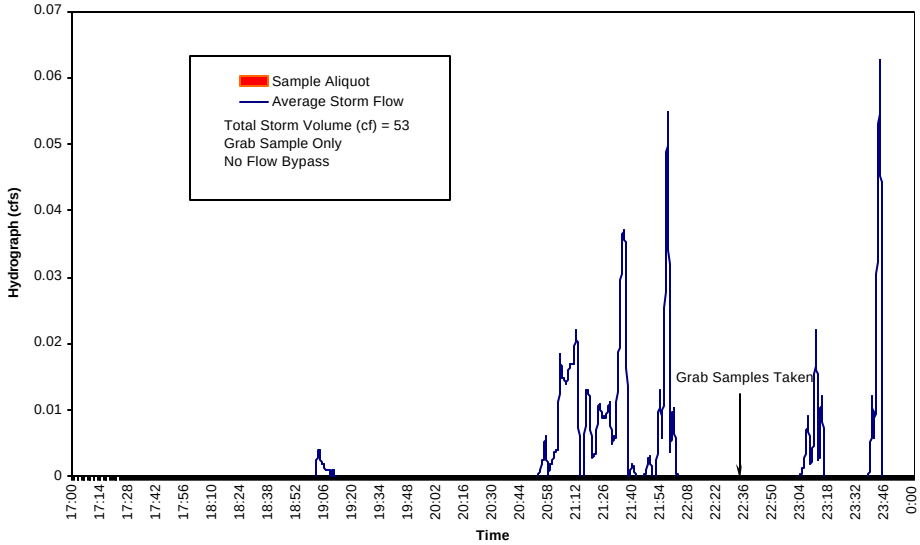
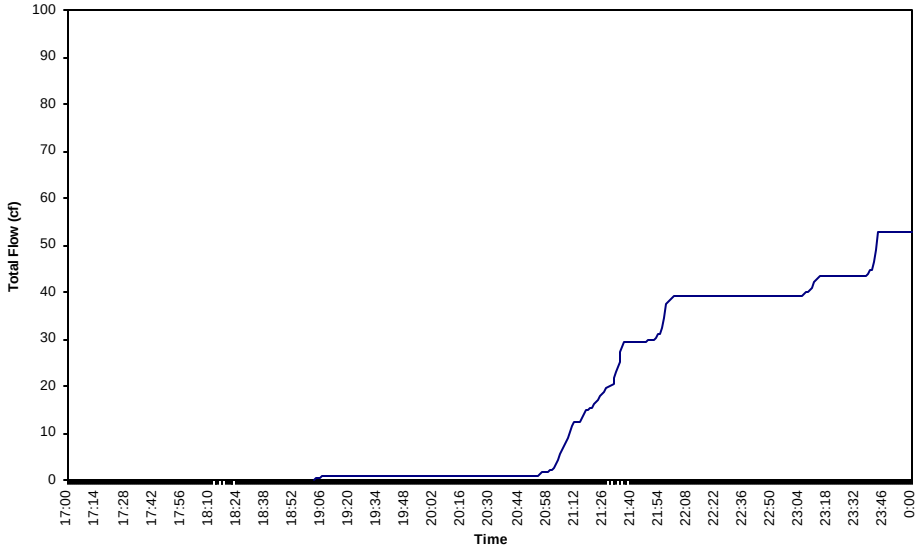


Figure 1-17d: Effluent Hydrograph, Cumulative Flow, and Cumulative Rainfall at the Orcas Avenue CDS Unit for Event 9 on April 7, 2001

Effluent



Cumulative Flow



Cumulative Rainfall

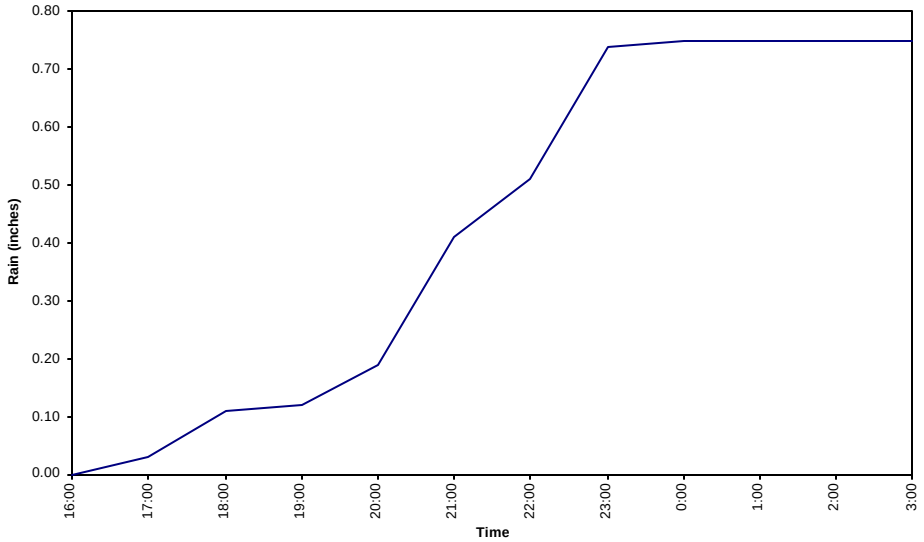
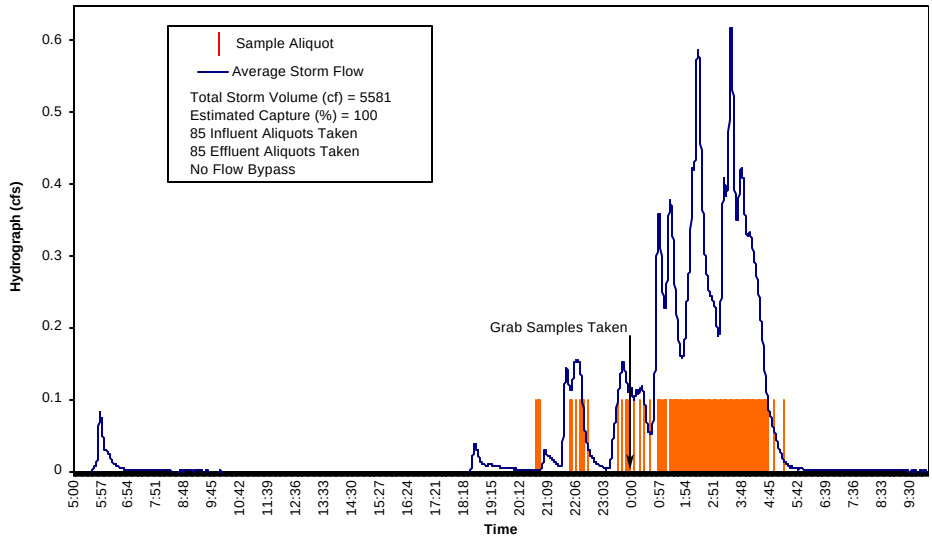
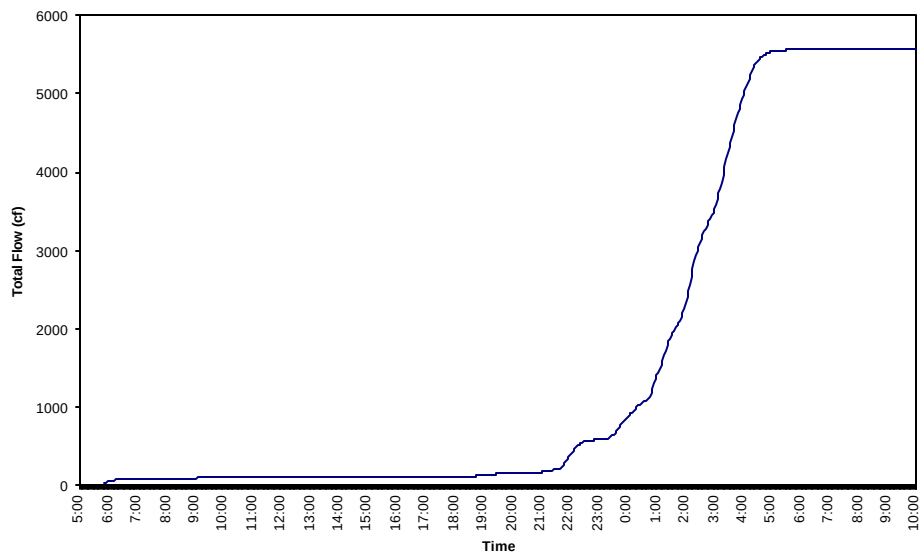


Figure 1-17e: Effluent Hydrograph, Cumulative Flow, and Cumulative Rainfall at the Orcas Avenue CDS Unit for Event 10 on April 20-21, 2001

Effluent



Cumulative Flow



Cumulative Rainfall

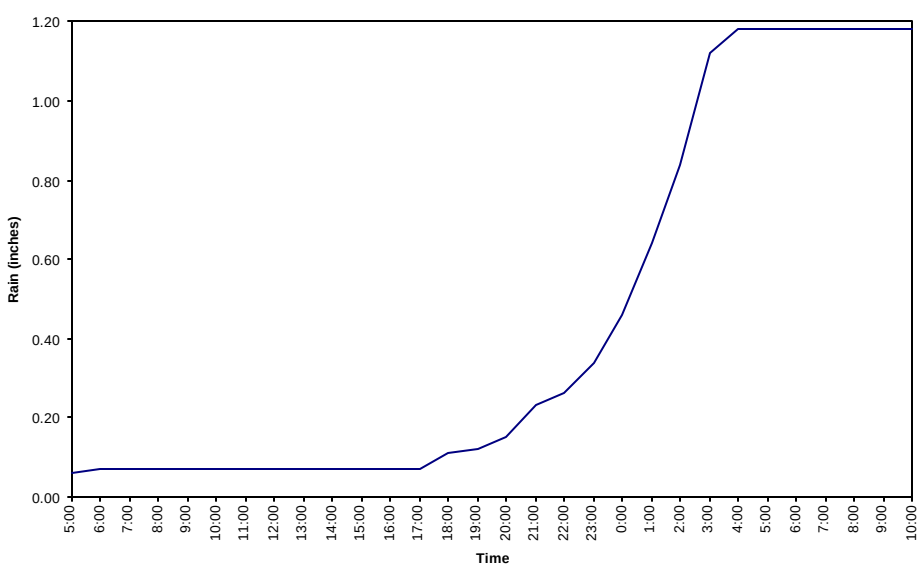
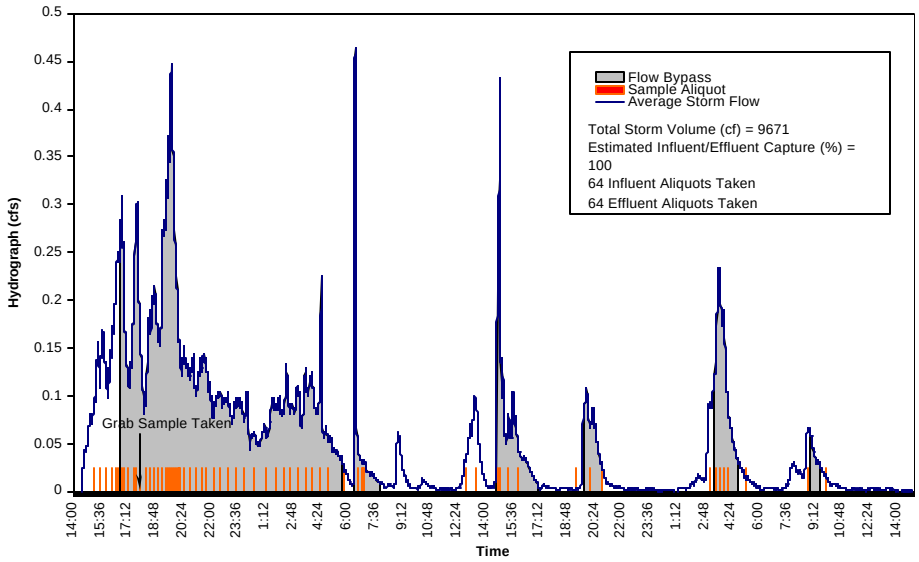
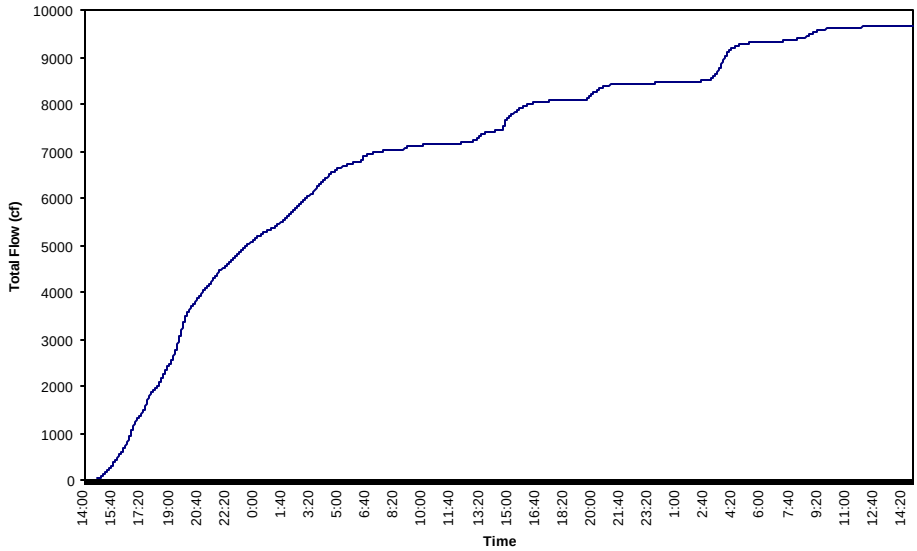


Figure 1-18a: Effluent Hydrograph, Cumulative Flow, and Cumulative Rainfall at the I-210 East of Filmore Street CDS Unit for Event 2 on October 26-27, 2000

Effluent



Cumulative Flow



Cumulative Rainfall

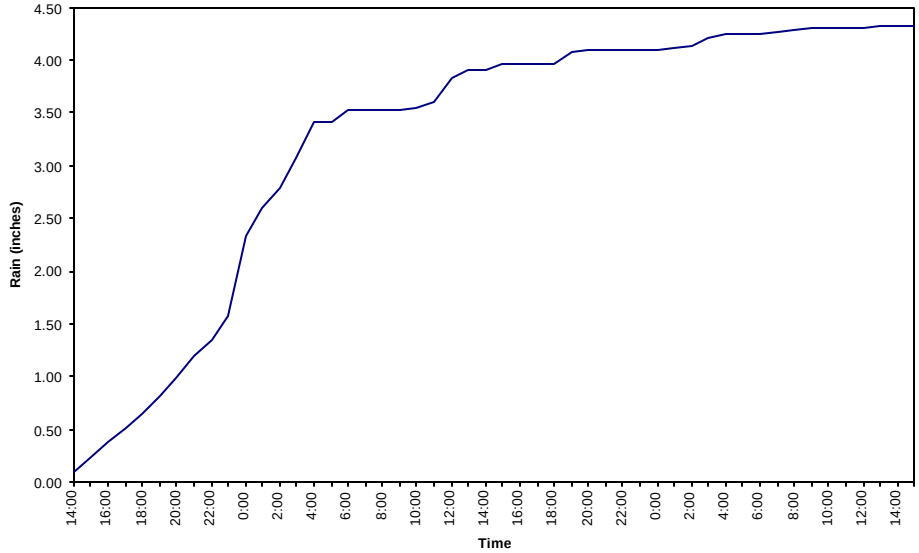
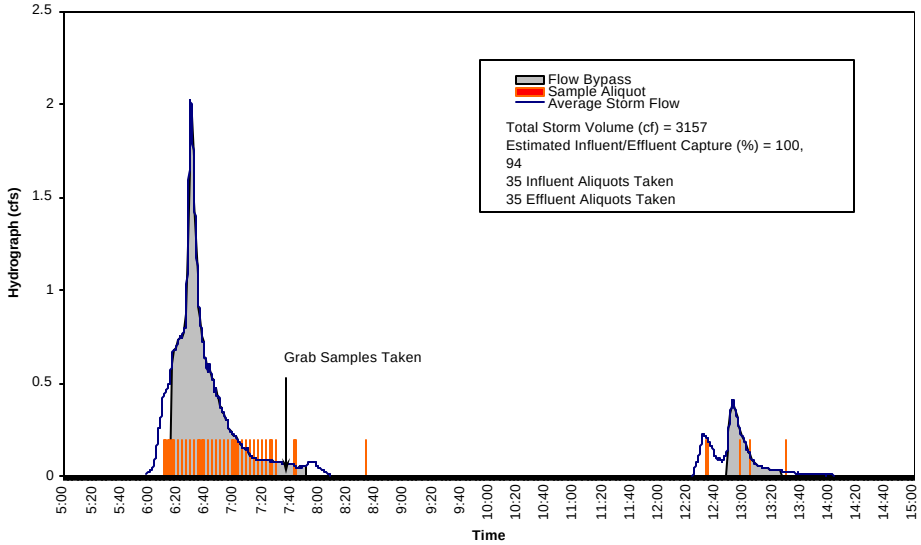
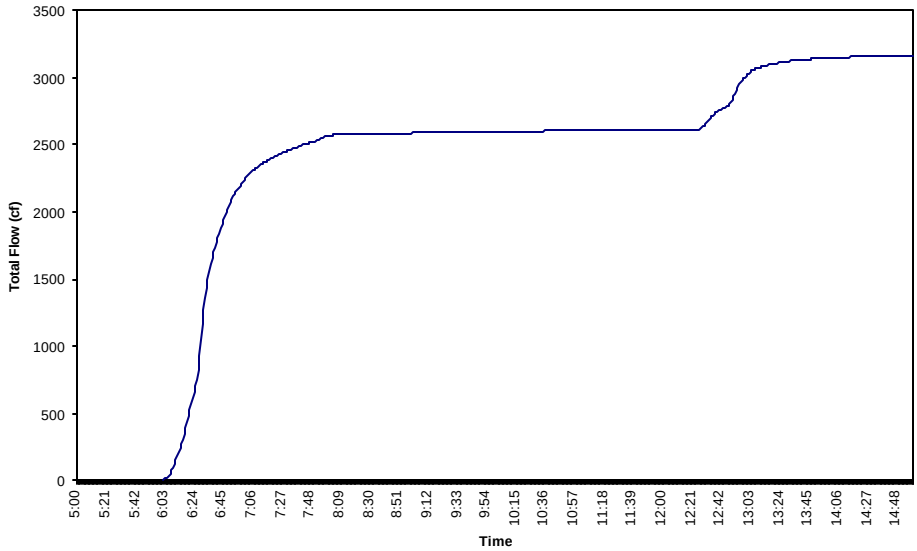


Figure 1-18b: Effluent Hydrograph, Cumulative Flow, and Cumulative Rainfall at the I-210 East of Filmore Street CDS Unit for Event 4 on January 10-12, 2001

Effluent



Cumulative Flow



Cumulative Rainfall

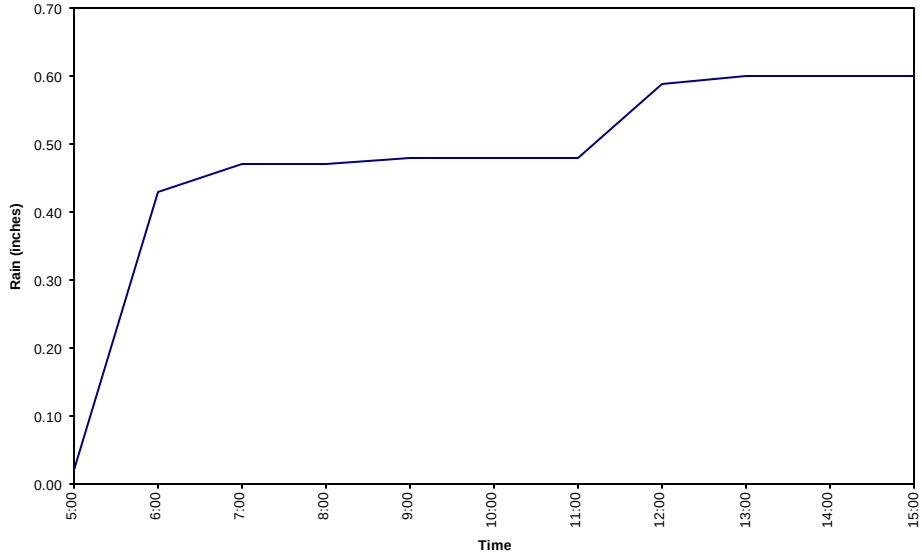
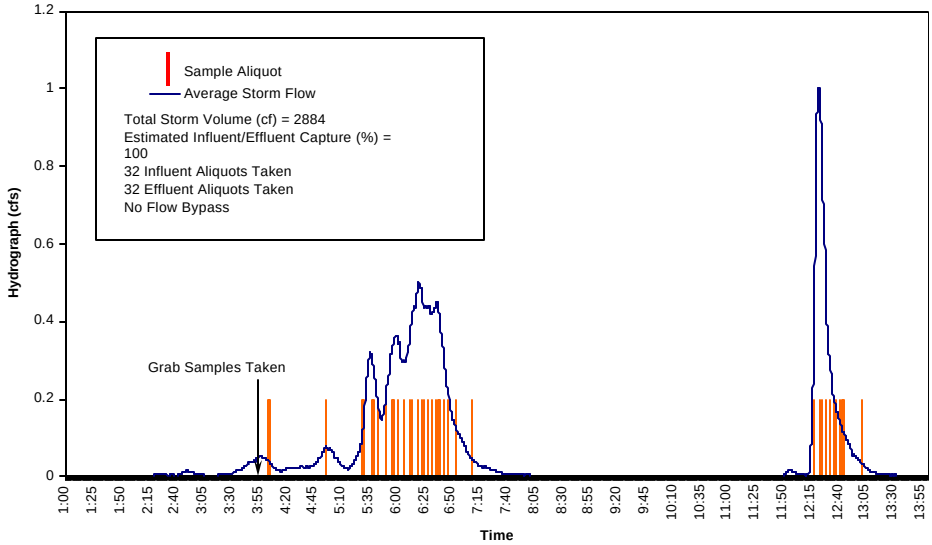
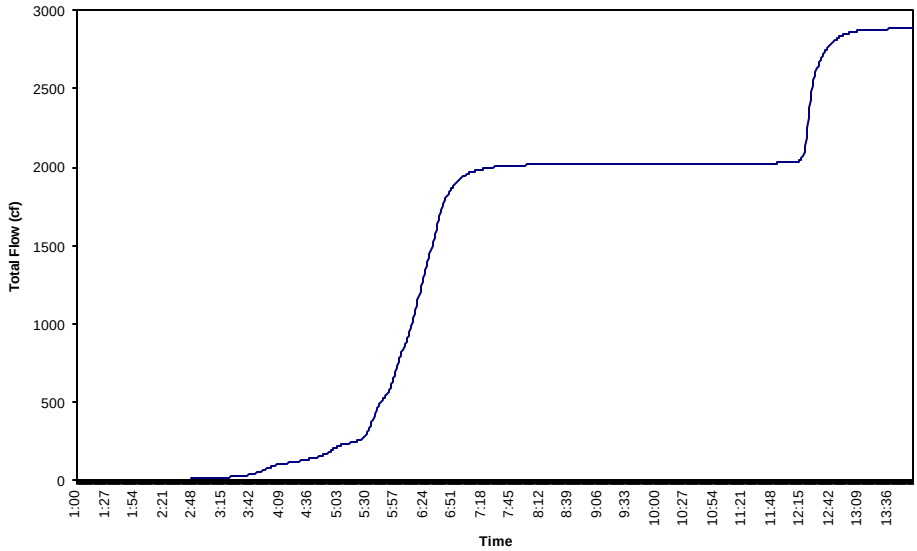


Figure 1-18c: Effluent Hydrograph, Cumulative Flow, and Cumulative Rainfall at the I-210 East of Filmore Street CDS Unit for Event 5 on January 24, 2001

Effluent



Cumulative Flow



Cumulative Rainfall

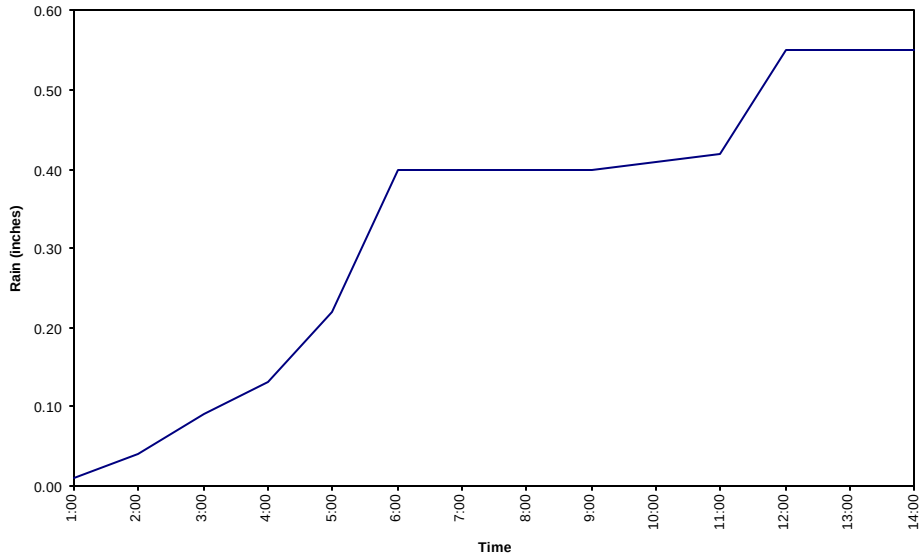
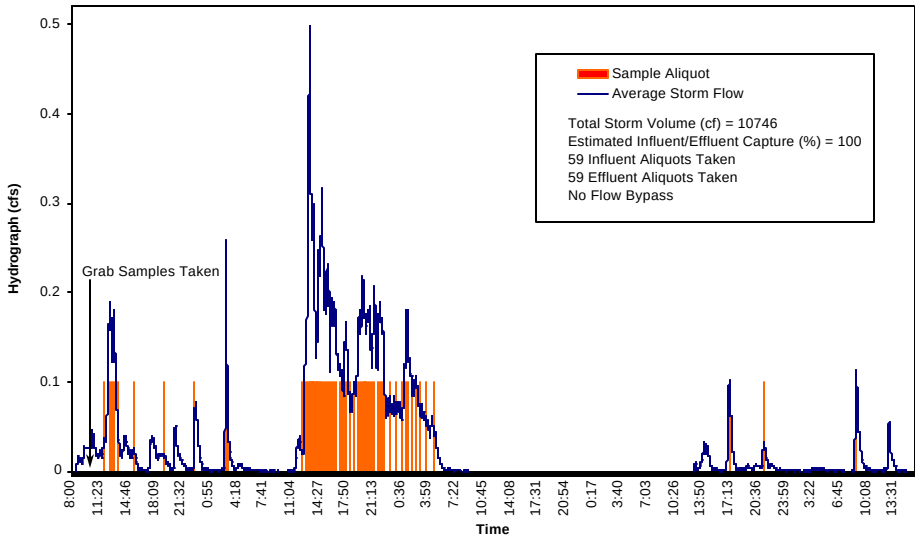
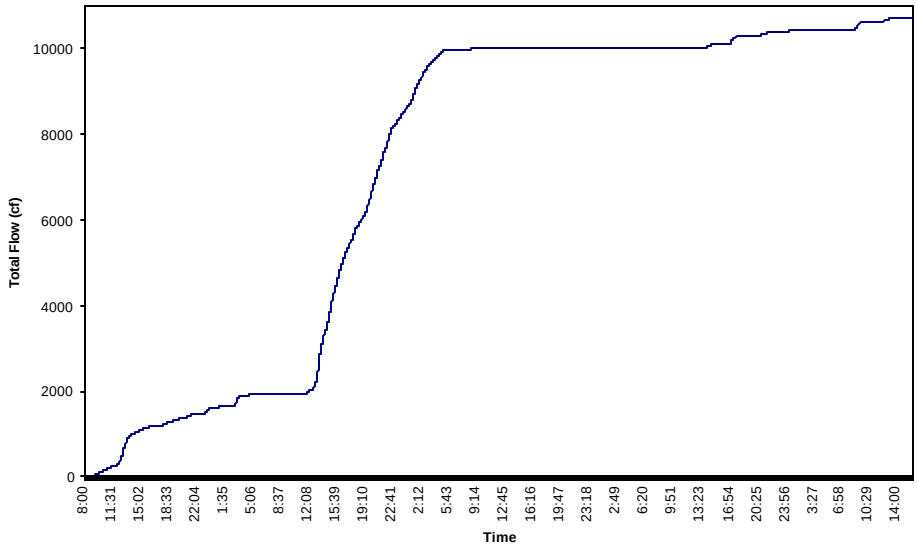


Figure 1-18d: Effluent Hydrograph, Cumulative Flow, and Cumulative Rainfall at the I-210 East of Filmore Street CDS Unit for Event 6 on February 10, 2001

Effluent



Cumulative Flow



Cumulative Rainfall

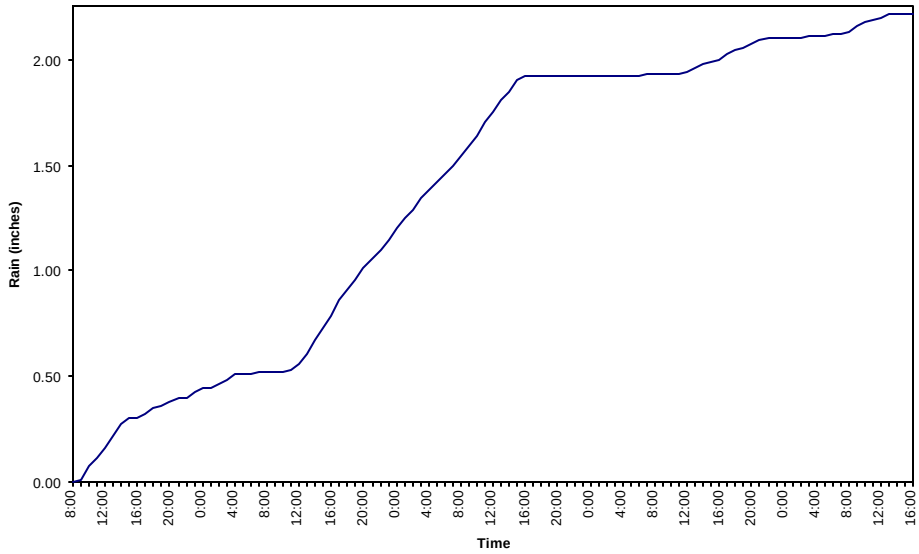
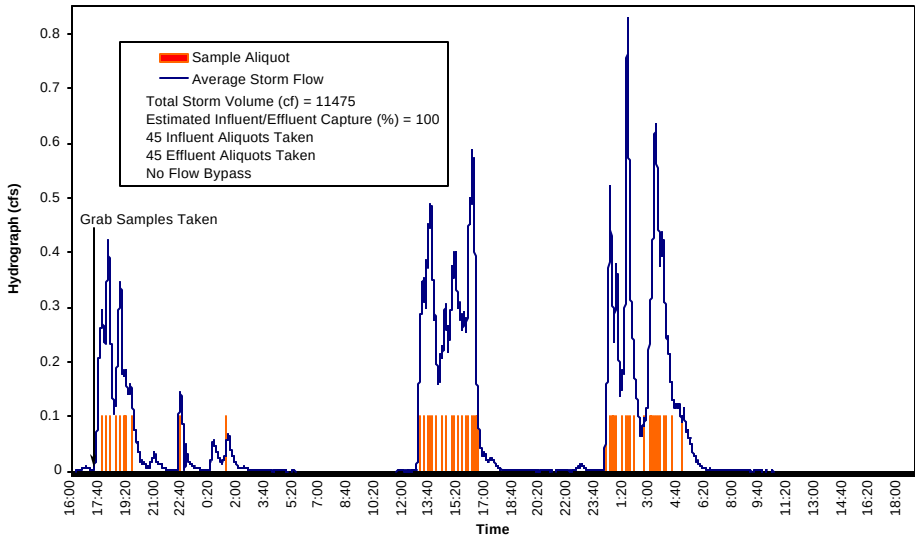
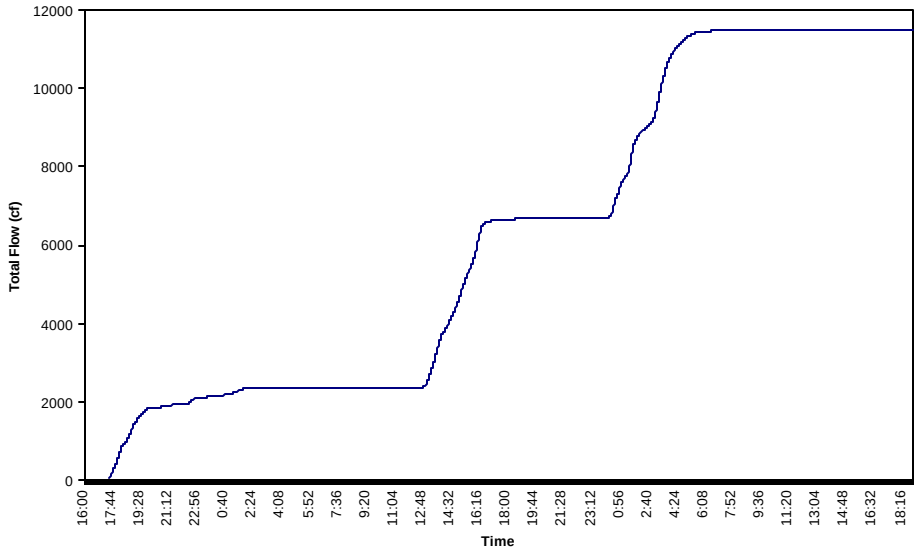


Figure 1-18e: Effluent Hydrograph, Cumulative Flow, and Cumulative Rainfall at the I-210 East of Filmore Street CDS Unit for Event 7 on February 24-28, 2001

Effluent



Cumulative Flow



Cumulative Rainfall

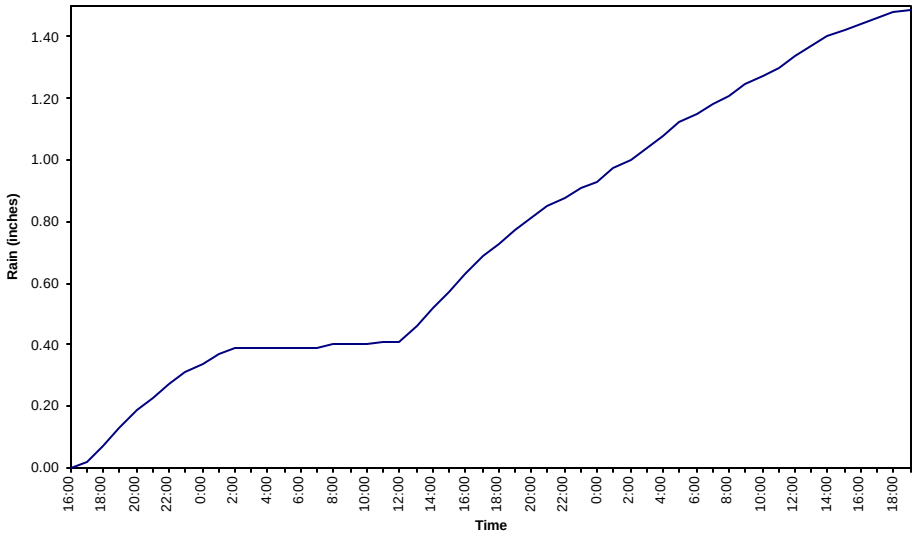
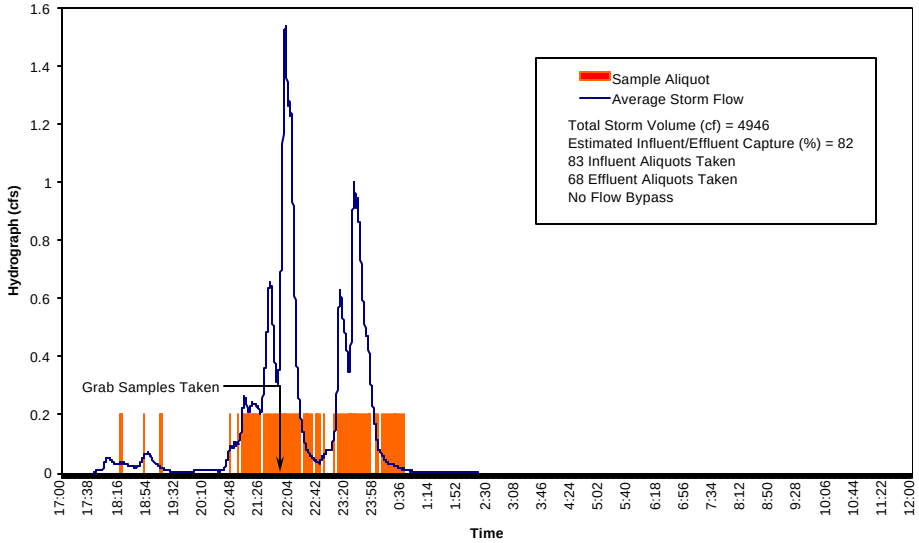
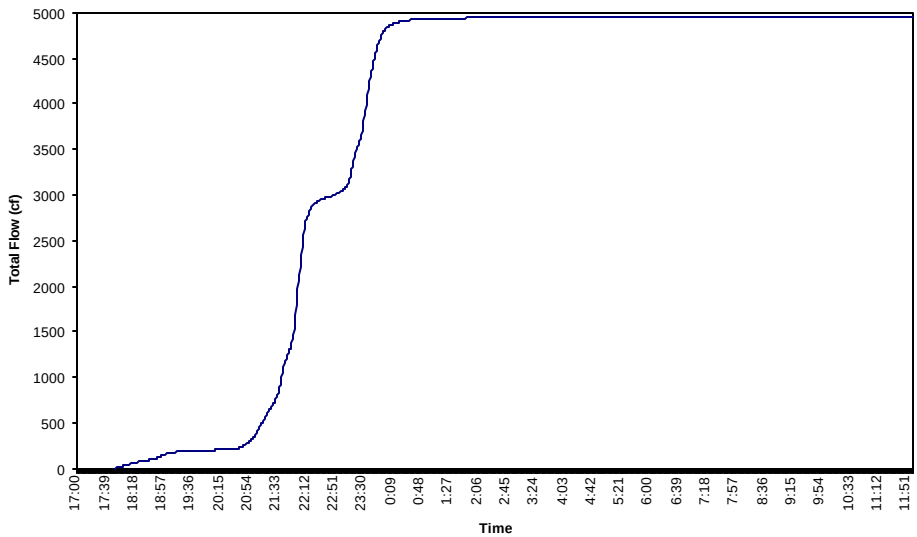


Figure 1-18f: Effluent Hydrograph, Cumulative Flow, and Cumulative Rainfall l at the I-210 East of Filmore Street CDS Unit for Event 8 on March 4-6, 2001

Effluent



Cumulative Flow



Cumulative Rainfall

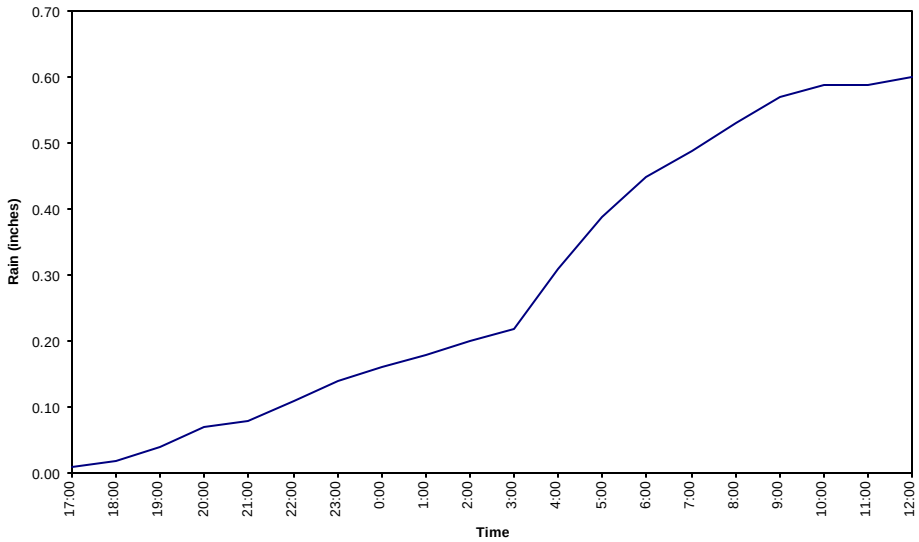
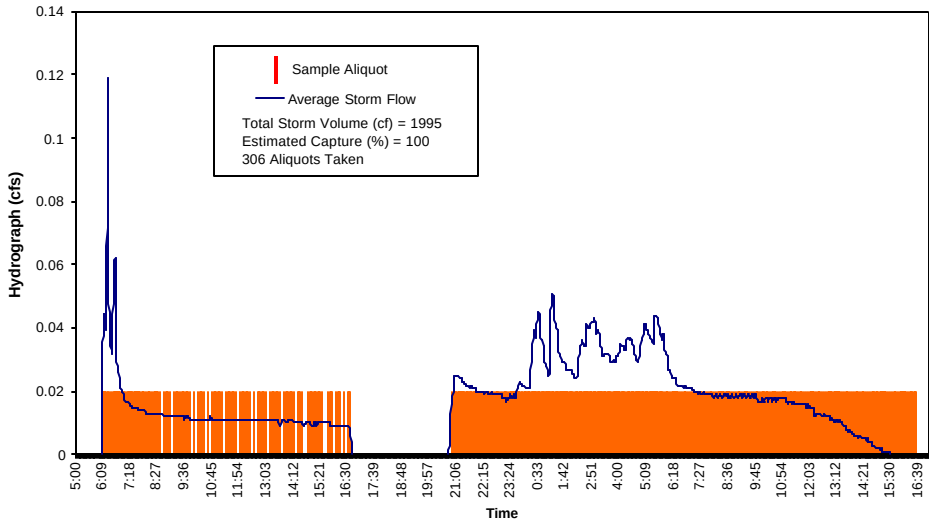
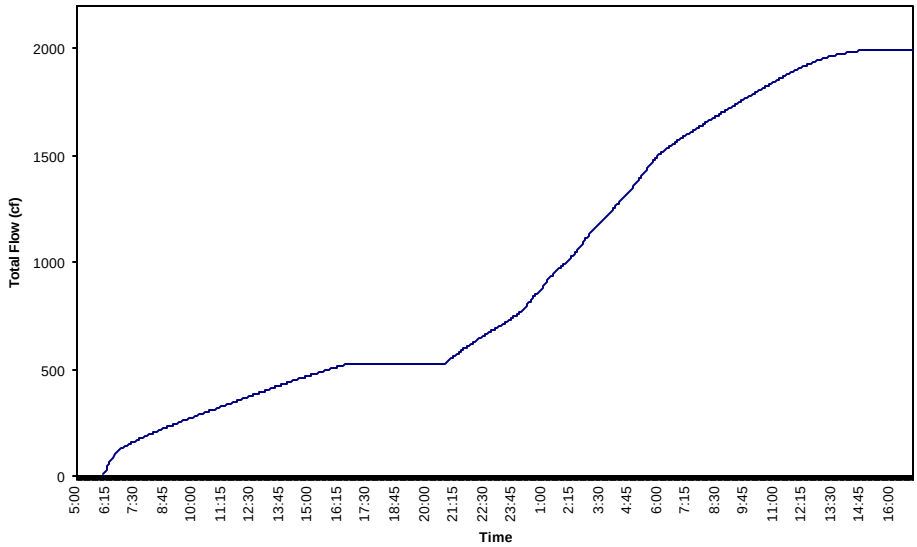


Figure 1-18g: Effluent Hydrograph, Cumulative Flow, and Cumulative Rainfall at the I-210 East of Filmore Street CDS Unit for Event 10 on April 20-21, 2001

Effluent



Cumulative Flow



Cumulative Rainfall

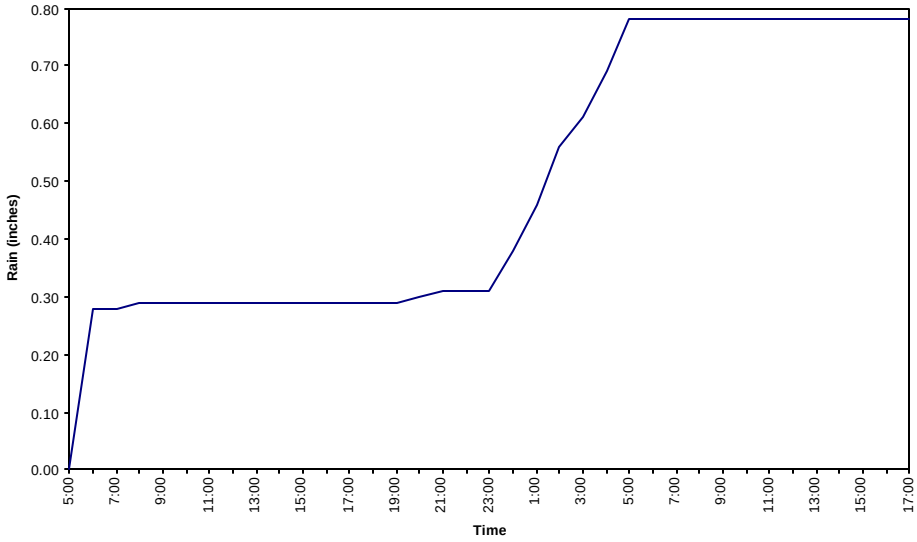
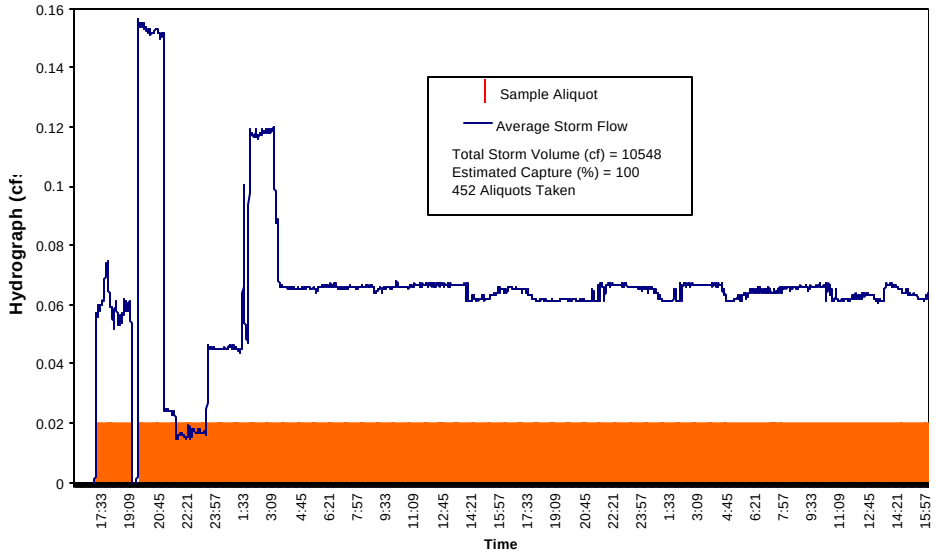
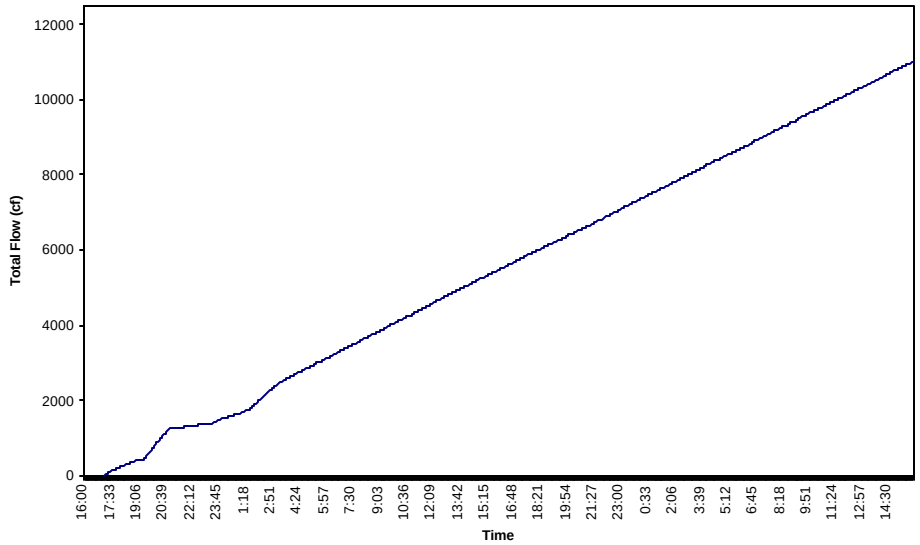


Figure 1-19a: Effluent Hydrograph, Cumulative Flow, and Cumulative Rainfall at the Foothill MS StreamGuard™ DII for Event 2 on October 26-27, 2000

Effluent



Cumulative Flow



Cumulative Rainfall

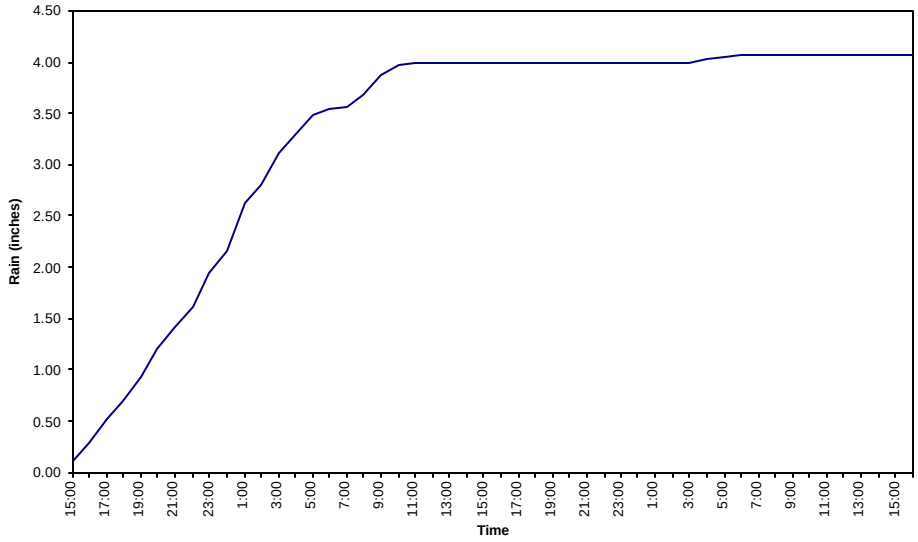
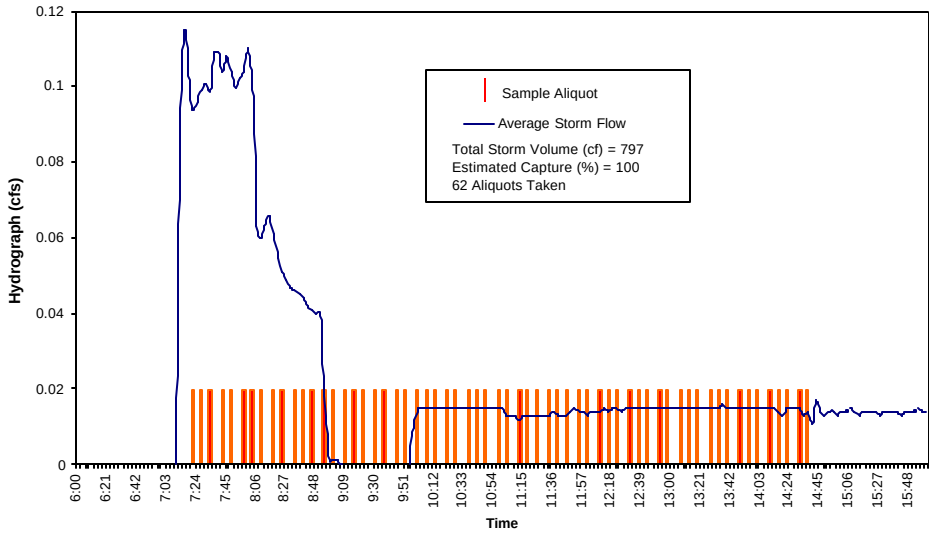
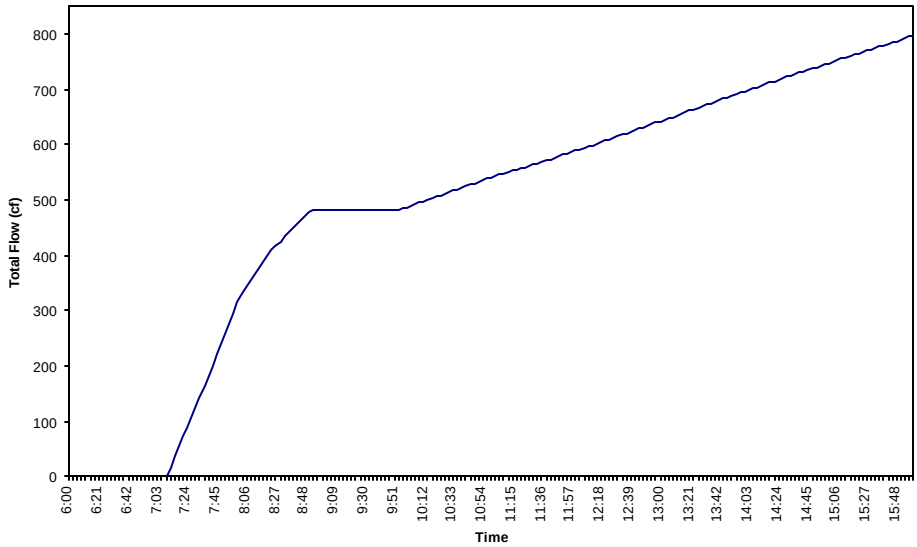


Figure 1-19b: Effluent Hydrograph, Cumulative Flow, and Cumulative Rainfall at the Foothill MS StreamGuard™ DII for Event 4 on January 10-12, 2001

Effluent



Cumulative Flow



Cumulative Rainfall

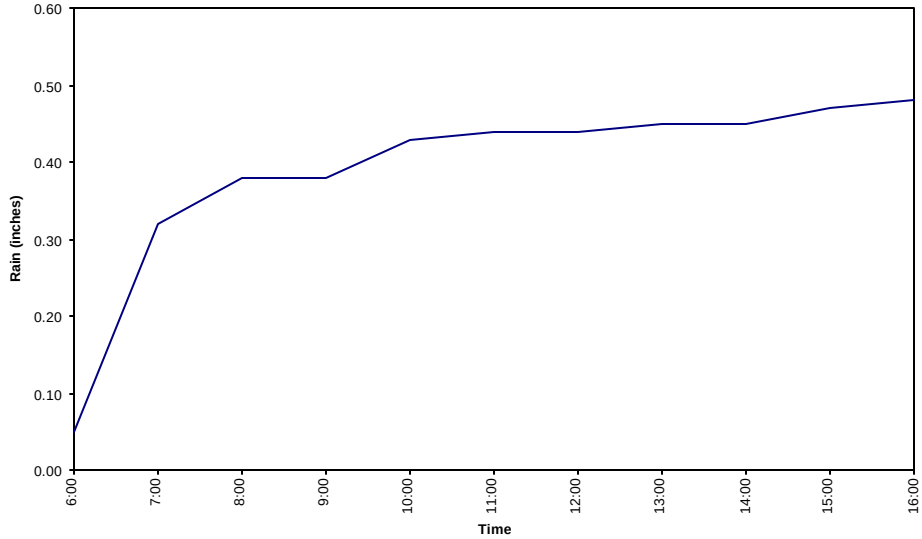
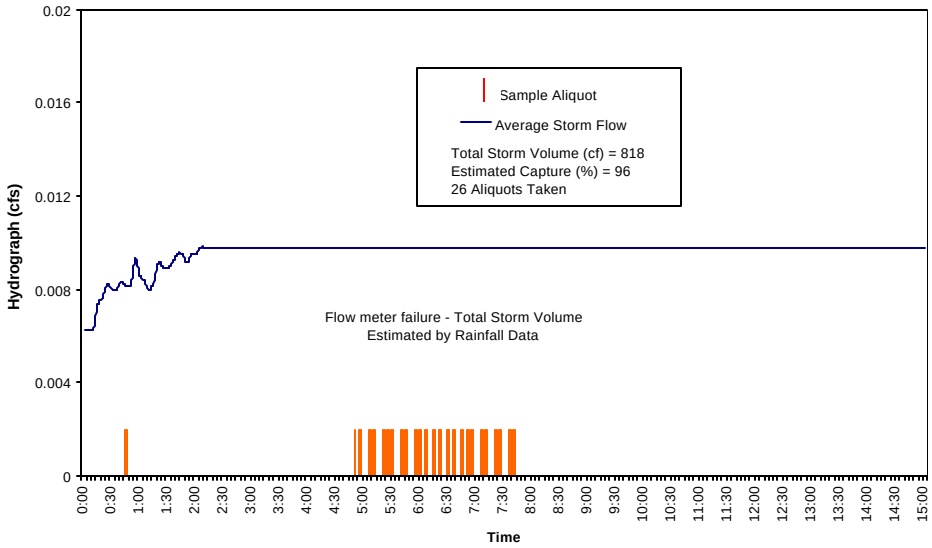
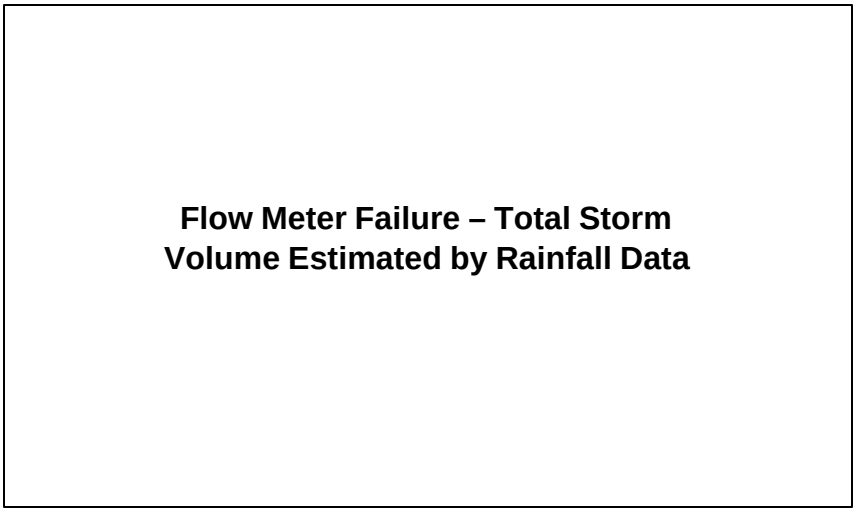


Figure 1-19c: Effluent Hydrograph, Cumulative Flow, and Cumulative Rainfall at the Foothill MS StreamGuard™ DII for Event 5 on January 24, 2001

Effluent



Cumulative Flow



Cumulative Rainfall

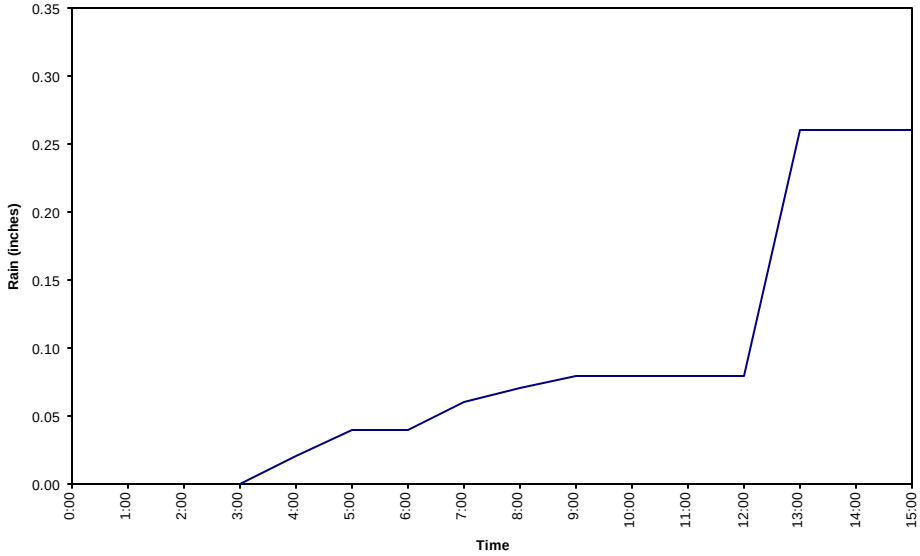
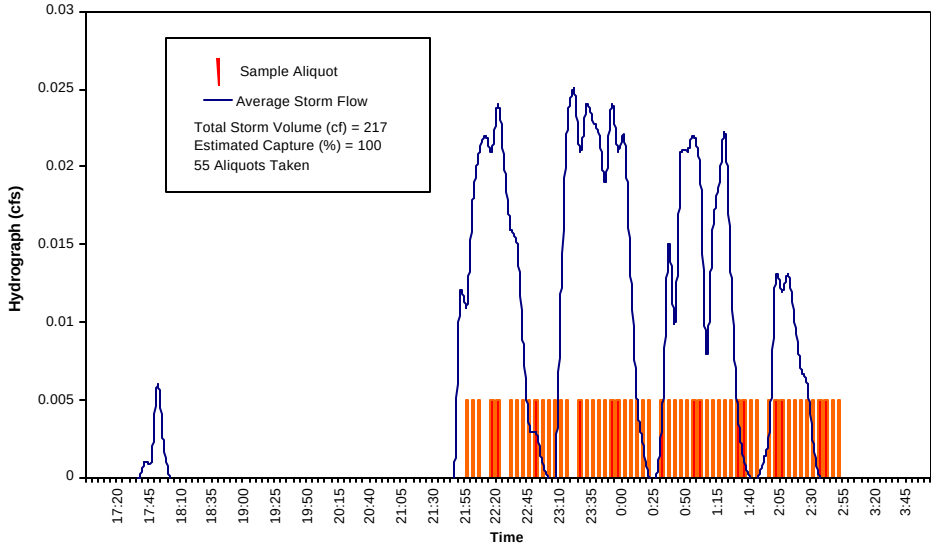
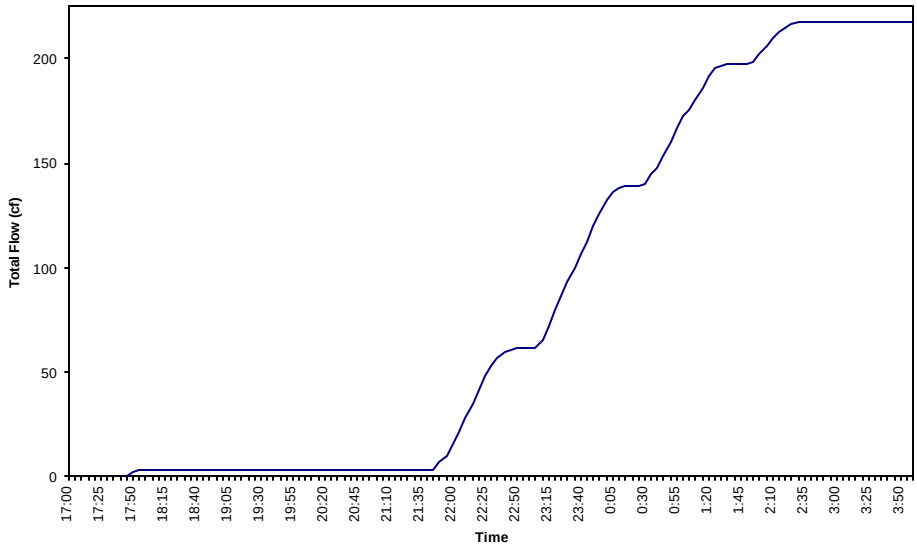


Figure 1-19d: Effluent Hydrograph, Cumulative Flow, and Cumulative Rainfall at the Foothill MS StreamGuard™ DII for Event 6 on February 10, 2001

Effluent



Cumulative Flow



Cumulative Rainfall

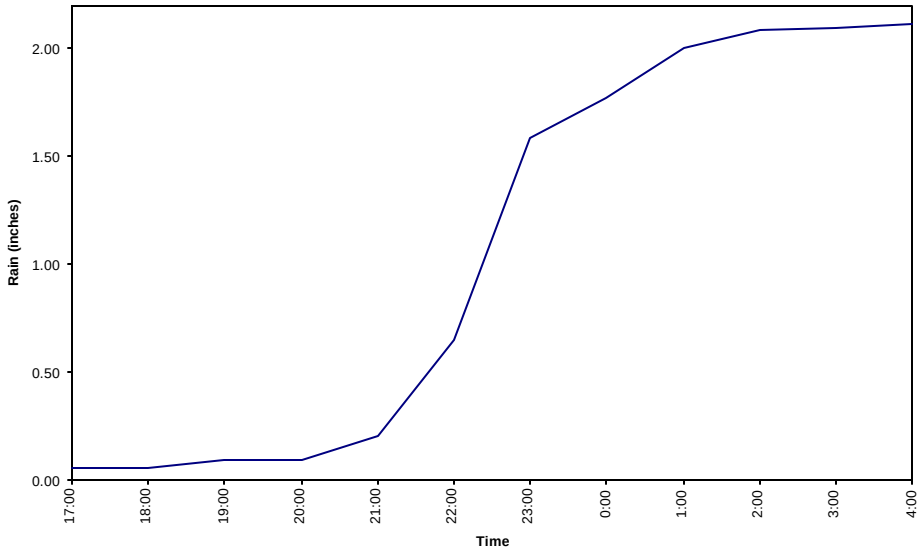
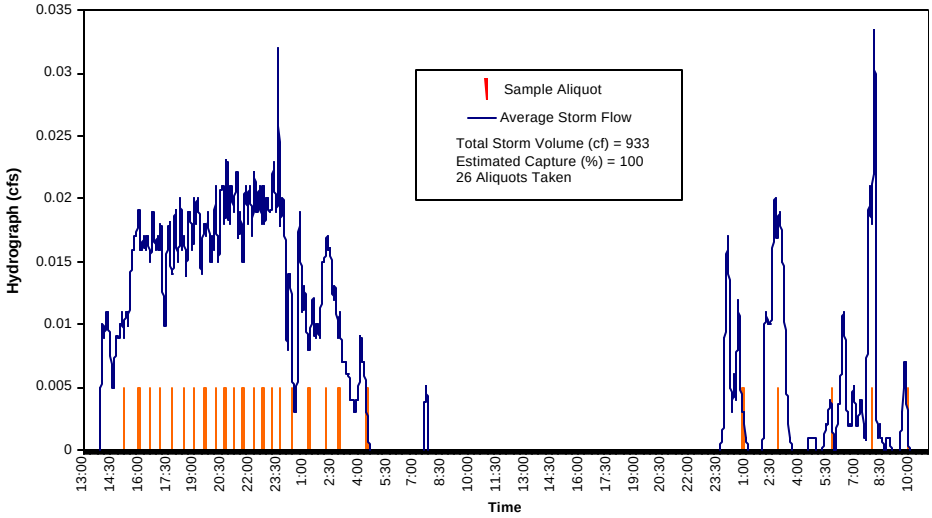
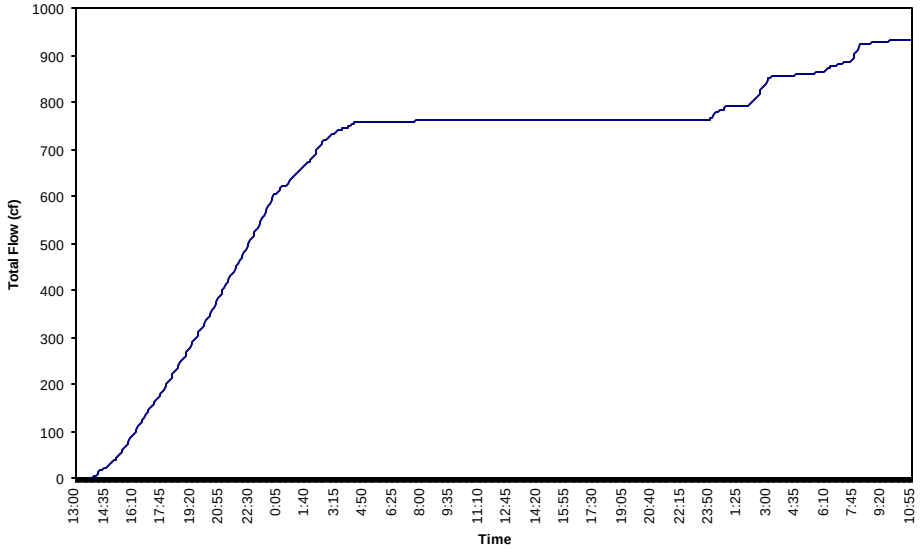


Figure 1-20a: Effluent Hydrograph, Cumulative Flow, and Cumulative Rainfall at the Las Flores MS StreamGuard™ DII for Event 2 on October 26-27, 2000

Effluent



Cumulative Flow



Cumulative Rainfall

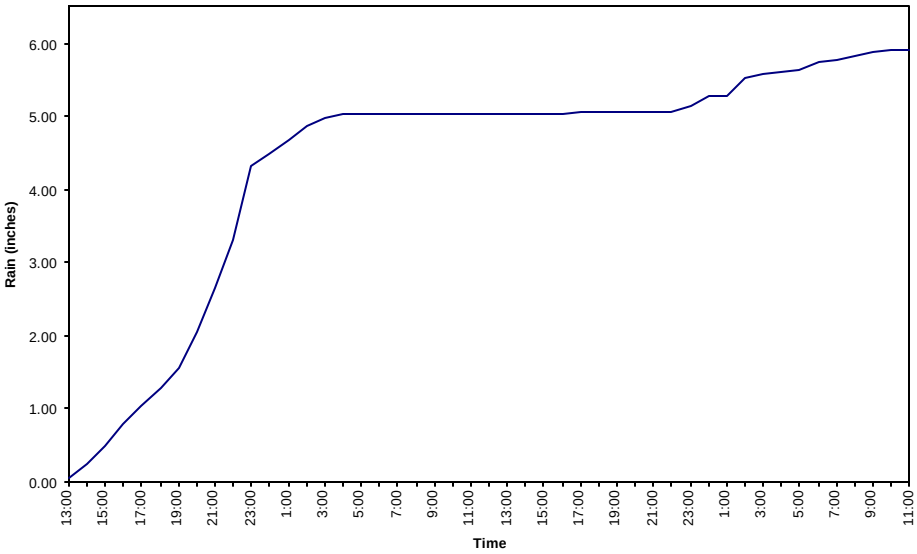
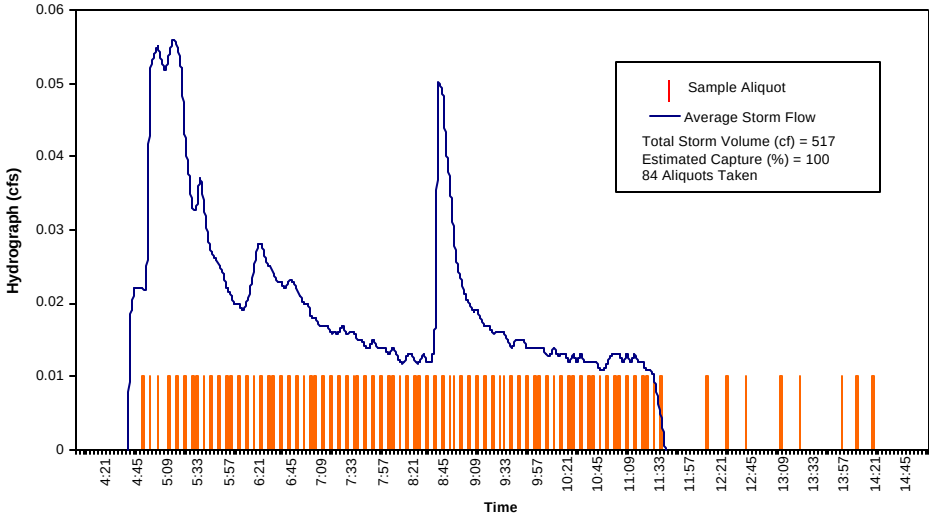
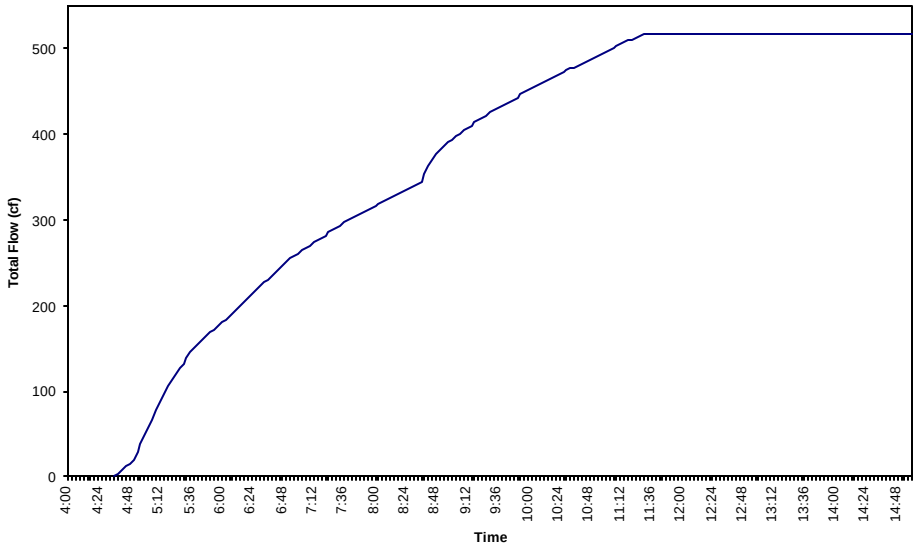


Figure 1-20b: Effluent Hydrograph, Cumulative Flow, and Cumulative Rainfall at the Las Flores MS StreamGuard™ DII for Event 4 on January 10-12, 2001

Effluent



Cumulative Flow



Cumulative Rainfall

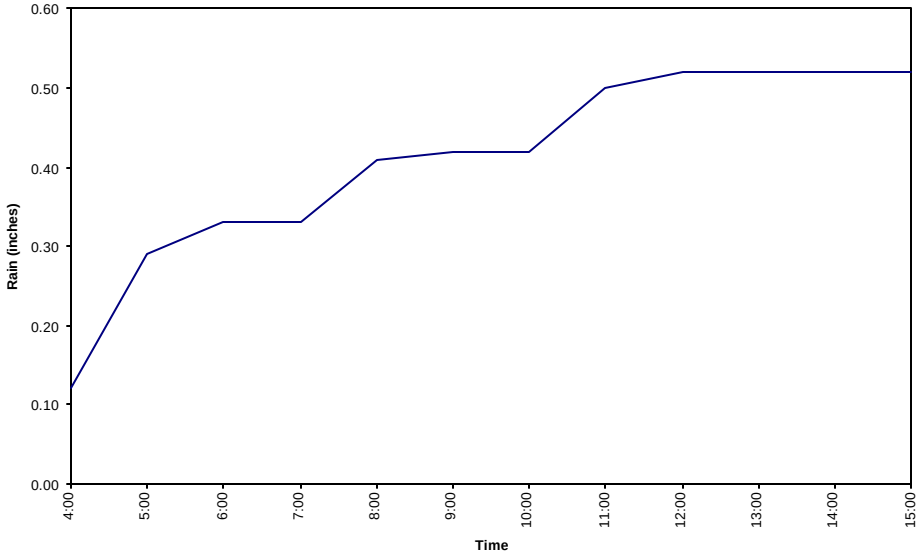
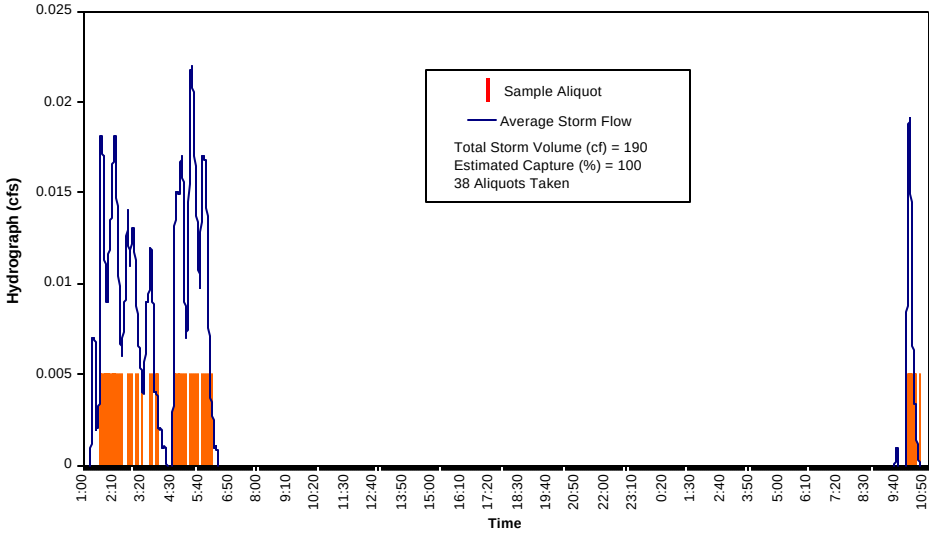
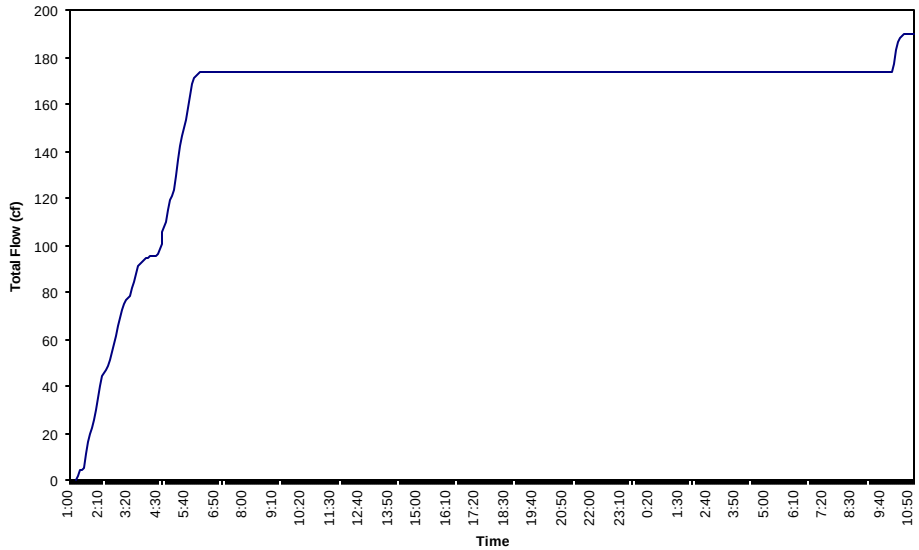


Figure 1-20c: Effluent Hydrograph, Cumulative Flow, and Cumulative Rainfall at the Las Flores MS StreamGuard™ DII for Event 5 on January 24, 2001

Effluent



Cumulative Flow



Cumulative Rainfall

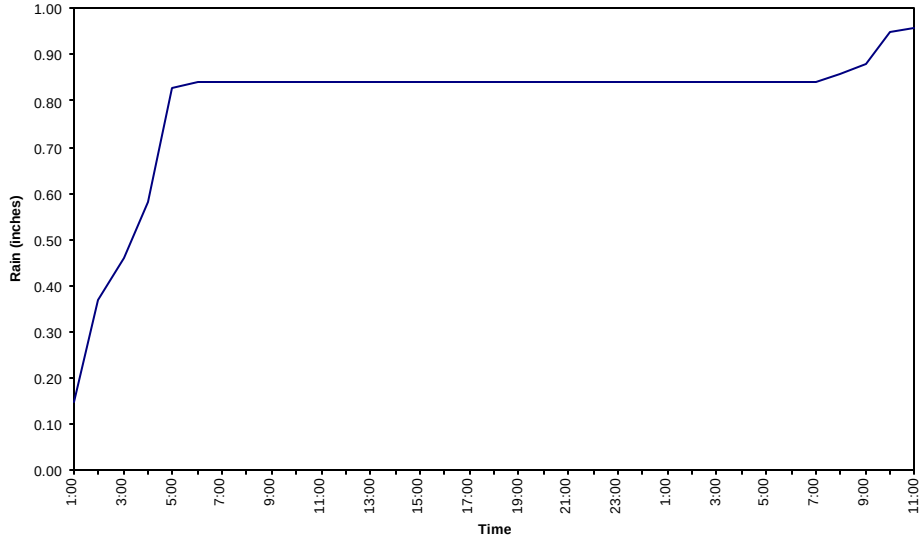
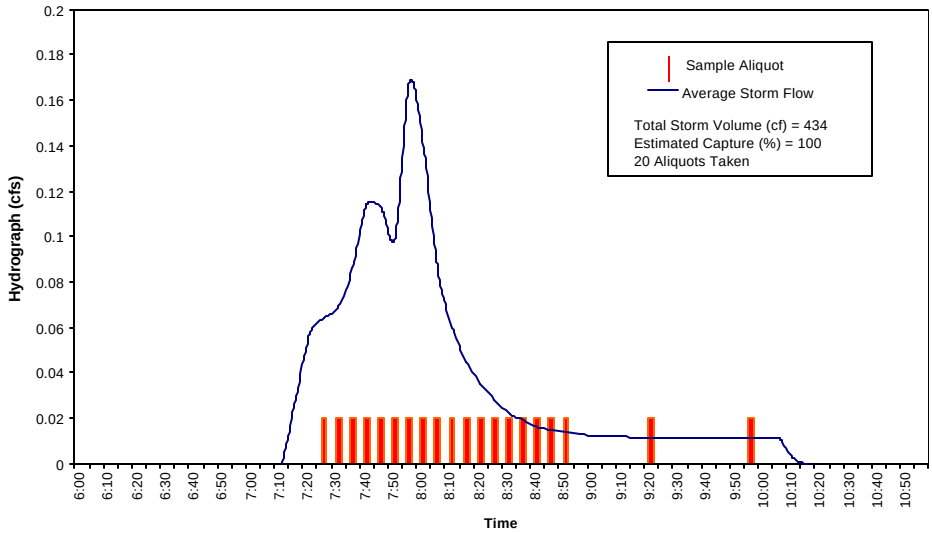
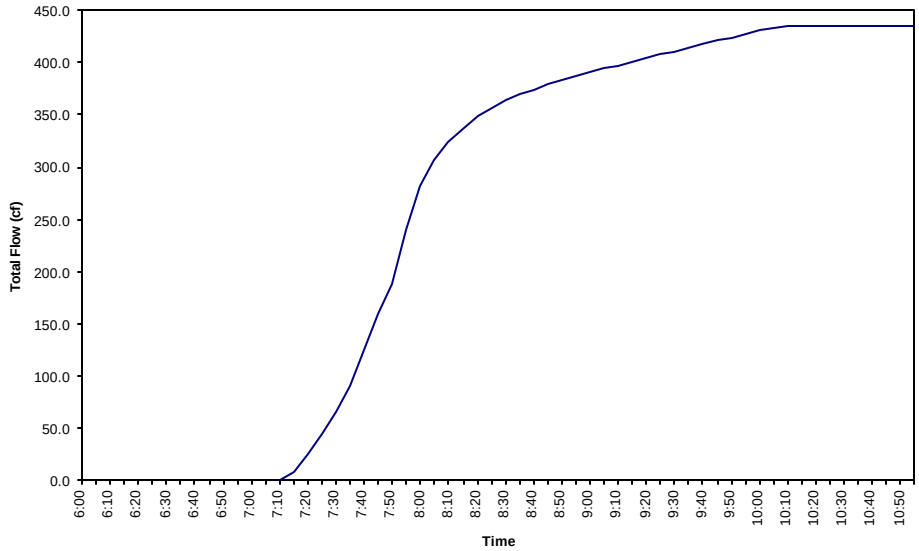


Figure 1-20d: Effluent Hydrograph, Cumulative Flow, and Cumulative Rainfall at the Las Flores MS StreamGuard™ DII for Event 6 on February 10-11, 2001

Effluent



Cumulative Flow



Cumulative Rainfall

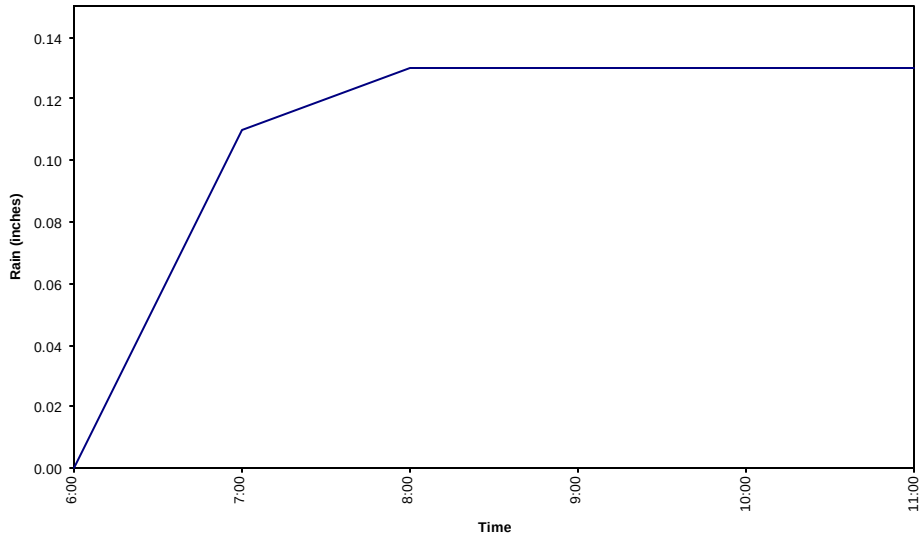
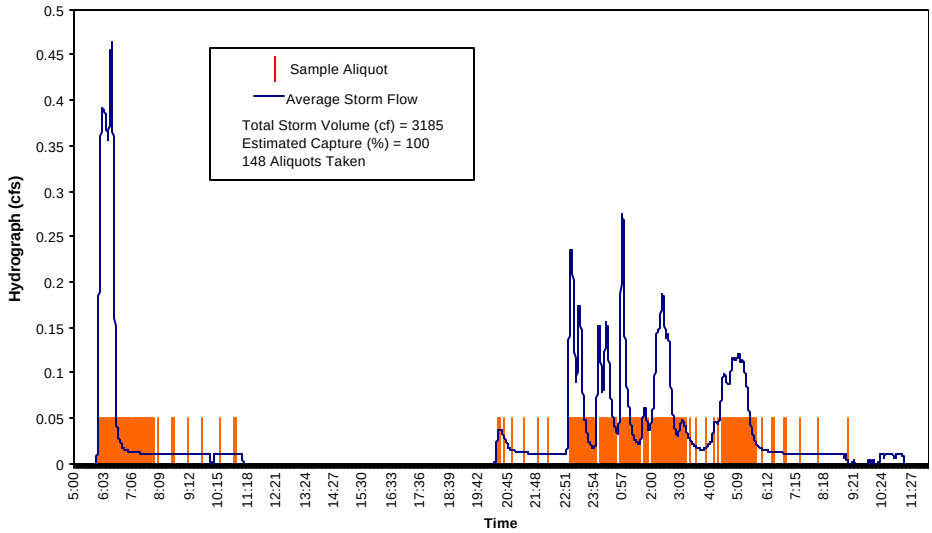
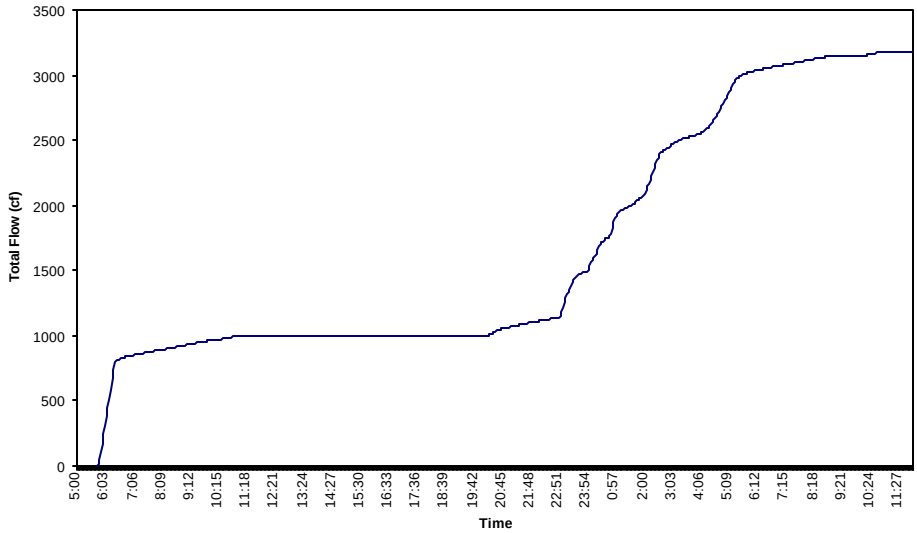


Figure 1-21a: Effluent Hydrograph, Cumulative Flow, and Cumulative Rainfall at the Rosemead MS StreamGuard™ DII for Event 1 on October 11, 2000

Effluent



Cumulative Flow



Cumulative Rainfall

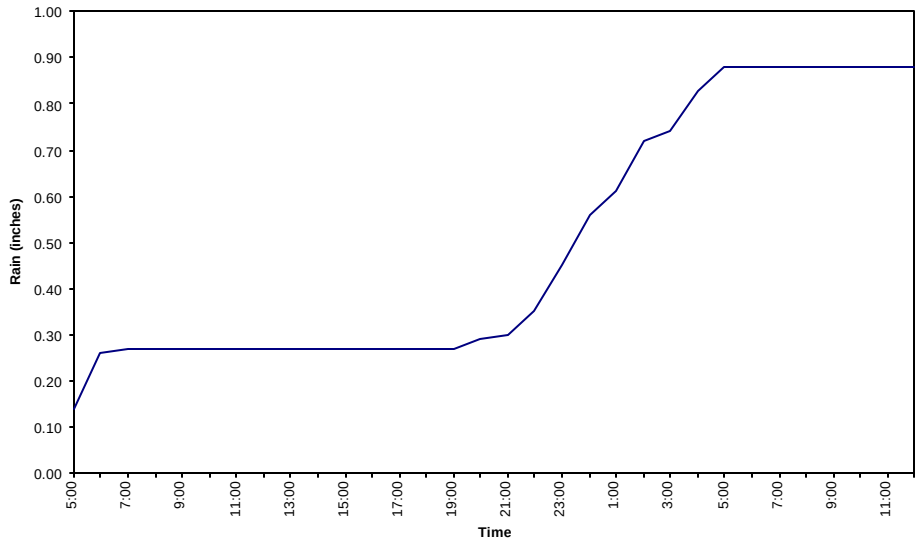
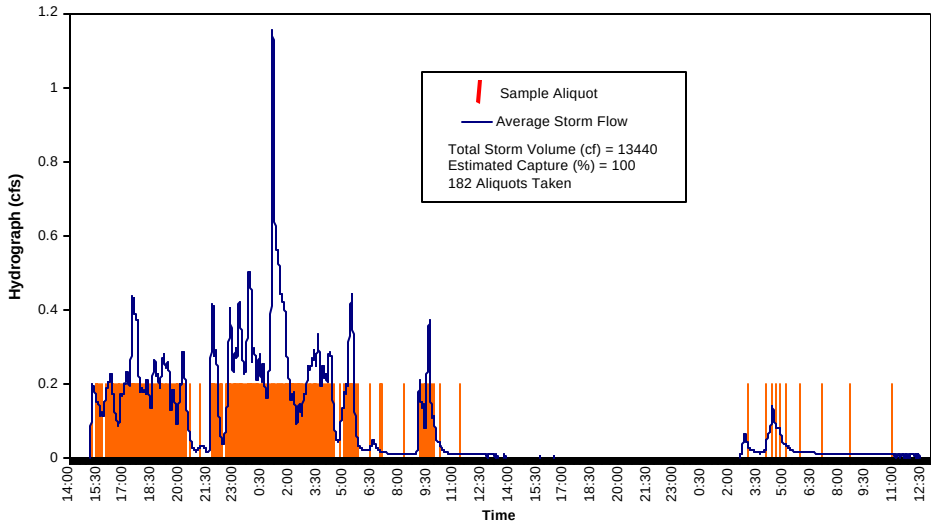
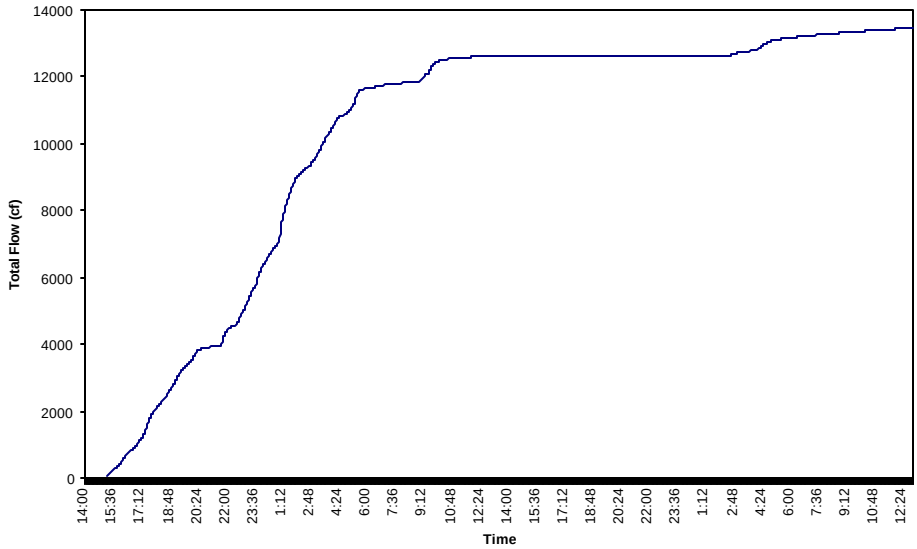


Figure 1-21b: Effluent Hydrograph, Cumulative Flow, and Cumulative Rainfall at the Rosemead MS StreamGuard™ DII for Event 2 on October 26-27, 2000

Effluent



Cumulative Flow



Cumulative Rainfall

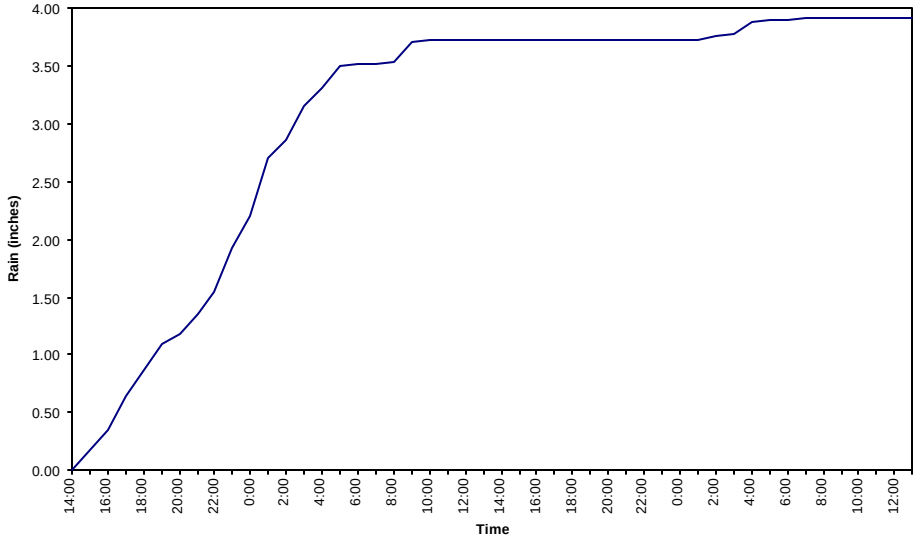
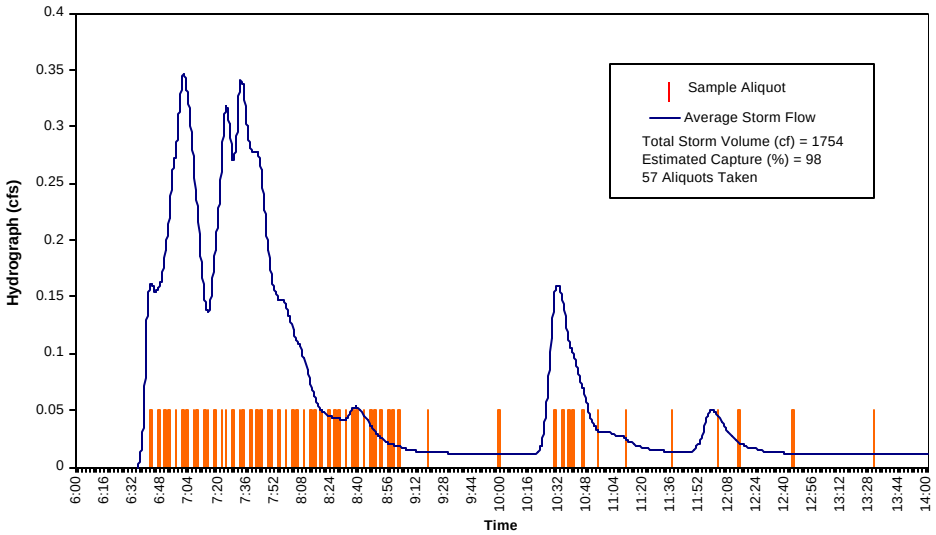
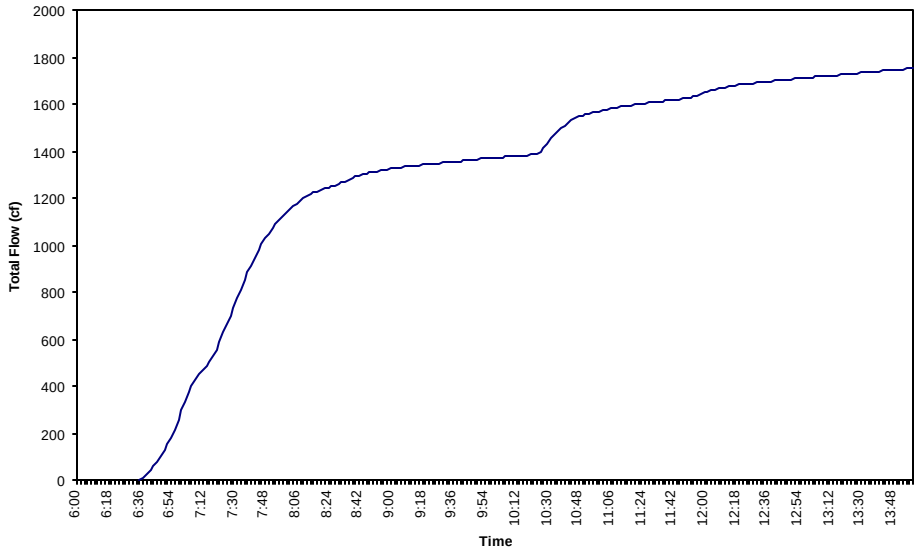


Figure 1-21c: Effluent Hydrograph, Cumulative Flow, and Cumulative Rainfall at the Rosemead MS StreamGuard™ DII for Event 4 on January 10-11, 2001

Effluent



Cumulative Flow



Cumulative Rainfall

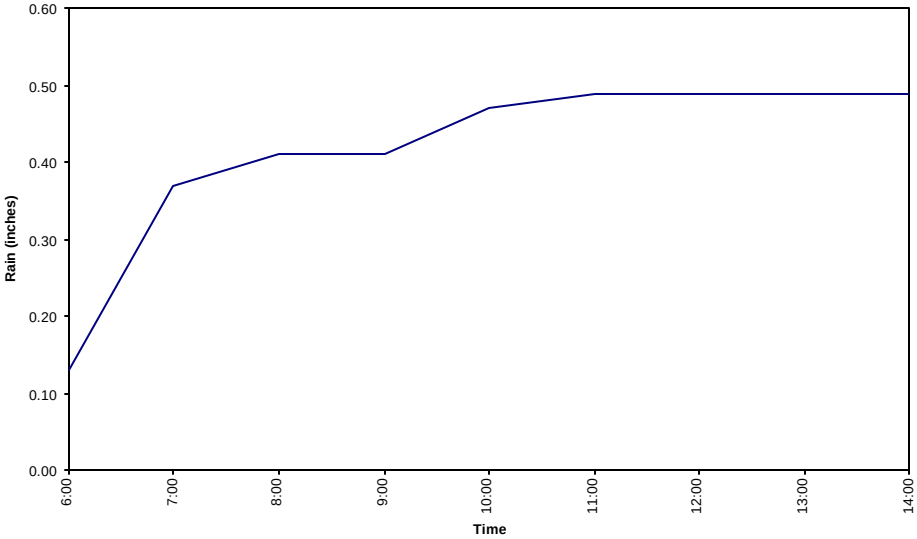
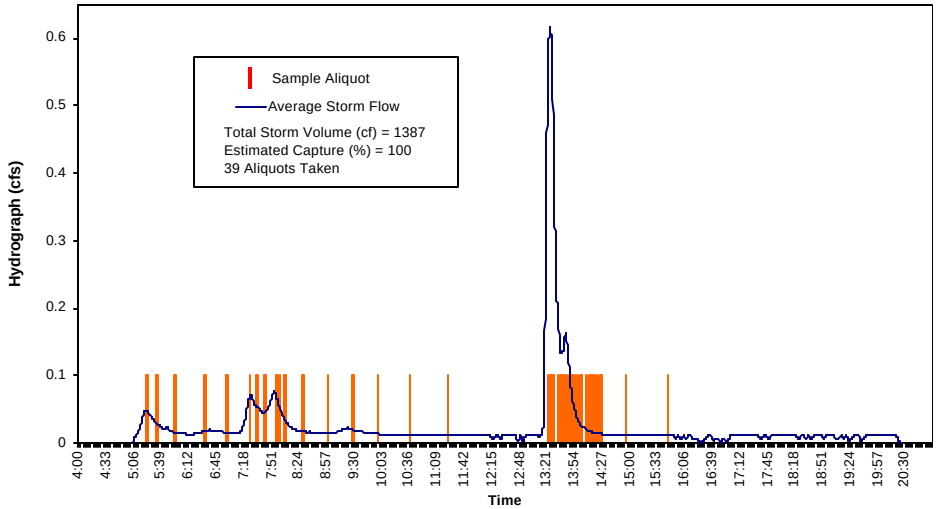
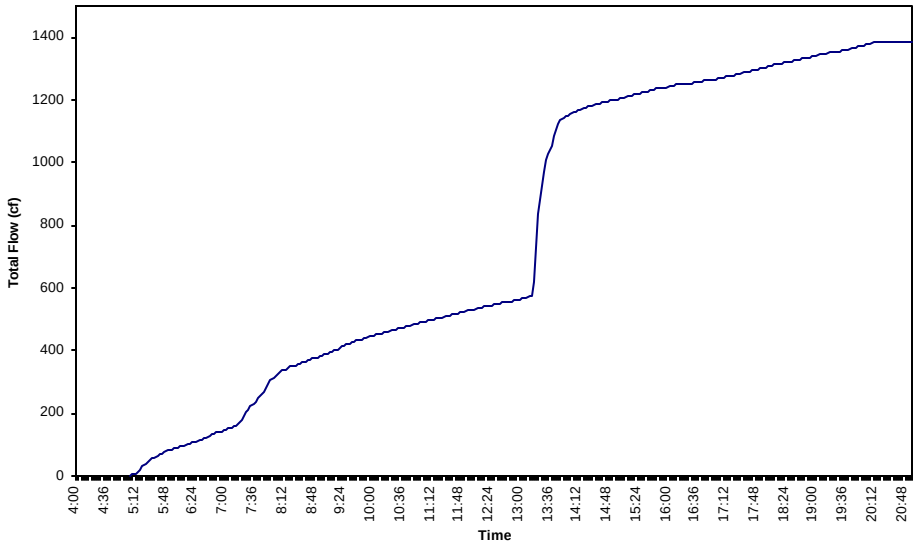


Figure 1-21d: Effluent Hydrograph, Cumulative Flow, and Cumulative Rainfall at the Rosemead MS StreamGuard™ DII for Event 5 on January 24, 2001

Effluent



Cumulative Flow



Cumulative Rainfall

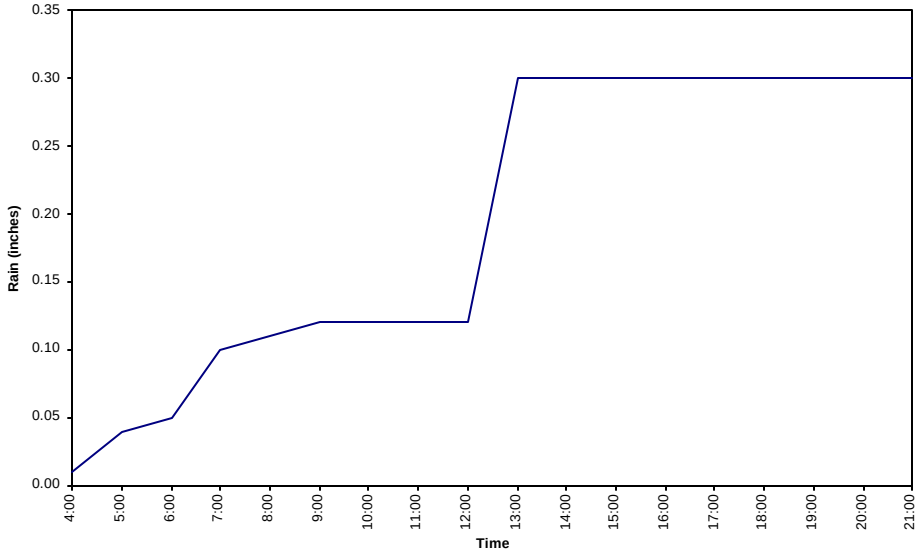
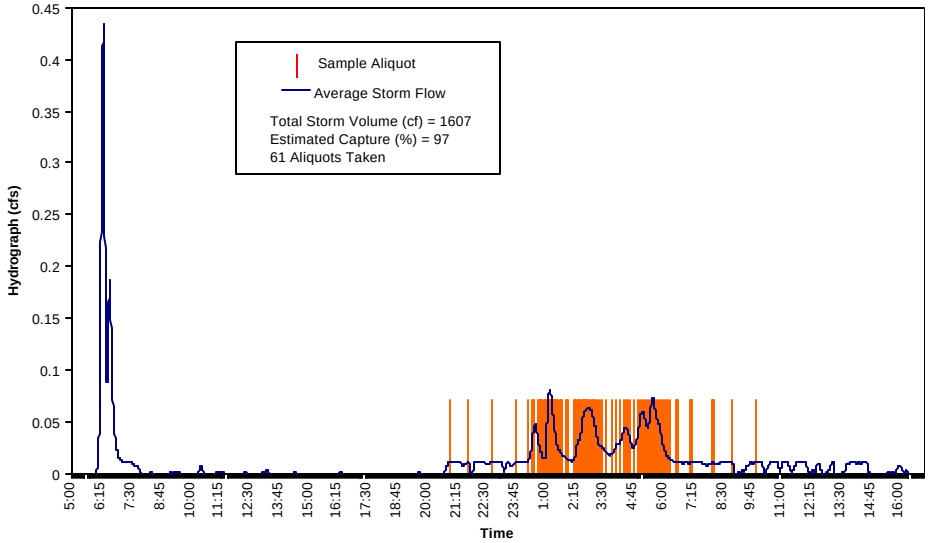
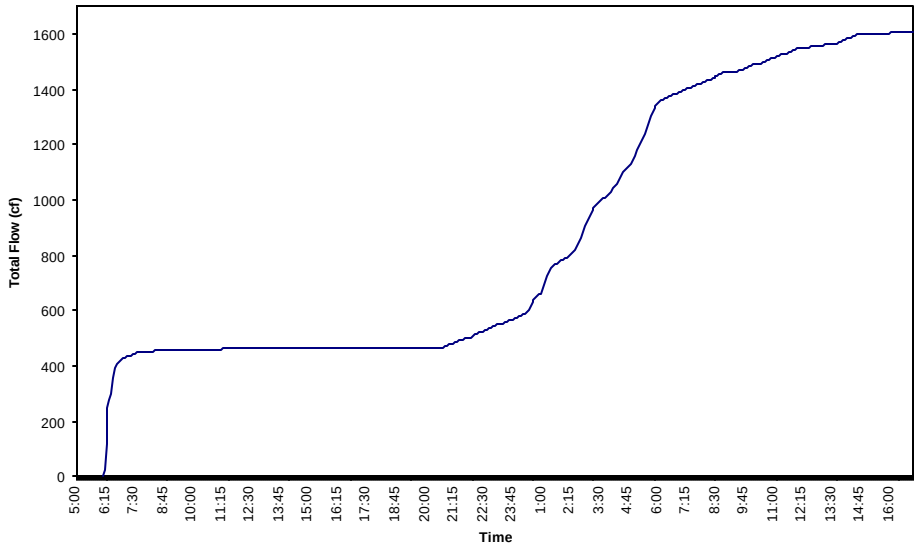


Figure 1-21e: Effluent Hydrograph, Cumulative Flow, and Cumulative Rainfall at the Rosemead MS StreamGuard™ DII for Event 6 on February 10, 2001

Effluent



Cumulative Flow



Cumulative Rainfall

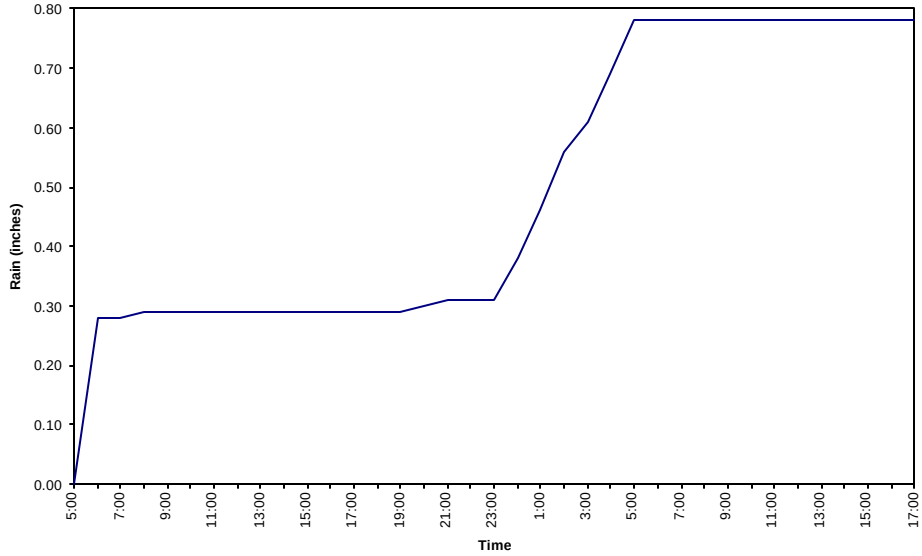
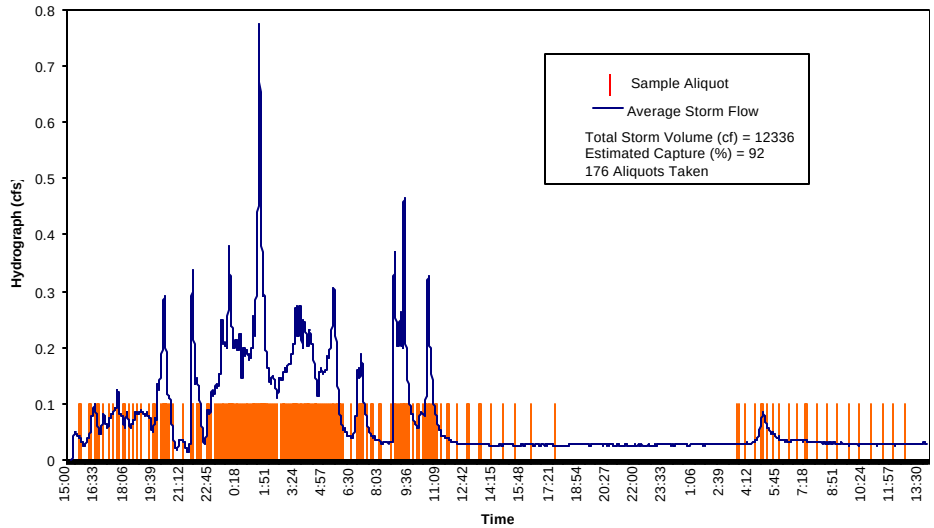
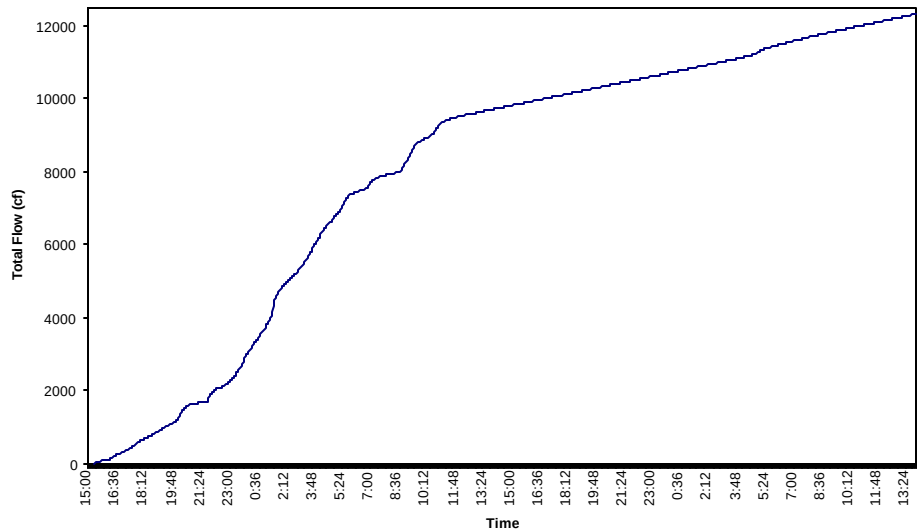


Figure 1-22a: Effluent Hydrograph, Cumulative Flow, and Cumulative Rainfall at the Foothill MS Fossil Filter™ DII for Event 2 on October 26-27, 2000

Effluent



Cumulative Flow



Cumulative Rainfall

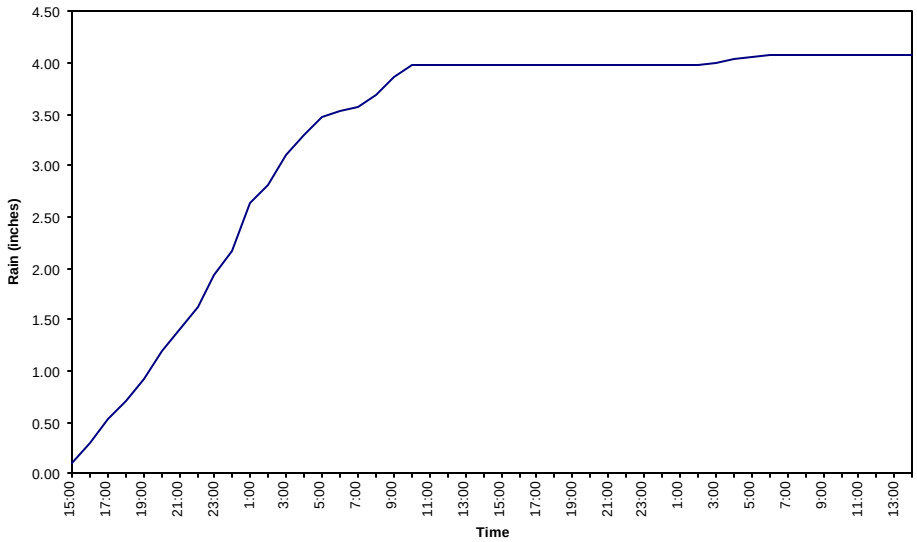
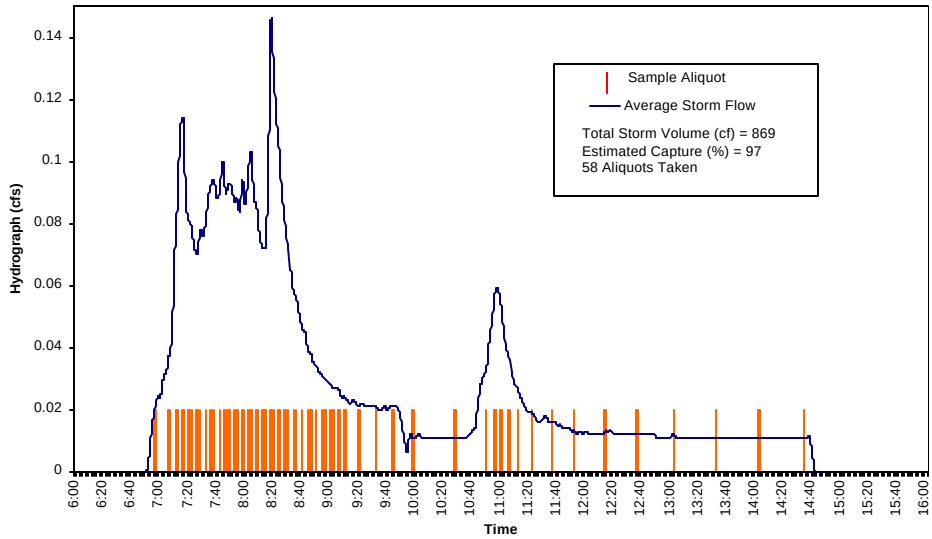
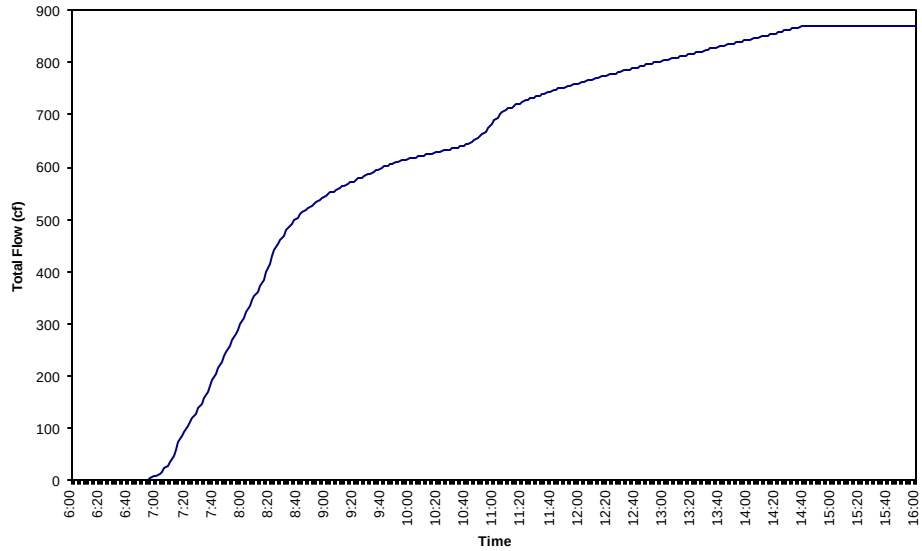


Figure 1-22b: Effluent Hydrograph, Cumulative Flow, and Cumulative Rainfall at the Foothill MS Fossil Filter™ DII for Event 4 on January 10-12, 2001

Effluent



Cumulative Flow



Cumulative Rainfall

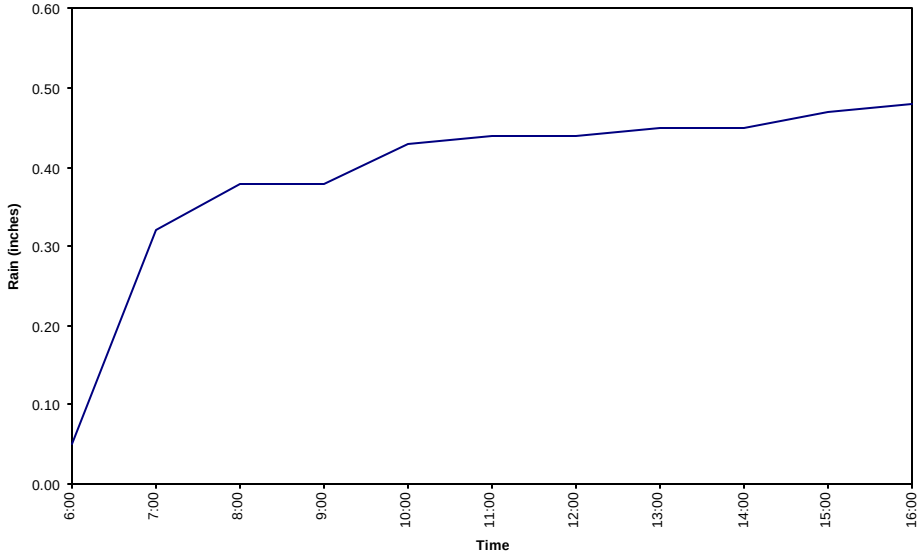
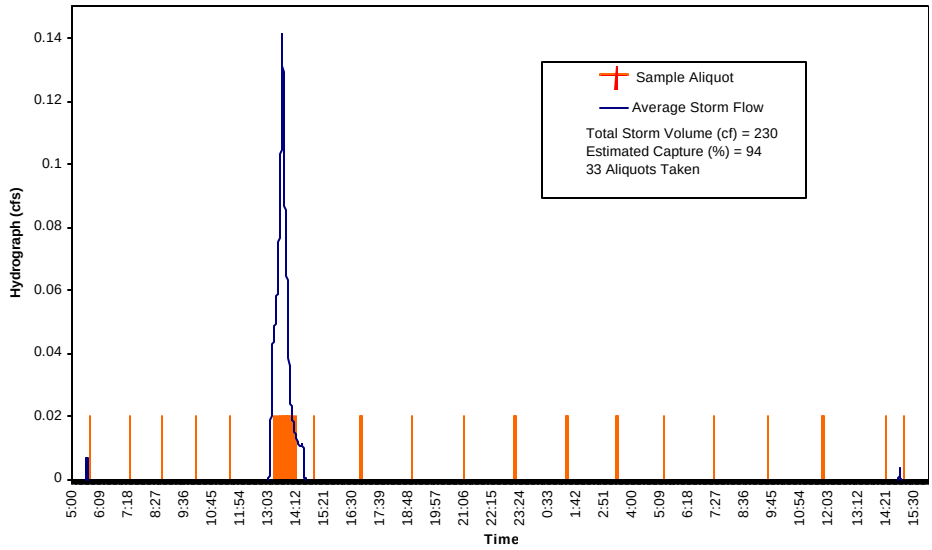
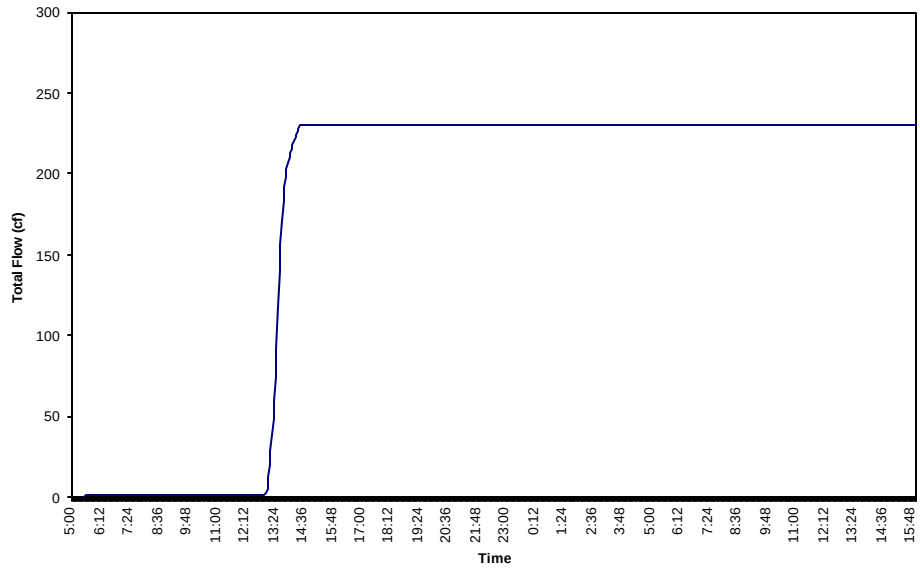


Figure 1-22c: Effluent Hydrograph, Cumulative Flow, and Cumulative Rainfall at the Foothill MS Fossil Filter™ DII for Event 5 on January 24, 2001

Effluent



Cumulative Flow



Cumulative Rainfall

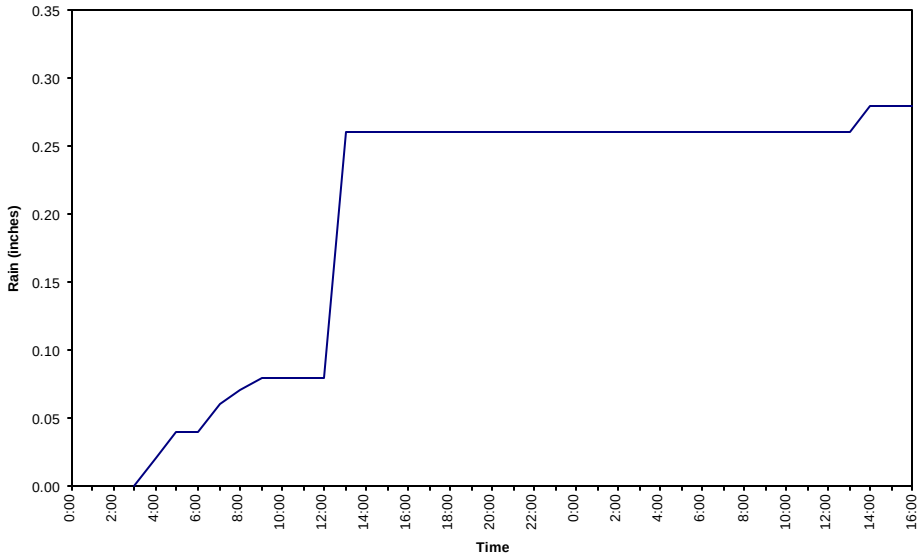
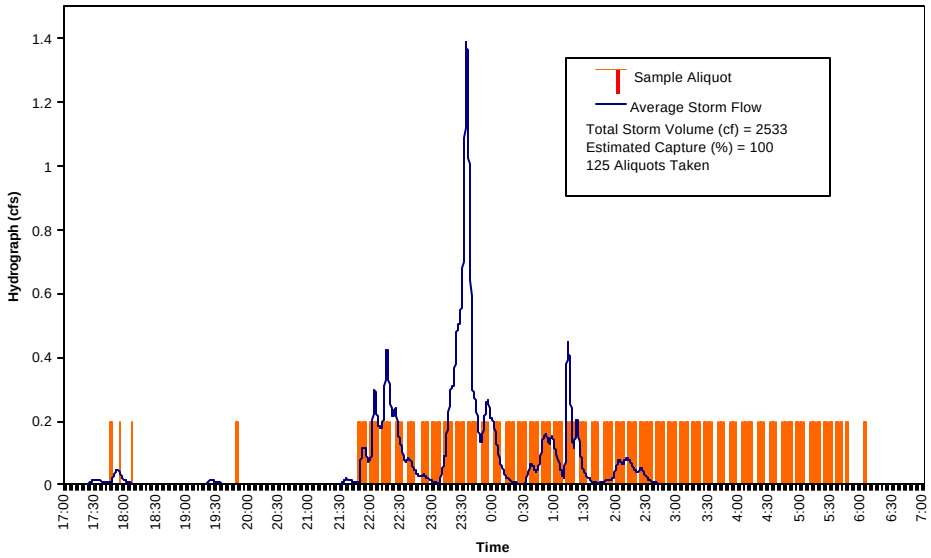
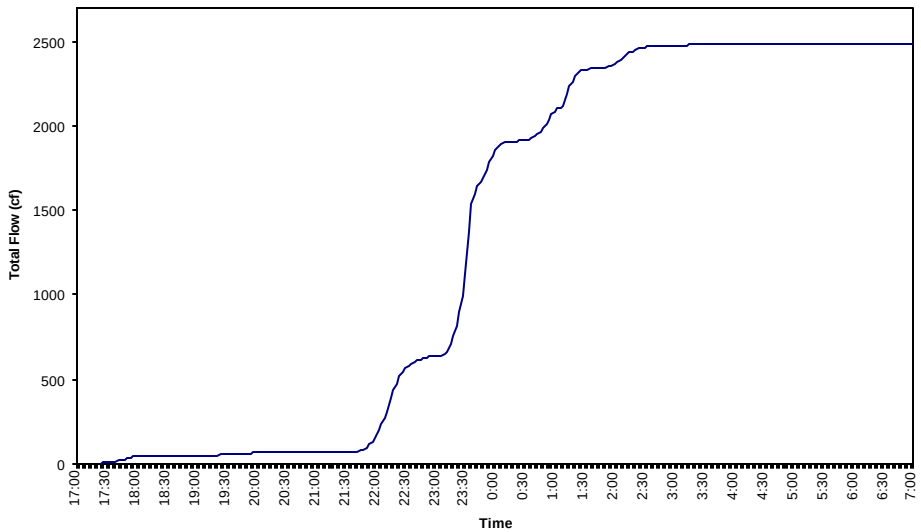


Figure 1-22d: Effluent Hydrograph, Cumulative Flow, and Cumulative Rainfall at the Foothill MS Fossil Filter™ DII for Event 6 on February 10, 2001

Effluent



Cumulative Flow



Cumulative Rainfall

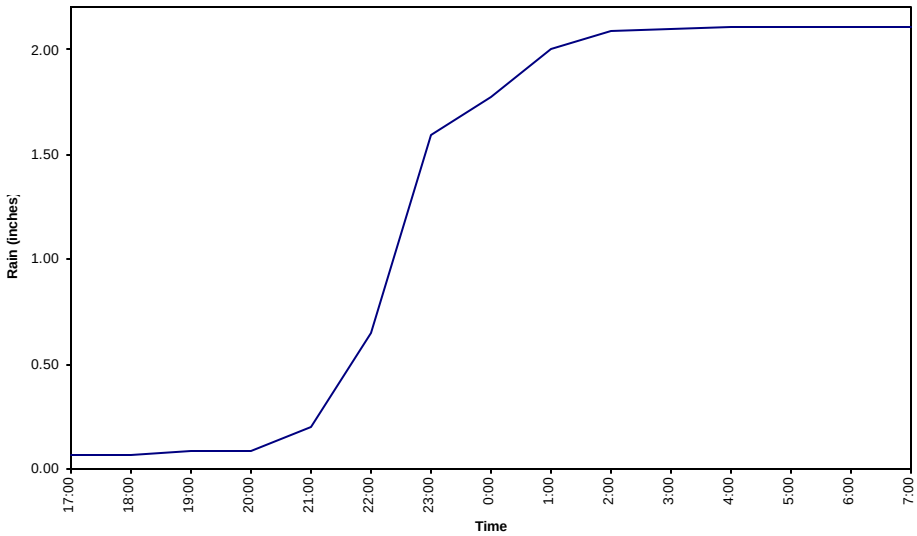
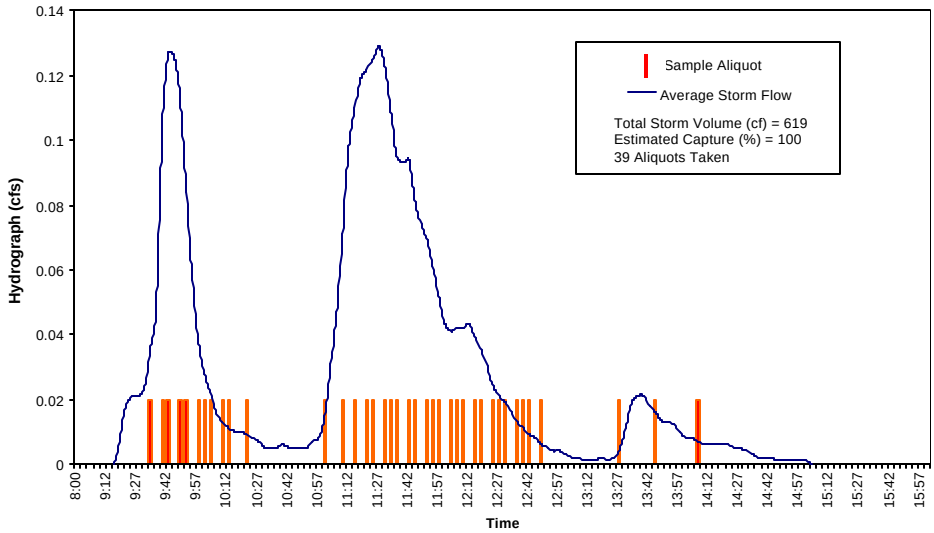
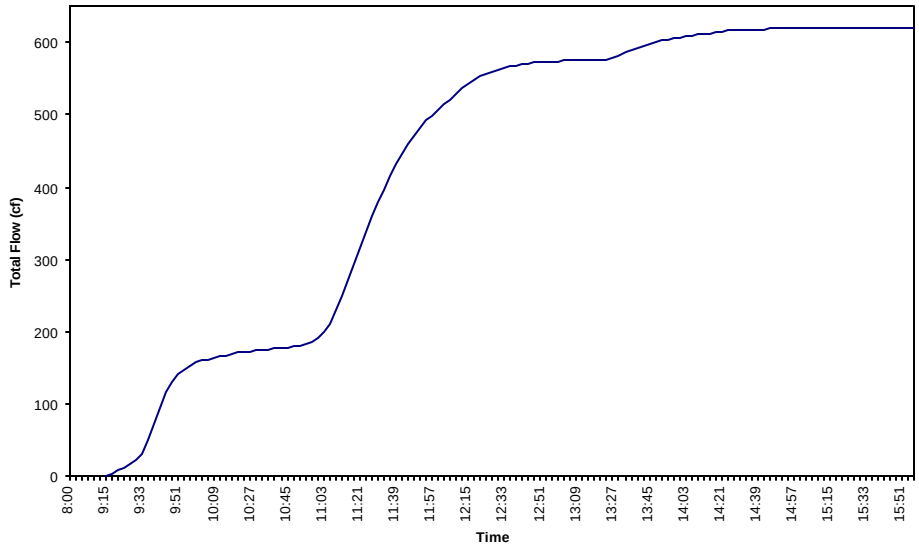


Figure 1-23a: Effluent Hydrograph, Cumulative Flow, and Cumulative Rainfall at the Las Flores MS Fossil Filter™ DII for Event 2 on October 26-27, 2000

Effluent



Cumulative Flow



Cumulative Rainfall

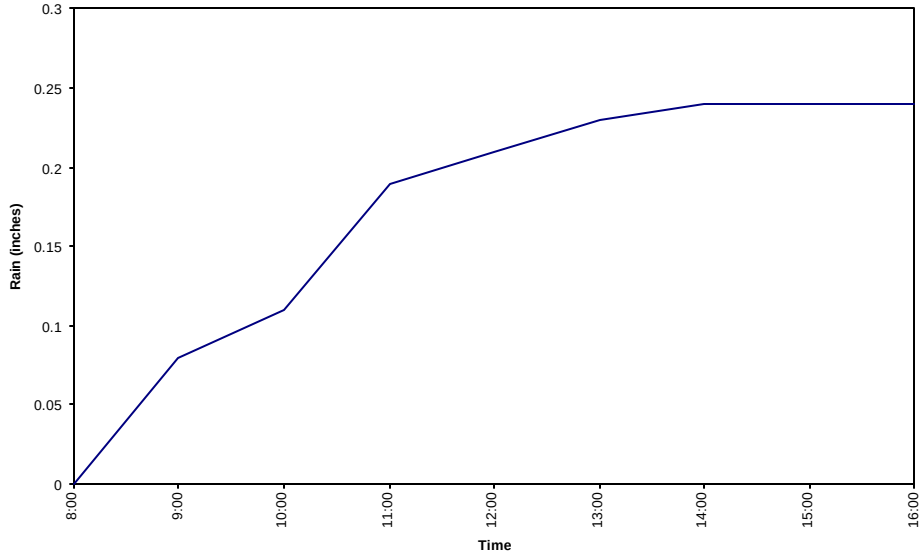
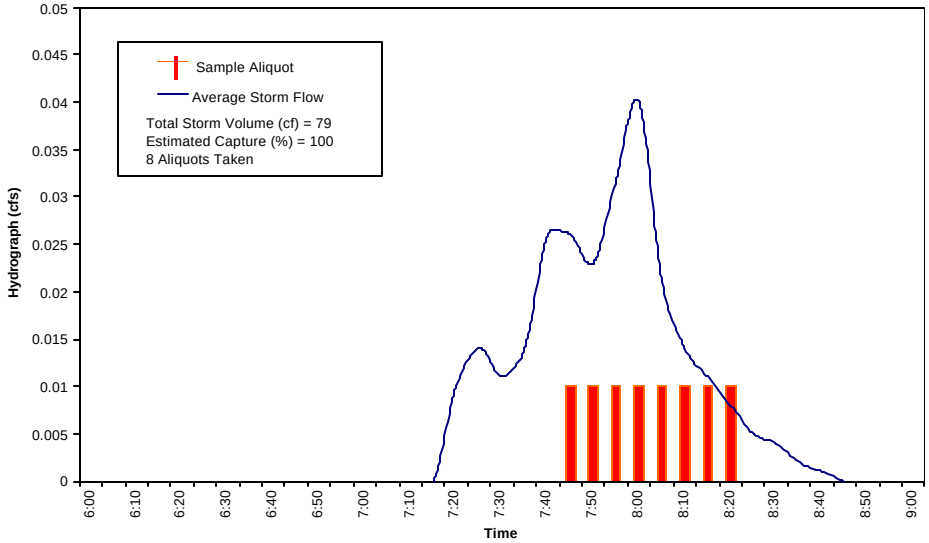
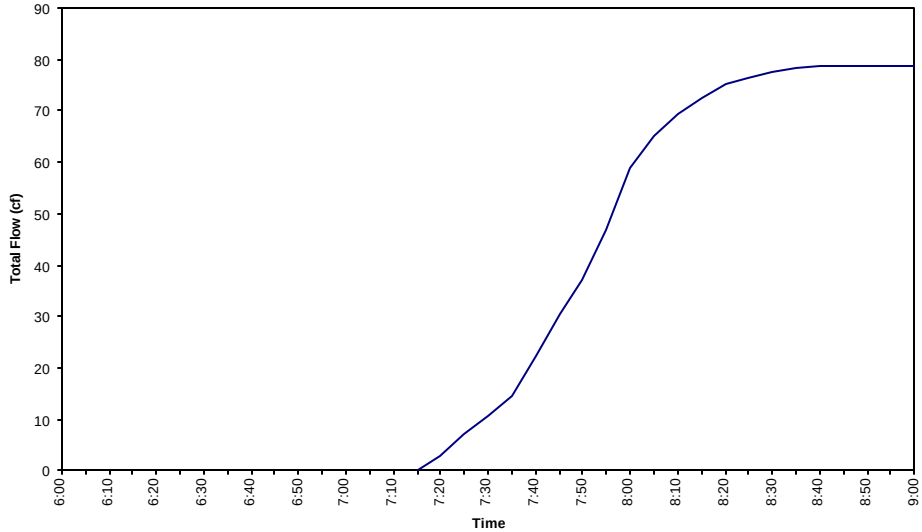


Figure 1-23b: Effluent Hydrograph, Cumulative Flow, and Cumulative Rainfall at the Las Flores MS Fossil Filter™ DII for Event 3 on January 8, 2001

Effluent



Cumulative Flow



Cumulative Rainfall

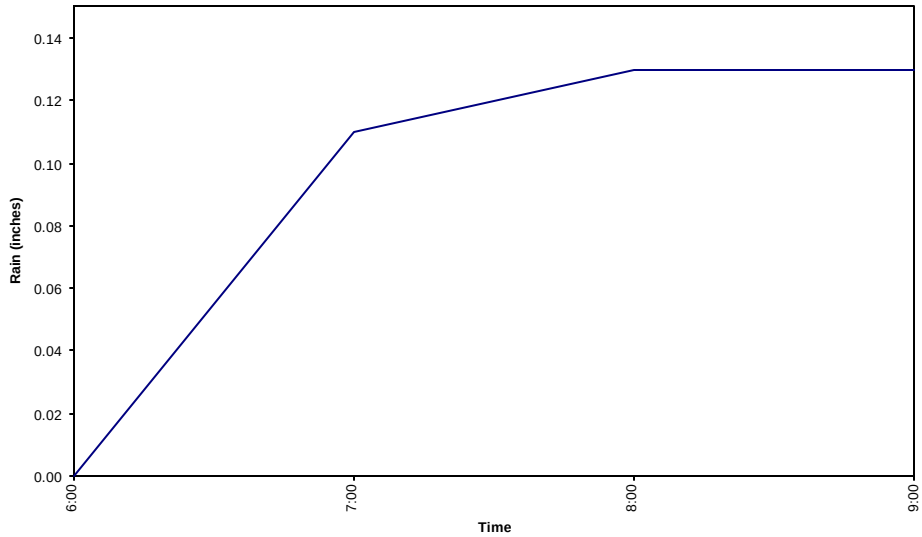
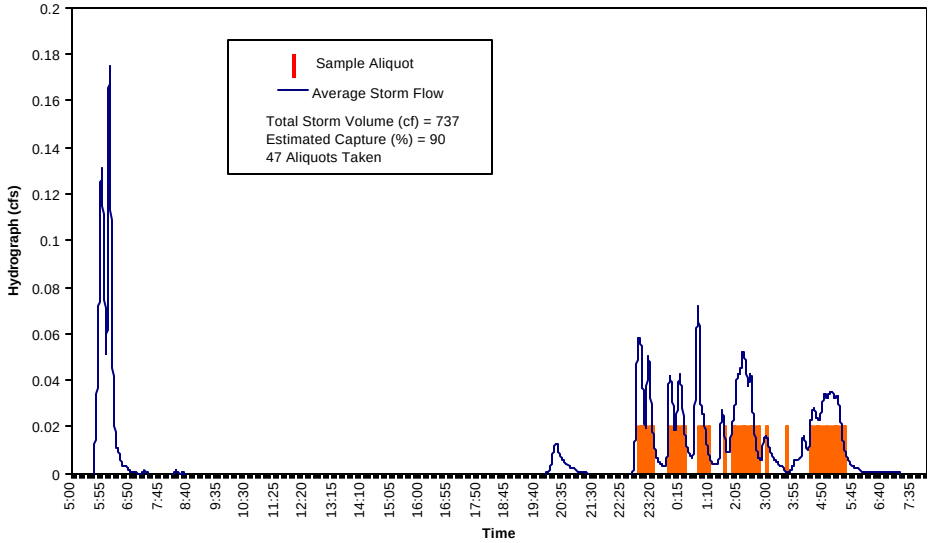
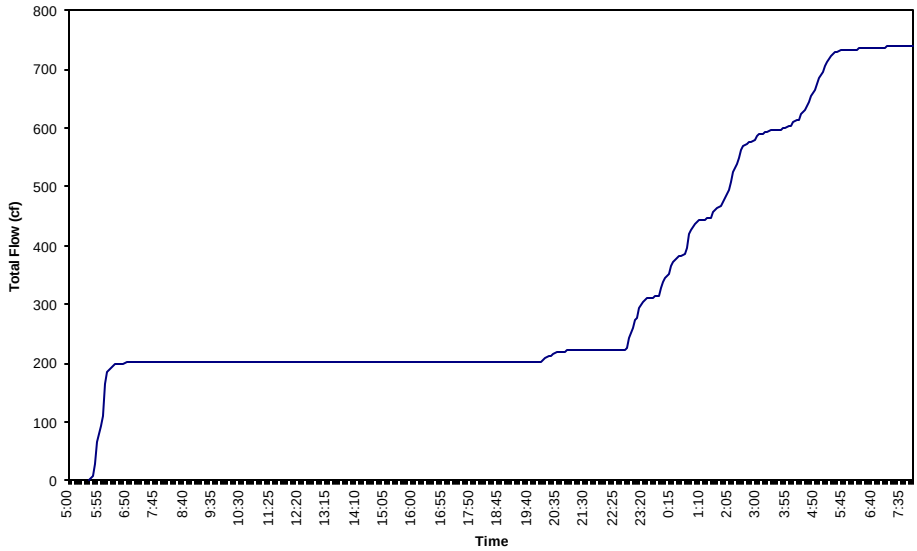


Figure 1-24a: Effluent Hydrograph, Cumulative Flow, and Cumulative Rainfall at the Rosemead MS Fossil Filter™ DII for Event 1 on October 11, 2000

Effluent



Cumulative Flow



Cumulative Rainfall

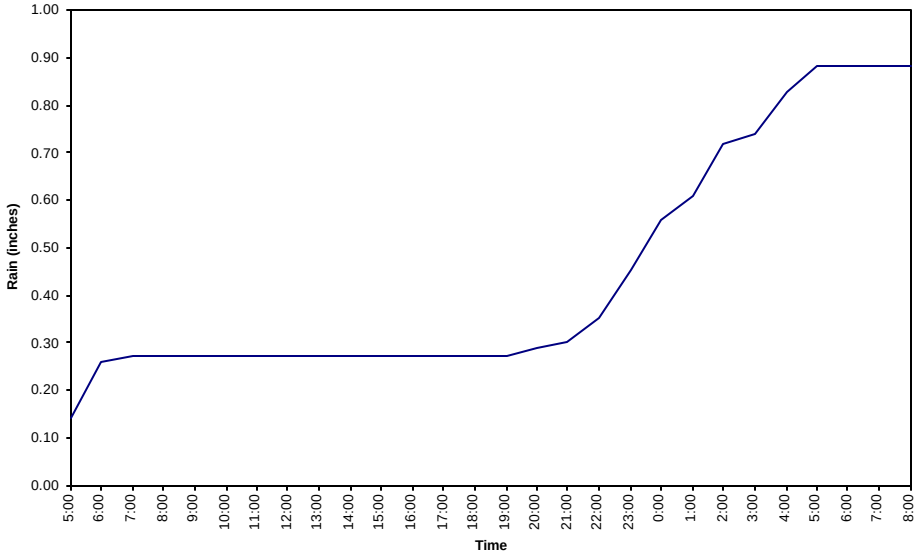
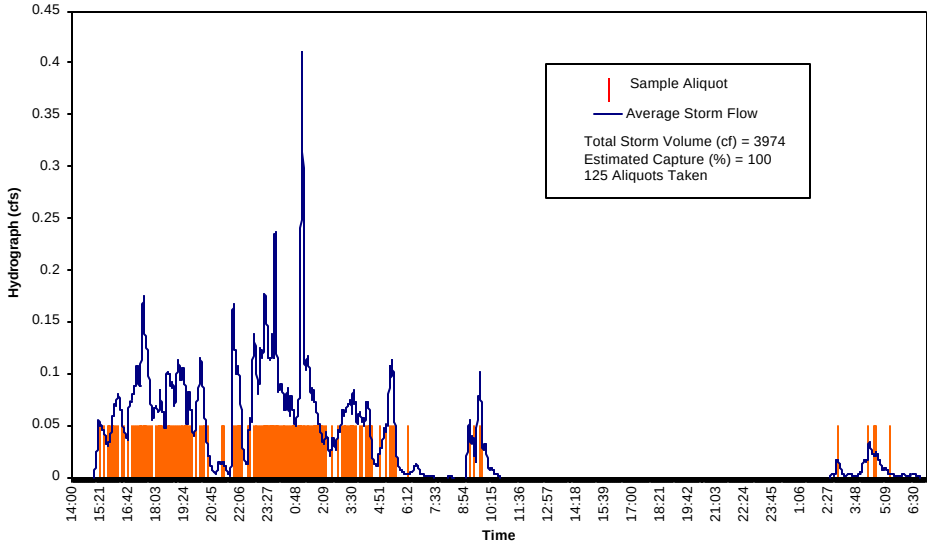
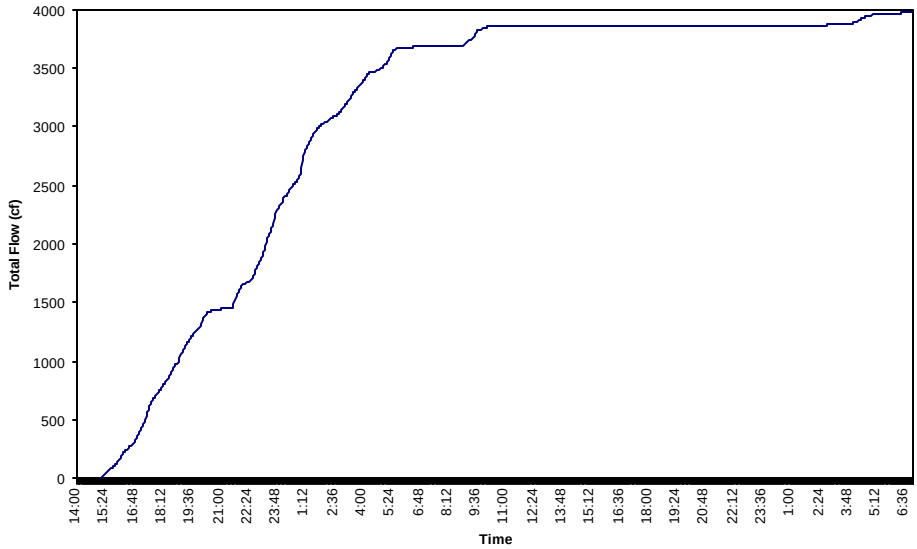


Figure 1-24b: Effluent Hydrograph, Cumulative Flow, and Cumulative Rainfall at the Rosemead MS Fossil Filter™ DII for Event 2 on October 26-27, 2000

Effluent



Cumulative Flow



Cumulative Rainfall

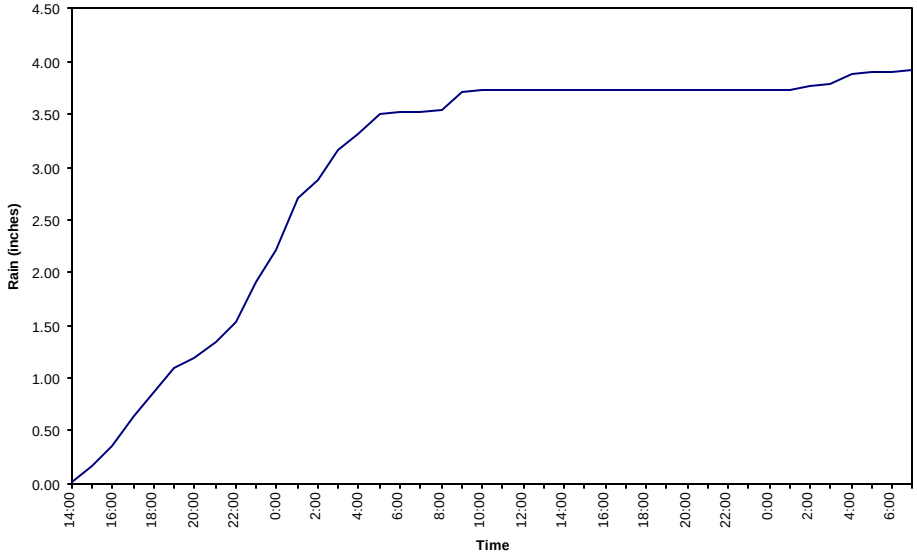
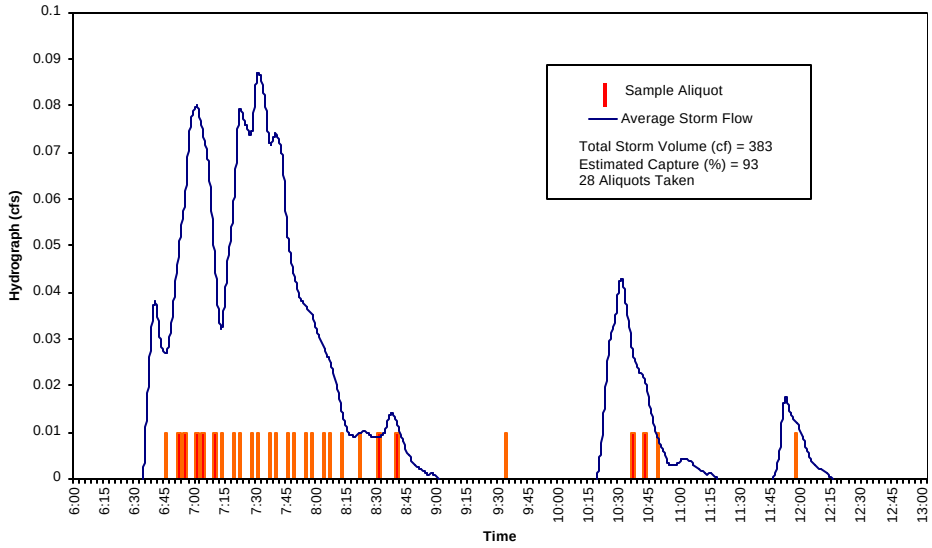
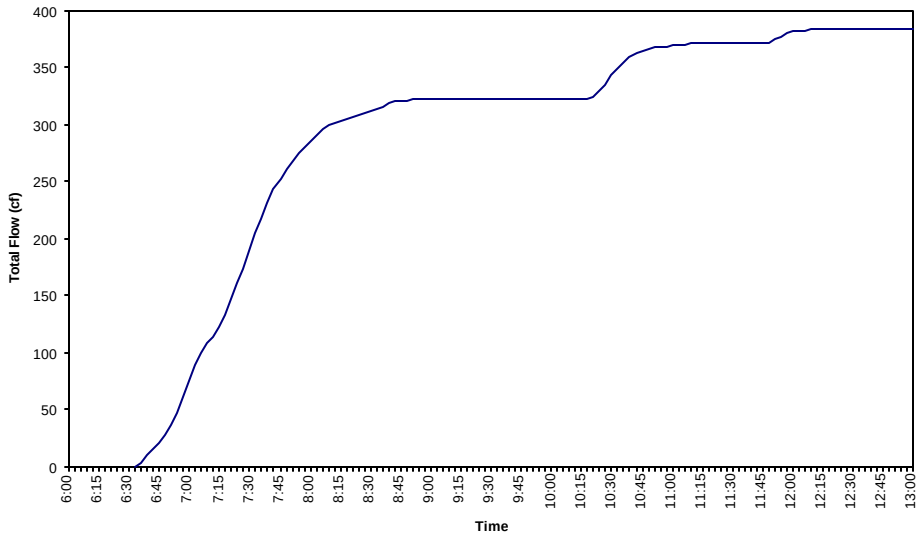


Figure 1-24c: Effluent Hydrograph, Cumulative Flow, and Cumulative Rainfall at the Rosemead MS Fossil Filter™ DII for Event 4 on January 10-12, 2001

Effluent



Cumulative Flow



Cumulative Rainfall

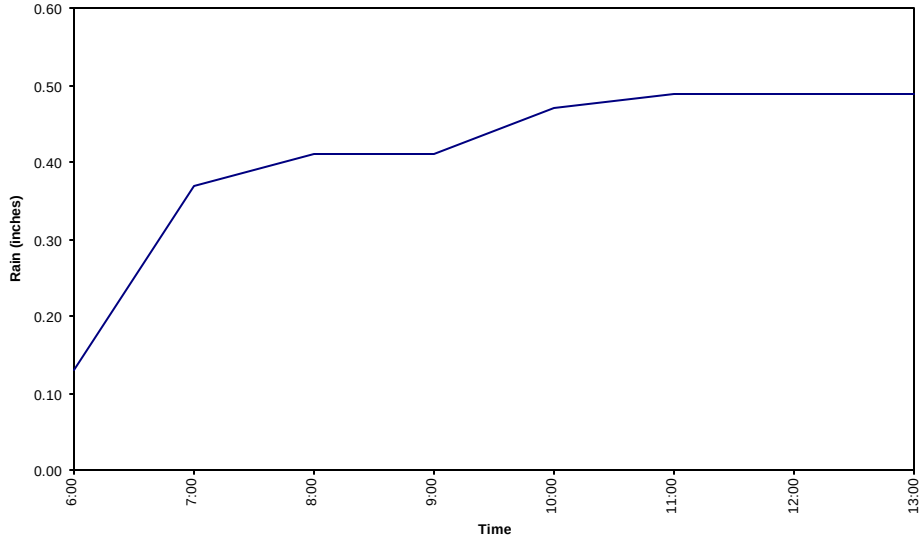
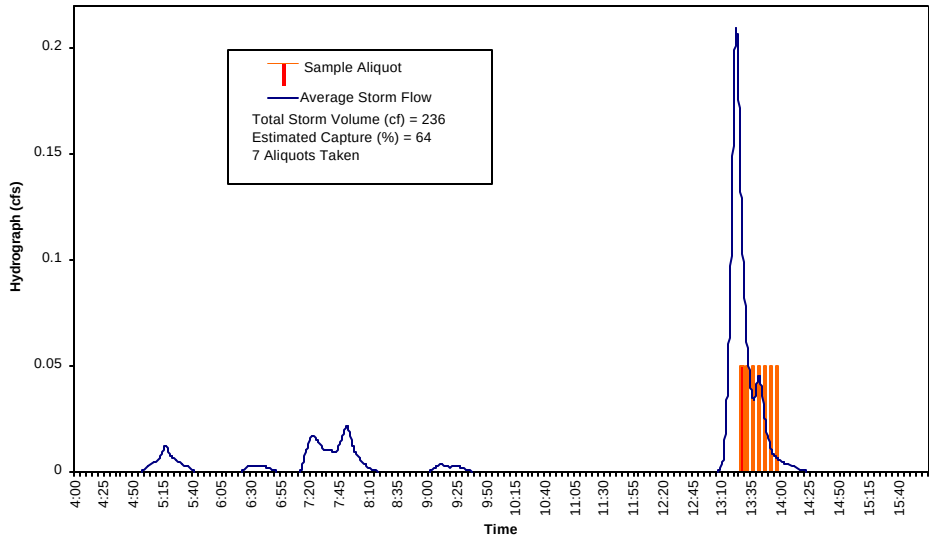
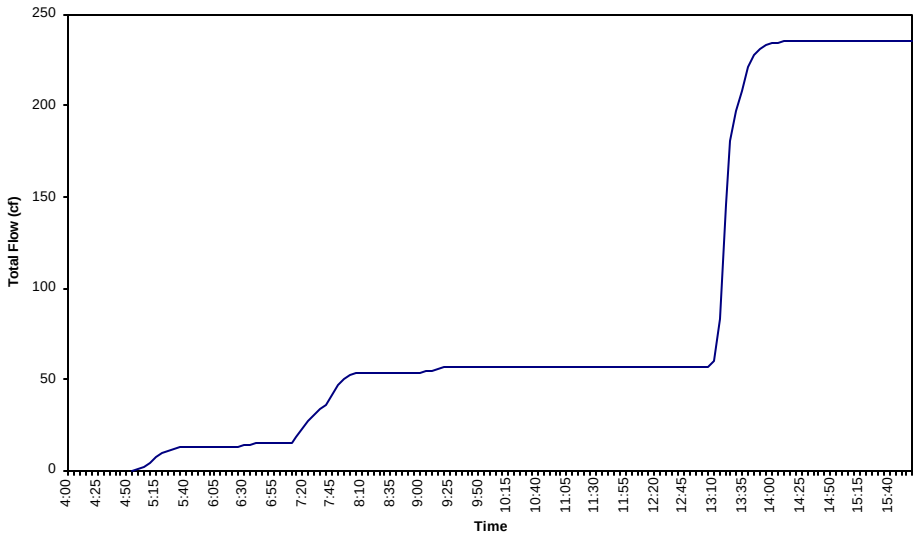


Figure 1-24d: Effluent Hydrograph, Cumulative Flow, and Cumulative Rainfall at the Rosemead MS Fossil Filter™ DII for Event 5 on January 24, 2001

Effluent



Cumulative Flow



Cumulative Rainfall

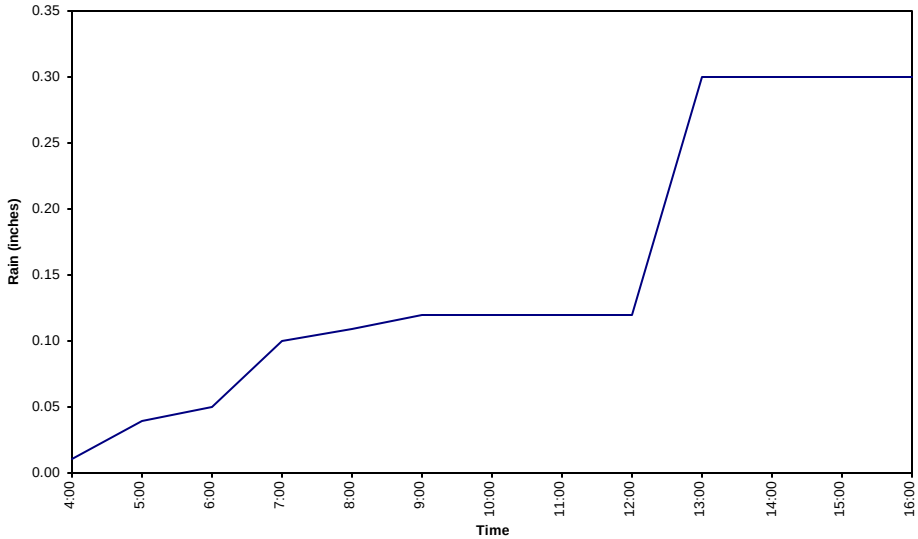
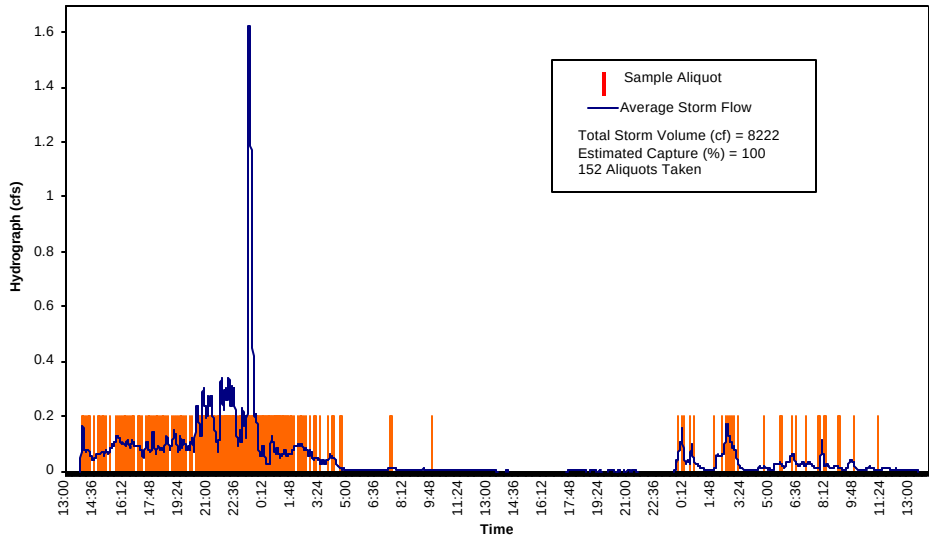
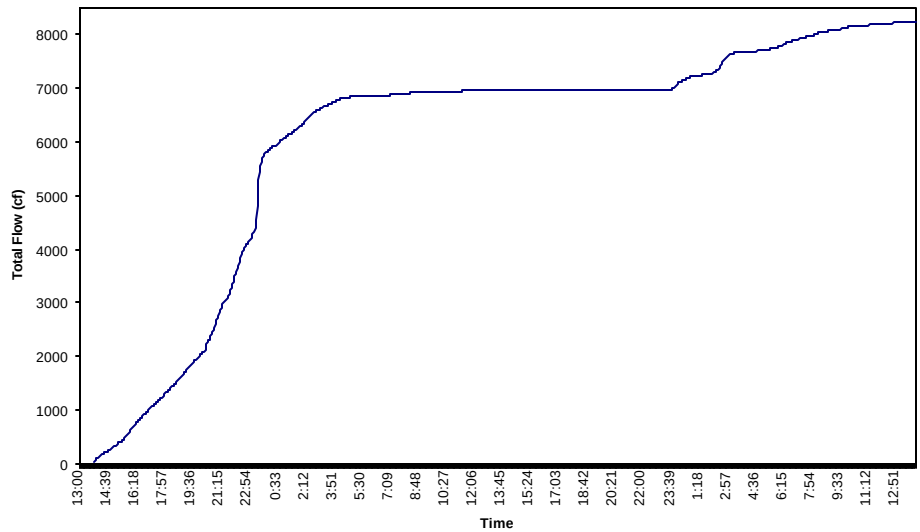


Figure 1-24e: Effluent Hydrograph, Cumulative Flow, and Cumulative Rainfall at the Rosemead MS Fossil Filter™ DII for Event 6 on February 10, 2001

Effluent



Cumulative Flow



Cumulative Rainfall

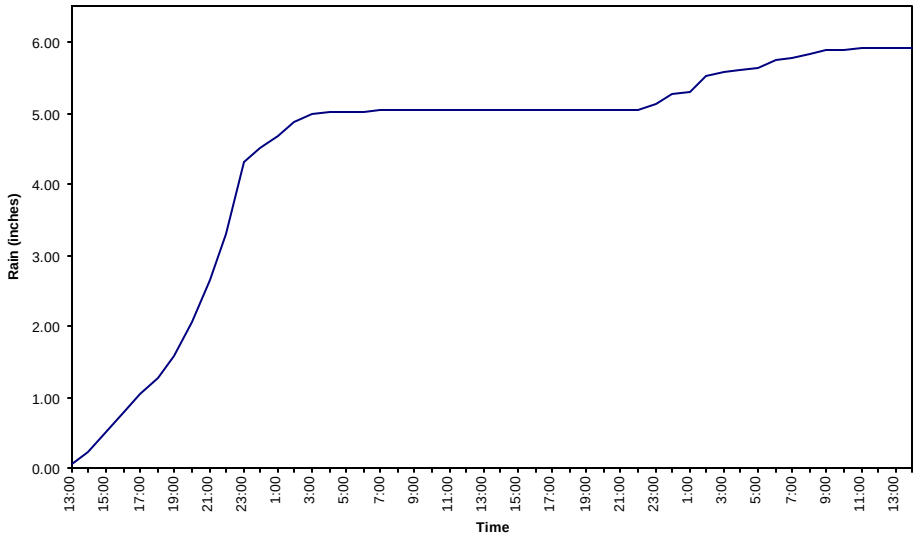
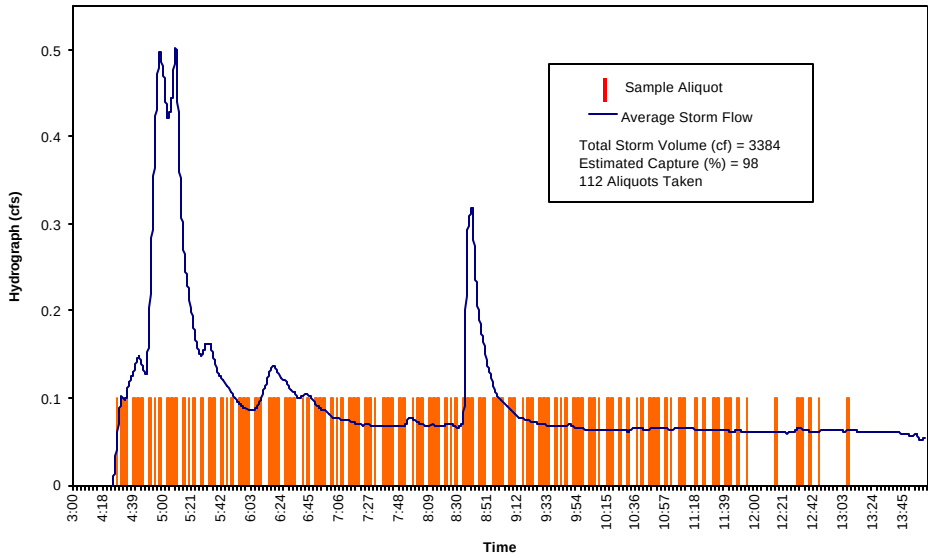
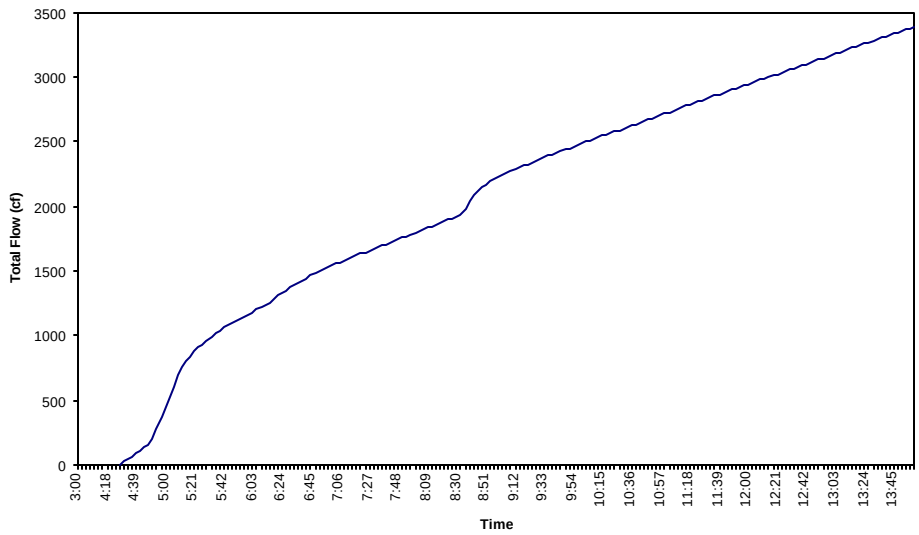


Figure 1-23c: Effluent Hydrograph, Cumulative Flow, and Cumulative Rainfall at the Las Flores MS Fossil Filter™ DII for Event 4 on January 10-12, 2001

Effluent



Cumulative Flow



Cumulative Rainfall

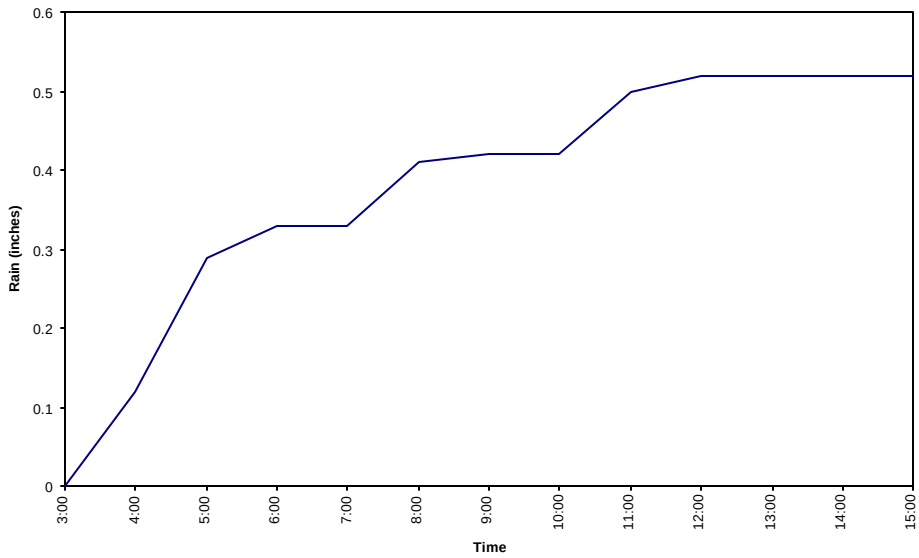
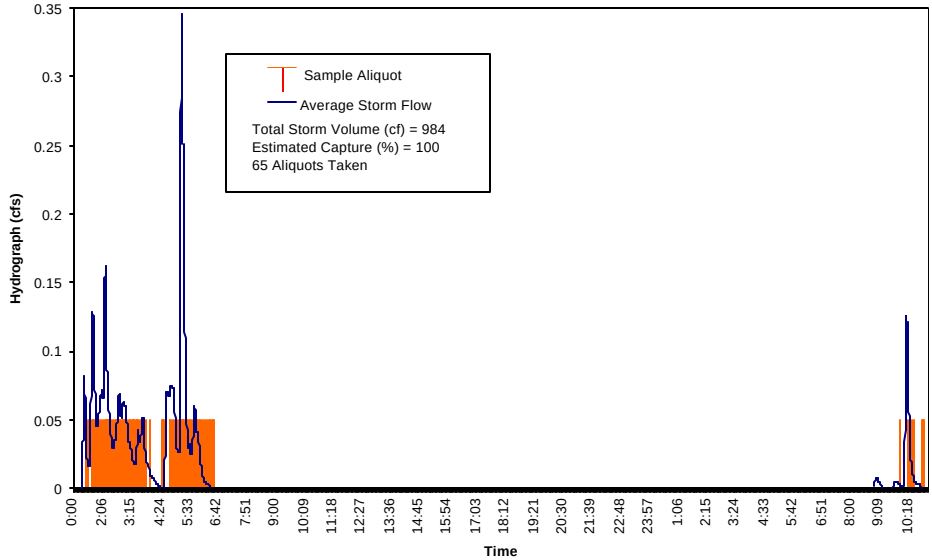
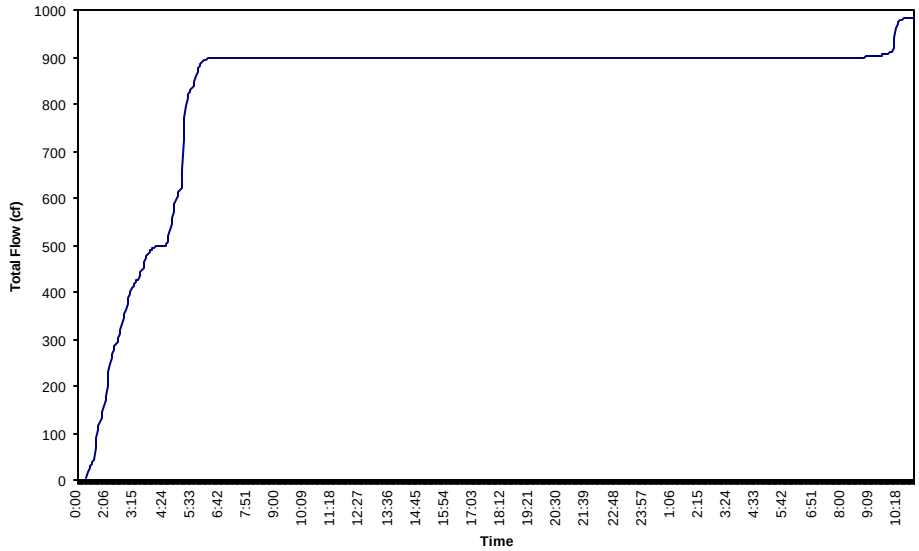


Figure 1-23d: Effluent Hydrograph, Cumulative Flow, and Cumulative Rainfall at the Las Flores MS Fossil Filter™ DII for Event 5 on January 24, 2001

Effluent



Cumulative Flow



Cumulative Rainfall

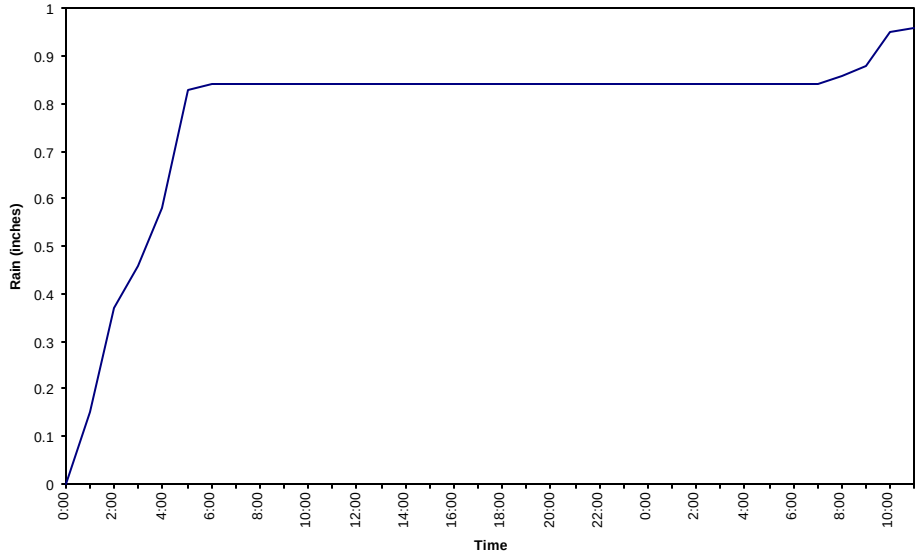
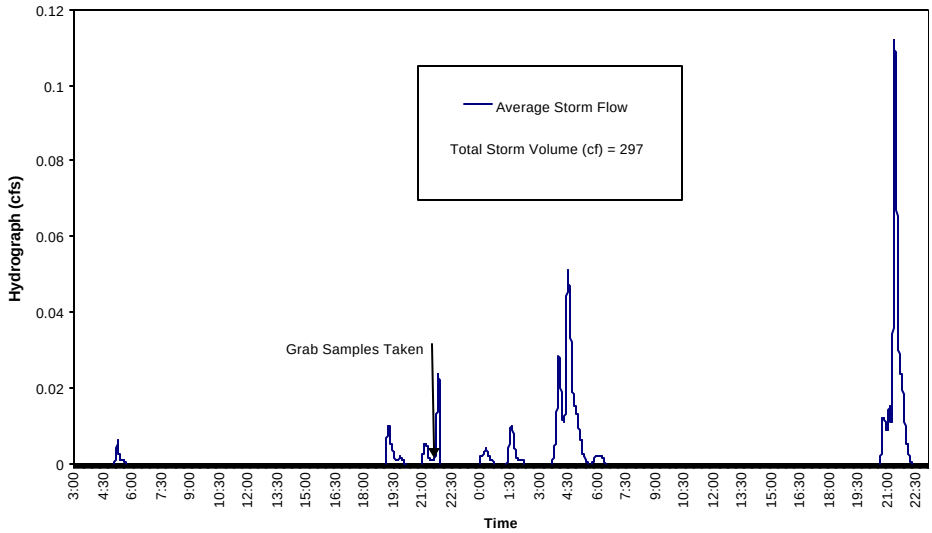
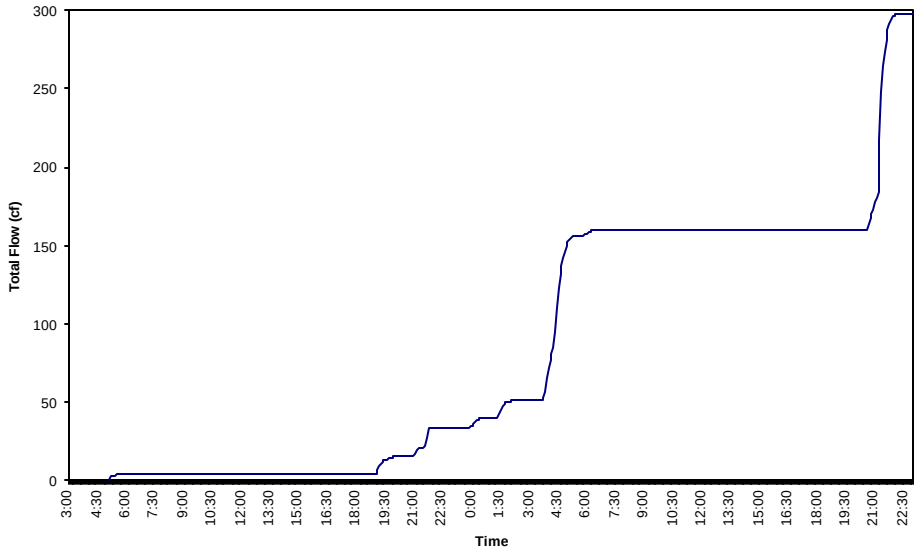


Figure 1-23e: Effluent Hydrograph, Cumulative Flow, and Cumulative Rainfall at the Las Flores MS Fossil Filter™ DII for Event 6 on February 10-11, 2001

Effluent



Cumulative Flow



Cumulative Rainfall

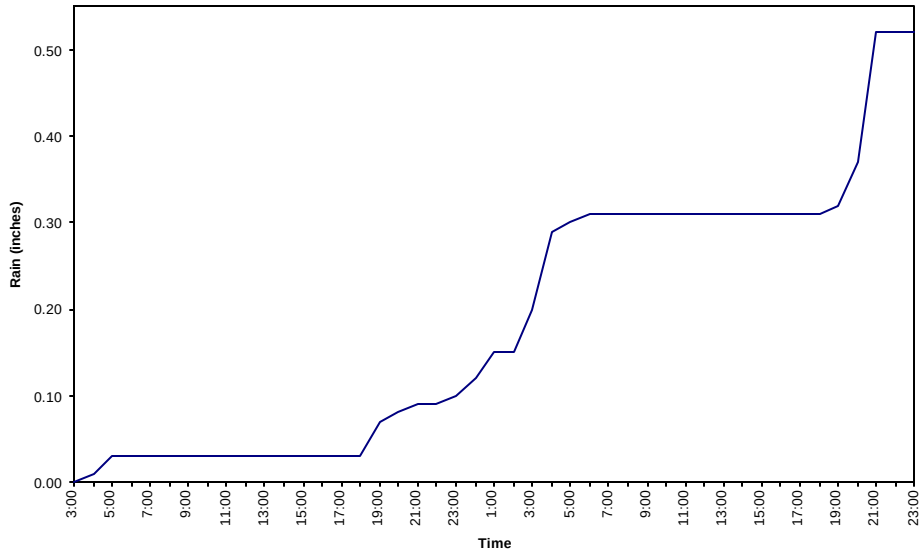
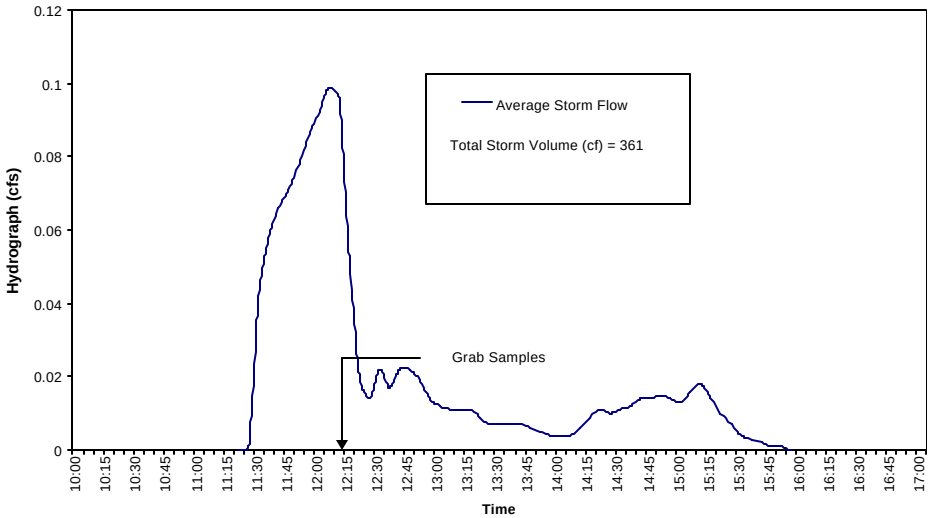
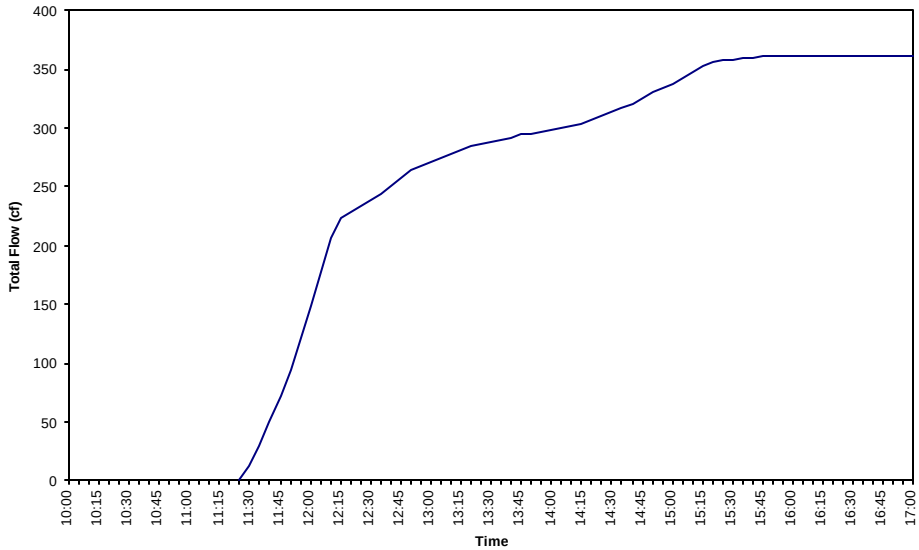


Figure 1-25a: Effluent Hydrograph, Cumulative Flow, and Cumulative Rainfall at the Alameda Maintenance Station Oil/Water Separator for Event 2 on October 26-27, 2000

Effluent



Cumulative Flow



Cumulative Rainfall

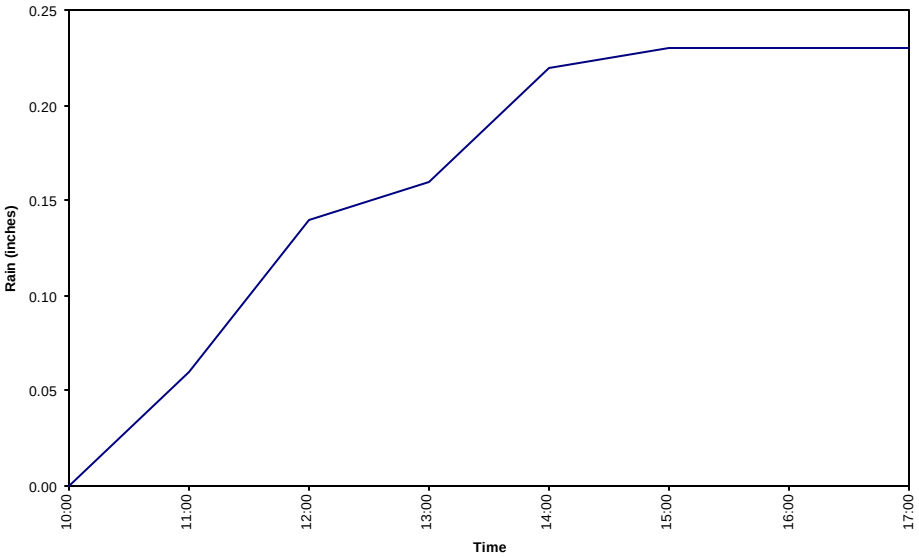
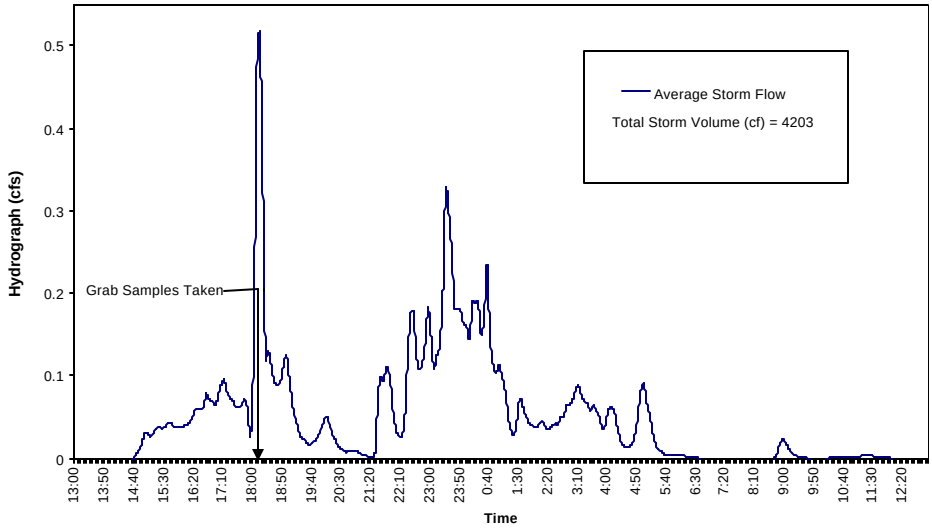
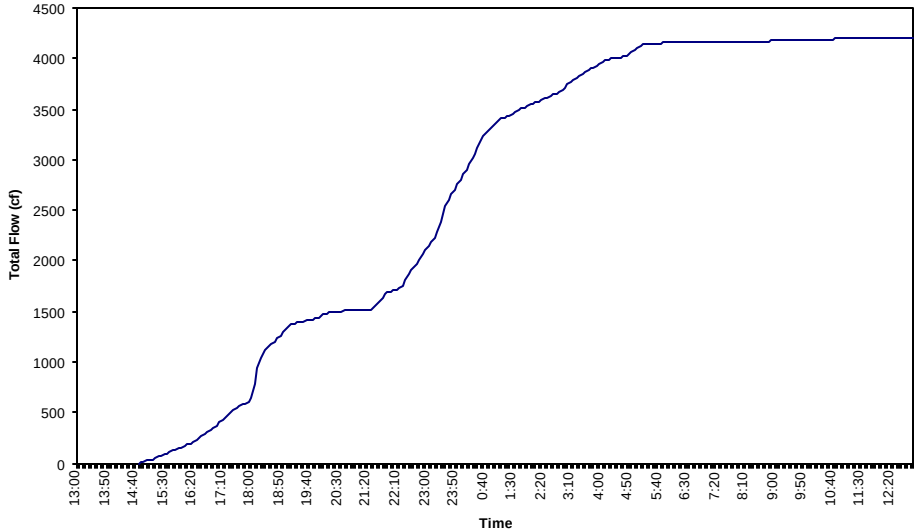


Figure 1-25b Effluent Hydrograph, Cumulative Flow, and Cumulative Rainfall at the Alameda Maintenance Station Oil/Water Separator for Event 3 on January 8, 2001

Effluent



Cumulative Flow



Cumulative Rainfall

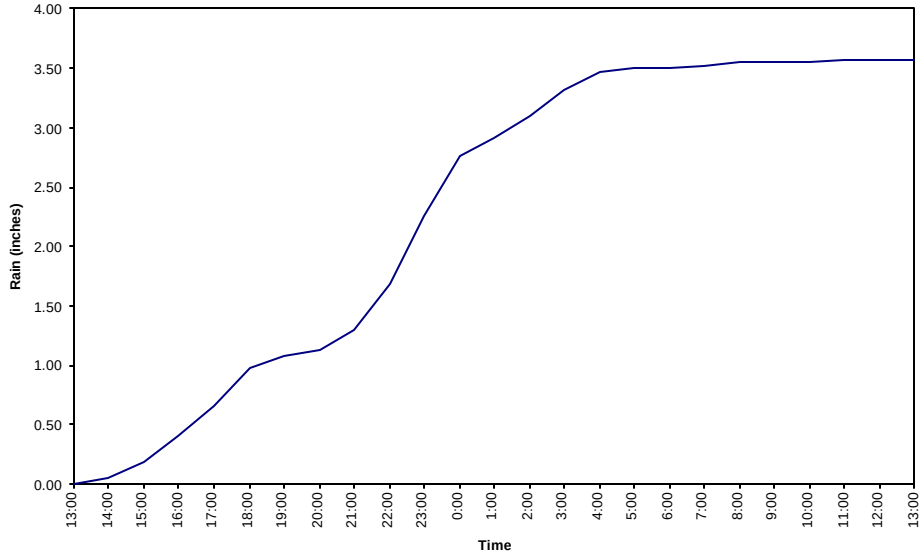
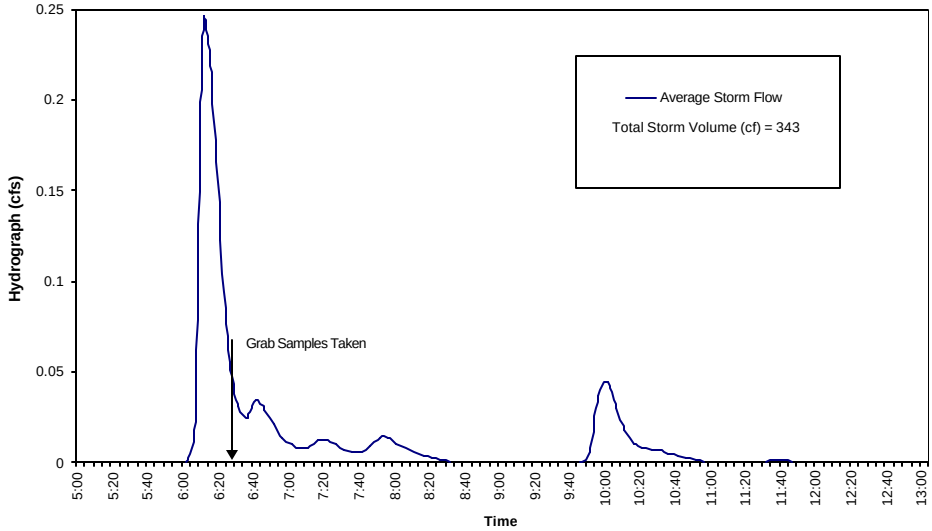
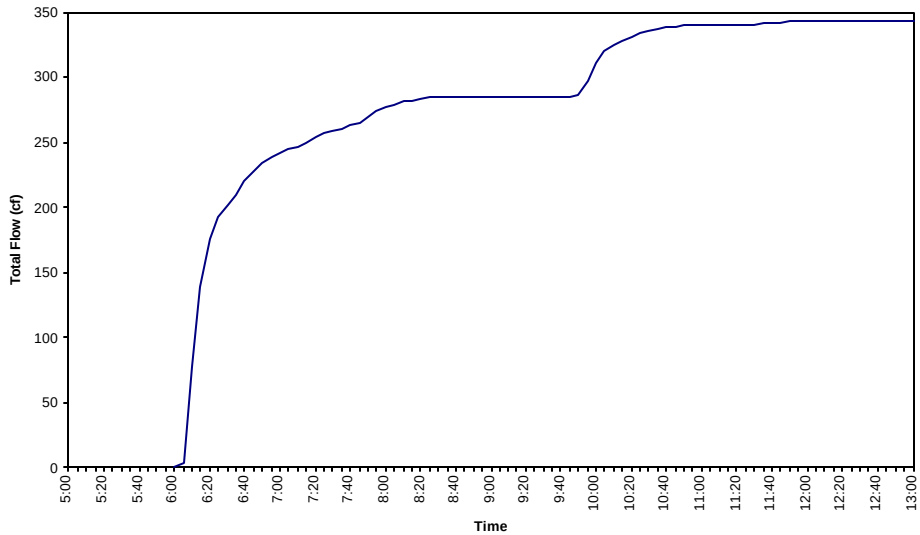


Figure 1-25c Effluent Hydrograph, Cumulative Flow, and Cumulative Rainfall at the Alameda Maintenance Station Oil/Water Separator for Event 4 on January 10-11, 2001

Effluent



Cumulative Flow



Cumulative Rainfall

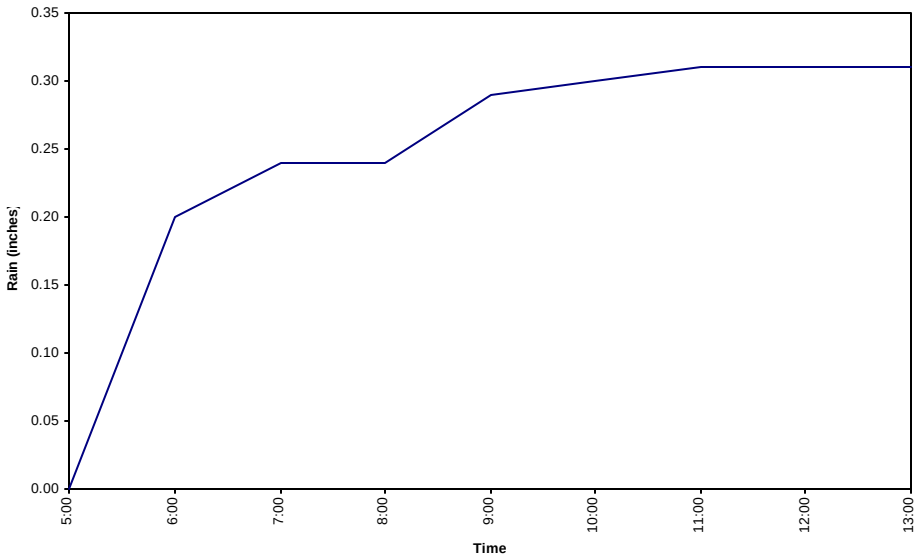
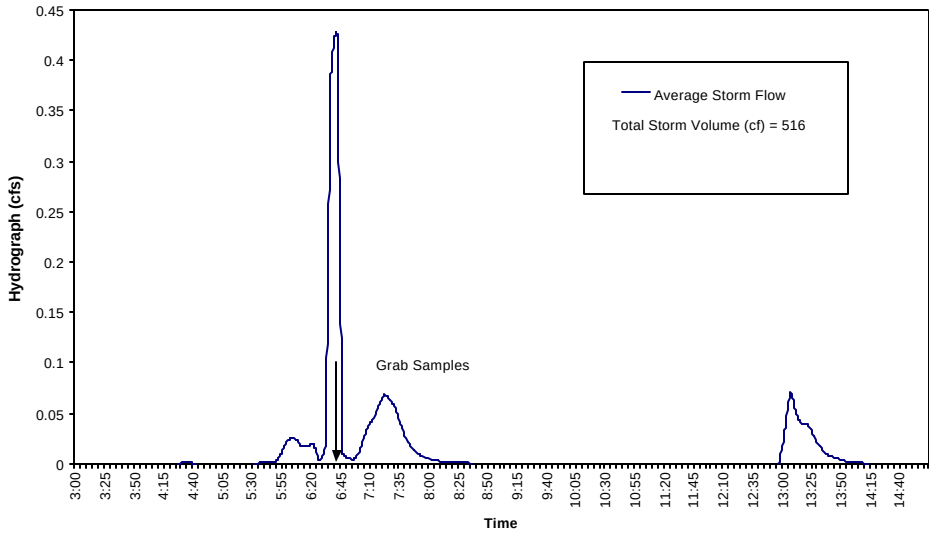
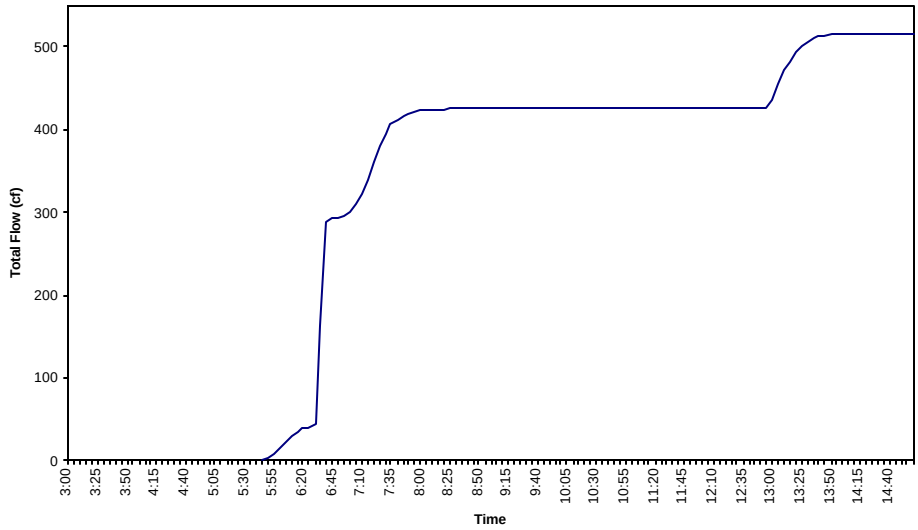


Figure 1-25d Effluent Hydrograph, Cumulative Flow, and Cumulative Rainfall at the Alameda Maintenance Station Oil/Water Separator for Event 5 on January 24, 2001

Effluent



Cumulative Flow



Cumulative Rainfall

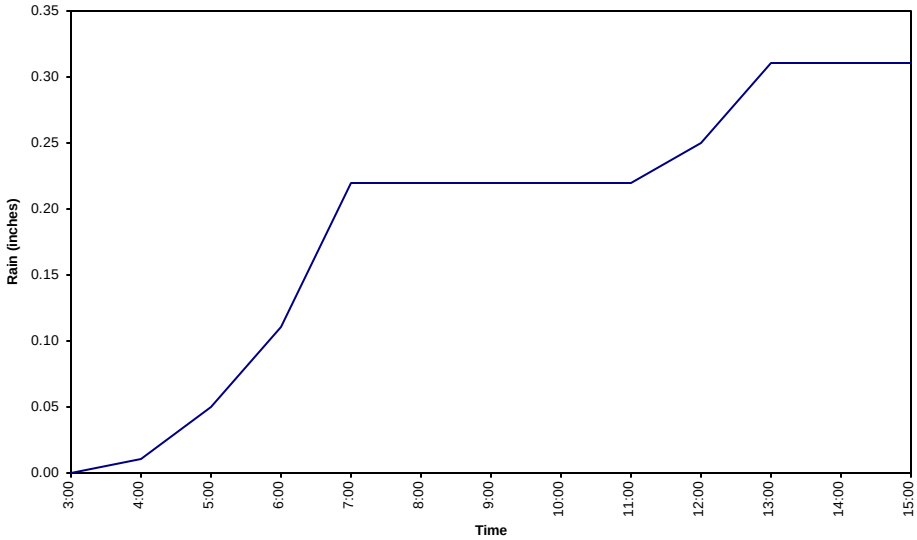
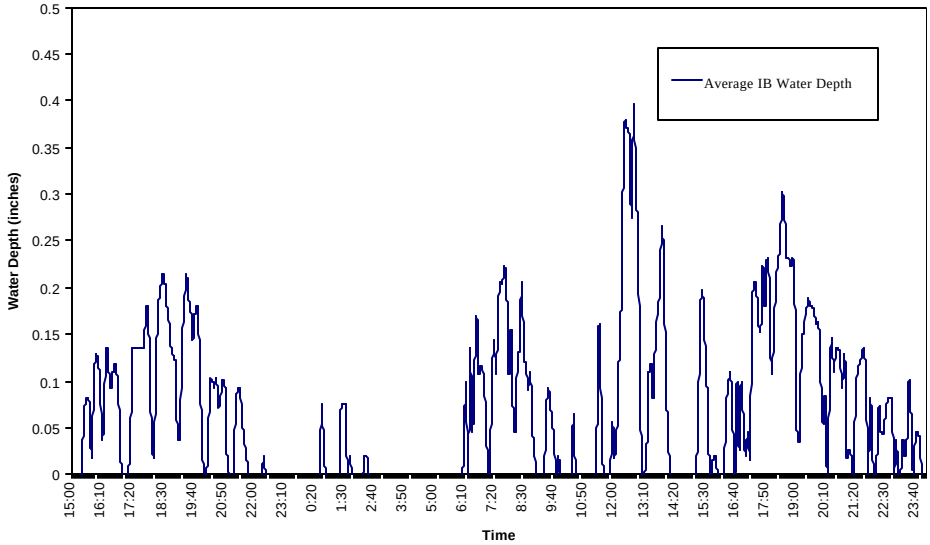


Figure 1-25e Effluent Hydrograph, Cumulative Flow, and Cumulative Rainfall at the Alameda Maintenance Station Oil/Water Separator for Event 6 on February 10, 2001

IB Water Depth



Cumulative Rainfall

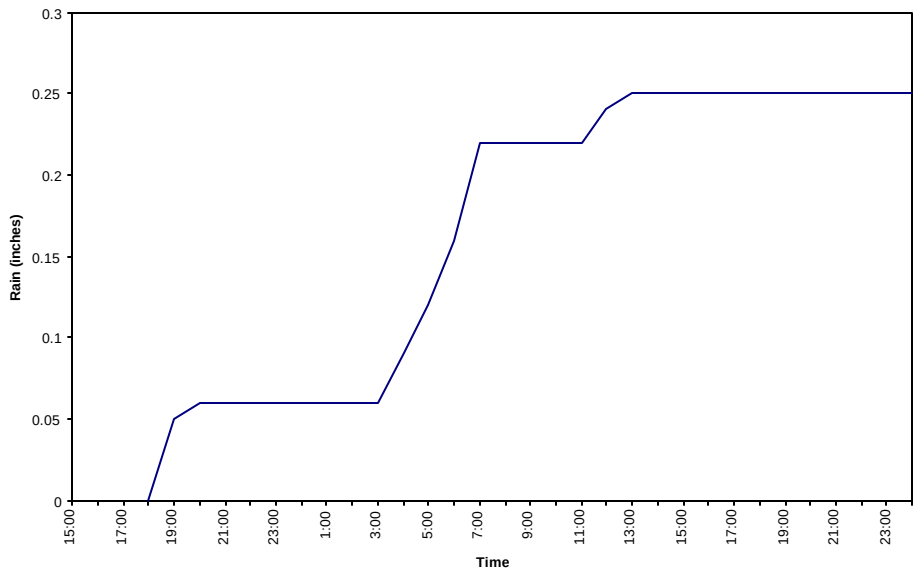
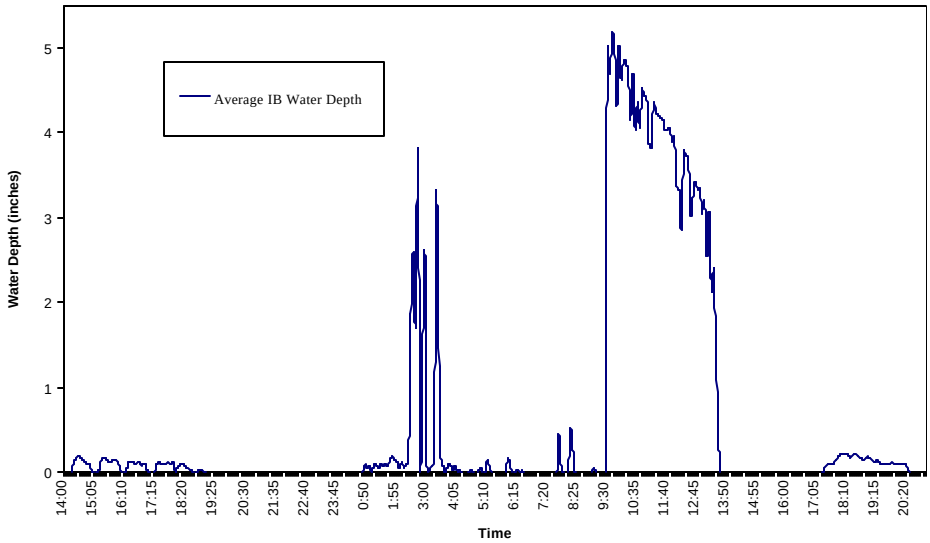


Figure 1-26a: IB Water Depth and Cumulative Rainfall at the I-605/SR-91 Infiltration Basin for Event 1 on October 10, 2000

IB Water Depth



Cumulative Rainfall

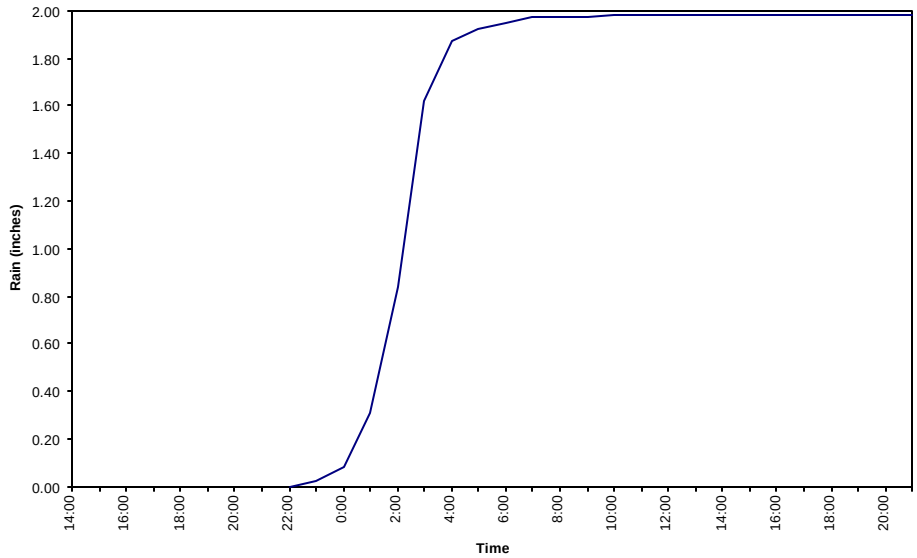
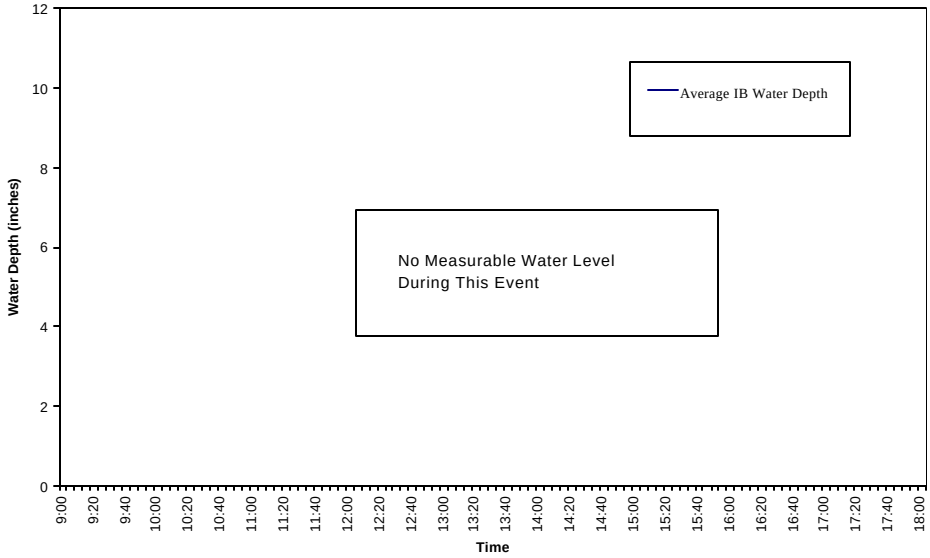


Figure 1-26b: IB Water Depth and Cumulative Rainfall at the I-605/SR-91 Infiltration Basin for Event 2 on October 26, 2000

IB Water Depth



Cumulative Rainfall

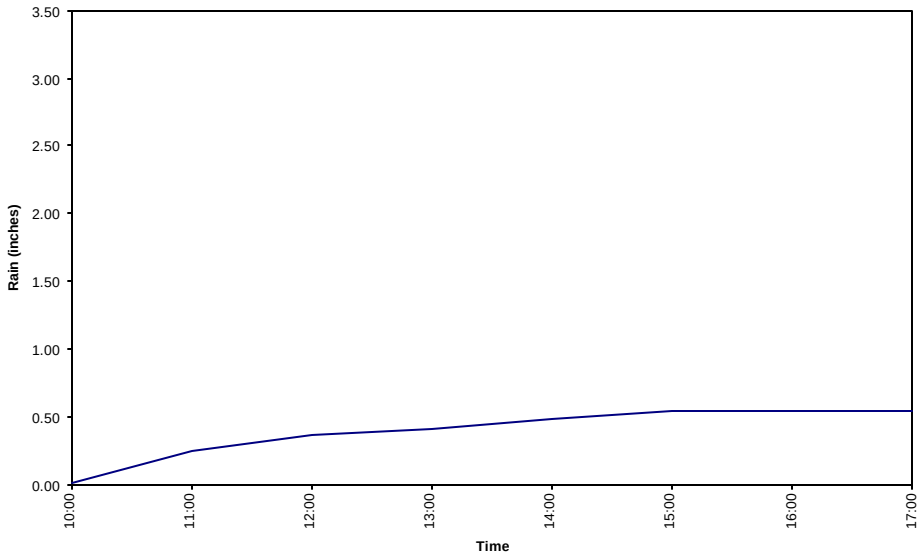
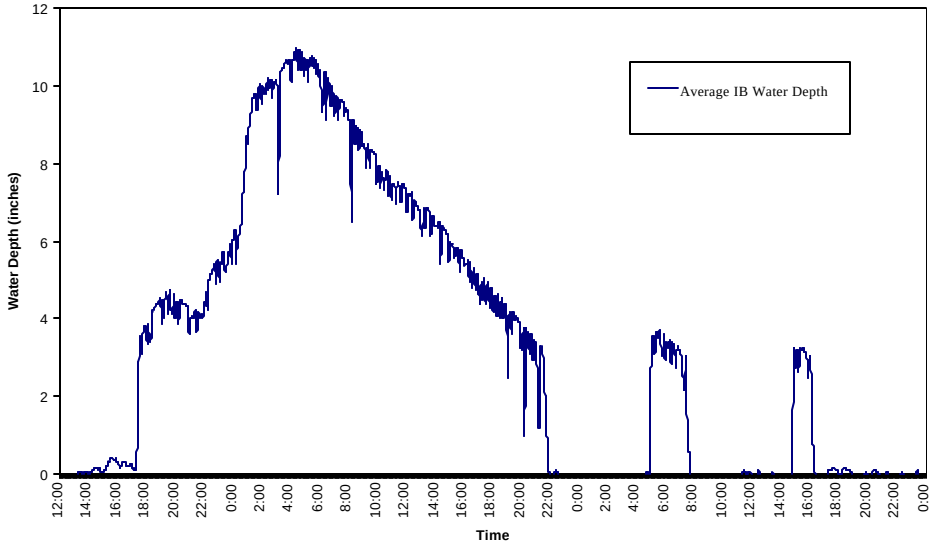


Figure 1-26c: IB Water Depth and Cumulative Rainfall at the I-605/SR-91 Infiltration Basin for Event 3 on January 8, 2001

IB Water Depth



Cumulative Rainfall

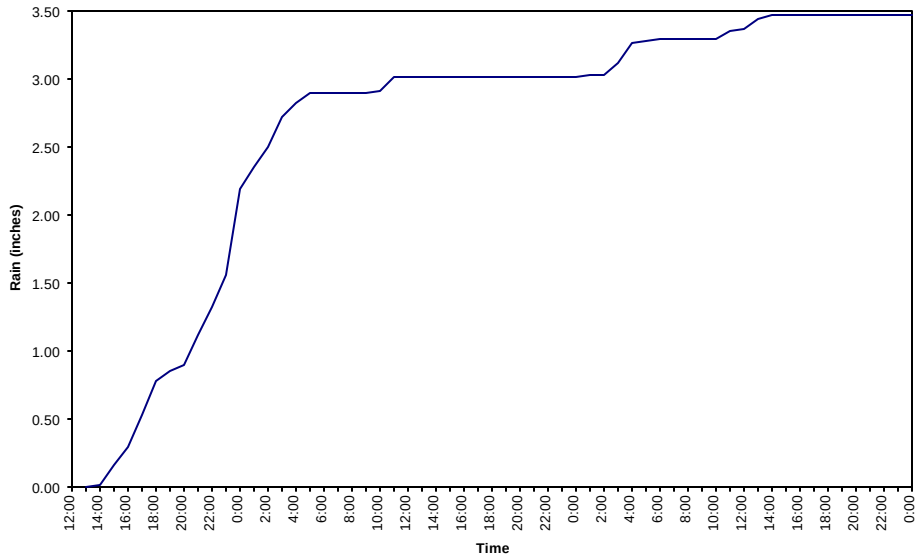
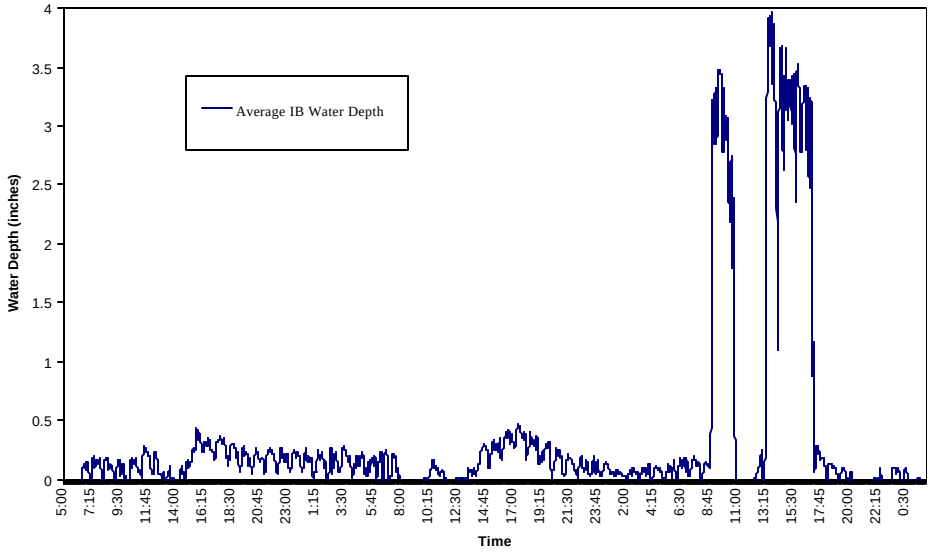


Figure 1-26d: IB Water Depth and Cumulative Rainfall at the I-605/SR-91 Infiltration Basin for Event 4 on January 10, 2001

IB Water Depth



Cumulative Rainfall

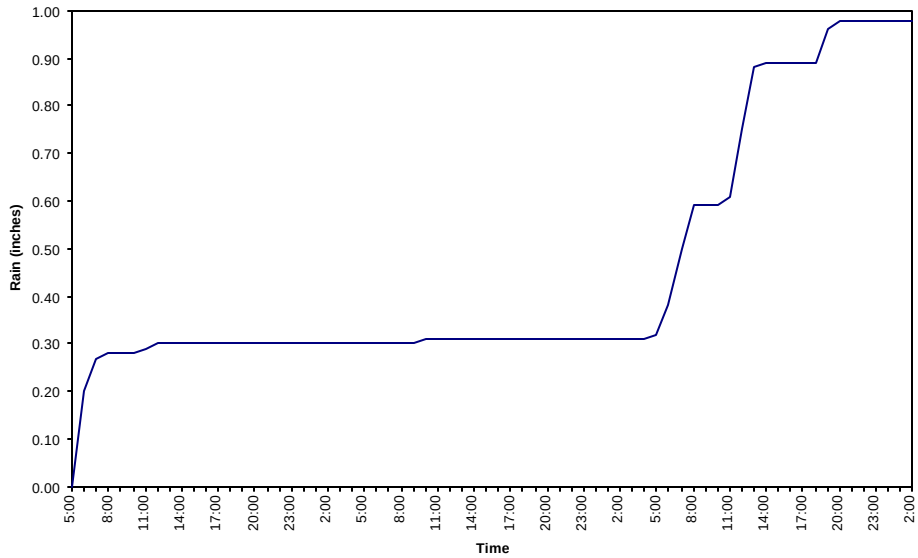
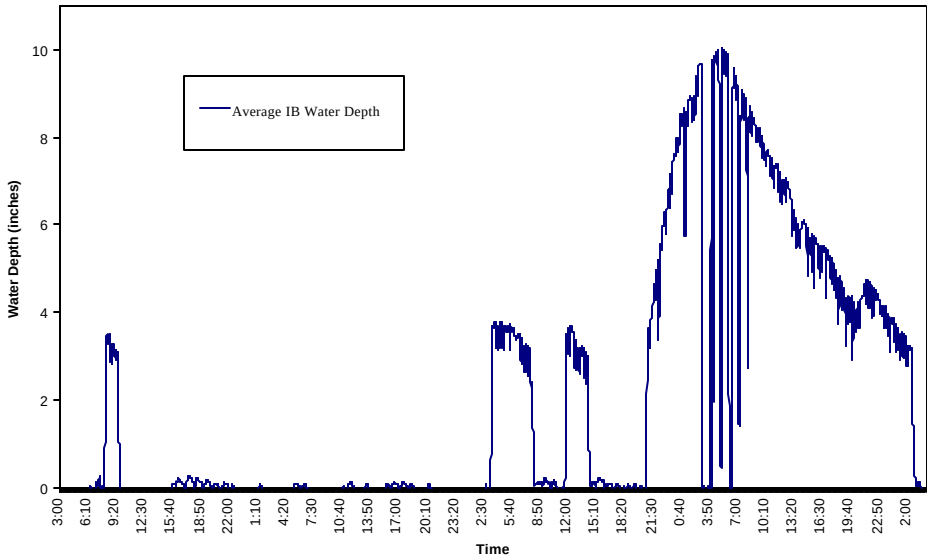


Figure 1-26e: IB Water Depth and Cumulative Rainfall at the I-605/SR-91 Infiltration Basin for Event 5 on January 24, 2001

IB Water Depth



Cumulative Rainfall

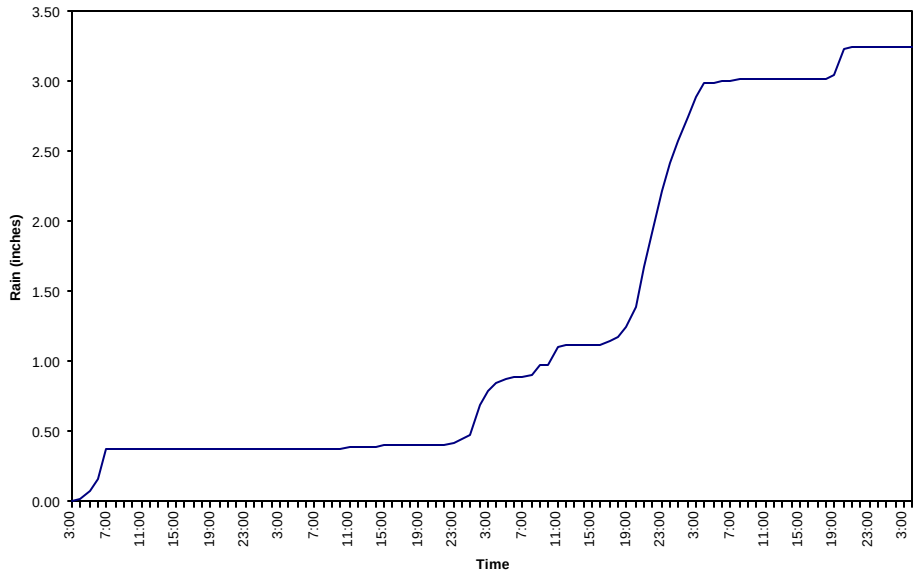
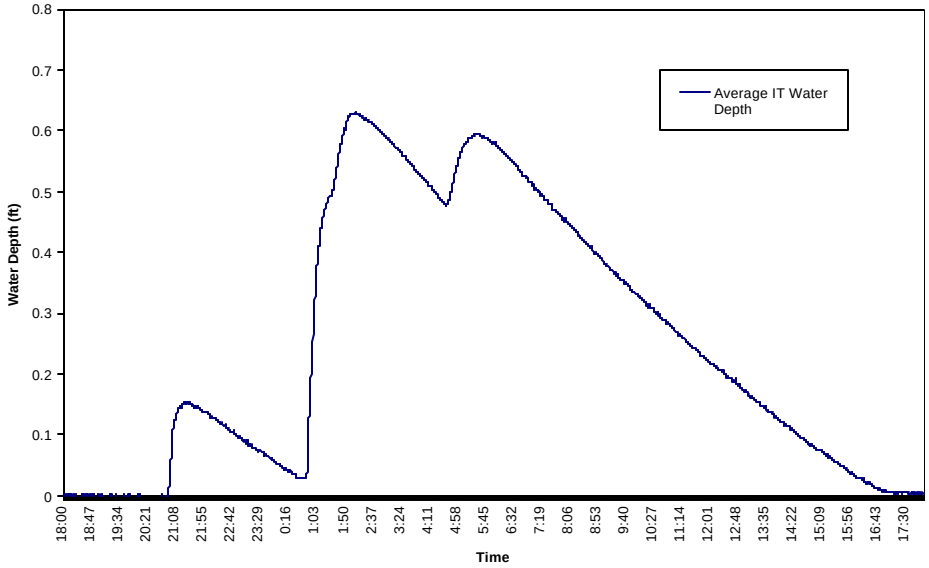
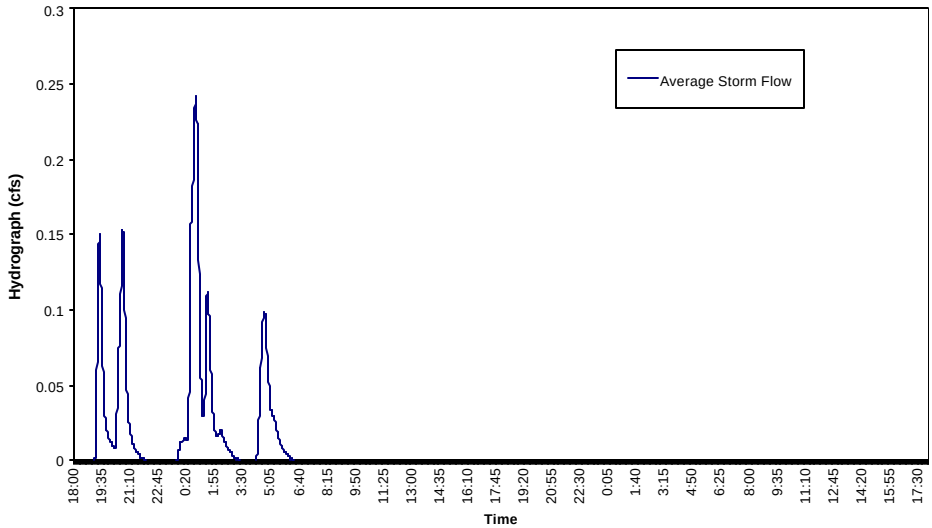


Figure 1-26f: IB Water Depth and Cumulative Rainfall at the I-605/SR-91 Infiltration Basin for Event 6 on February 10, 2001

IT Water Depth



Influent



Cumulative Rainfall

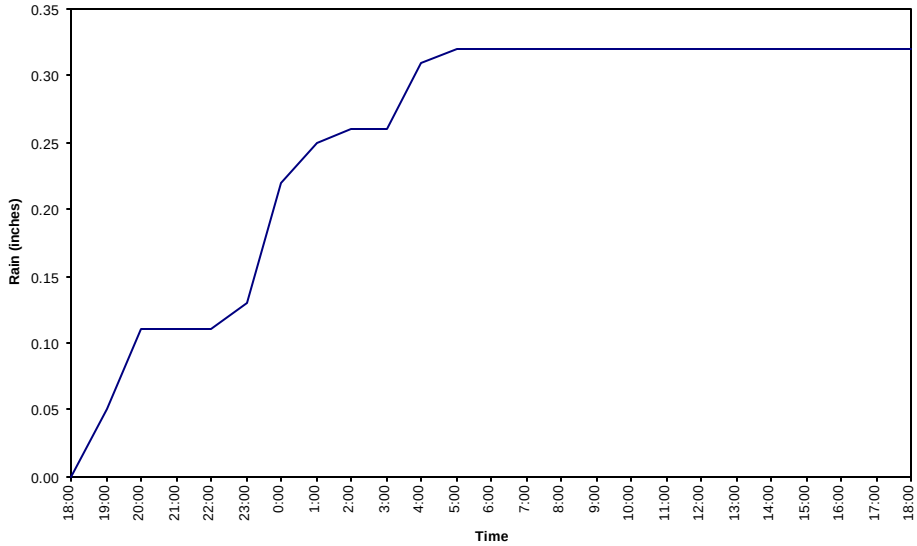
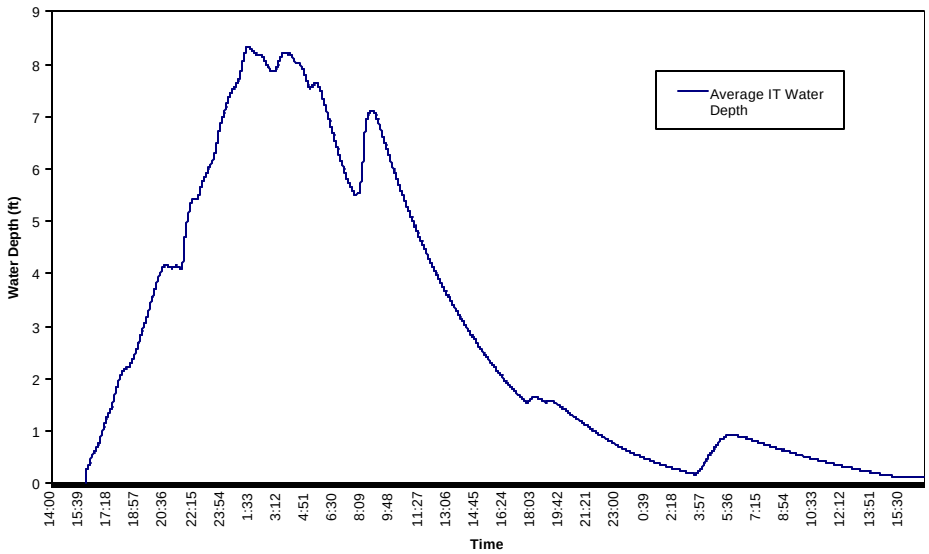
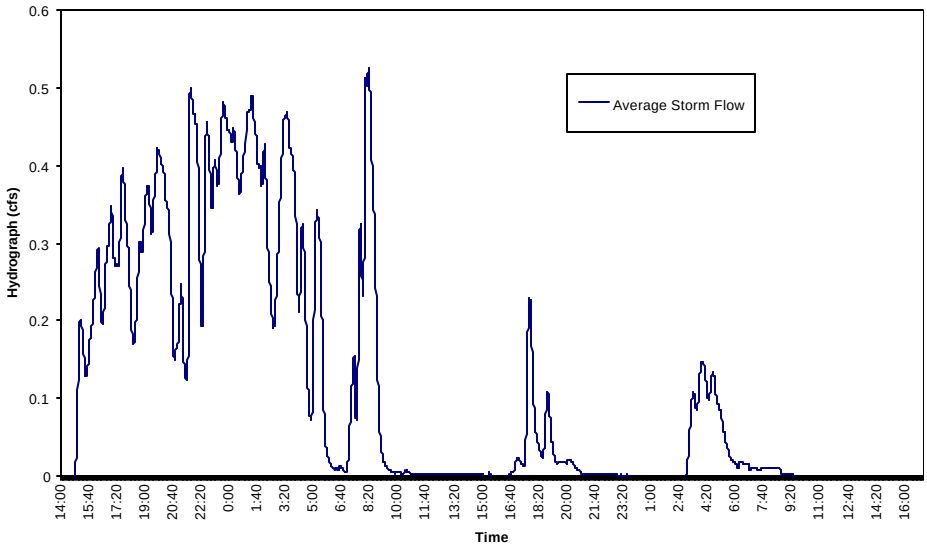


Figure 1-27a: IT Water Depth and Cumulative Rainfall at the Altadena Maintenance Station Infiltration Trench for Event 2 on October 27, 2000

IT Water Depth



Influent



Cumulative Rainfall

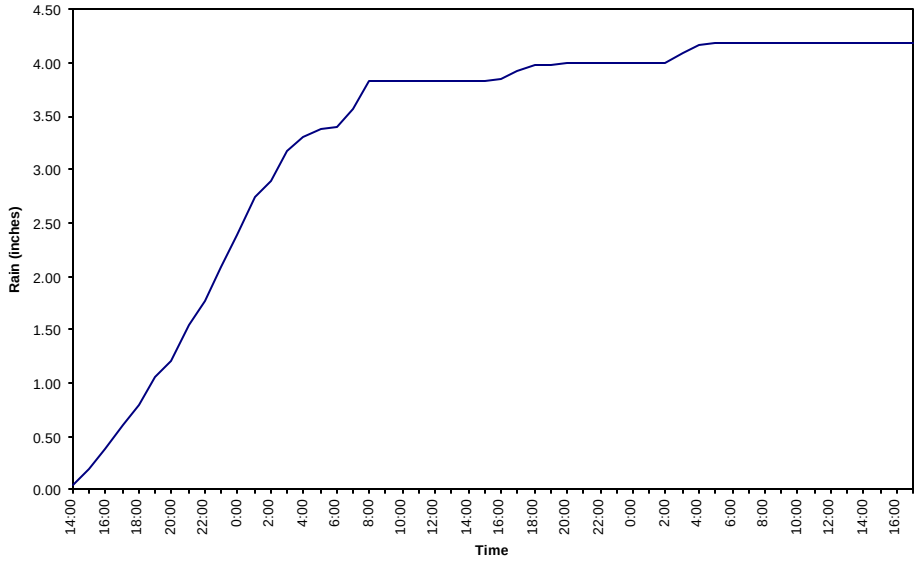
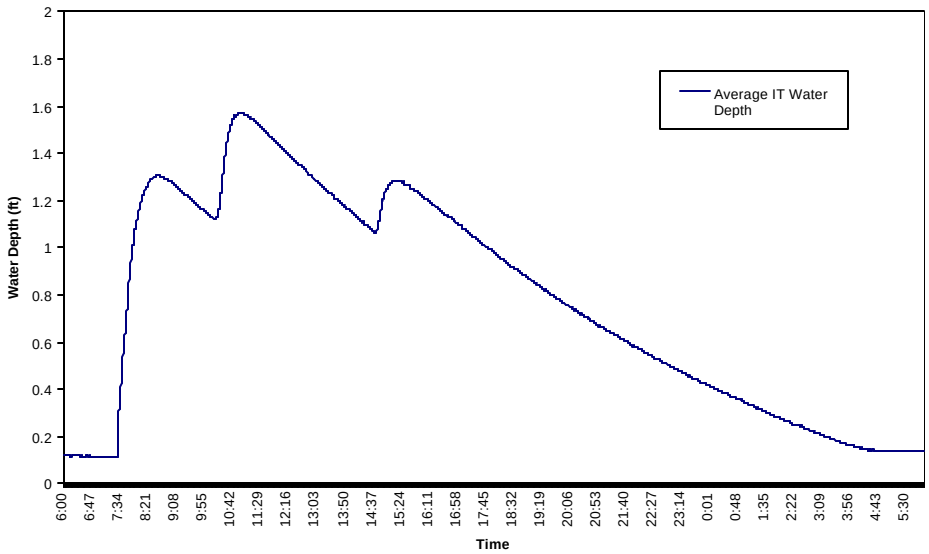
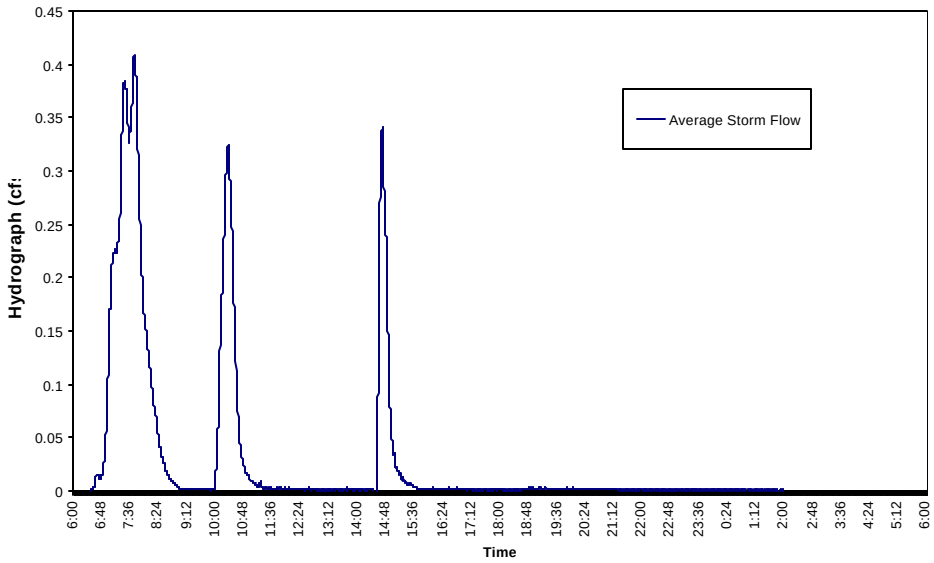


Figure 1-27b: IT Water Depth and Cumulative Rainfall at the Altadena Maintenance Station Infiltration Trench for Event 4 on January 11, 2001

IT Water Depth



Influent



Cumulative Rainfall

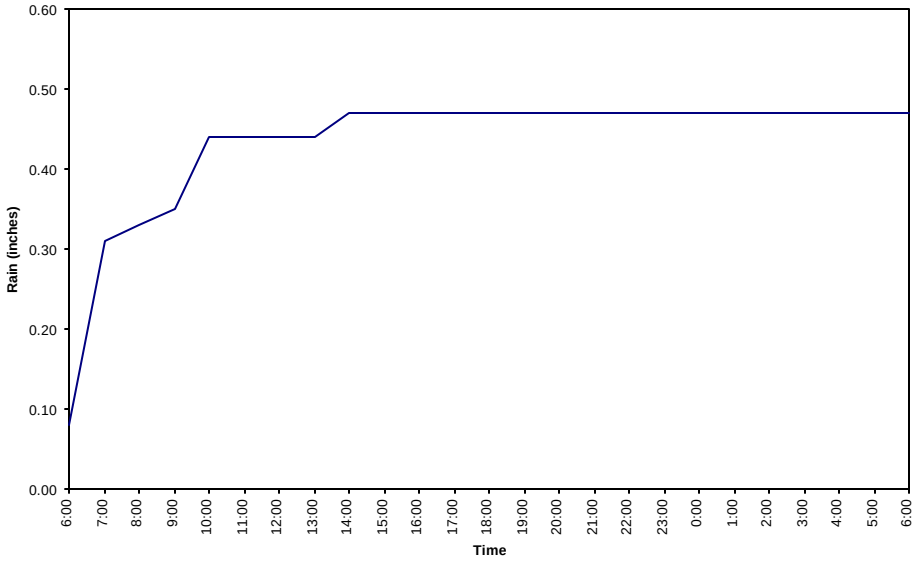
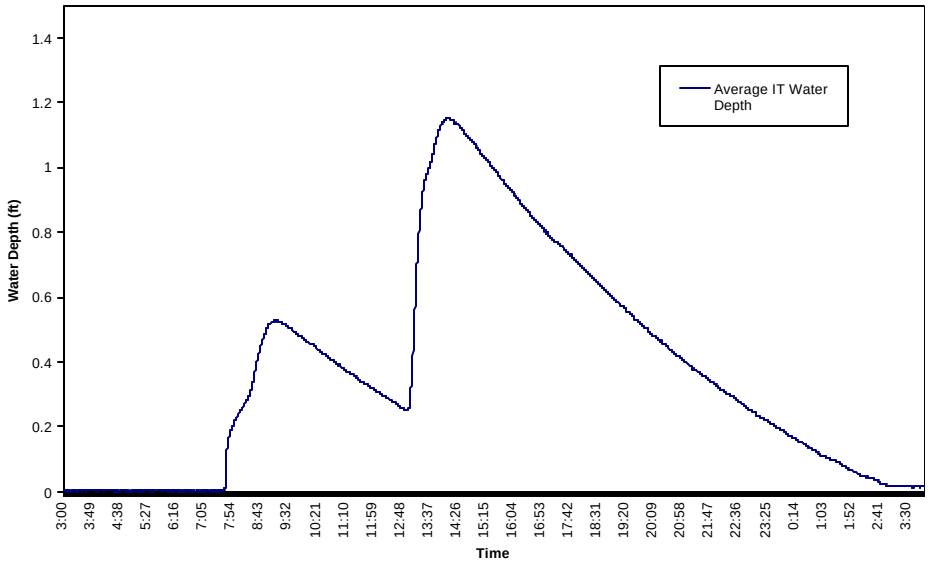


Figure 1-27c: IT Water Depth and Cumulative Rainfall at the Altadena Maintenance Station Infiltration Trench for Event 5 on January 24, 2001

IT Water Depth



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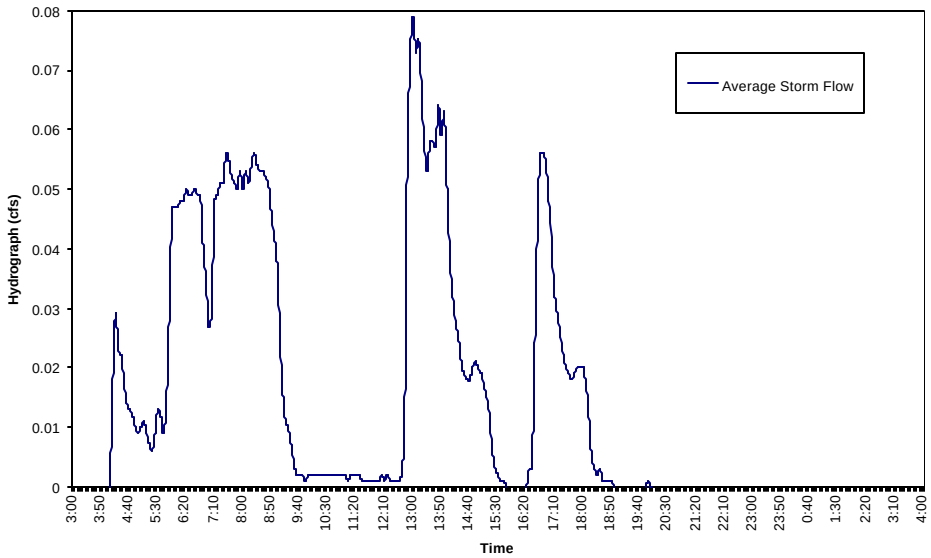


Cumulative Rainfall

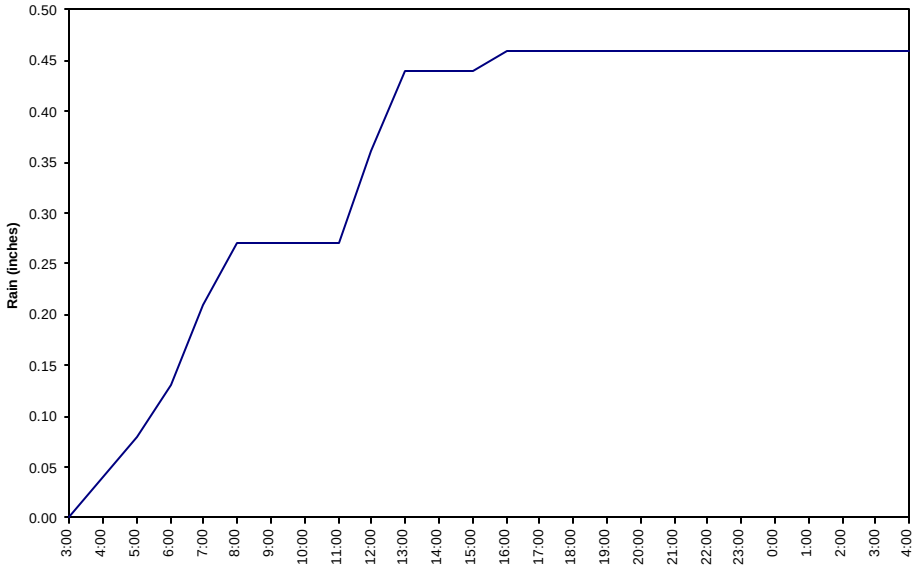
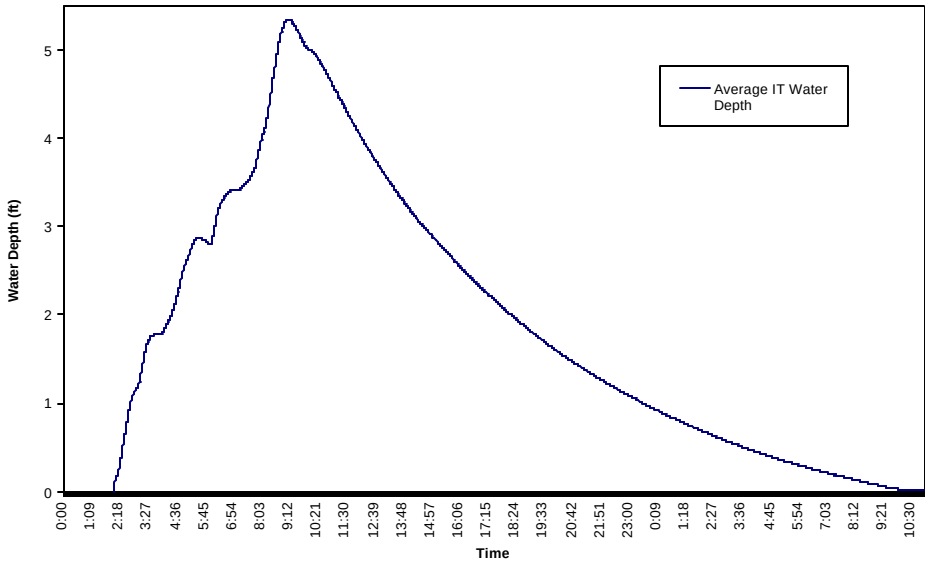
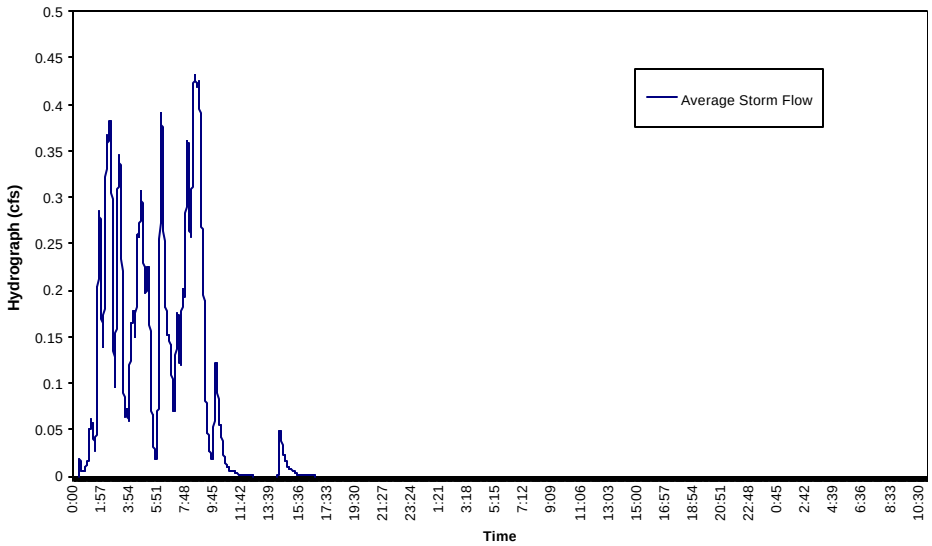


Figure 1-27d: IT Water Depth and Cumulative Rainfall at the Altadena Maintenance Station Infiltration Trench for Event 6 on February 10, 2001

IT Water Depth



Influent



Cumulative Rainfall

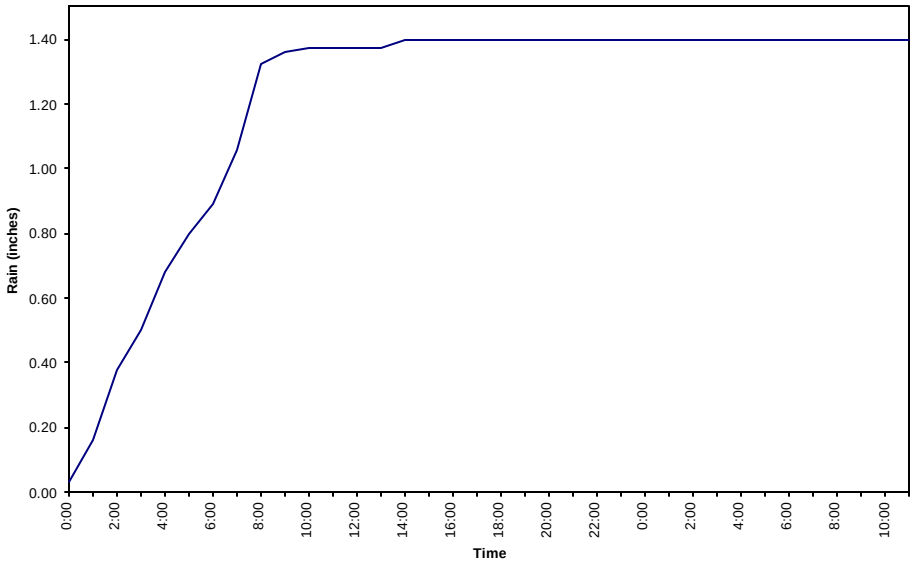
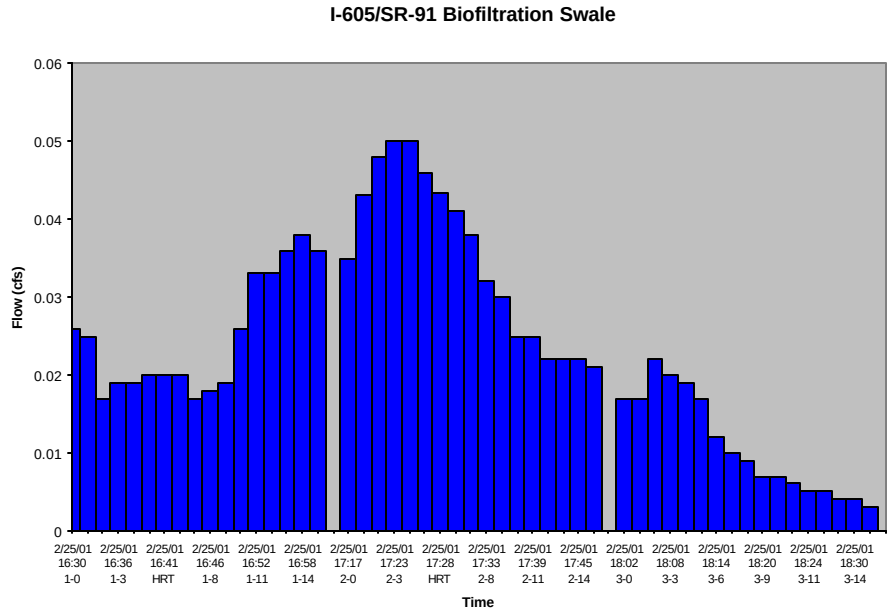
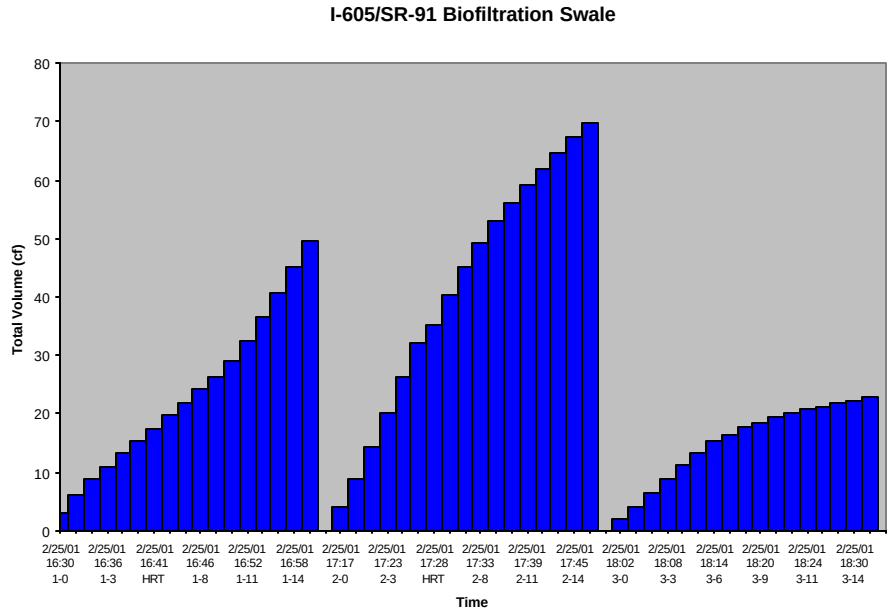


Figure 1-27e: IT Water Depth and Cumulative Rainfall at the Altadena Maintenance Station Infiltration Trench for Event 6 on April 7, 2001

Effluent Flow



Cumulative Flow



Fluorescence

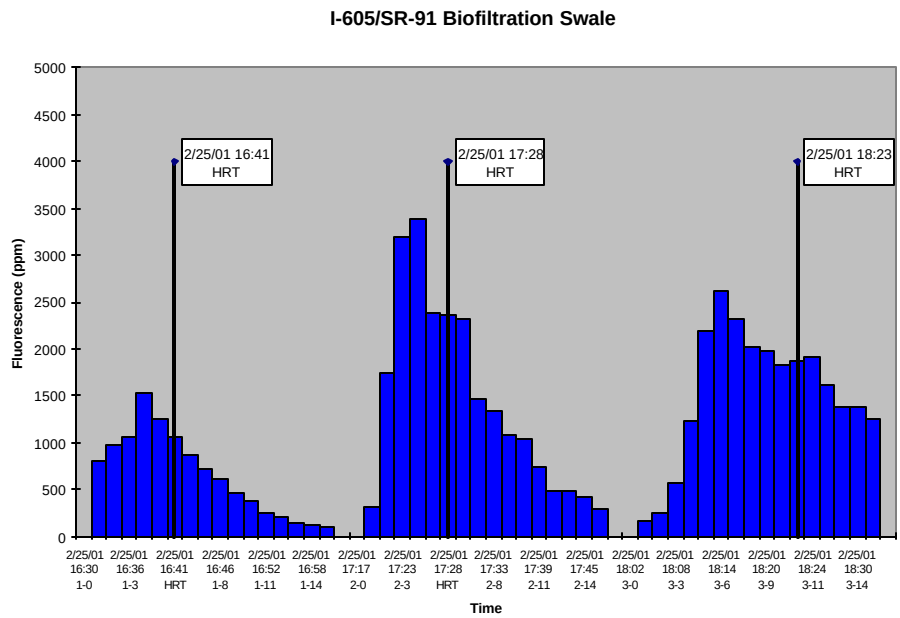
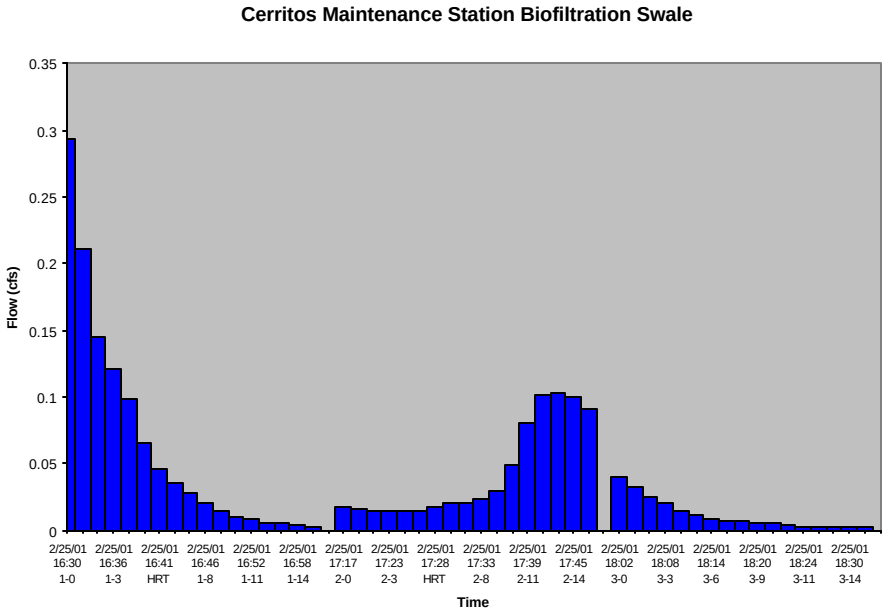
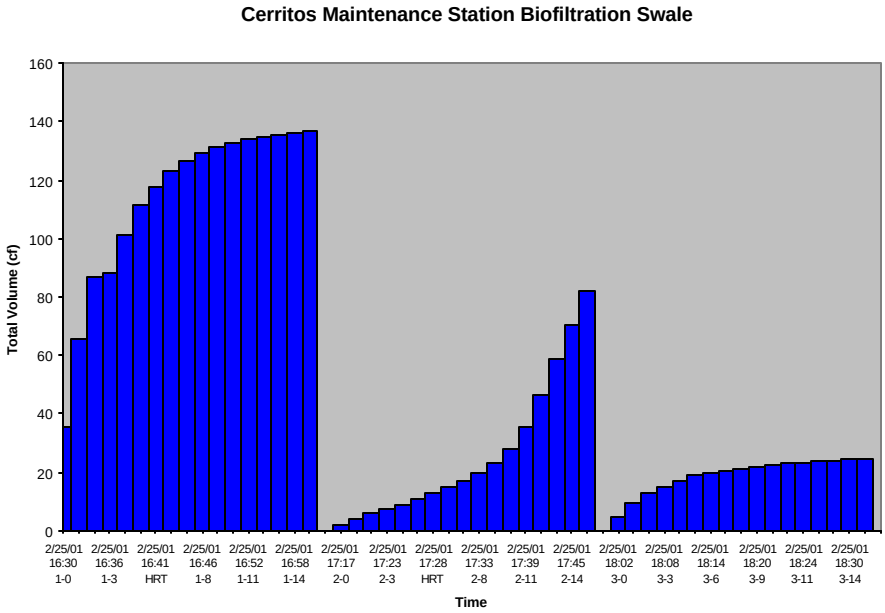


Figure 1-28a Hydraulic Residence Time Characteristics (Effluent Flow, Cumulative Flow, and Fluorescence) at the I-605/SR-91 Biofiltration Swale

Effluent Flow



Cumulative Flow



Fluorescence

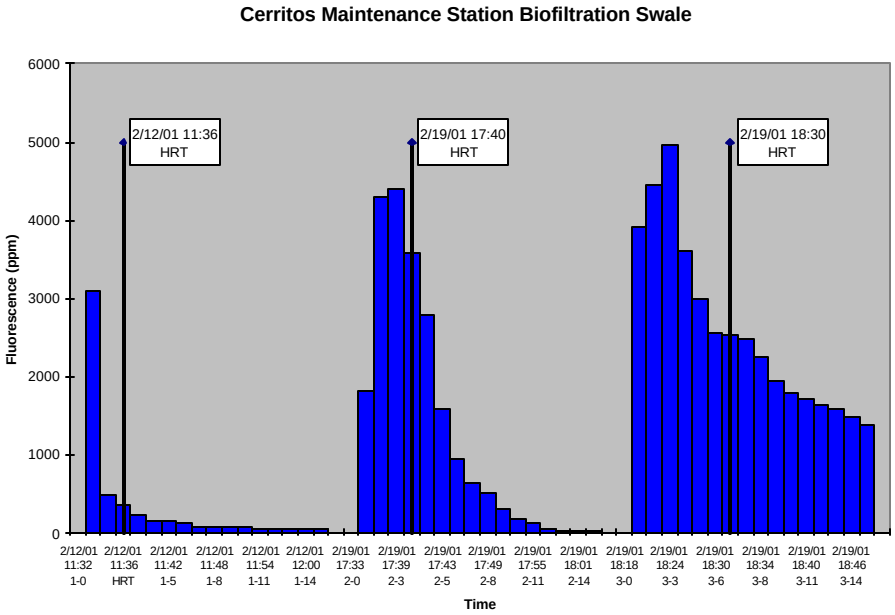
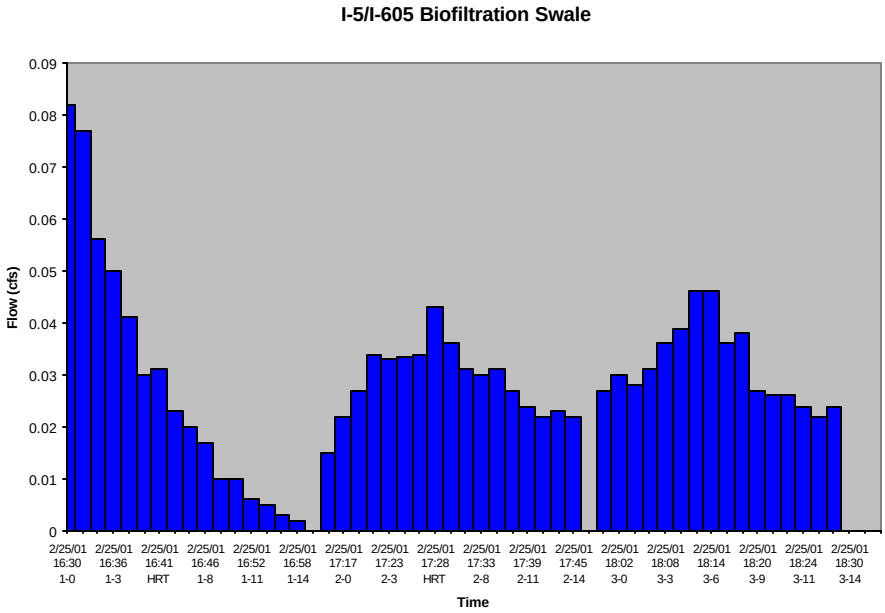
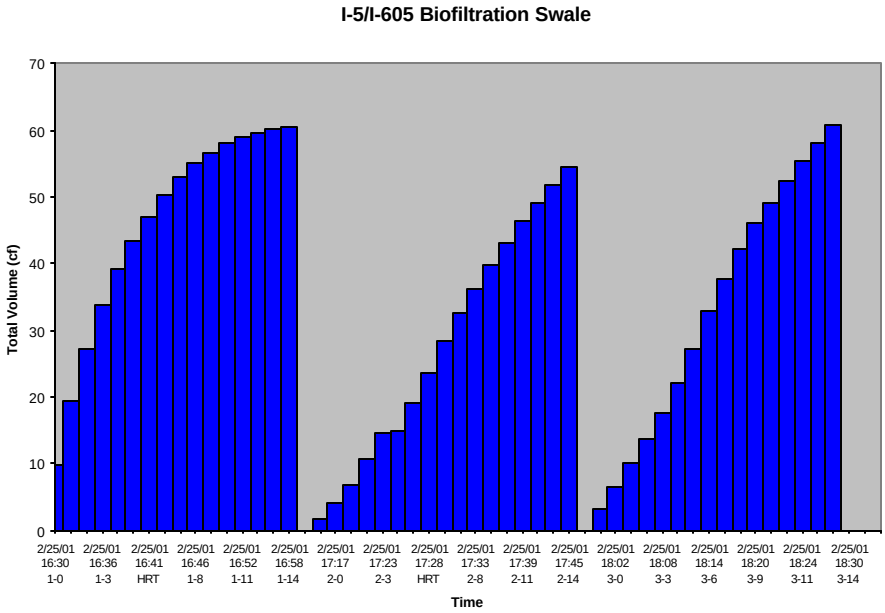


Figure 1-28b Hydraulic Residence Time Characteristics (Effluent Flow, Cumulative Flow, and Fluorescence) at the Cerritos Maintenance Station Biofiltration Swale

Effluent Flow



Cumulative Flow



Fluorescence

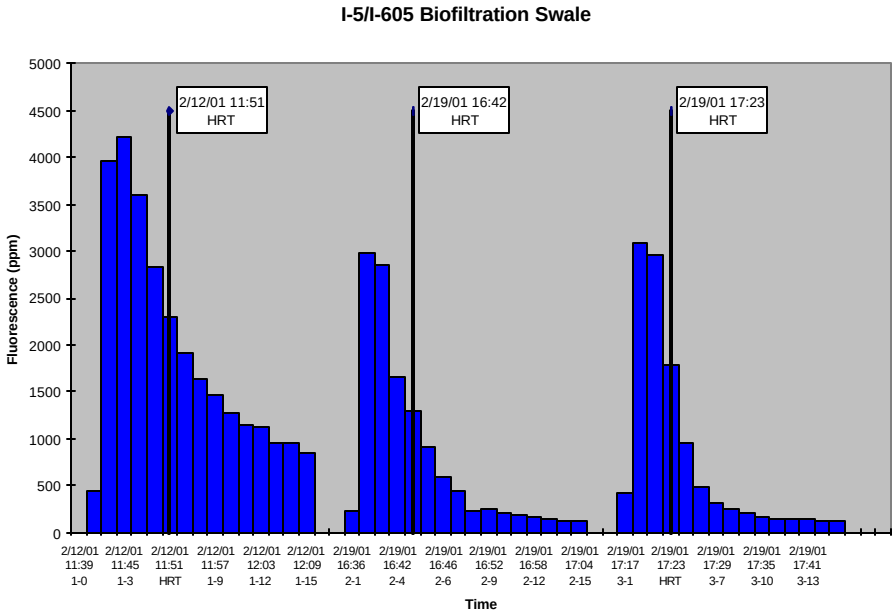
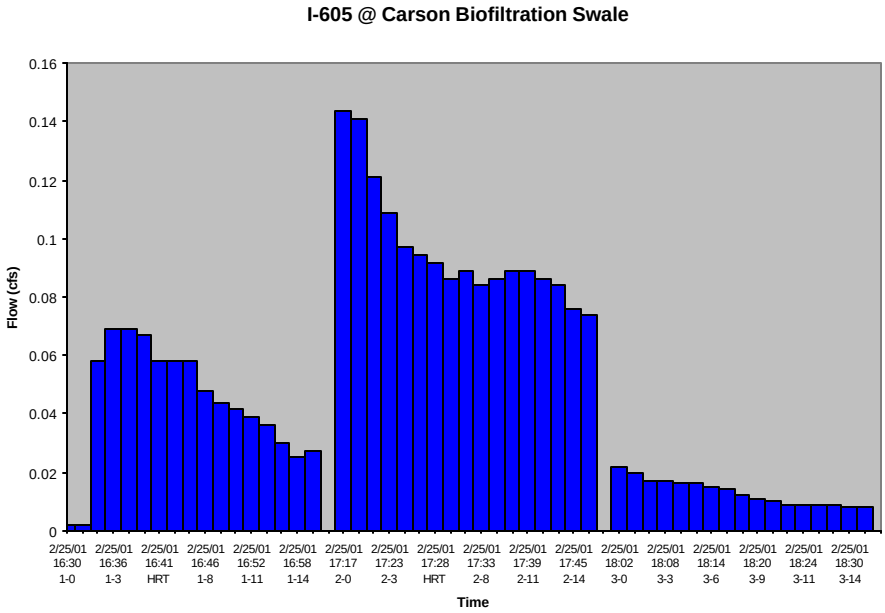
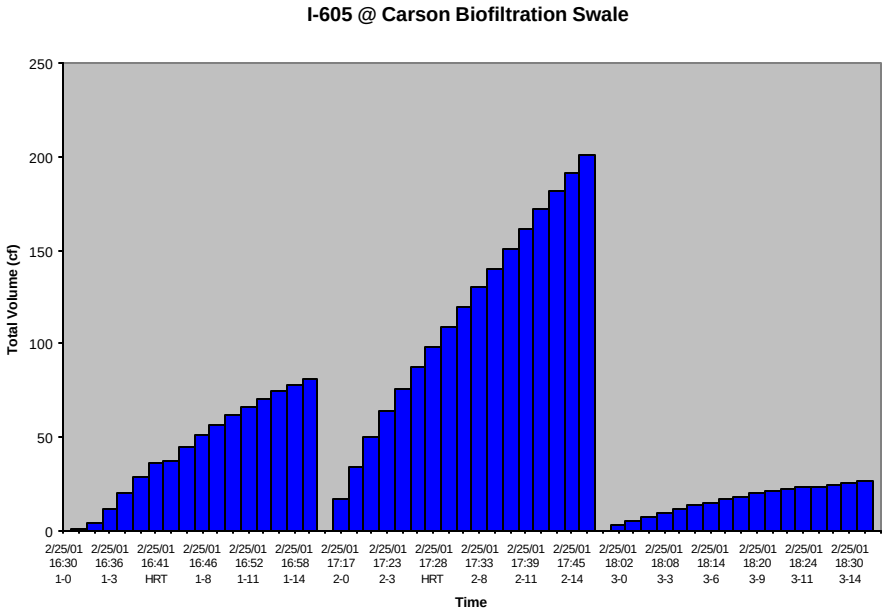


Figure 1-28c Hydraulic Residence Time Characteristics (Effluent Flow, Cumulative Flow, and Fluorescence) at the I-5/I-605 Biofiltration Swale

Effluent Flow



Cumulative Flow



Fluorescence

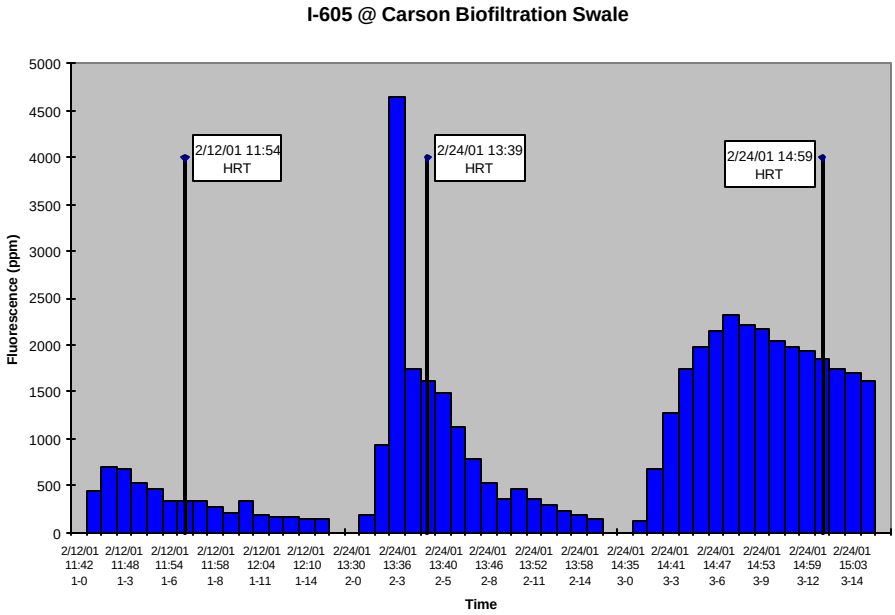
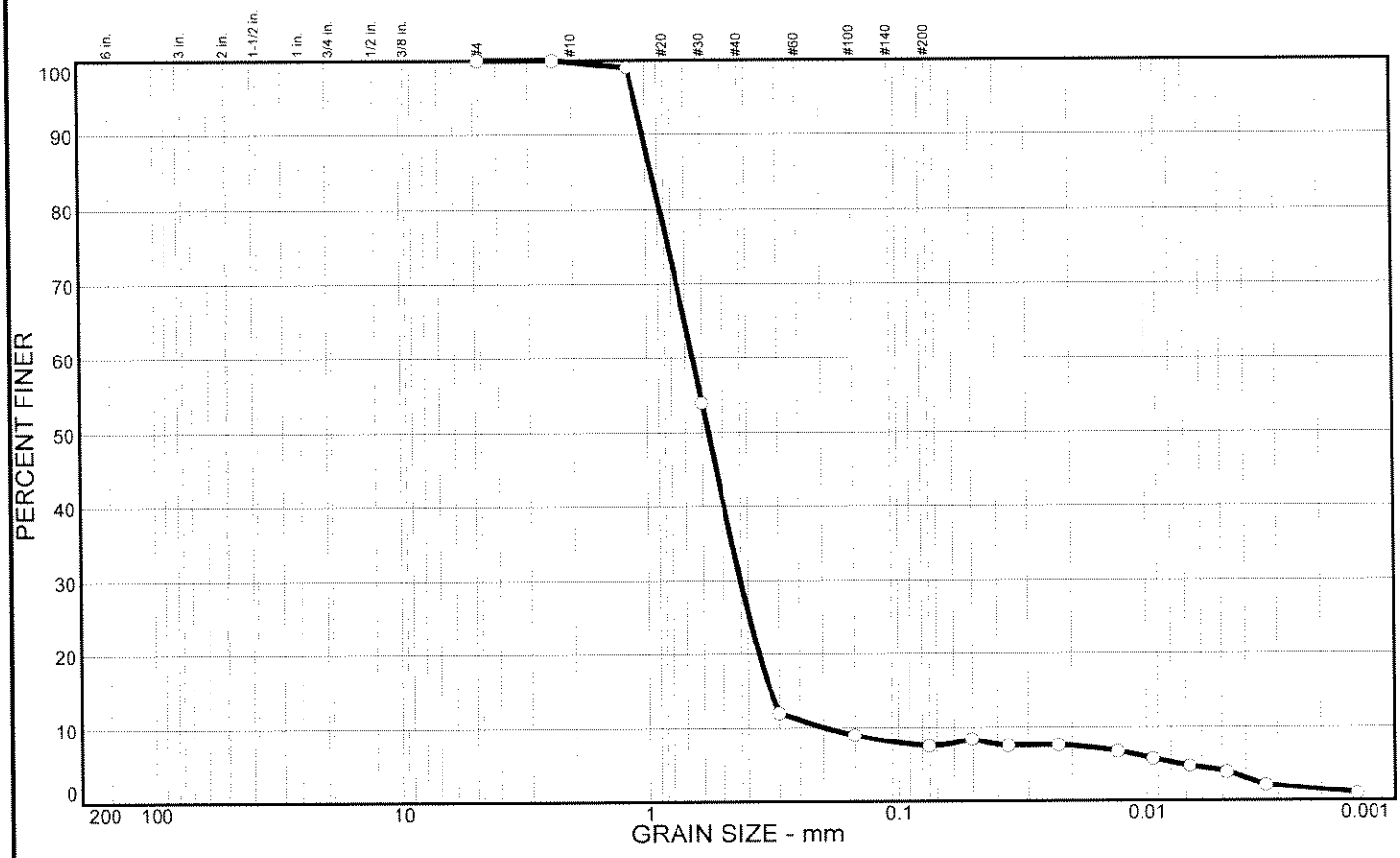


Figure 1-28d Hydraulic Residence Time Characteristics (Effluent Flow, Cumulative Flow, and Fluorescence) at the I-605 @ Carson Biofiltration Swale

PARTICLE SIZE DISTRIBUTION TEST REPORT



% + 3"	% GRAVEL	% SAND	% SILT	% CLAY	USCS	AASHTO	PL	LL
		92.5	3.4	4.1	SP-SM			

SIEVE inches size	PERCENT FINER		

	GRAIN SIZE		
D_{60}	0.653		
D_{30}	0.427		
D_{10}	0.197		
	COEFFICIENTS		
C_c	1.42		
C_u	3.32		

SIEVE number size	PERCENT FINER		
#4	100.0		
#8	100.0		
#16	99.0		
#30	54.0		
#50	12.0		
#100	9.0		
#200	7.5		

SOIL DESCRIPTION

fine to medium SAND to silty SAND (SP-SM)

REMARKS:

Eastern Maintenance Station Sand Filter Field Sample No.:074202-SED-09301-SECTION1

Source:

Sample No.: 11584

Elev./Depth: 0 TO 2"

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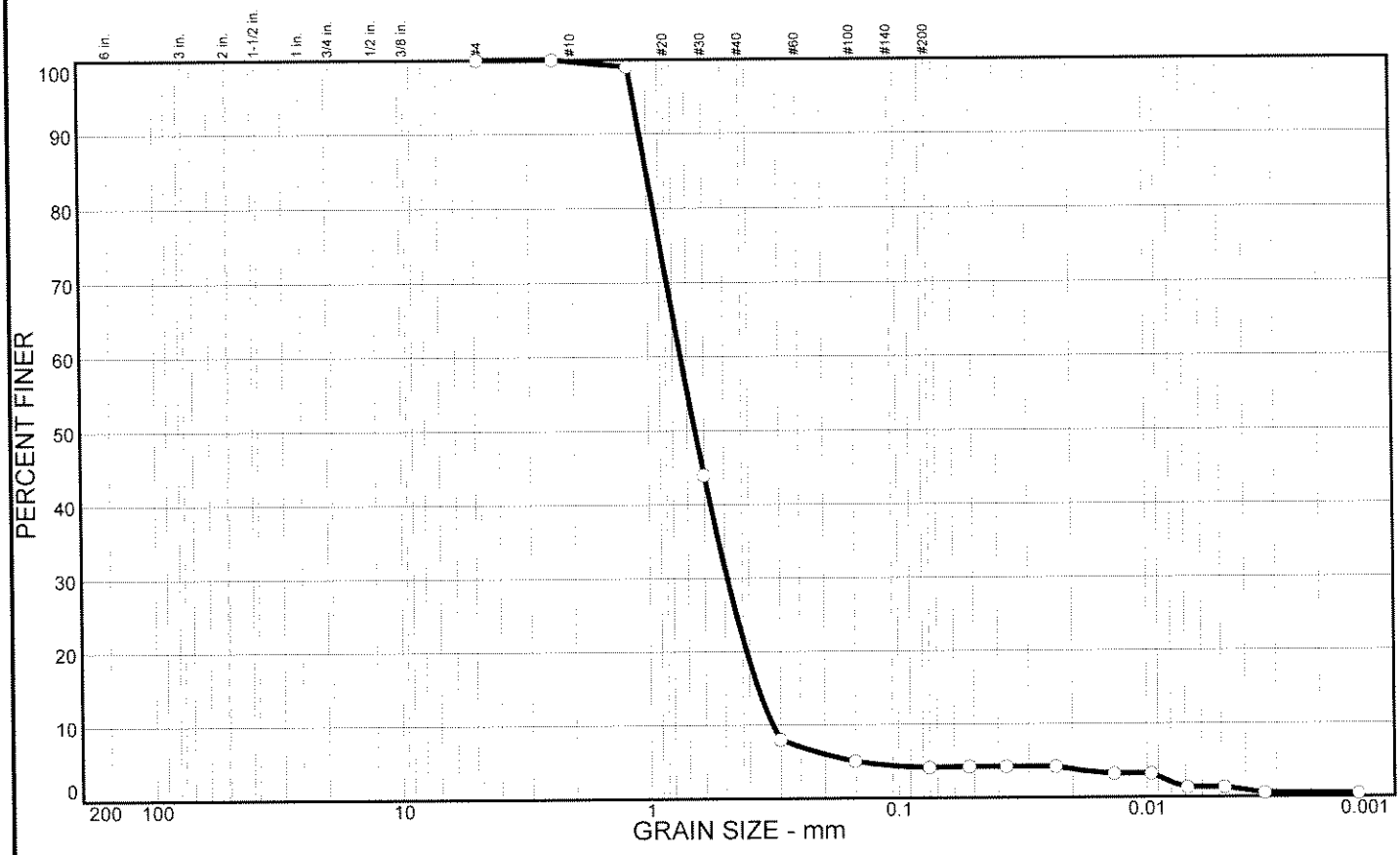
Client: CALTRANS

Project: CALTRANS BMP Pilot Study

Project No.: 70311-0-0099

Figure 1-29a

PARTICLE SIZE DISTRIBUTION TEST REPORT



	% + 3"	% GRAVEL	% SAND	% SILT	% CLAY	USCS	AASHTO	PL	LL
○			95.9	2.8	1.3	SP			

SIEVE inches size	PERCENT FINER ○		
	GRAIN SIZE		
D_{60}	0.740		
D_{30}	0.488		
D_{10}	0.322		
	COEFFICIENTS		
C_c	1.00		
C_u	2.30		

SIEVE number size	PERCENT FINER ○		
#4	100.0		
#8	100.0		
#16	99.0		
#30	44.0		
#50	8.0		
#100	5.0		
#200	4.1		

SOIL DESCRIPTION

○ fine to medium SAND (SP)

REMARKS:

○ Eastern Maintenance Station Sand Filter Field Sample No.:074202-SED-09301-SECTION2

○ Source: Sample No.: 11585 Elev./Depth: 2" TO 5"

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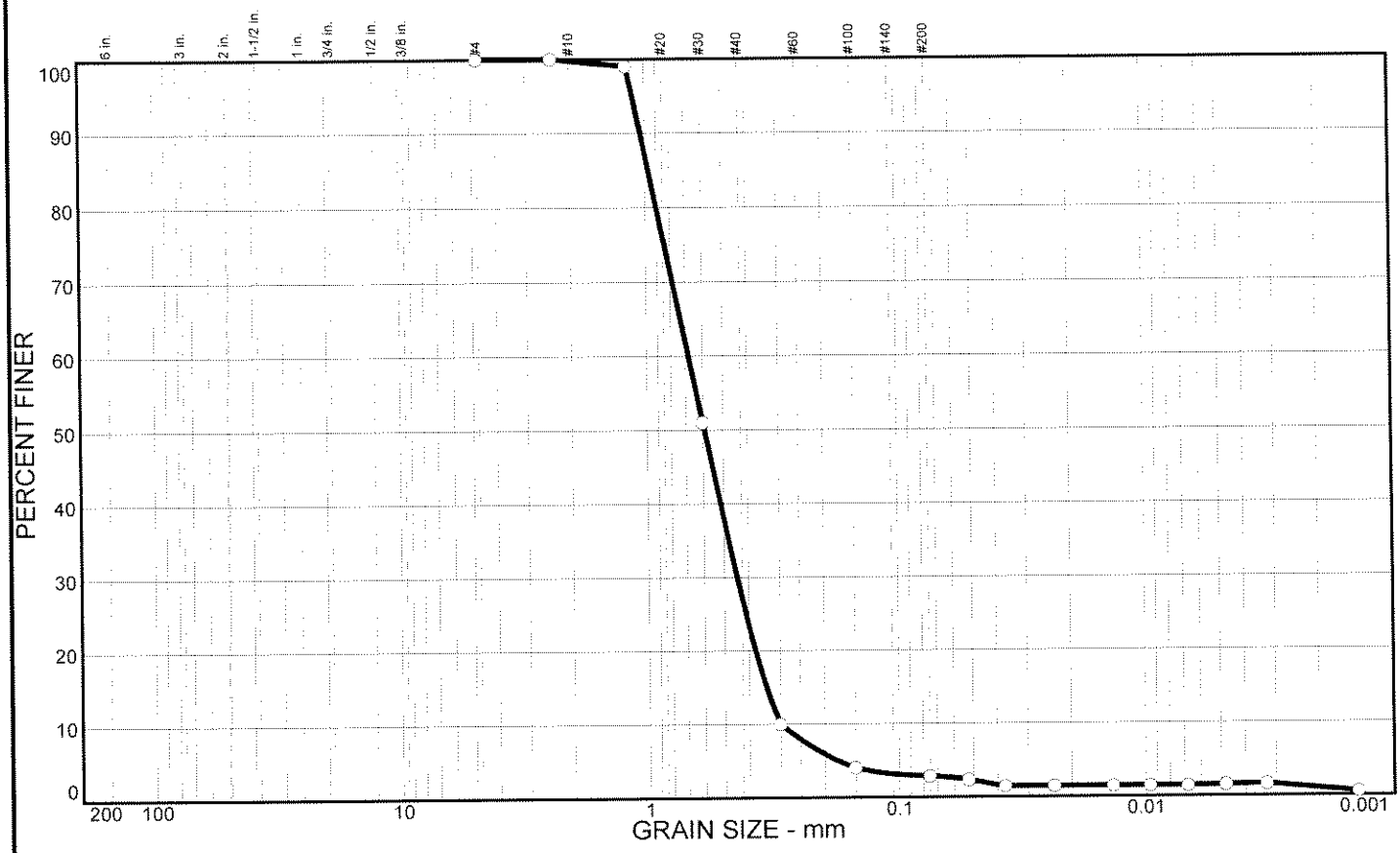
Client: CALTRANS
Project: CALTRANS BMP Pilot Study
Project No.: 70311-0-0099 Figure 1-29b

PARTICLE SIZE DISTRIBUTION TEST REPORT



	% + 3"	% GRAVEL	% SAND	% SILT	% CLAY	USCS	AASHTO	PL	LL
○			97.2	1.3	1.5	SP			

SIEVE inches size	PERCENT FINER ○		
	GRAIN SIZE		
D_{60}	0.681		
D_{30}	0.444		
D_{10}	0.300		
	COEFFICIENTS		
C_c	0.96		
C_u	2.27		

SIEVE number size	PERCENT FINER ○		
#4	100.0		
#8	100.0		
#16	99.0		
#30	51.0		
#50	10.0		
#100	4.0		
#200	2.8		

SOIL DESCRIPTION

○ fine to medium SAND (SP)

REMARKS:

○ Eastern Maintenance Station Sand Filter Field Sample No.:074202-SED-09301-SECTION3

○ Source: Sample No.: 11586 Elev./Depth: 5" TO 10"

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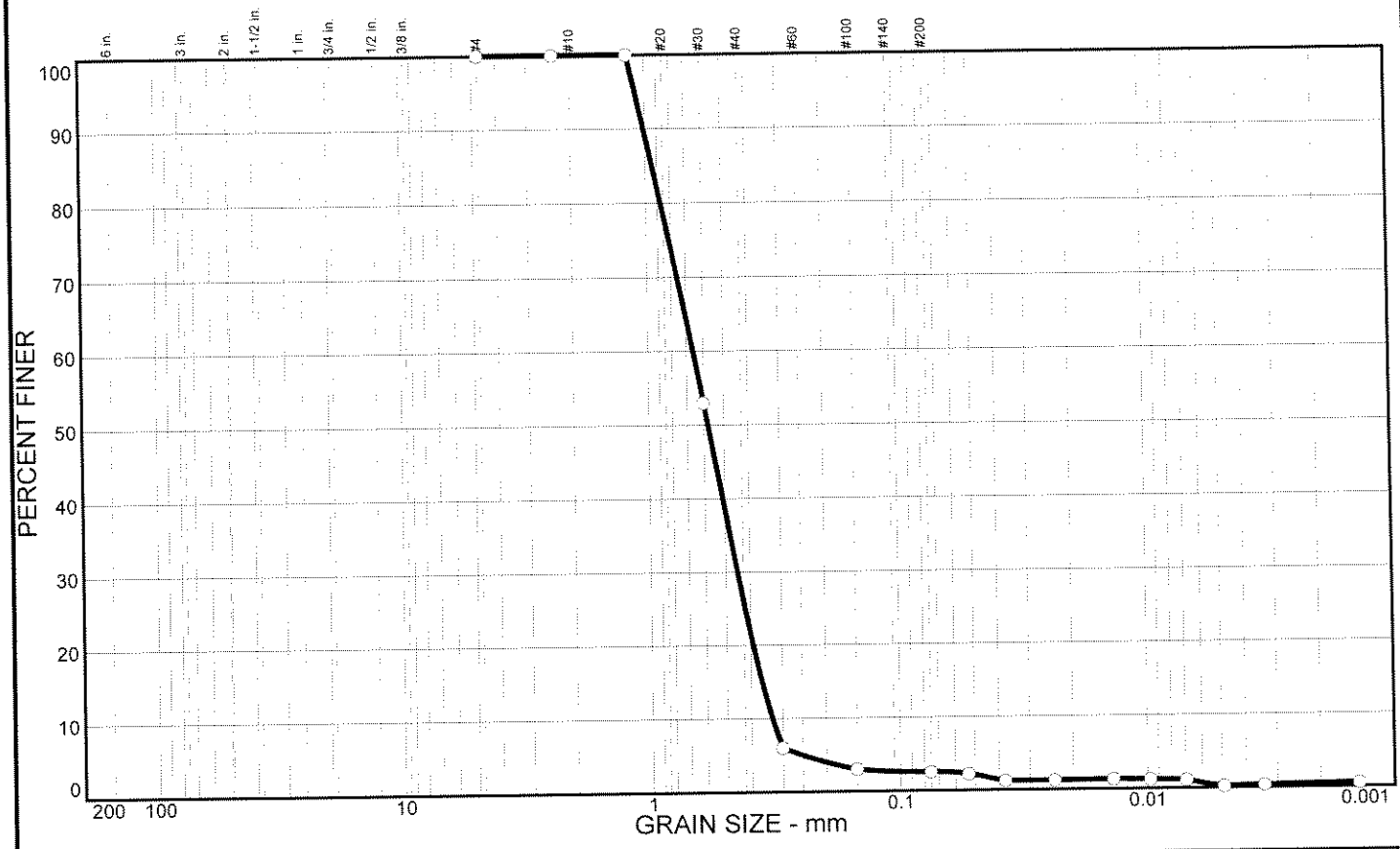
Client: CALTRANS
Project: CALTRANS BMP Pilot Study
Project No.: 70311-0-0099 Figure 1-29c

PARTICLE SIZE DISTRIBUTION TEST REPORT



% + 3"	% GRAVEL	% SAND	% SILT	% CLAY	USCS	AASHTO	PL	LL
		97.5	2.3	0.2	SP			

SIEVE inches size	PERCENT FINER		

	GRAIN SIZE		
D_{60}	0.658		
D_{30}	0.448		
D_{10}	0.329		
	COEFFICIENTS		
C_c	0.93		
C_u	2.00		

SIEVE number size	PERCENT FINER		
#4	100.0		
#8	100.0		
#16	100.0		
#30	53.0		
#50	6.0		
#100	3.0		
#200	2.5		

SOIL DESCRIPTION

fine to medium SAND (SP)

REMARKS:

Eastern Maintenance Station Sand Filter Field Sample No.:074202-SED-09301-SECTION4

Source:

Sample No.: 11587

Elev./Depth: 10" TO 15"

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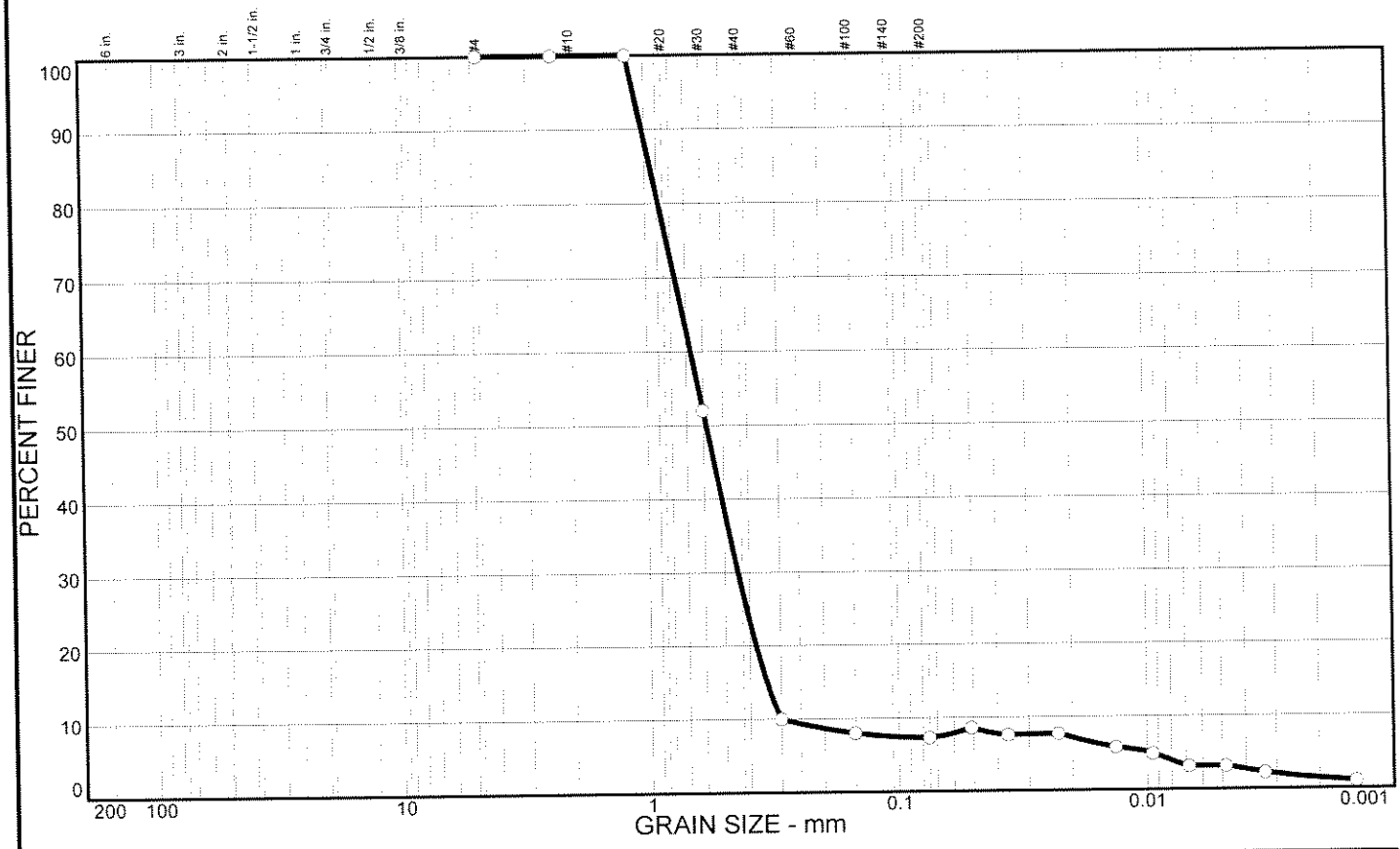
Client: CALTRANS

Project: CALTRANS BMP Pilot Study

Project No.: 70311-0-0099

Figure 1-29d

PARTICLE SIZE DISTRIBUTION TEST REPORT



	% + 3"	% GRAVEL	% SAND	% SILT	% CLAY	USCS	AASHTO	PL	LL
○			92.7	4.2	3.1	SP-SM			

SIEVE inches size	PERCENT FINER ○		
	GRAIN SIZE		
D_{60}	0.669		
D_{30}	0.442		
D_{10}	0.300		
	COEFFICIENTS		
C_c	0.97		
C_u	2.23		

SIEVE number size	PERCENT FINER ○		
#4	100.0		
#8	100.0		
#16	100.0		
#30	52.0		
#50	10.0		
#100	8.0		
#200	7.3		

SOIL DESCRIPTION

○ fine to medium SAND to silty SAND (SP-SM)

REMARKS:

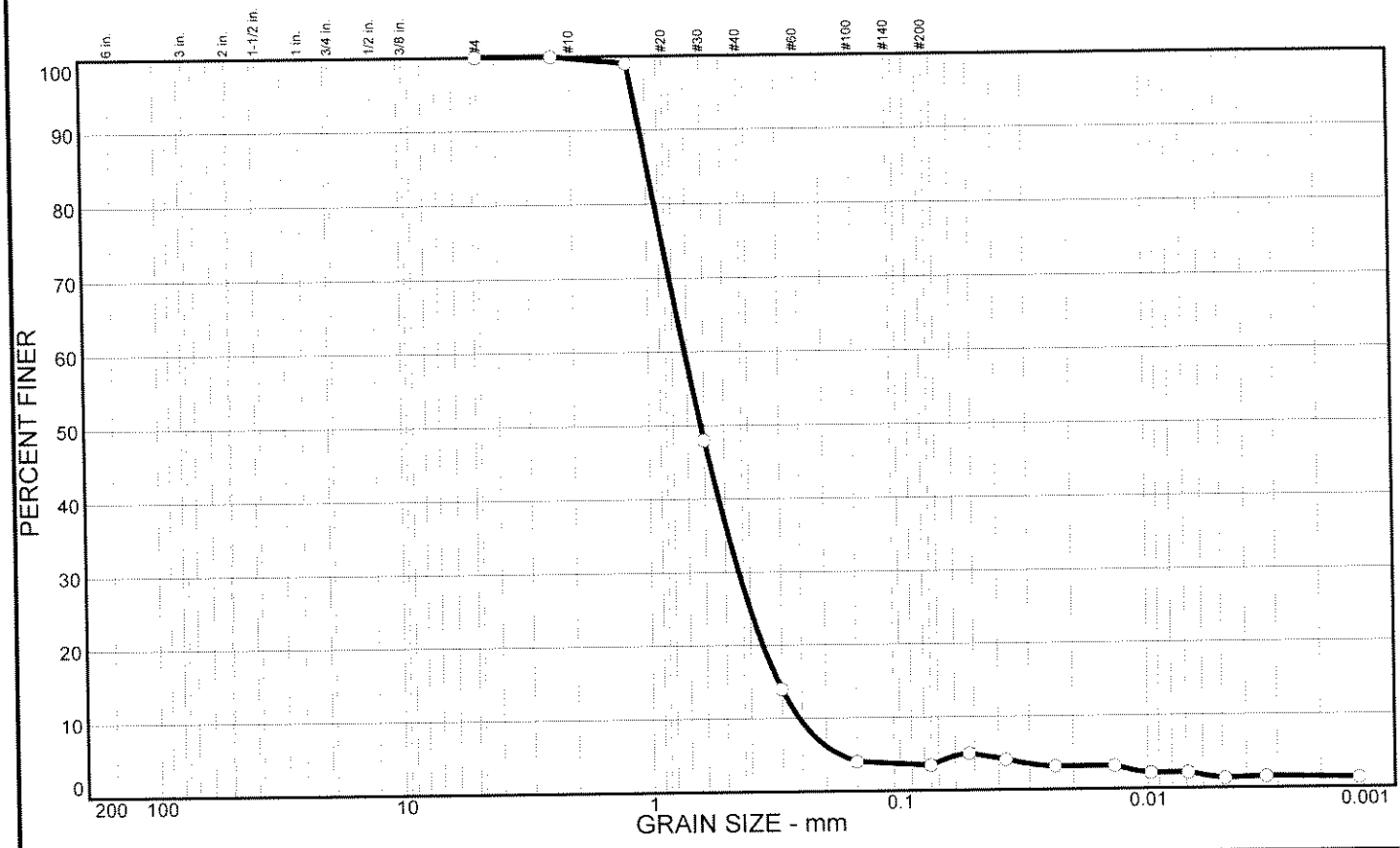
○ Foothill Maintenance Station Sand Filter Field Sample No.:074203-SED-09301-SECTION1

○ Source: Sample No.: 11588 Elev./Depth: 0" TO 2"

LAW/CRANDALL
A DIVISION OF LAW ENGINEERING AND ENVIRONMENTAL SERVICES, INC.

Client: CALTRANS
Project: CALTRANS BMP Pilot Study
Project No.: 70311-0-0099 Figure 1-30a

PARTICLE SIZE DISTRIBUTION TEST REPORT



% + 3"	% GRAVEL	% SAND	% SILT	% CLAY	USCS	AASHTO	PL	LL
		96.6	2.1	1.3	SP			

SIEVE inches size	PERCENT FINER		

	GRAIN SIZE		
D_{60}	0.713		
D_{30}	0.442		
D_{10}	0.256		
	COEFFICIENTS		
C_c	1.07		
C_u	2.79		

SIEVE number size	PERCENT FINER		
#4	100.0		
#8	100.0		
#16	99.0		
#30	48.0		
#50	14.0		
#100	4.0		
#200	3.4		

SOIL DESCRIPTION

fine to medium SAND (SP)

REMARKS:

Foothill Maintenance Station Sand Filter Field Sample No.:074203-SED-09301-SECTION2

Source:

Sample No.: 11589

Elev./Depth: 2" TO 5"

LAW/CRANDALL
A DIVISION OF LAW ENGINEERING AND ENVIRONMENTAL SERVICES, INC.

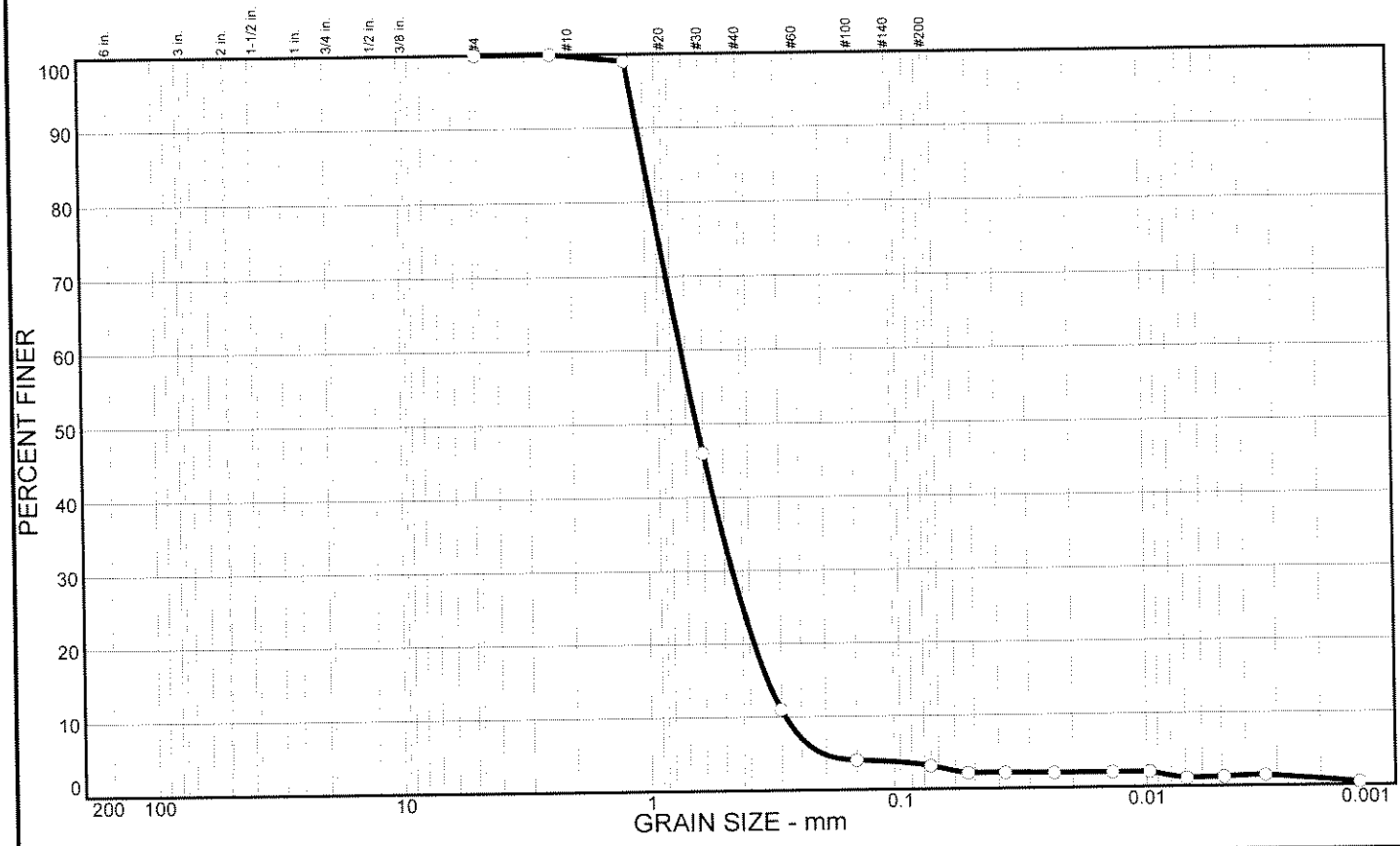
Client: CALTRANS

Project: CALTRANS BMP Pilot Study

Project No.: 70311-0-0099

Figure 1-30b

PARTICLE SIZE DISTRIBUTION TEST REPORT



% + 3"	% GRAVEL	% SAND	% SILT	% CLAY	USCS	AASHTO	PL	LL
		96.9	1.9	1.2	SP			

SIEVE inches size	PERCENT FINER		

	GRAIN SIZE		
D_{60}	0.728		
D_{30}	0.466		
D_{10}	0.289		
	COEFFICIENTS		
C_c	1.03		
C_u	2.52		

SIEVE number size	PERCENT FINER		
#4	100.0		
#8	100.0		
#16	99.0		
#30	46.0		
#50	11.0		
#100	4.0		
#200	3.1		

SOIL DESCRIPTION

fine to medium SAND (SP)

REMARKS:

Foothill Maintenance Station Sand Filter Field Sample No.:074203-SED-09301-SECTION3

Source:

Sample No.: 11590

Elev./Depth: 5" TO 10"

LAW/CRANDALL
A DIVISION OF LAW ENGINEERING AND ENVIRONMENTAL SERVICES, INC.

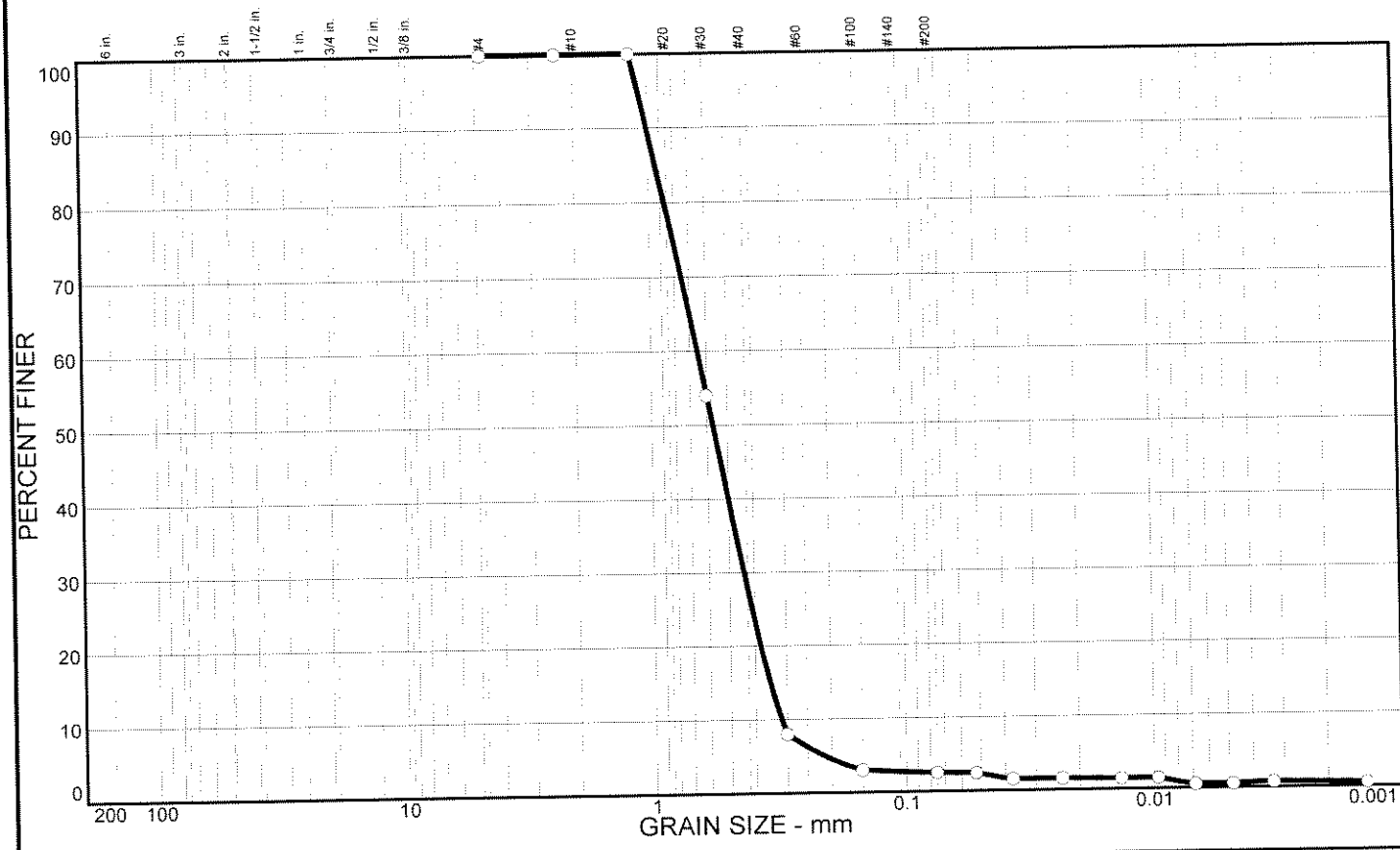
Client: CALTRANS

Project: CALTRANS BMP Pilot Study

Project No.: 70311-0-0099

Figure 1-30c

PARTICLE SIZE DISTRIBUTION TEST REPORT



	% + 3"	% GRAVEL	% SAND	% SILT	% CLAY	USCS	AASHTO	PL	LL
○			97.5	2.0	0.5	SP			

SIEVE inches size	PERCENT FINER ○		

	GRAIN SIZE		
D_{60}	0.651		
D_{30}	0.438		
D_{10}	0.315		
	COEFFICIENTS		
C_c	0.94		
C_u	2.06		

SIEVE number size	PERCENT FINER ○		
#4	100.0		
#8	100.0		
#16	100.0		
#30	54.0		
#50	8.0		
#100	3.0		
#200	2.5		

SOIL DESCRIPTION

○ fine to medium SAND (SP)

REMARKS:

○ Foothill Maintenance Station Sand Filter Field Sample No.:074203-SED-09301-SECTION4

○ Source:

Sample No.: 11591

Elev./Depth: 10" TO 15"

LAW/CRANDALL
A DIVISION OF LAW ENGINEERING AND ENVIRONMENTAL SERVICES, INC.

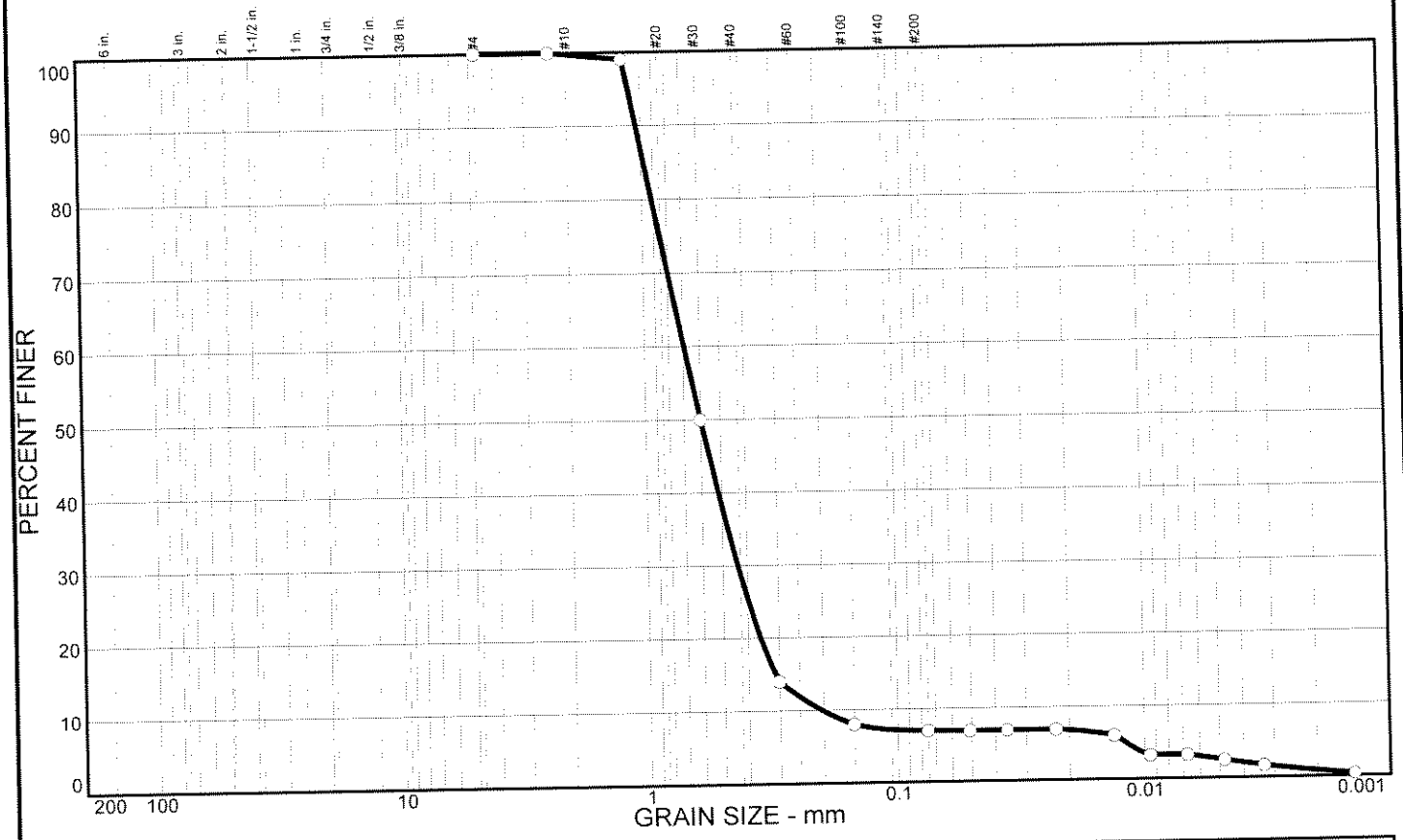
Client: CALTRANS

Project: CALTRANS BMP Pilot Study

Project No.: 70311-0-0099

Figure 1-30d

PARTICLE SIZE DISTRIBUTION TEST REPORT



	% + 3"	% GRAVEL	% SAND	% SILT	% CLAY	USCS	AASHTO	PL	LL
○			93.0	4.5	2.5	SP-SM			

SIEVE inches size	PERCENT FINER ○		

	GRAIN SIZE		
D_{60}	0.694		
D_{30}	0.435		
D_{10}	0.203		
	COEFFICIENTS		
C_c	1.34		
C_u	3.42		

SIEVE number size	PERCENT FINER ○		
#4	100.0		
#8	100.0		
#16	99.0		
#30	50.0		
#50	14.0		
#100	8.0		
#200	7.0		

SOIL DESCRIPTION

○ fine to medium SAND to silty SAND (SP-SM)

REMARKS:

○ Termination Park and Ride Sand Filter Field Sample No.:074204-SED-09201-SECTION1

○ Source:

Sample No.: 11580

Elev./Depth: 0" TO 2"

LAW/CRANDALL
A DIVISION OF LAW ENGINEERING AND ENVIRONMENTAL SERVICES, INC.

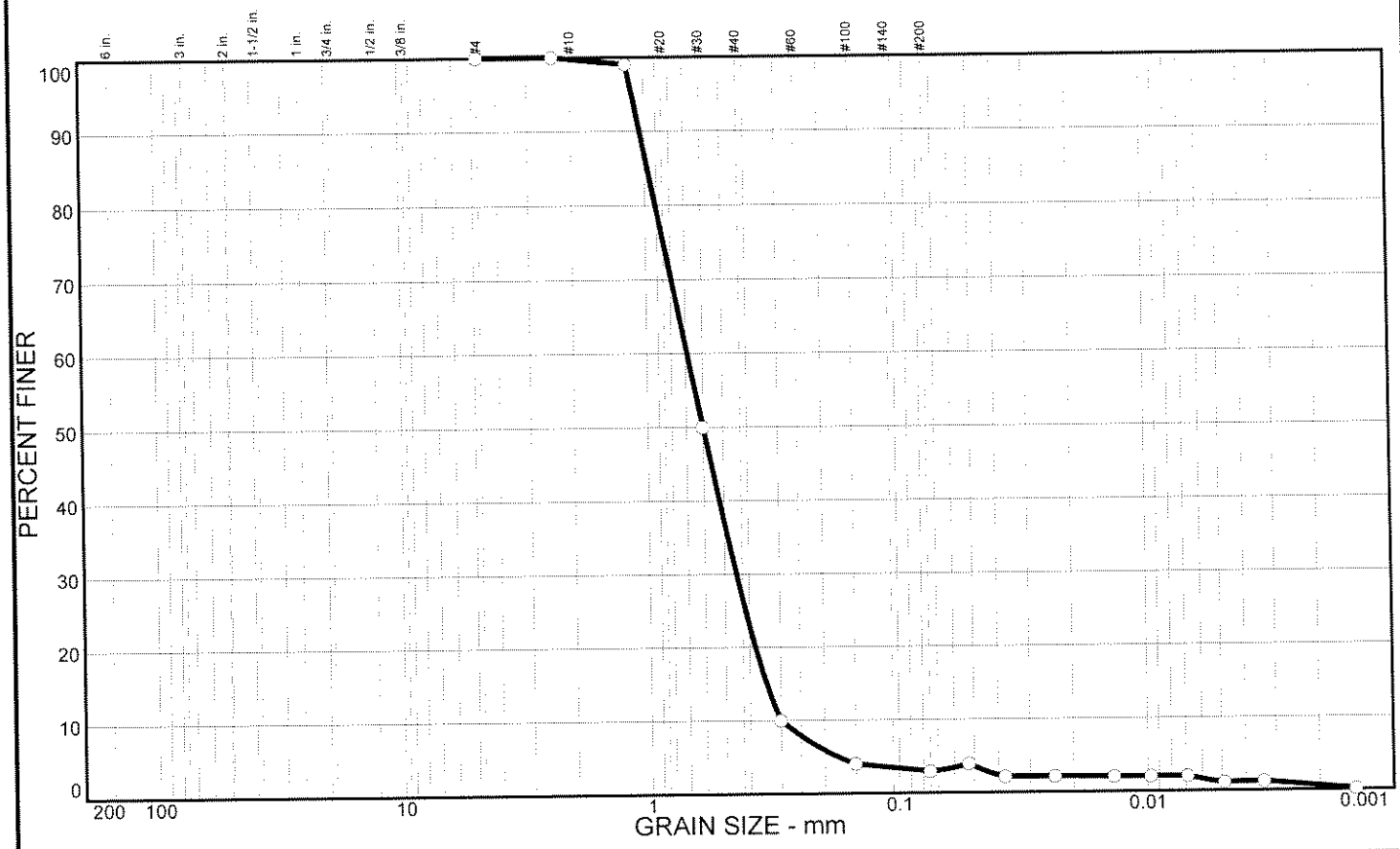
Client: CALTRANS

Project: CALTRANS BMP Pilot Study

Project No.: 70311-0-0099

Figure 1-31a

PARTICLE SIZE DISTRIBUTION TEST REPORT



	% + 3"	% GRAVEL	% SAND	% SILT	% CLAY	USCS	AASHTO	PL	LL
○			97.1	1.8	1.1	SP			

SIEVE inches size	PERCENT FINER ○		
	GRAIN SIZE		
D_{60}	0.690		
D_{30}	0.448		
D_{10}	0.300		
	COEFFICIENTS		
C_c	0.97		
C_u	2.30		

SIEVE number size	PERCENT FINER ○		
#4	100.0		
#8	100.0		
#16	99.0		
#30	50.0		
#50	10.0		
#100	4.0		
#200	2.9		

SOIL DESCRIPTION

○ fine to medium SAND (SP)

REMARKS:

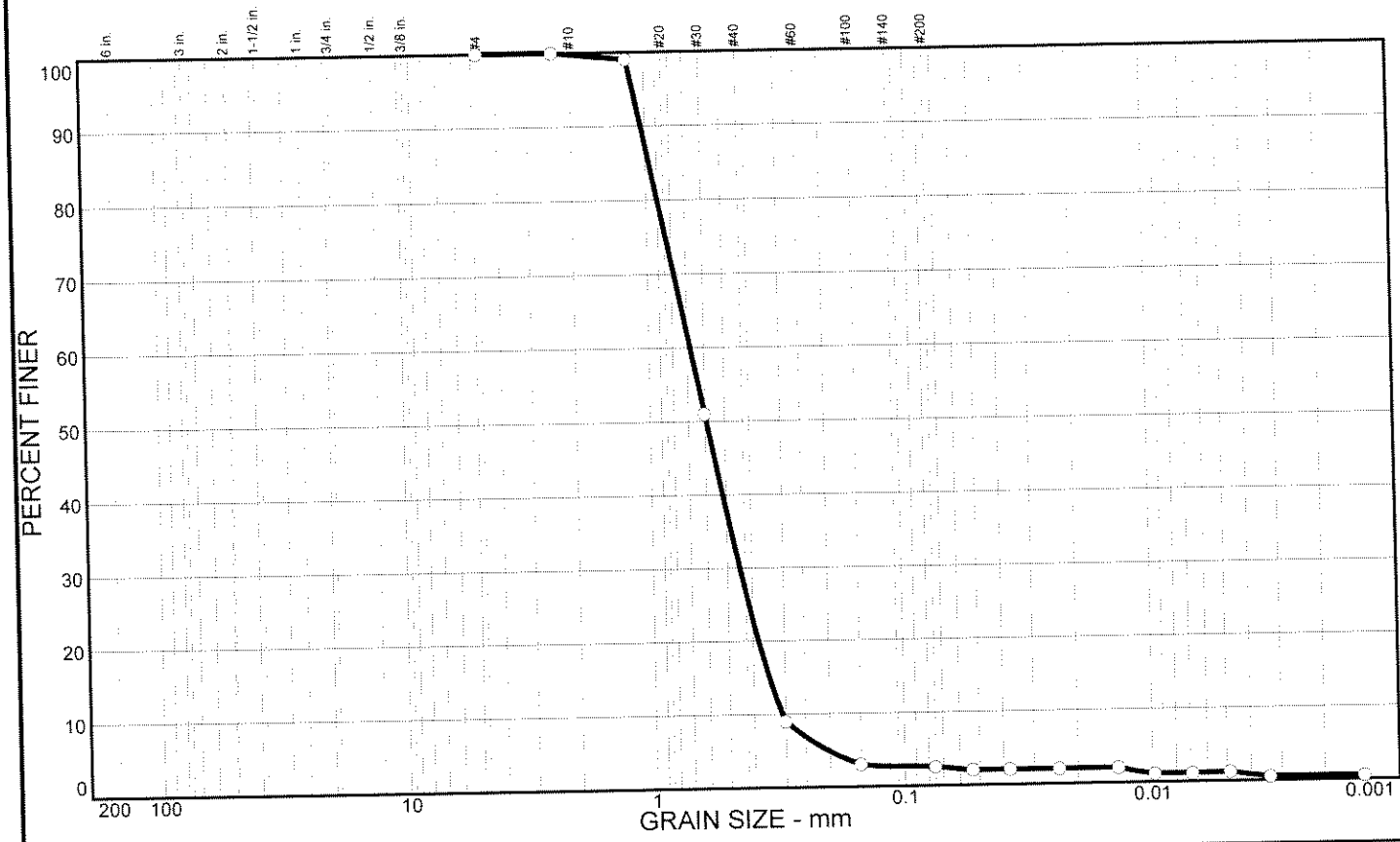
○ Termination Park and Ride Sand Filter Field Sample No.:074204-SED-09201-SECTION2

○ Source: Sample No.: 11581 Elev./Depth: 2" TO 5"

LAW/CRANDALL
A DIVISION OF LAW ENGINEERING AND ENVIRONMENTAL SERVICES, INC.

Client: CALTRANS
Project: CALTRANS BMP Pilot Study
Project No.: 70311-0-0099 Figure 1-31b

PARTICLE SIZE DISTRIBUTION TEST REPORT



% + 3"	% GRAVEL	% SAND	% SILT	% CLAY	USCS	AASHTO	PL	LL
		97.5	1.3	1.2	SP			

SIEVE inches size	PERCENT FINER		

	GRAIN SIZE		
D_{60}	0.680		
D_{30}	0.446		
D_{10}	0.308		
	COEFFICIENTS		
C_c	0.95		
C_u	2.20		

SIEVE number size	PERCENT FINER		
#4	100.0		
#8	100.0		
#16	99.0		
#30	51.0		
#50	9.0		
#100	3.0		
#200	2.5		

SOIL DESCRIPTION

fine to medium SAND (SP)

REMARKS:

Termination Park and Ride Sand Filter Field Sample No.:074204-SED-09201-SECTION3

Source:

Sample No.: 11582

Elev./Depth: 5" TO 10"

LAW/CRANDALL
A DIVISION OF LAW ENGINEERING AND ENVIRONMENTAL SERVICES, INC.

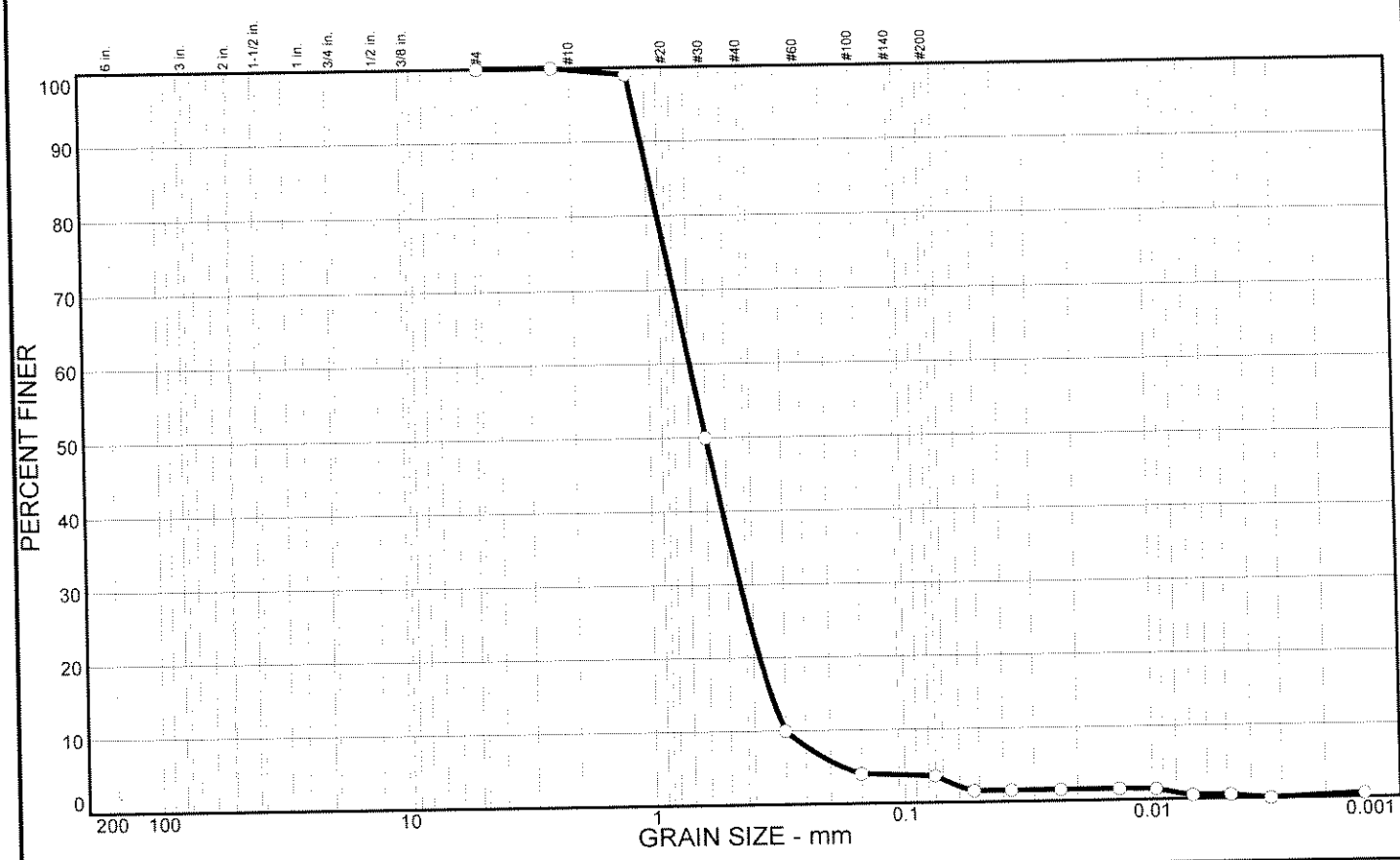
Client: CALTRANS

Project: CALTRANS BMP Pilot Study

Project No.: 70311-0-0099

Figure 1-31c

PARTICLE SIZE DISTRIBUTION TEST REPORT



	% + 3"	% GRAVEL	% SAND	% SILT	% CLAY	USCS	AASHTO	PL	LL
○			96.4	3.1	0.5	SP			

SIEVE inches size	PERCENT FINER ○		
	GRAIN SIZE		
D_{60}	0.690		
D_{30}	0.448		
D_{10}	0.300		
	COEFFICIENTS		
C_c	0.97		
C_u	2.30		

SIEVE number size	PERCENT FINER ○		
#4	100.0		
#8	100.0		
#16	99.0		
#30	50.0		
#50	10.0		
#100	4.0		
#200	3.6		

SOIL DESCRIPTION

○ fine to medium SAND (SP)

REMARKS:

○ Termination Park and Ride Sand Filter Field Sample No.:07204-SED-09201-SECTION4

○ Source:

Sample No.: 11583

Elev./Depth: 10" TO 15"

LAW/CRANDALL
A DIVISION OF LAW ENGINEERING AND ENVIRONMENTAL SERVICES, INC.

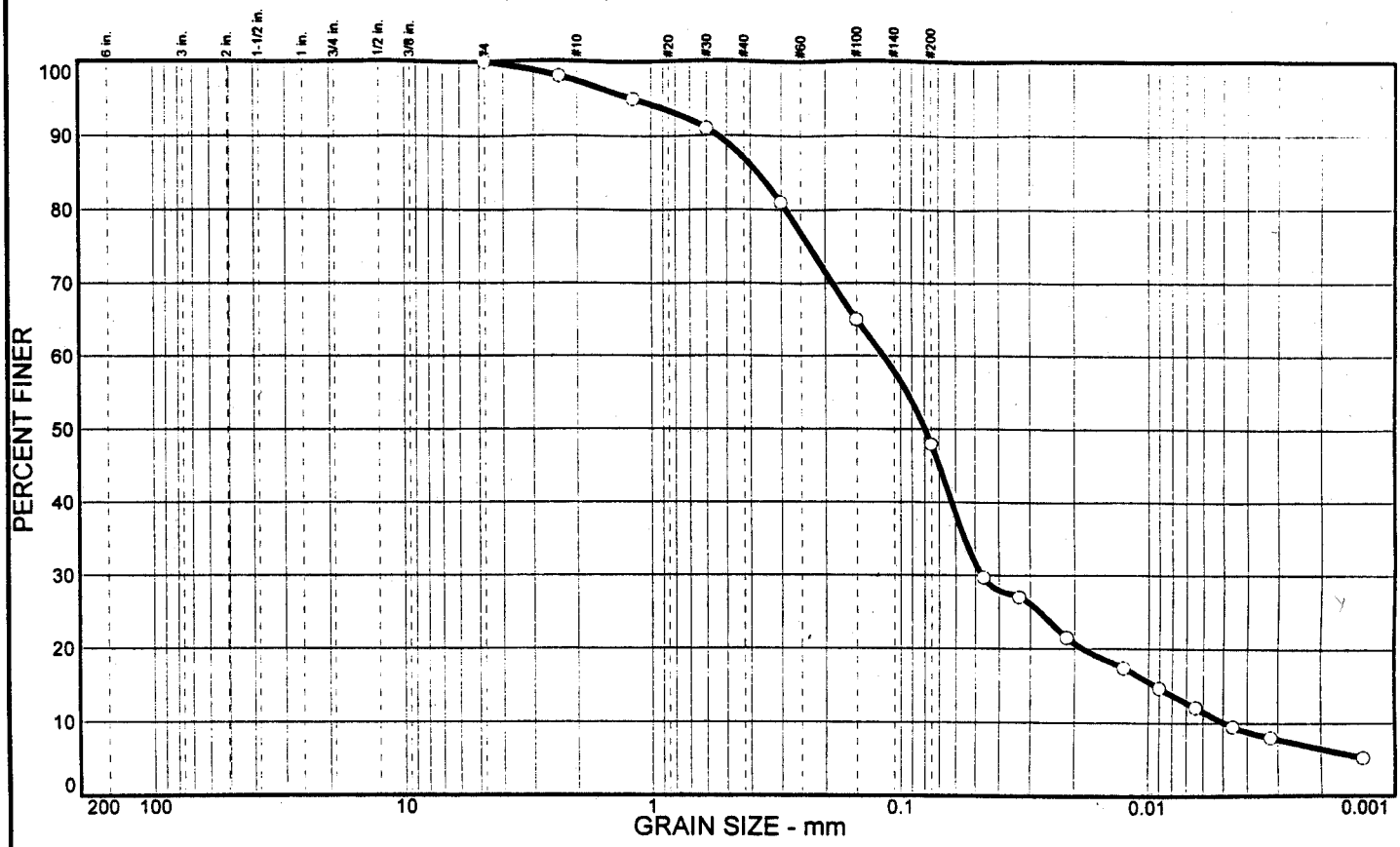
Client: CALTRANS

Project: CALTRANS BMP Pilot Study

Project No.: 70311-0-0099

Figure 1-31d

PARTICLE SIZE DISTRIBUTION TEST REPORT



	% + 3"	% GRAVEL	% SAND	% SILT	% CLAY	USCS	AASHTO	PL	LL
○			52.1	37.8	10.1	SP-SM			

SIEVE inches size	PERCENT FINER ○		

	GRAIN SIZE		
D_{60}	0.117		
D_{30}	0.0468		
D_{10}	0.0049		
	COEFFICIENTS		
C_c	3.80		
C_u	23.82		

SIEVE number size	PERCENT FINER ○		
#4	100.0		
#8	98.0		
#16	95.0		
#30	91.0		
#50	81.0		
#100	65.0		
#200	47.9		

SOIL DESCRIPTION

○ fine to medium Sand to Silty Sand (SP-SM)

REMARKS:

○ I605/SR-91 Infiltration Basin
Layer 1

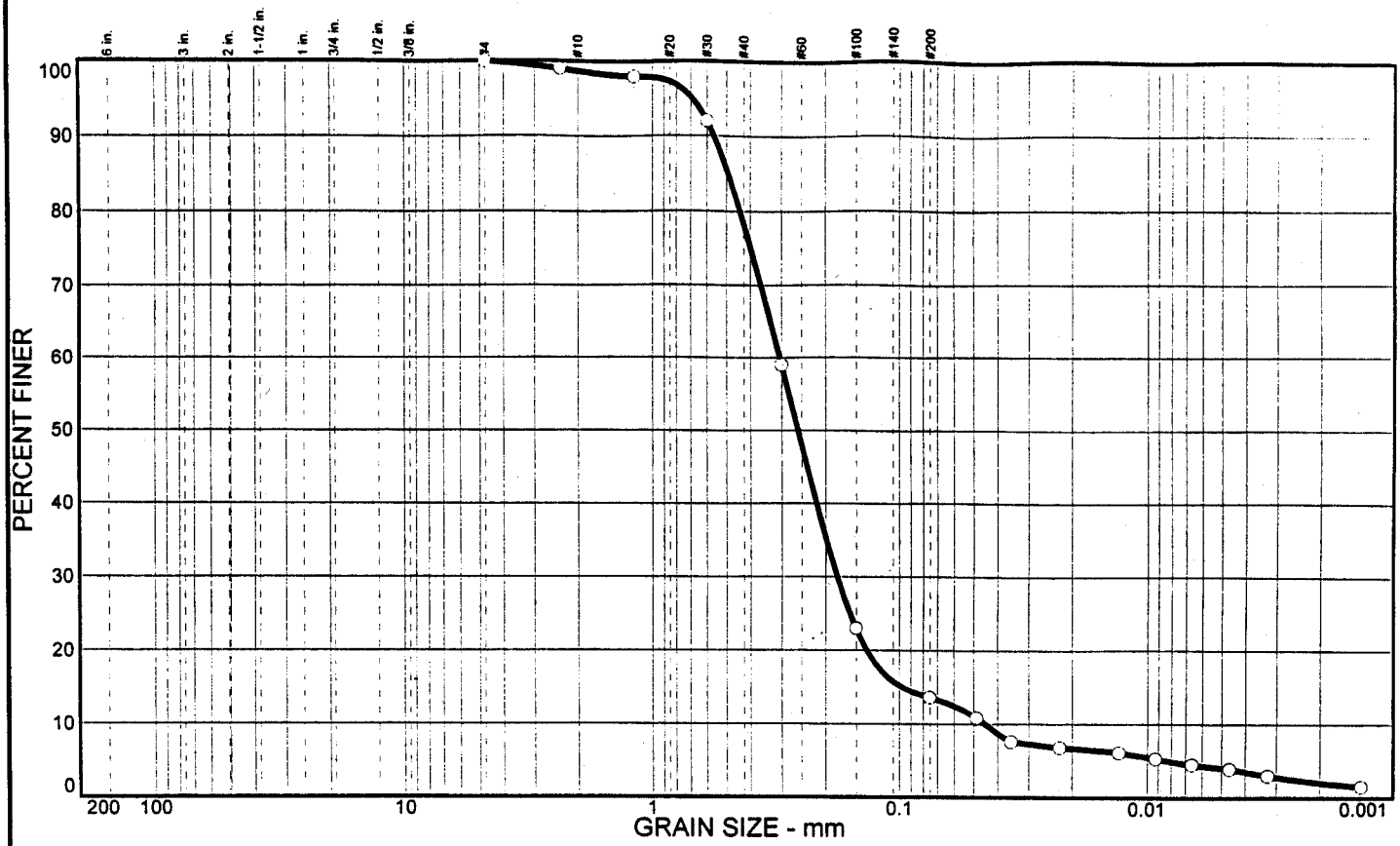
○ Location: Layer 1 Elevation: Surface to 0.2m Sample No.:11728

LAW/CRANDALL
A DIVISION OF LAW ENGINEERING AND ENVIRONMENTAL SERVICES, INC.

Client: Caltrans
Project: Caltrans BMP
Project No.: 70311-0-0099.01.004

FIGURE:1-32a

PARTICLE SIZE DISTRIBUTION TEST REPORT



	% + 3"	% GRAVEL	% SAND	% SILT	% CLAY	USCS	AASHTO	PL	LL
○			86.4	9.6	4.0	SP-SM			

SIEVE inches size	PERCENT FINER ○		
	GRAIN SIZE		
D_{60}	0.305		
D_{30}	0.179		
D_{10}	0.0450		
	COEFFICIENTS		
C_c	2.33		
C_u	6.78		

SIEVE number size	PERCENT FINER ○		
#4	100.0		
#8	99.0		
#16	98.0		
#30	92.0		
#50	59.0		
#100	23.0		
#200	13.6		

SOIL DESCRIPTION

○ fine to medium Sand to Silty Sand (SP-SM)

REMARKS:

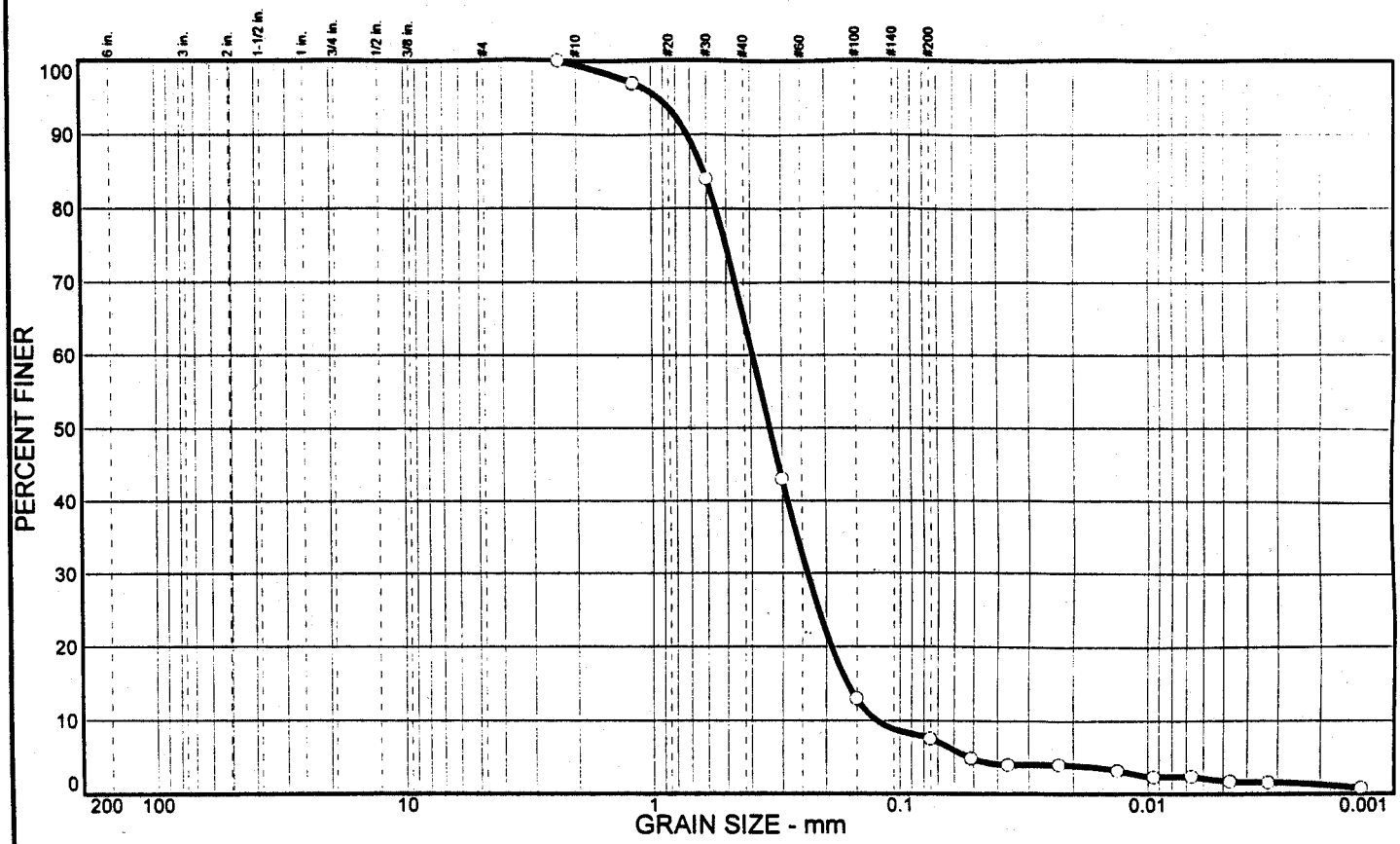
○ I-605/SR-91 Infiltration Basin
Layer 2

○ Location: Layer 2 Elevation: 0.3m to 0.5m Sample No.:11727

LAW/CRANDALL
A DIVISION OF LAW ENGINEERING AND ENVIRONMENTAL SERVICES, INC.

Client: Caltrans
Project: Caltrans BMP
Project No.: 70311-0-0099.01.004 FIGURE:1-32b

PARTICLE SIZE DISTRIBUTION TEST REPORT



	% + 3"	% GRAVEL	% SAND	% SILT	% CLAY	USCS	AASHTO	PL	LL
○			92.4	5.8	1.8	SP-SM			

SIEVE inches size	PERCENT FINER ○		
	GRAIN SIZE		
D_{60}	0.391		
D_{30}	0.238		
D_{10}	0.124		
	COEFFICIENTS		
C_c	1.17		
C_u	3.16		

SIEVE number size	PERCENT FINER ○		
#8	100.0		
#16	97.0		
#30	84.0		
#50	43.0		
#100	13.0		
#200	7.6		

SOIL DESCRIPTION

○ fine to medium Sand to Silty Sand (SP-SM)

REMARKS:

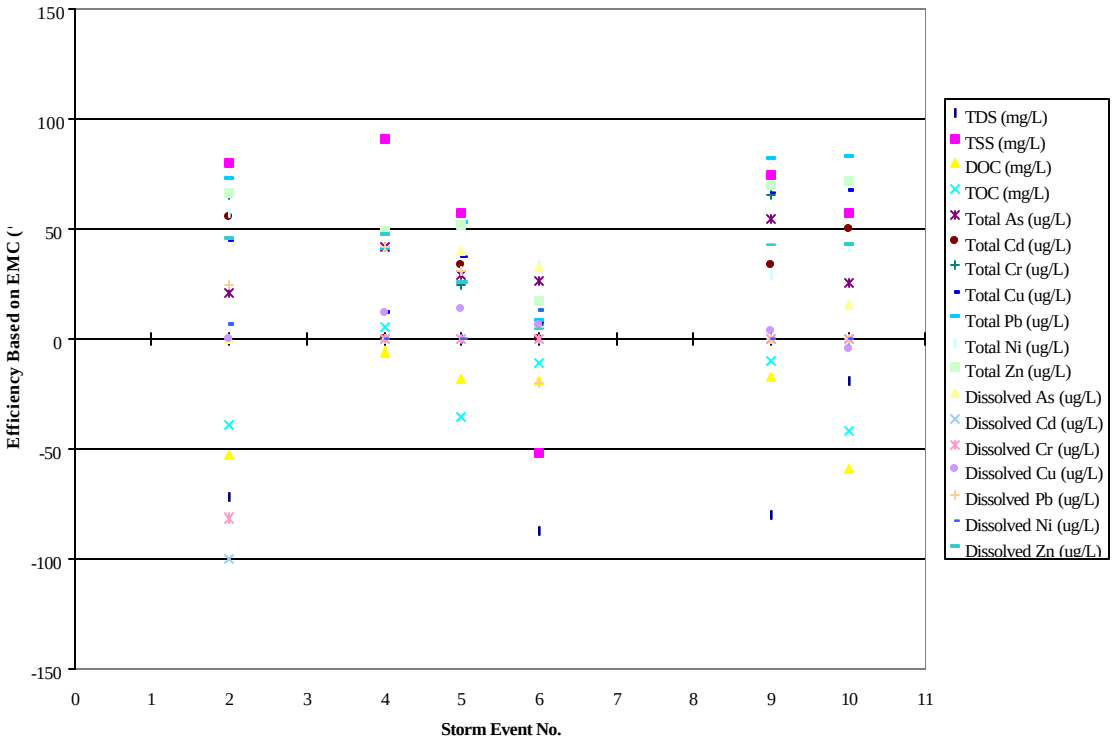
○ I-605/SR-91 Infiltration Basin
Layer 3

○ Location: Layer 3 Elevation:0.6m to 0.8m Sample No.:11726

LAW/CRANDALL
A DIVISION OF LAW ENGINEERING AND ENVIRONMENTAL SERVICES, INC.

Client: Caltrans
Project: Caltrans BMP
Project No.: 70311-0-0099.01.004 FIGURE:1-32c

Figure 1-33a: BMP Pollutant Removal Efficiency at the Altadena Maintenance Station Biofiltration Strip



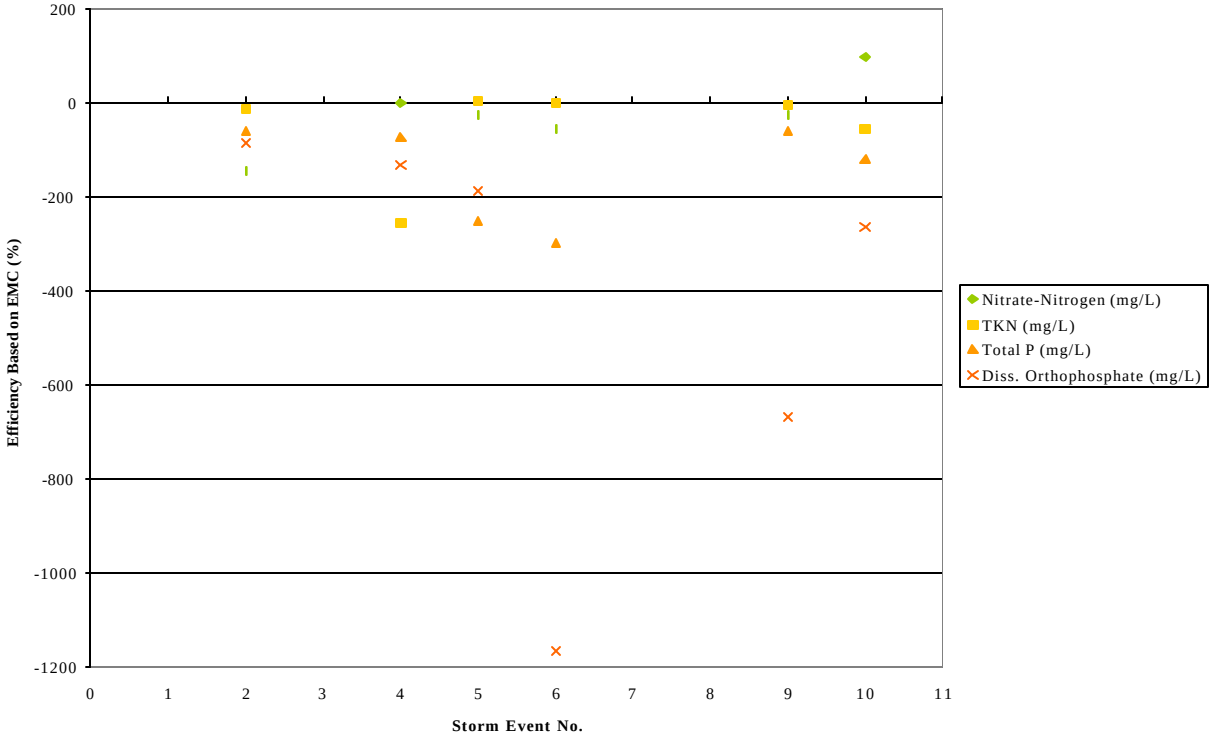
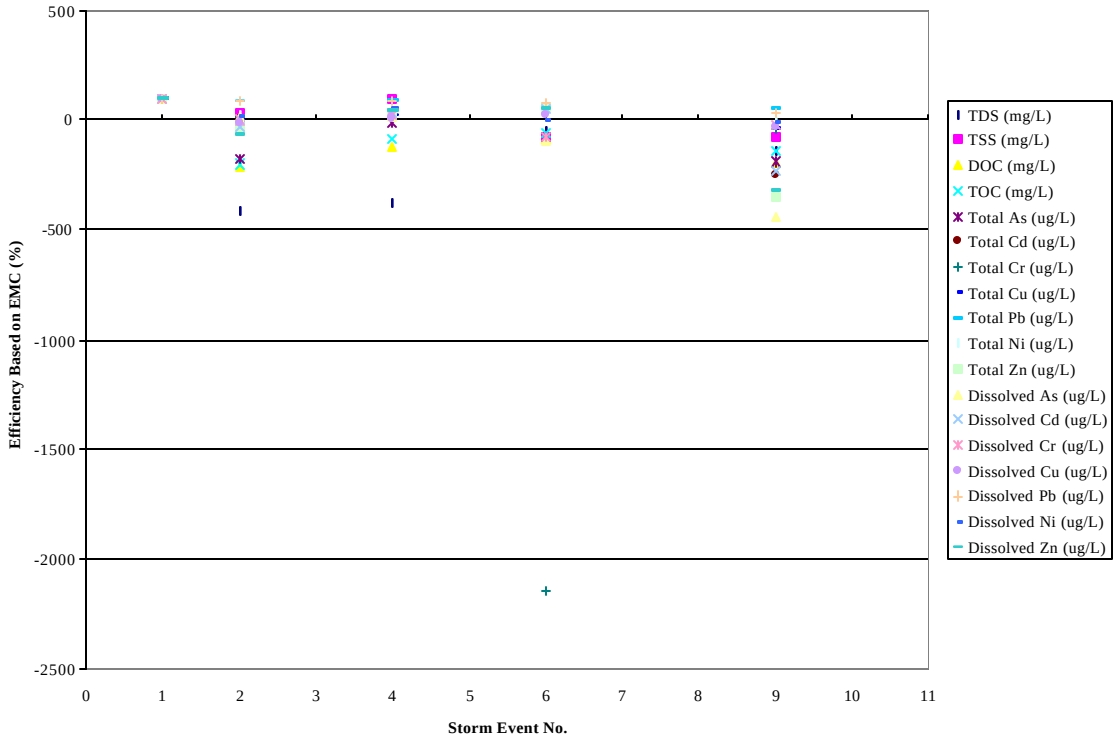


Figure 1-33b: BMP Pollutant Removal Efficiency at the I-605/SR-91 Biofiltration Strip



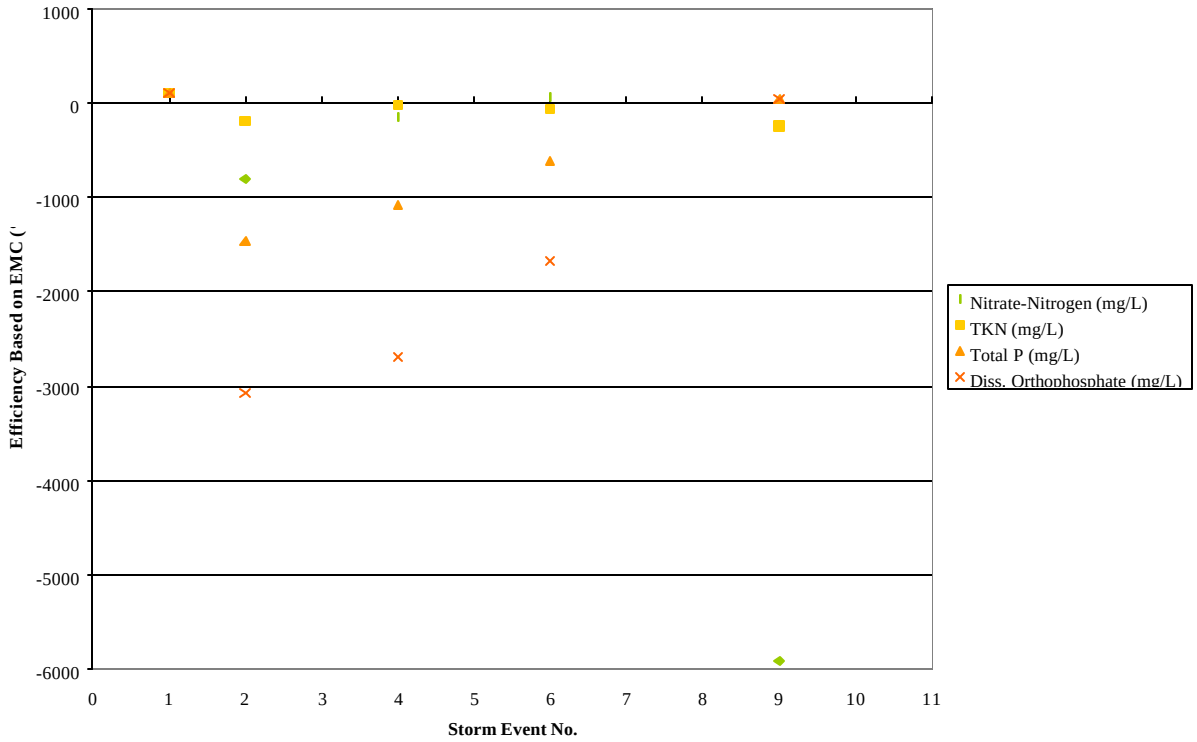
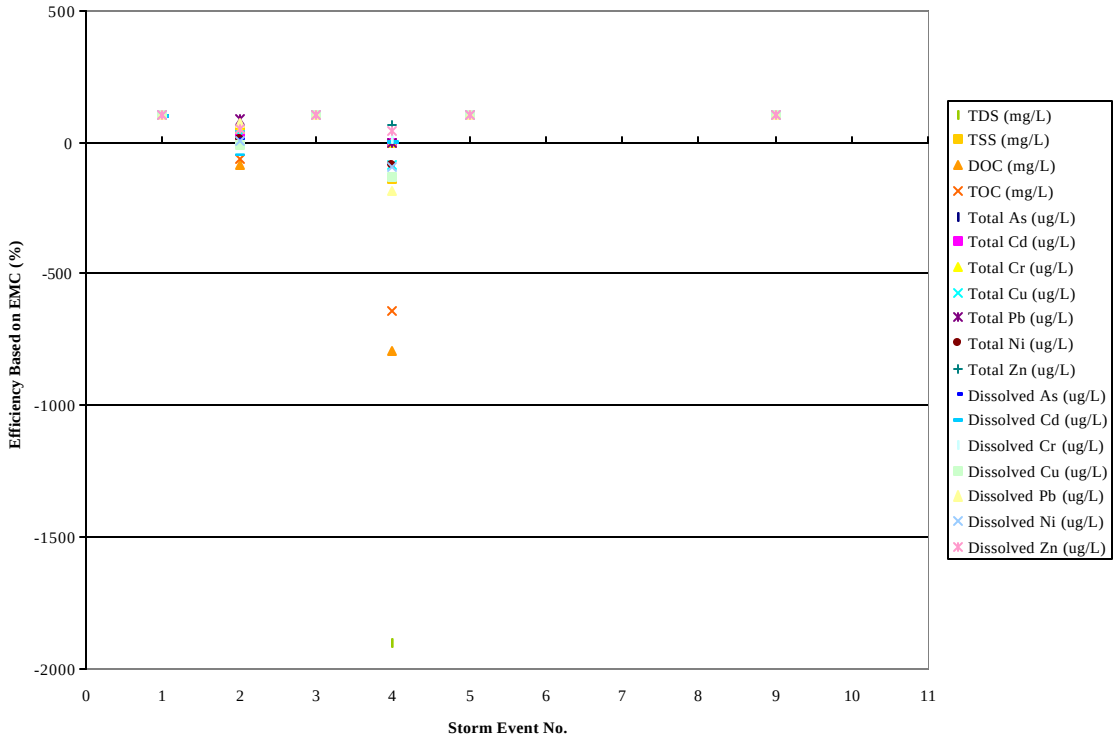


Figure 1-34a: BMP Pollutant Removal Efficiency at the I-605/SR-91 Biofiltration Swale



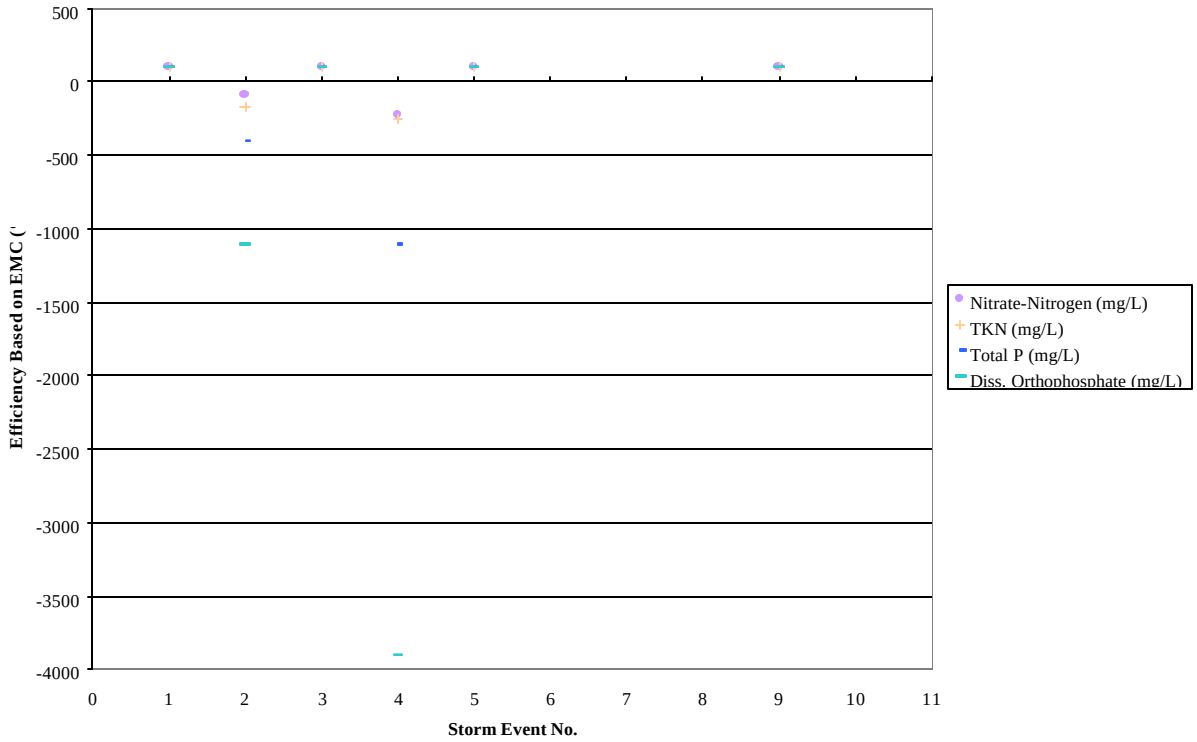
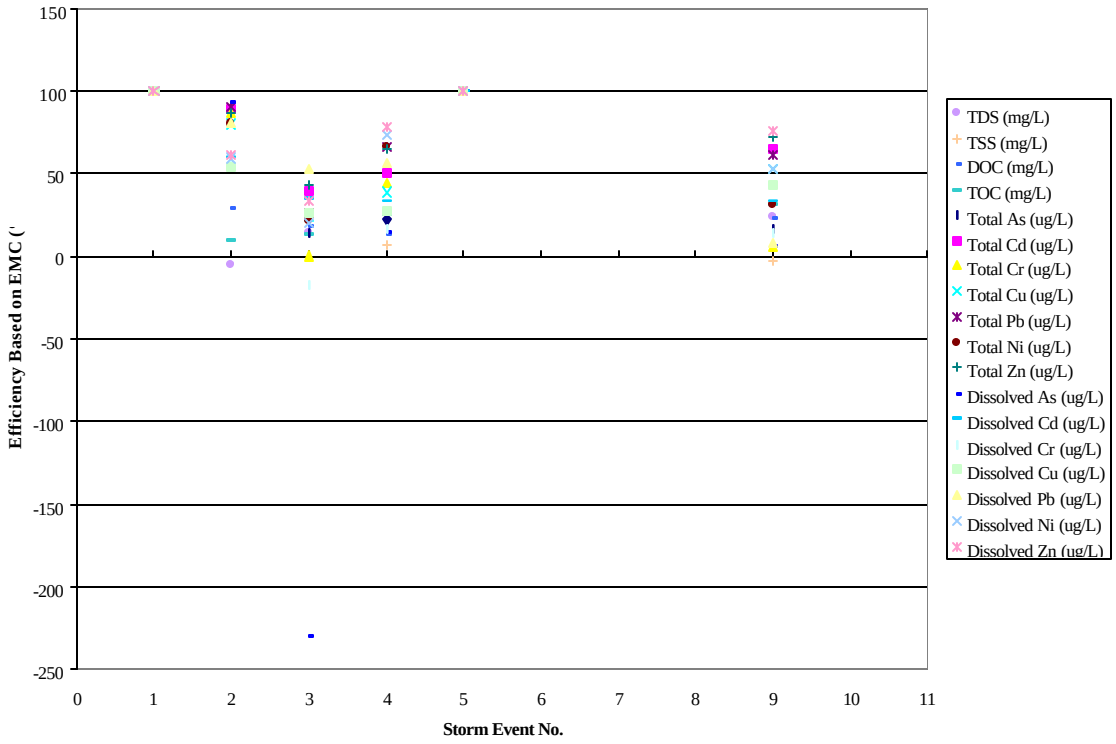


Figure 1-34b: BMP Pollutant Removal Efficiency at the Cerritos Maintenance Station Biofiltration Swale



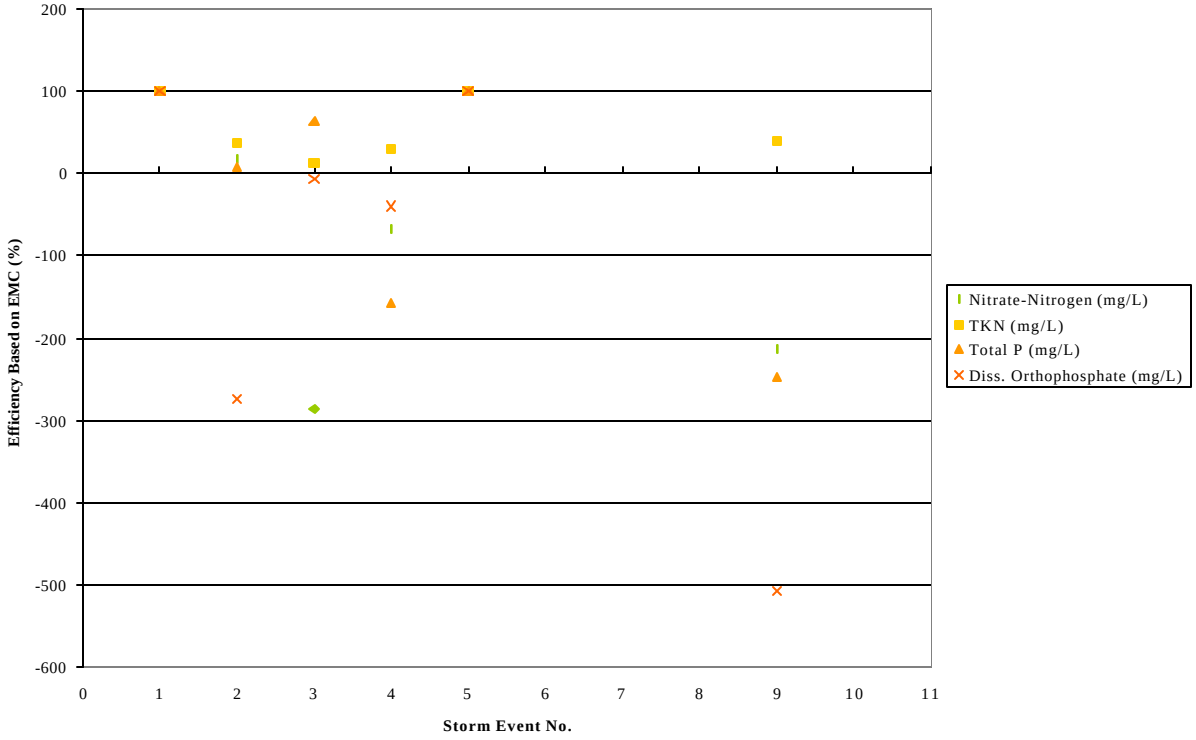
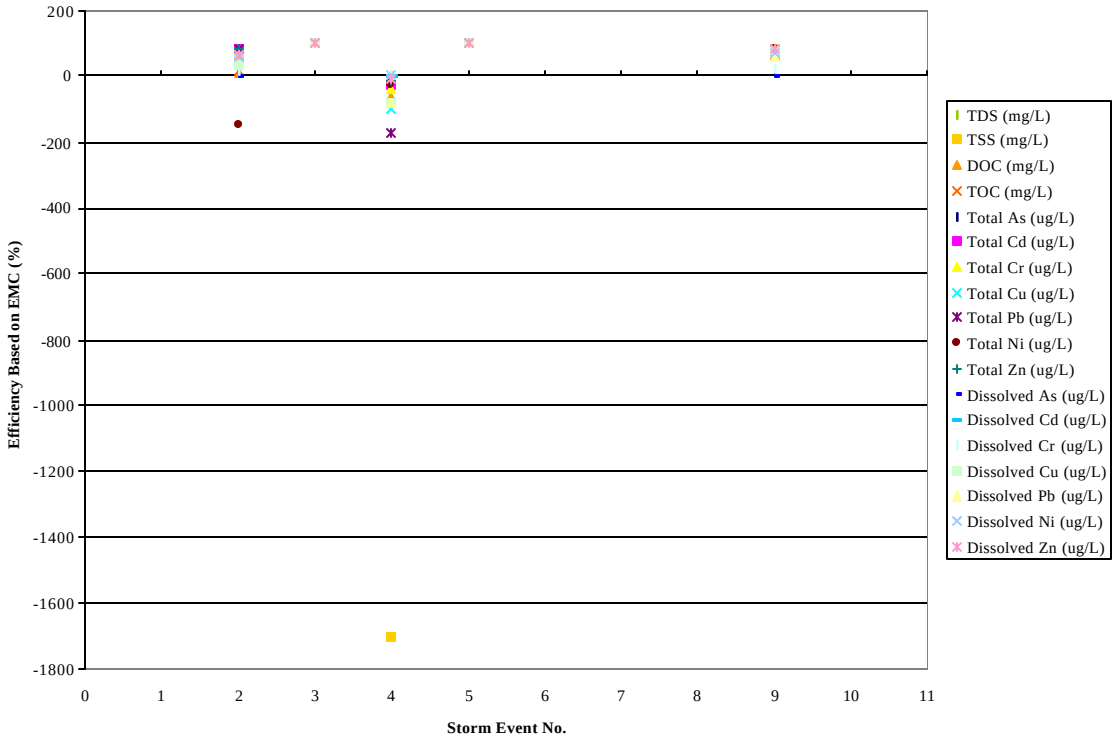


Figure 1-34c: BMP Pollutant Removal Efficiency at the I-5/I-605 Biofiltration Swale



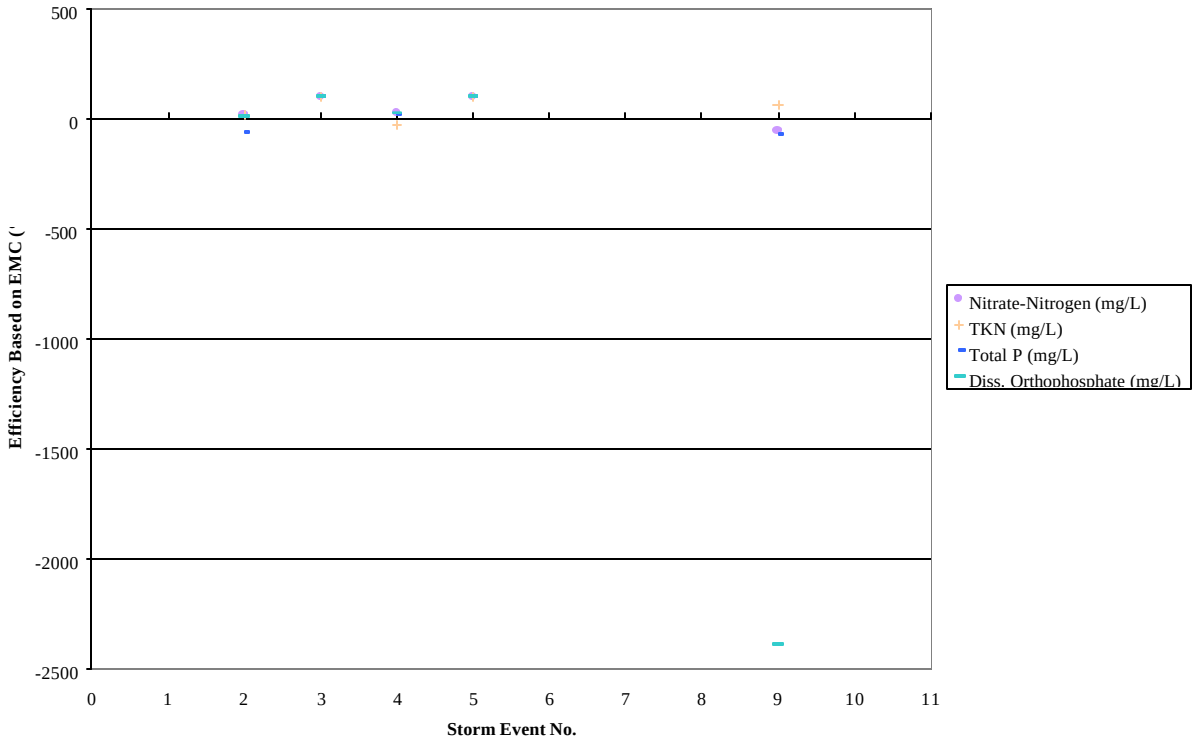
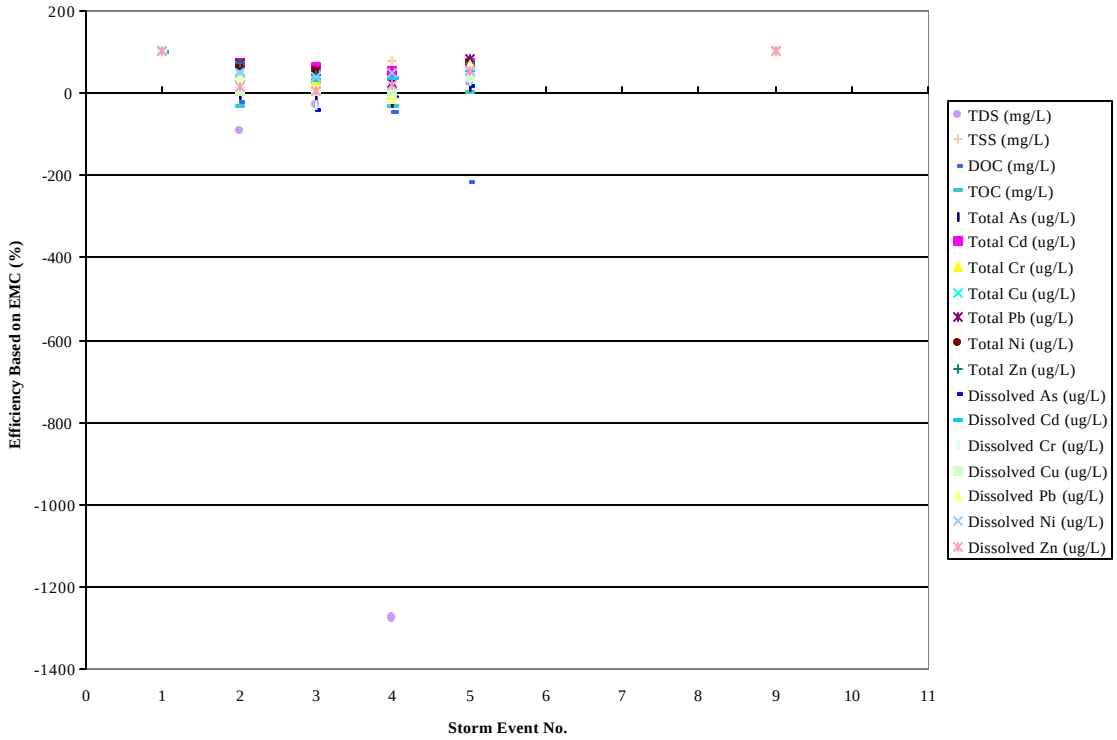


Figure 1-34d: BMP Pollutant Removal Efficiency at the I-605/Carson Biofiltration Swale



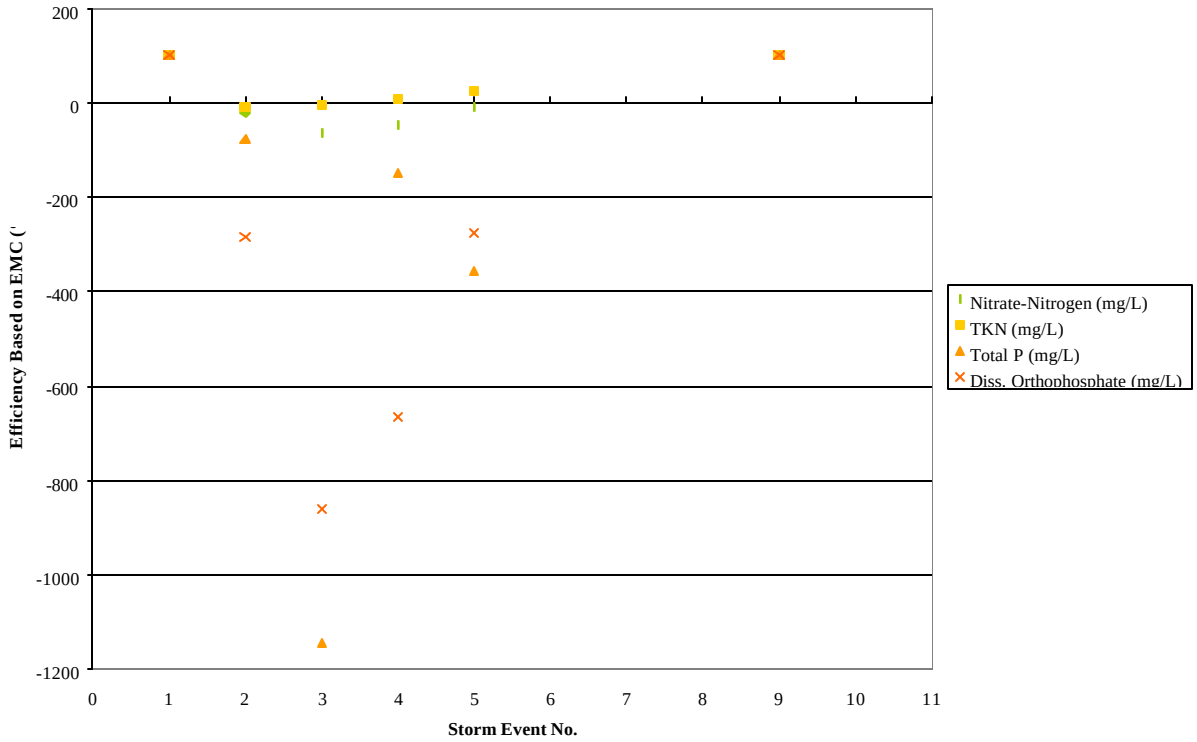
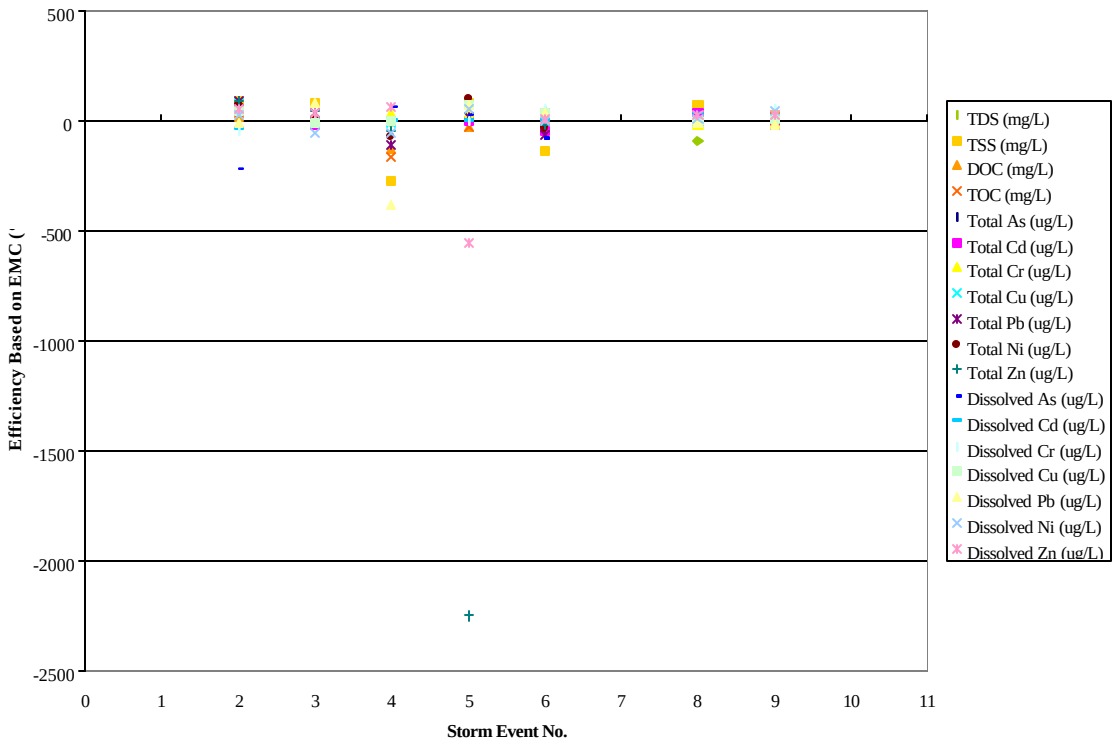


Figure 1-35a: BMP Pollutant Removal Efficiency at the I-5/I-605 Extended Detention Basin



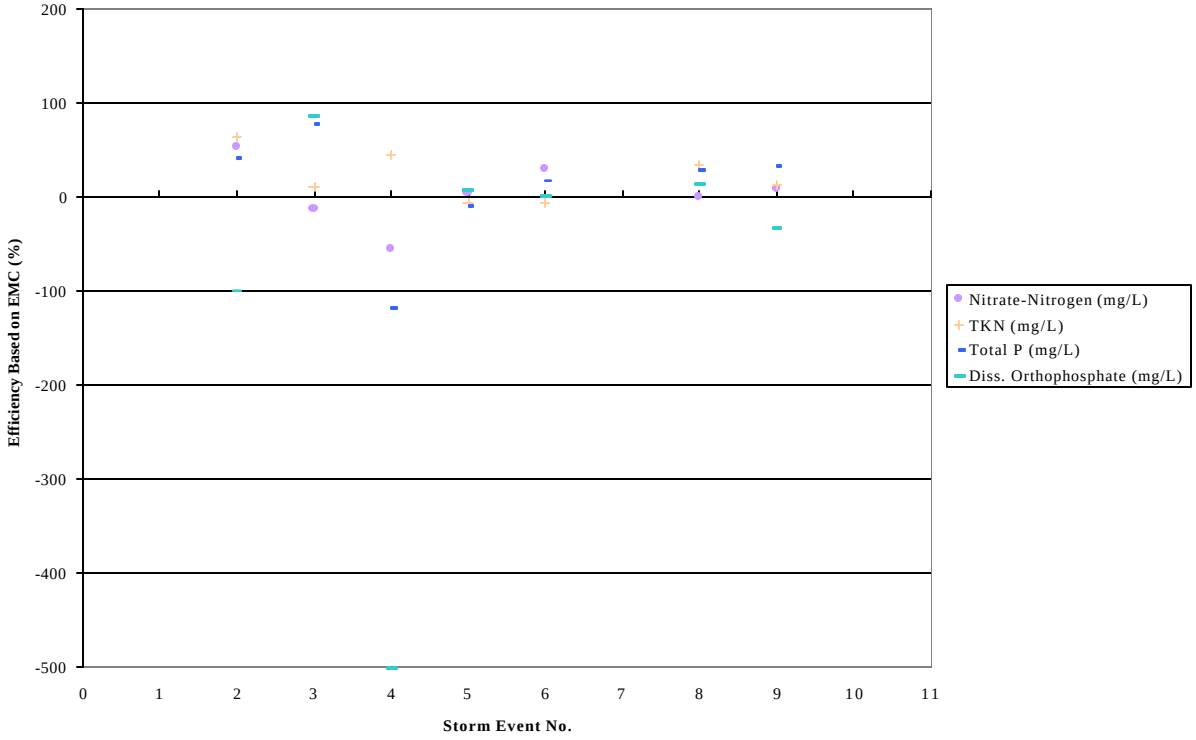
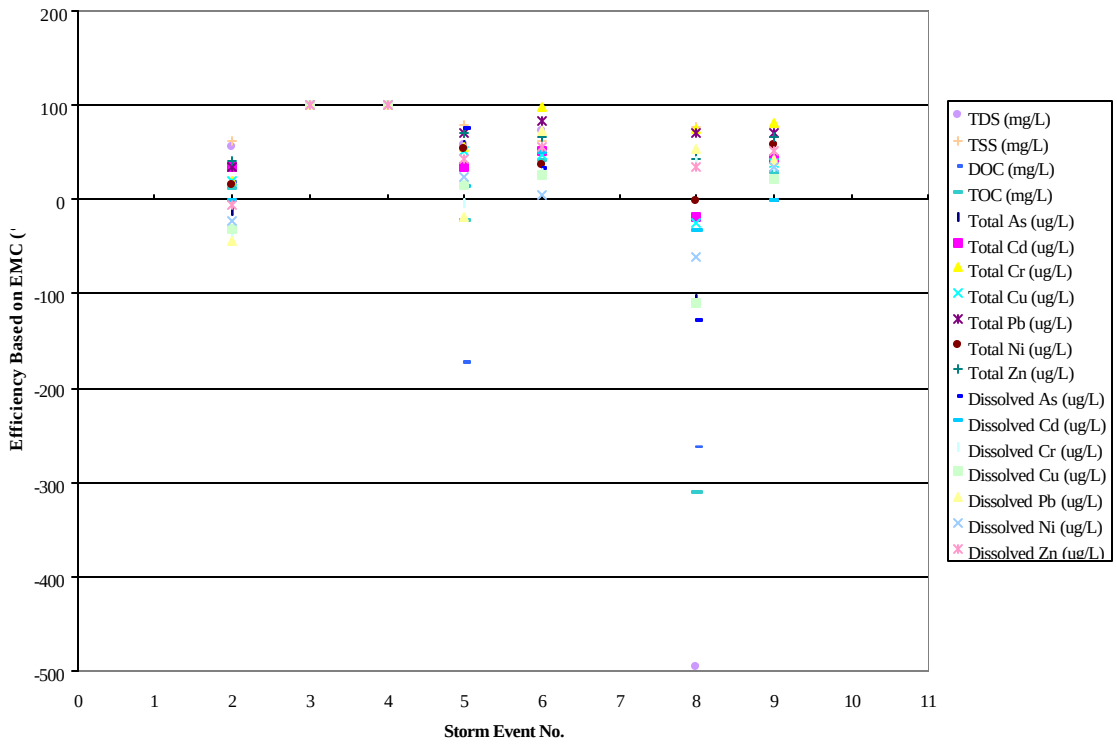


Figure 1-35b: BMP Pollutant Removal Efficiency at the I-605/SR-91 Extended Detention Basin



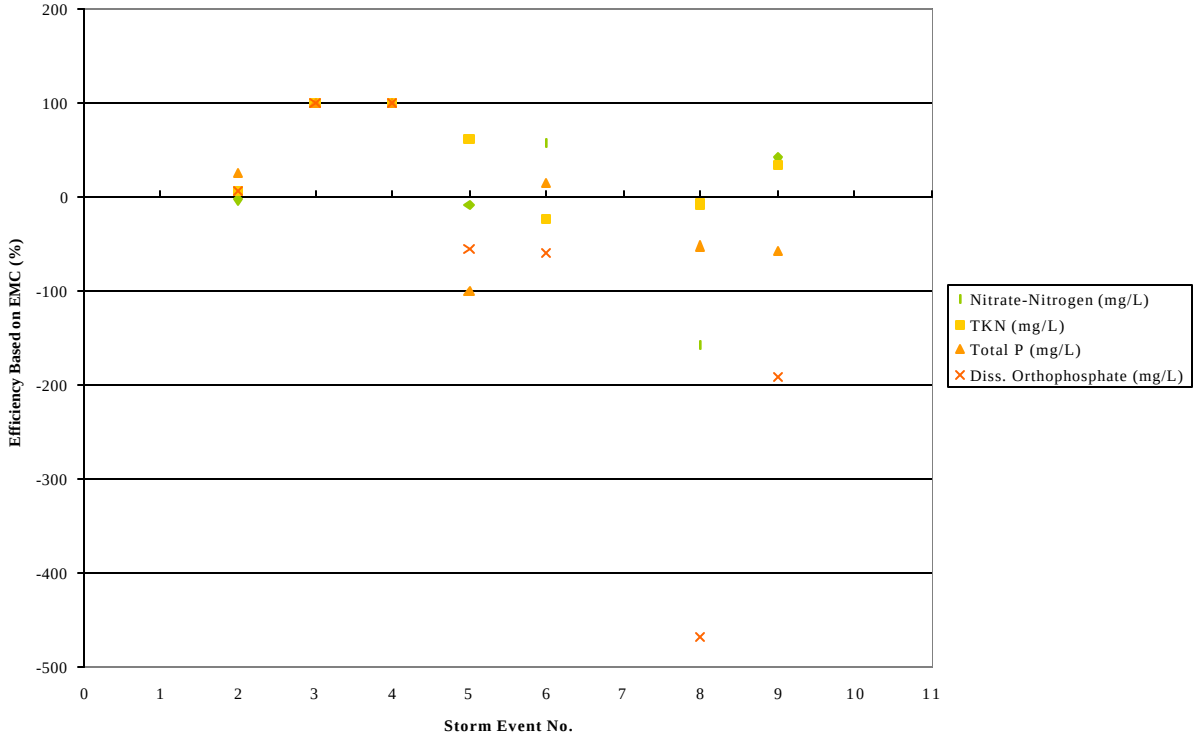
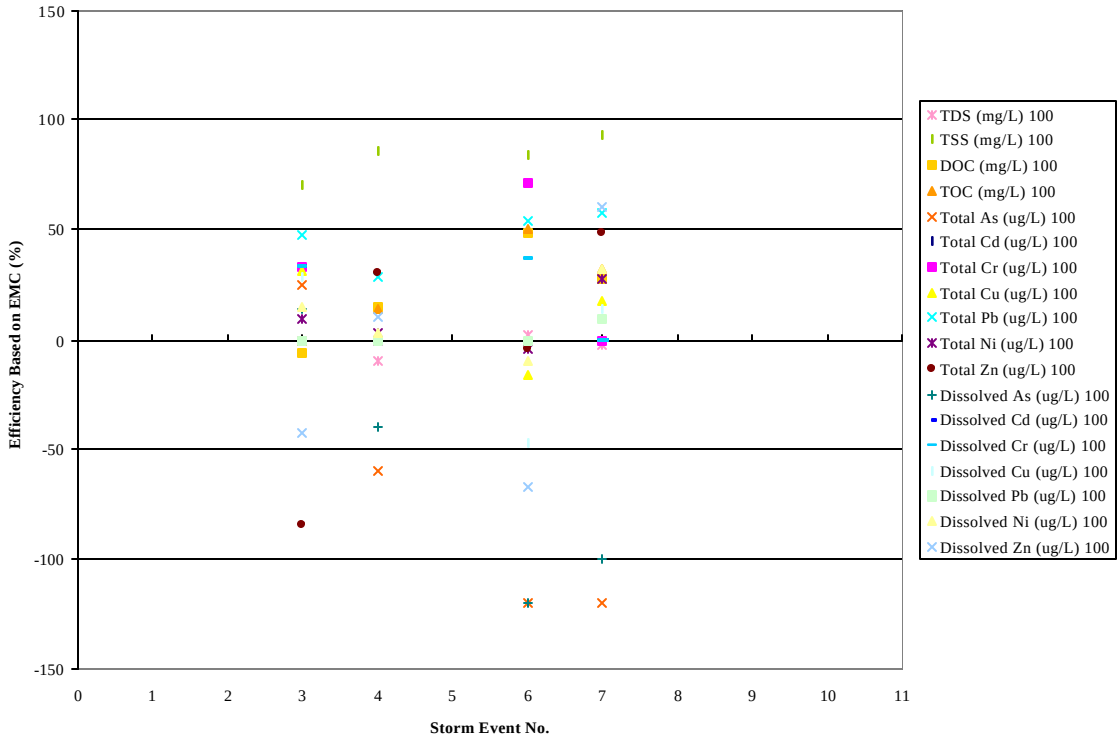


Figure 1-36c: BMP Pollutant Removal Efficiency at the Termination Park & Ride Sand Filter – Austin Type



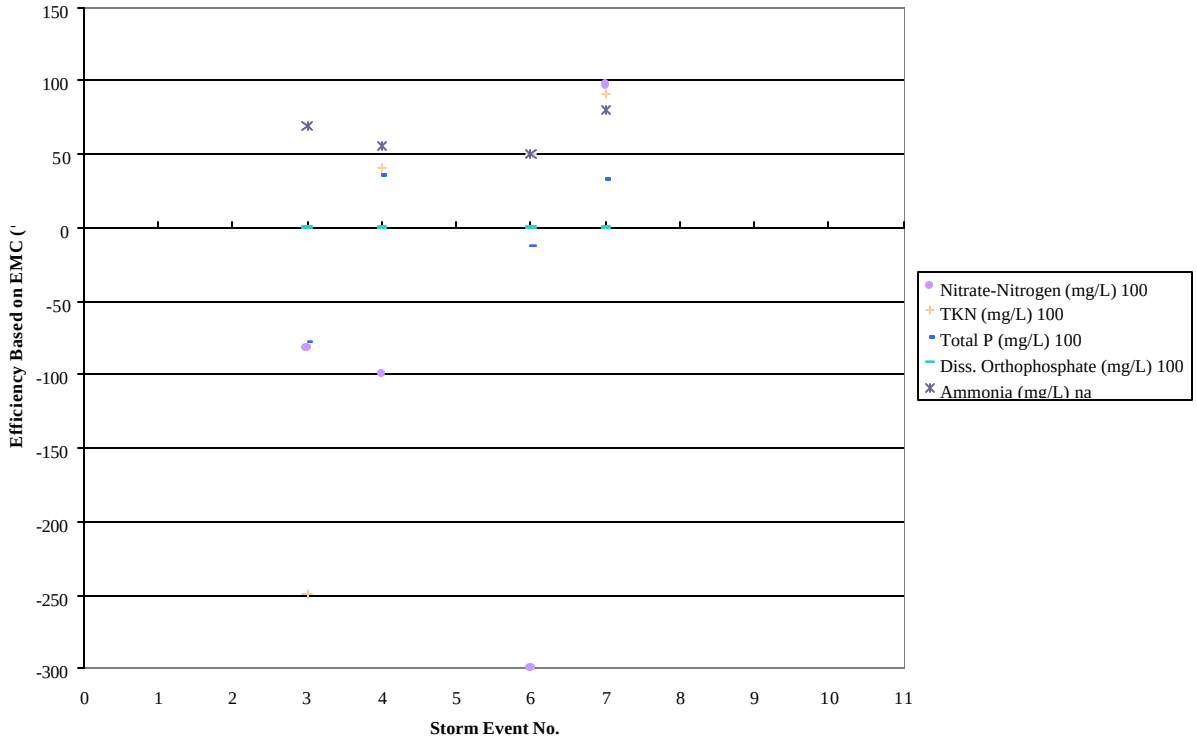
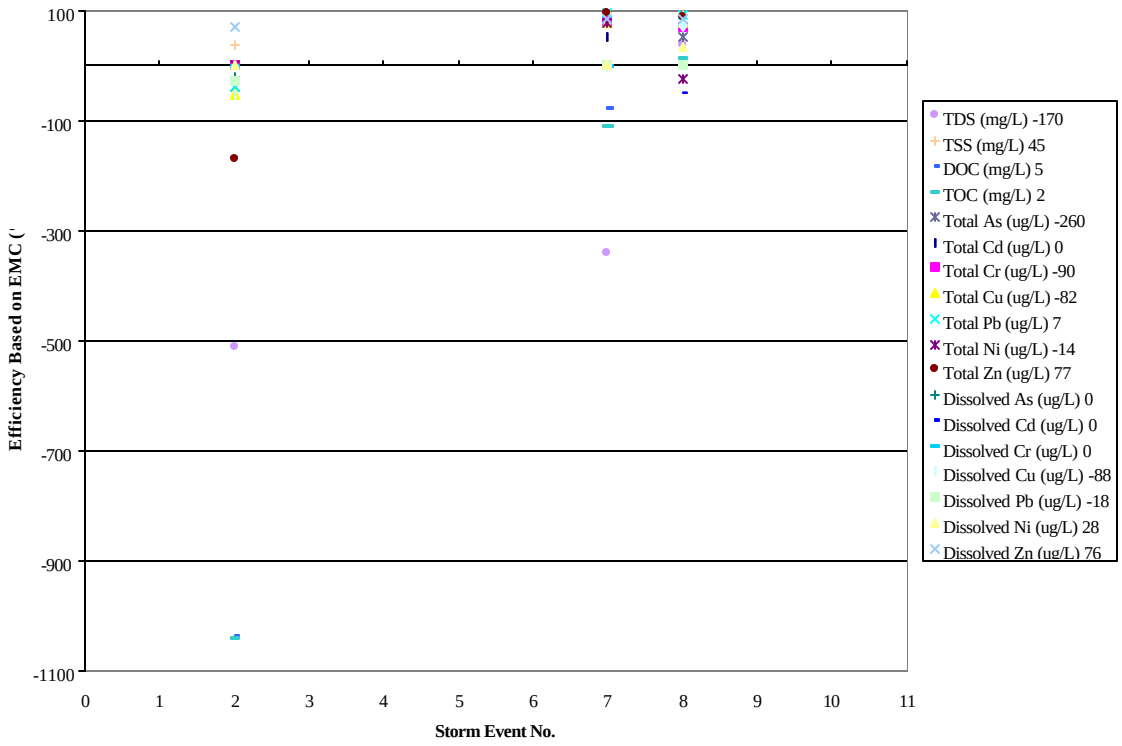


Figure 1-37a: BMP Pollutant Removal Efficiency at the Via Verde Park & Ride Multi-chambered Treatment Train



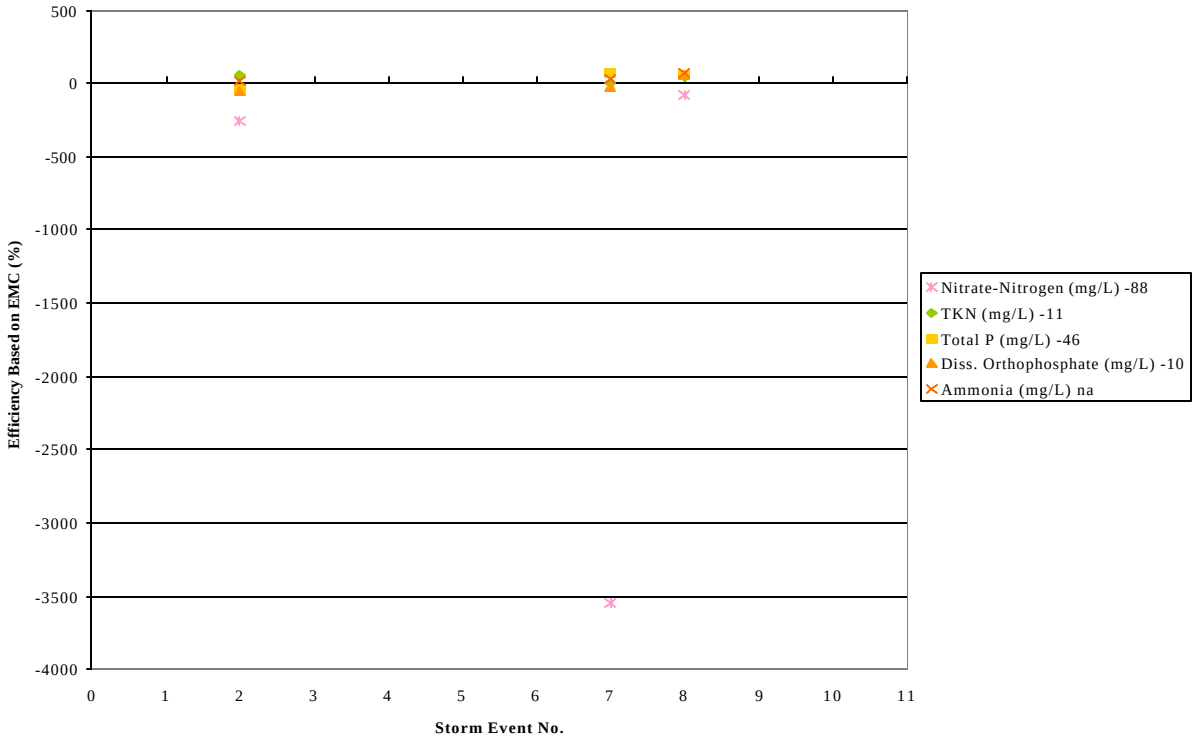
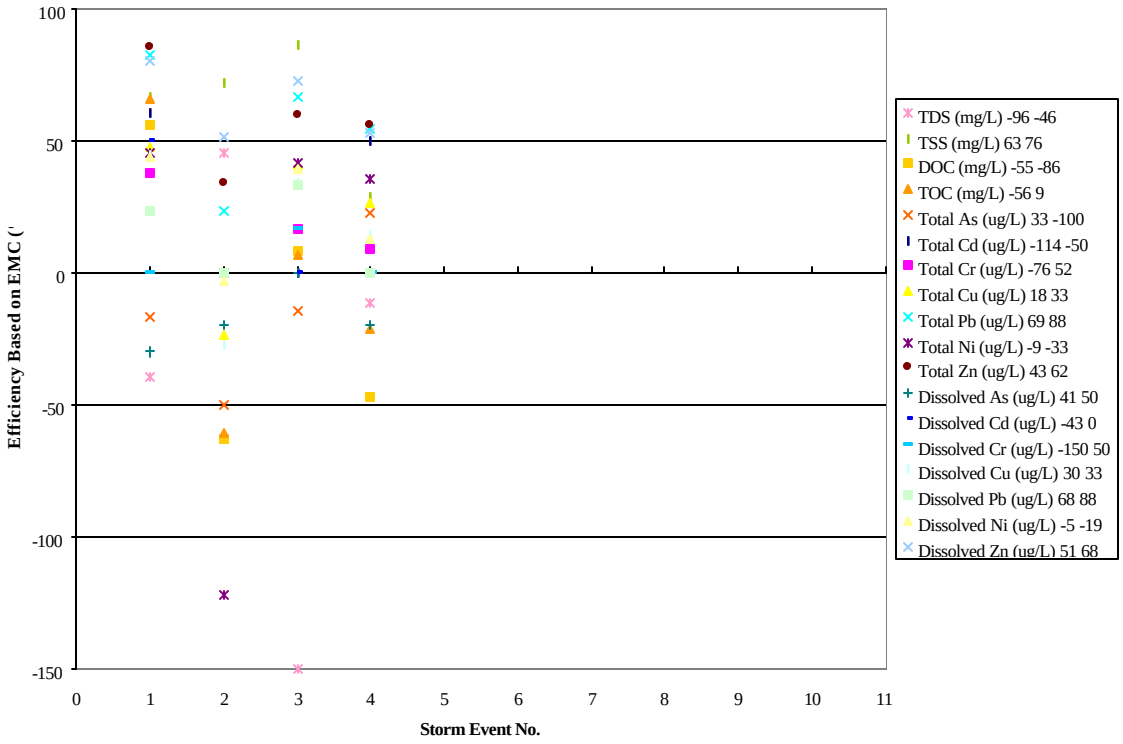


Figure 1-37b: BMP Pollutant Removal Efficiency at the Lakewood Park & Ride Multi-chambered Treatment Train



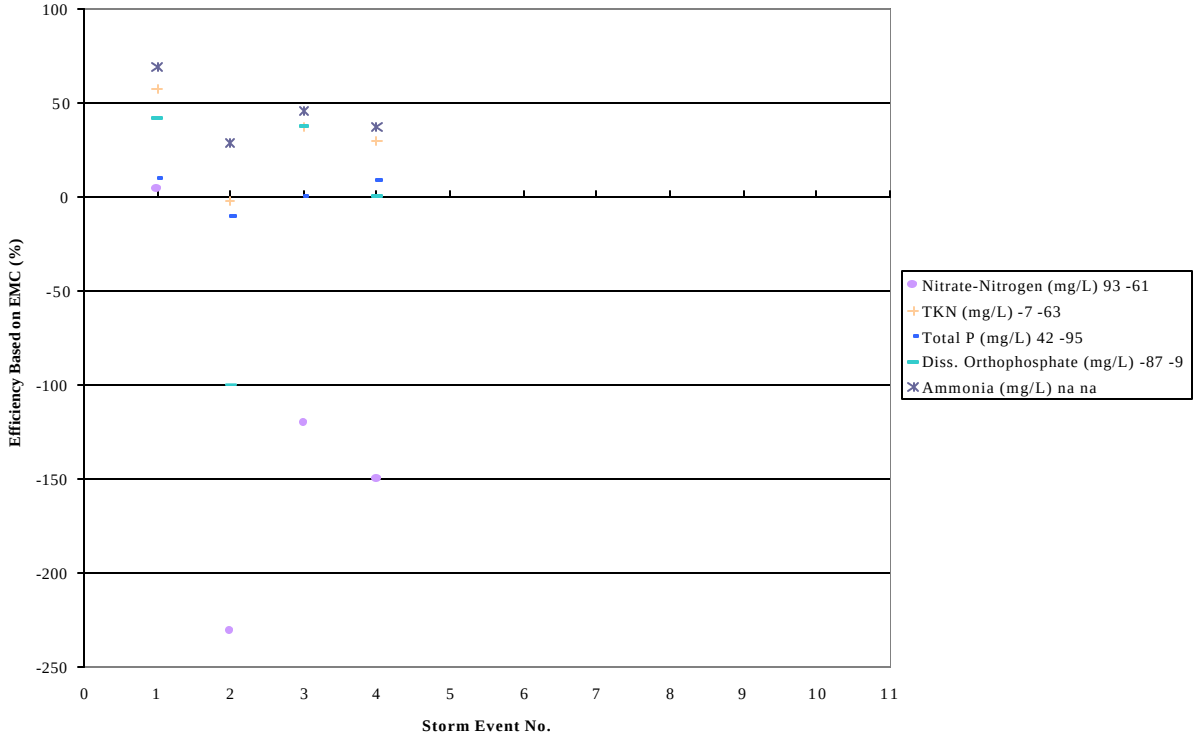
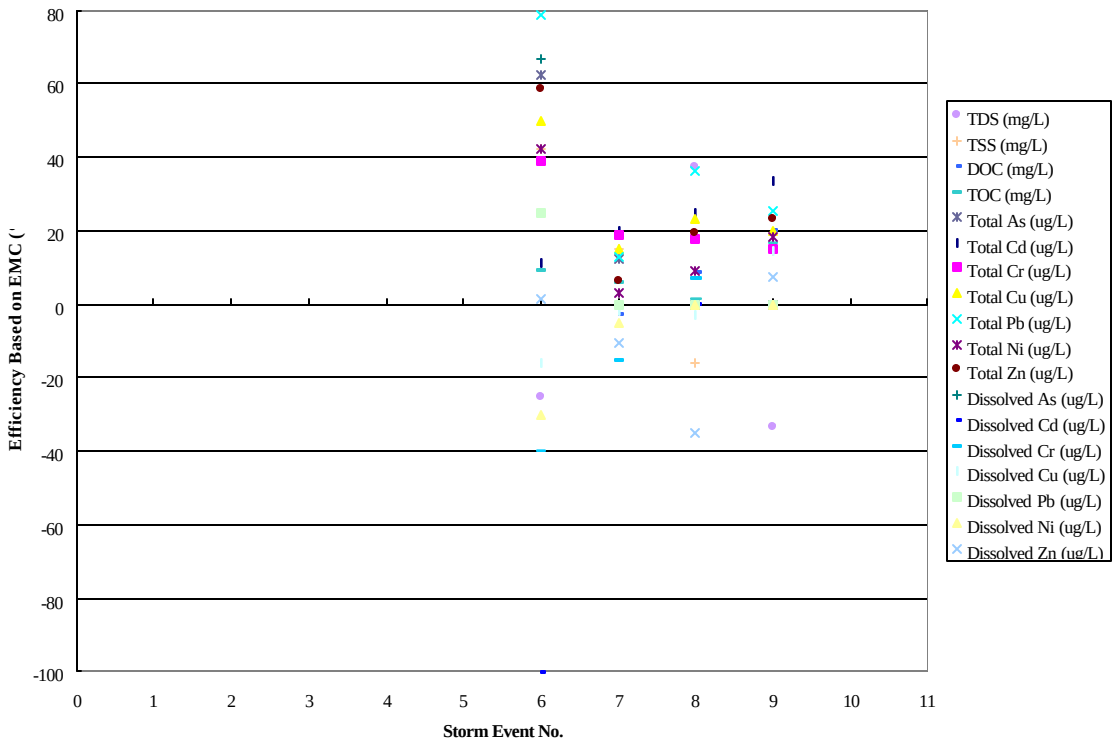


Figure 1-38a: BMP Pollutant Removal Efficiency at the Orcas Continuous Deflective Separation Unit



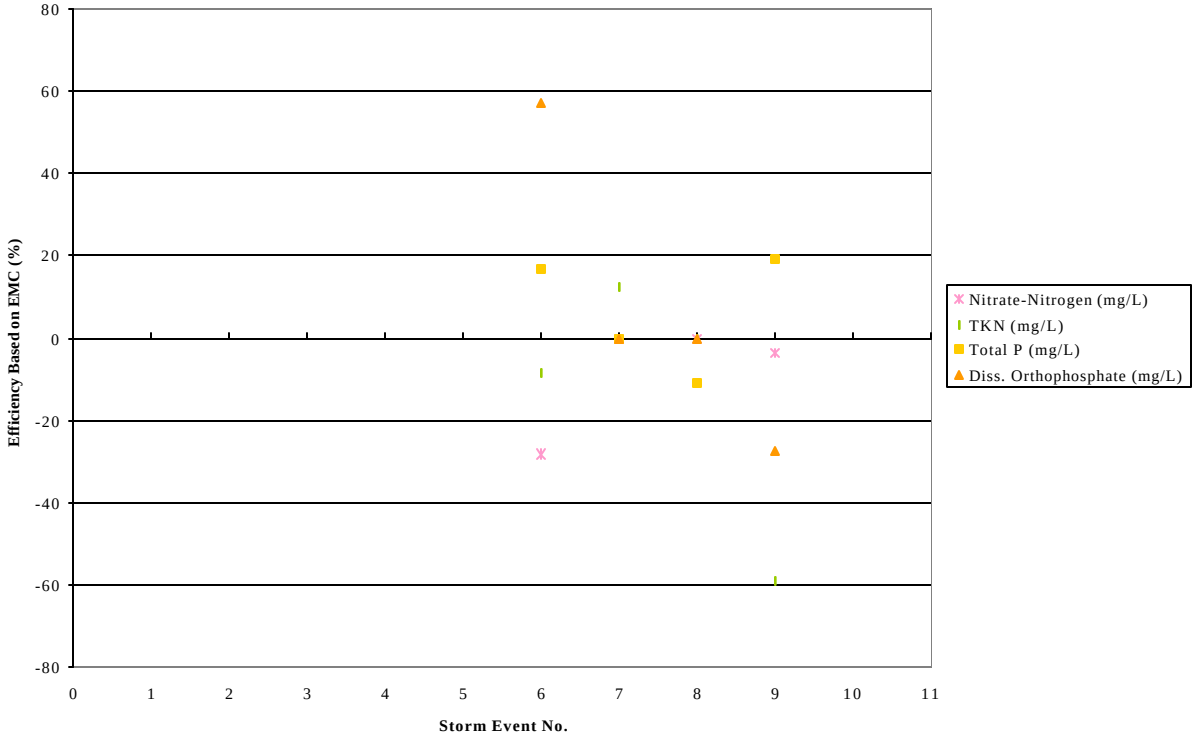
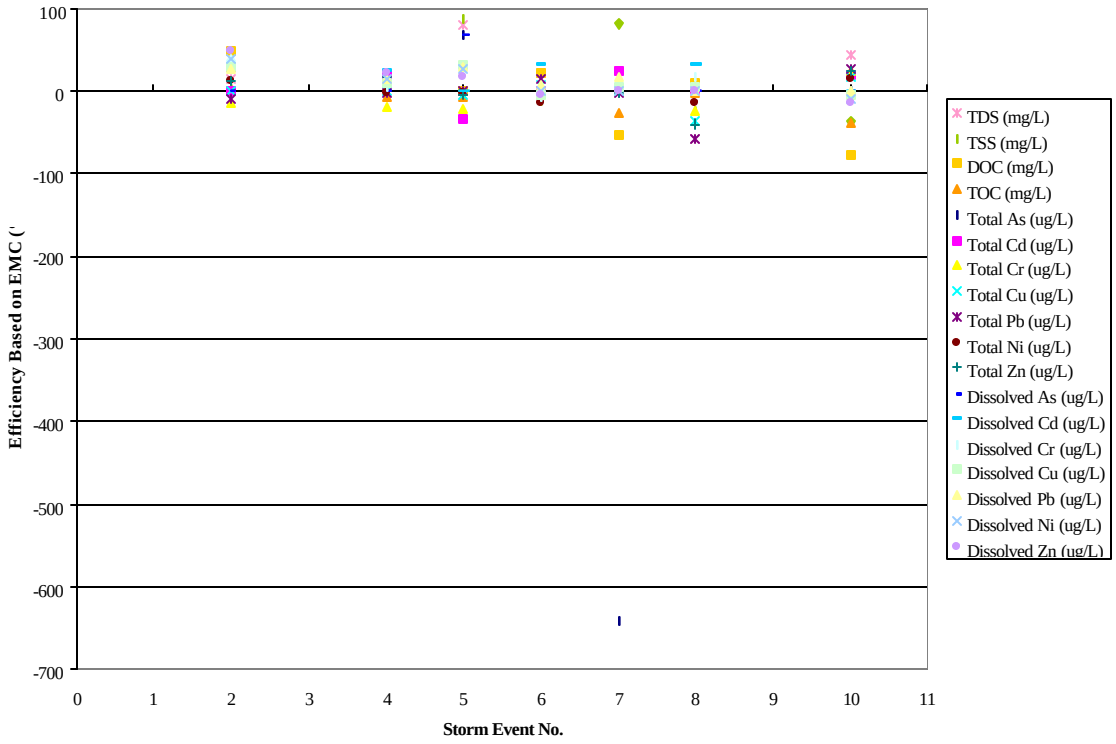


Figure 1-38b: BMP Pollutant Removal Efficiency at the Filmore Continuous Deflective Separation Unit



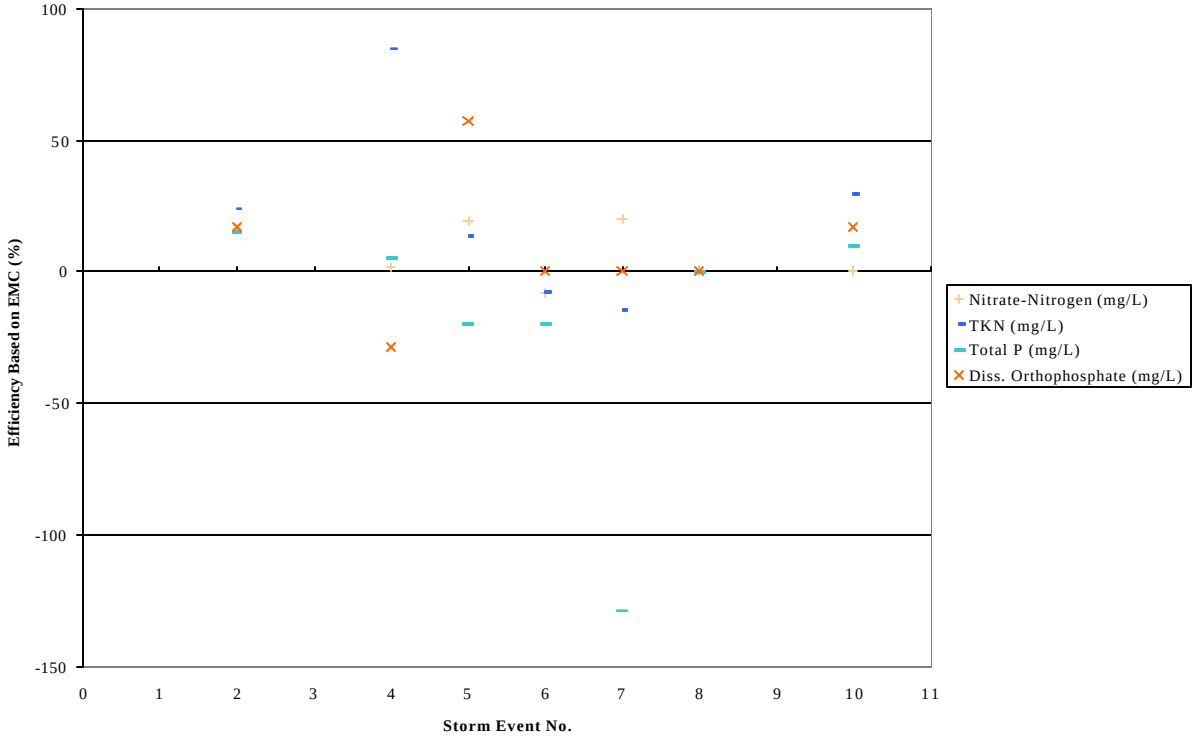


Figure 1-39a: BMP Pollutant Removal Efficiency at the Alameda Maintenance Station Oil/Water Separator

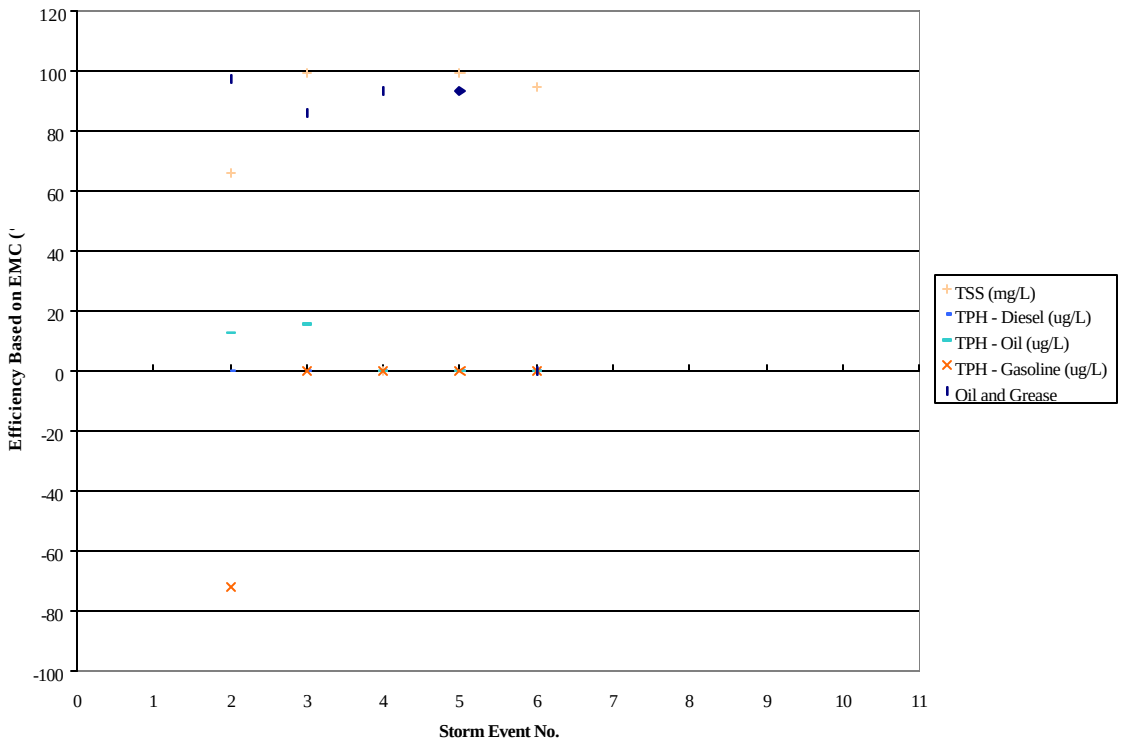
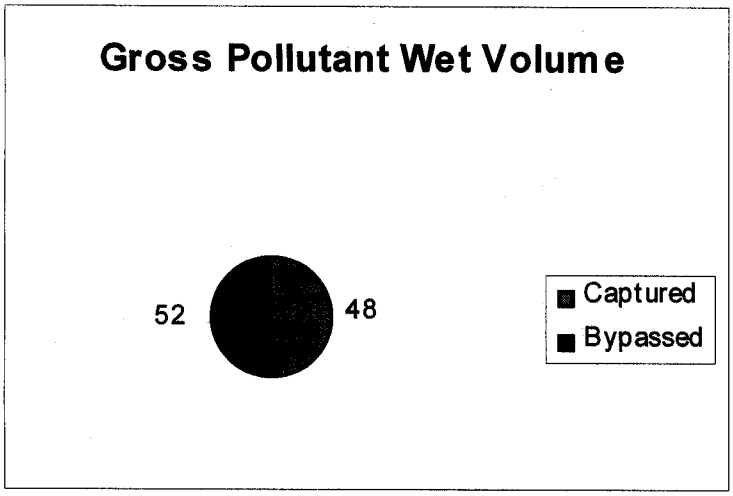
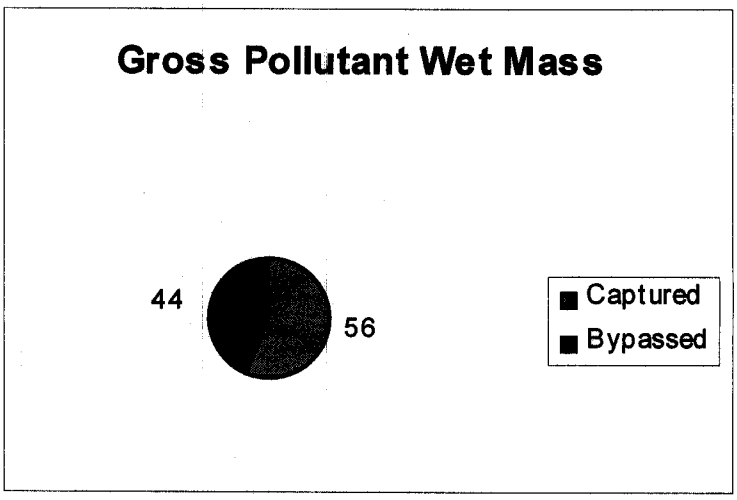


Figure 1-40a: I-210 East of Orcas Avenue CDS Gross Pollutant Removal Efficiency

October 1, 2000 through January 16, 2001

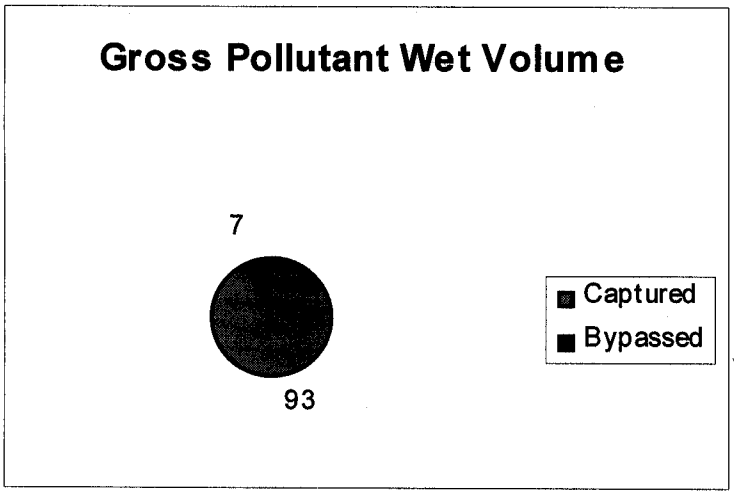


Captured: 140 L Bypassed: 150 L

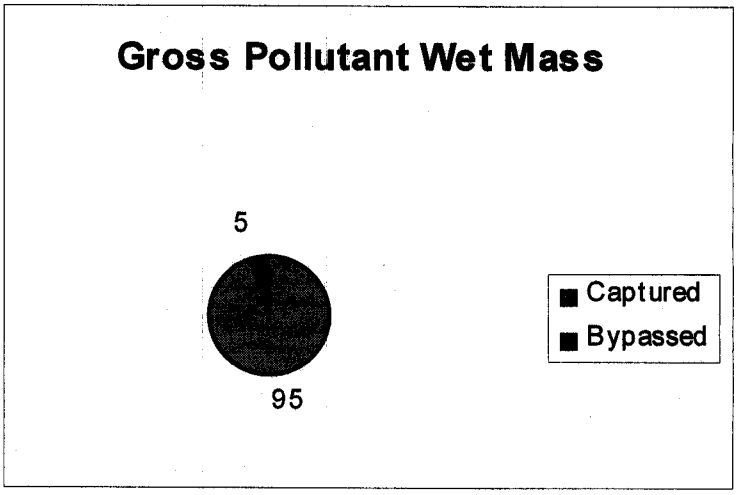


Captured: 79,830 g Bypassed: 63,053 g

January 16, 2001 through March 12, 2001

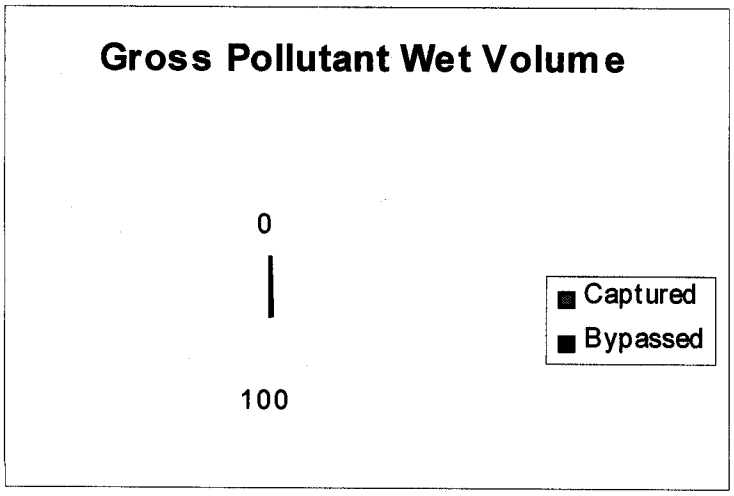


Captured: 135 L Bypassed: 10 L

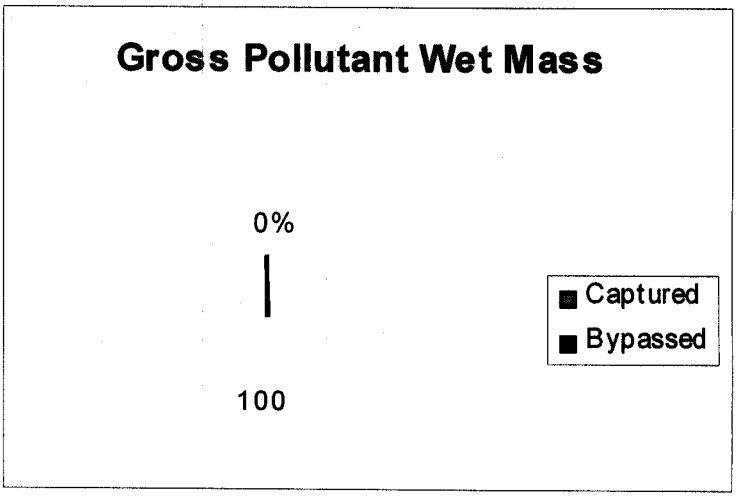


Captured: 101,618 g Bypassed: 5,000 g

March 12, 2001 through May 2, 2001



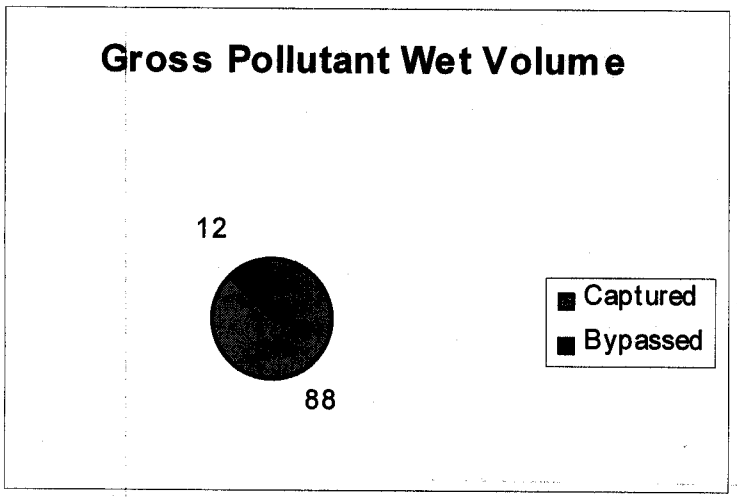
Captured: 76.5 L Bypassed: 0 L

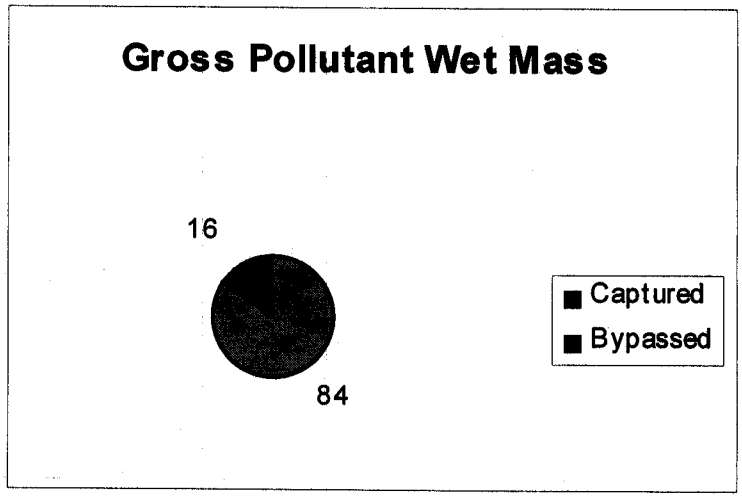


Captured: 28,496 g Bypassed: 0 g

Figure 1-40b: I-210 East of Filmore Street CDS Gross Pollutant Removal Efficiency

October 1, 2000 through January 16, 2001

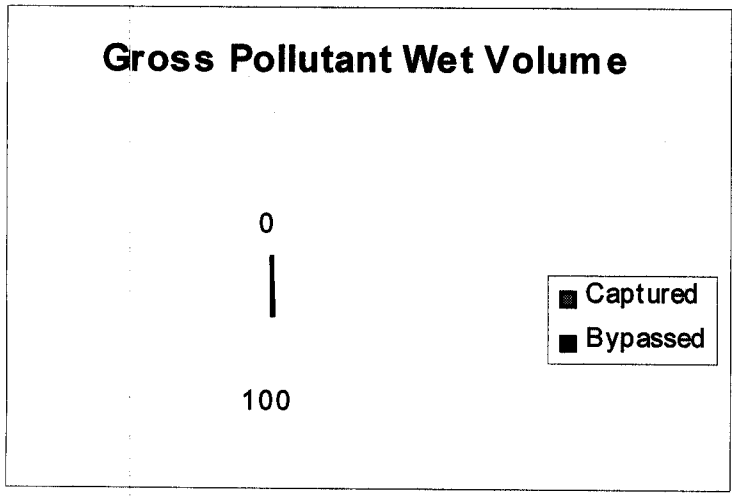


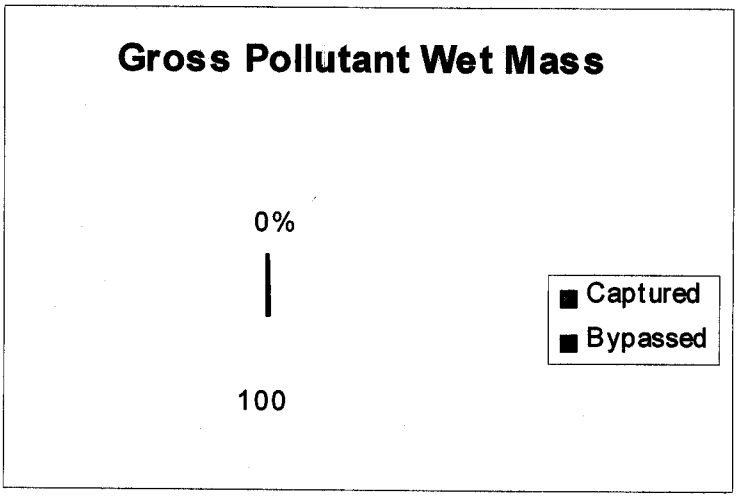


Captured: 107 L Bypassed: 15 L

Captured: 50,360 g Bypassed: 9,750 g

January 16, 2001 through May 2, 2001



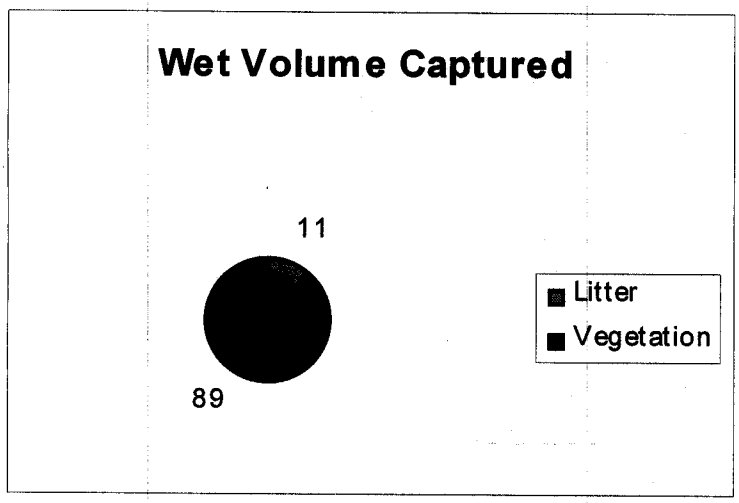


Captured: 86.5 L Bypassed: 0 L

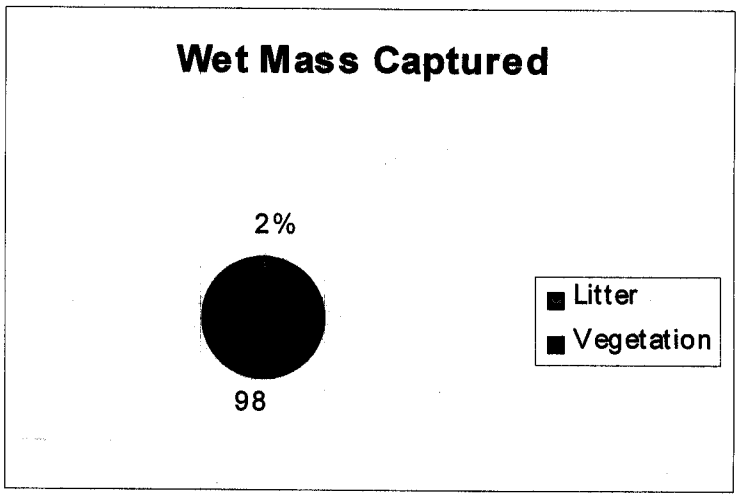
Captured: 40,537 g Bypassed: 0 g

Figure 1-41a: I-210 East of Orcas Avenue CDS Gross Pollutant Characterization

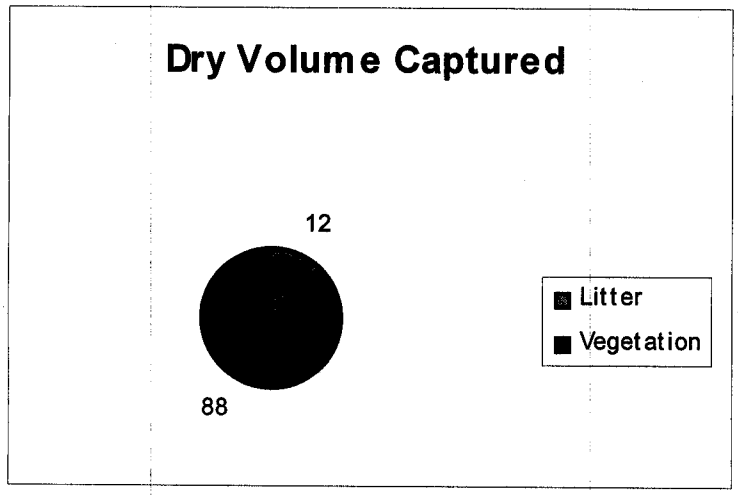
October 1, 2000 through January 16, 2001



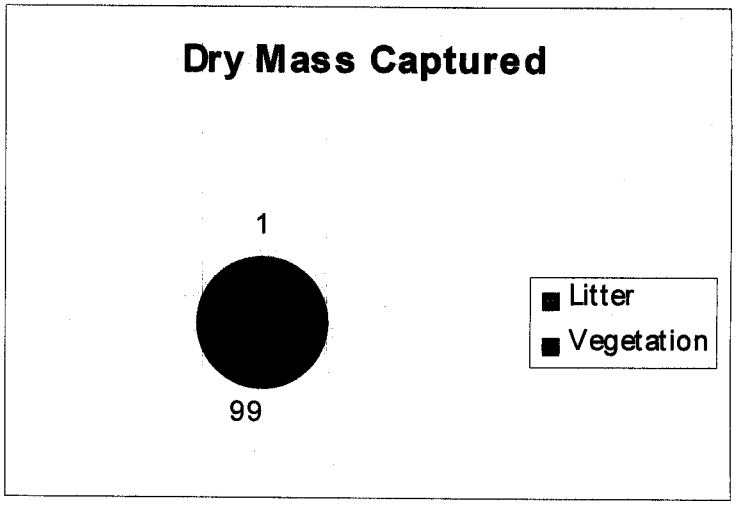
Litter: 14.5 L Vegetation: 122 L



Litter: 1,683 g Vegetation: 77,978 g



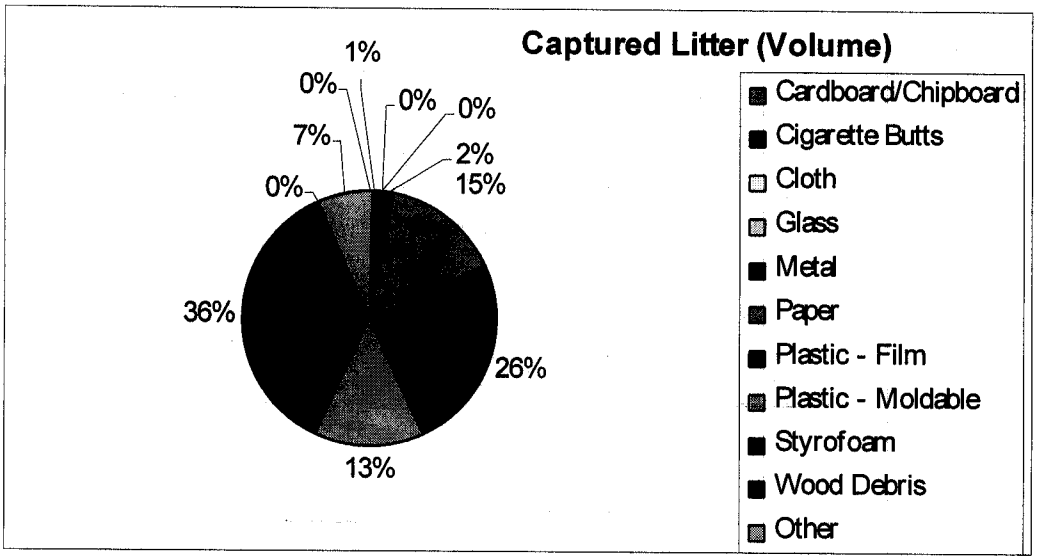
Litter: 16 L Vegetation: 114 L

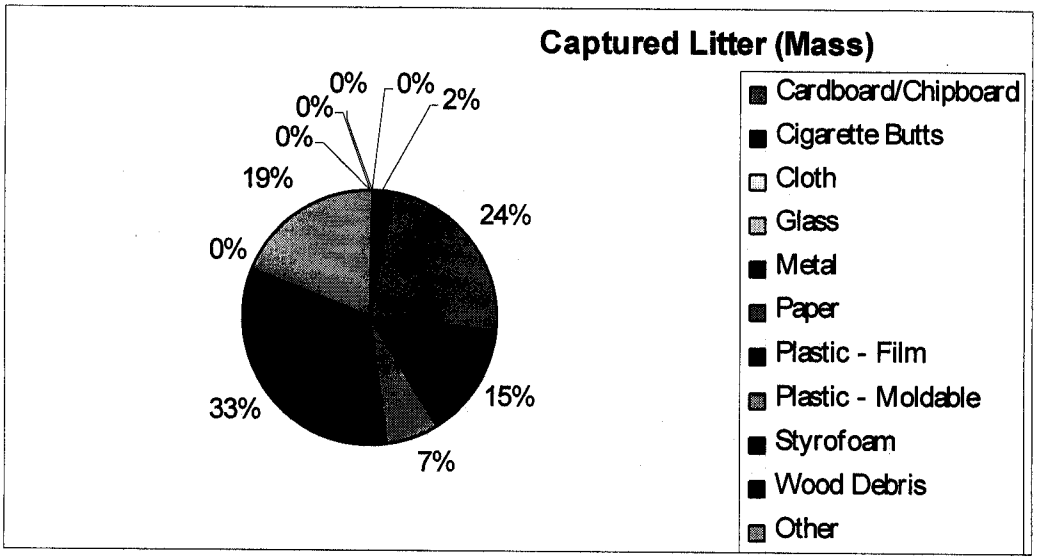


Litter: 774 g Vegetation: 67,724 g

Figure 1-41a: I-210 East of Orcas Avenue CDS Gross Pollutant Characterization

October 1, 2000 through January 16, 2001





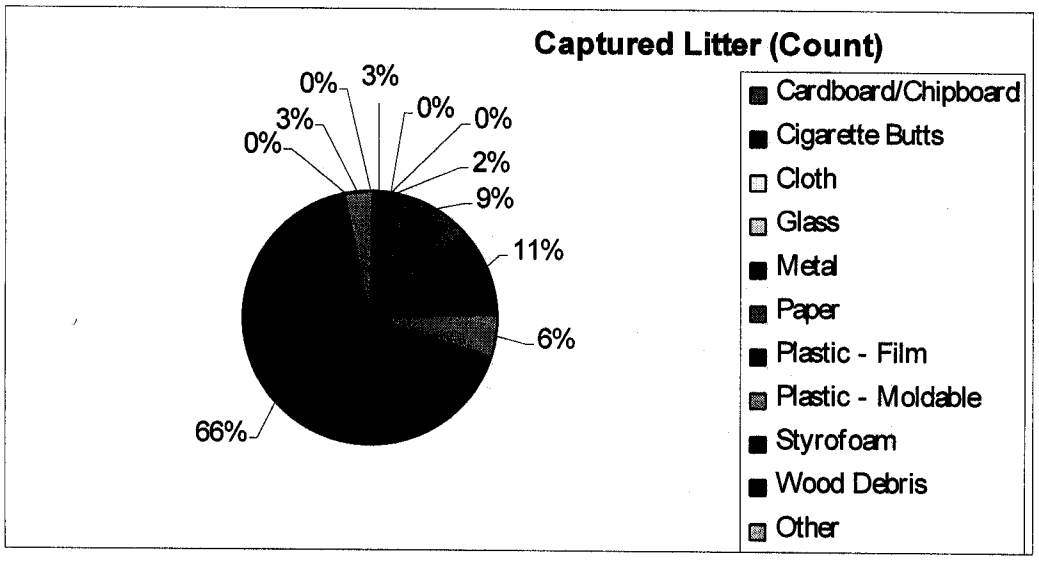
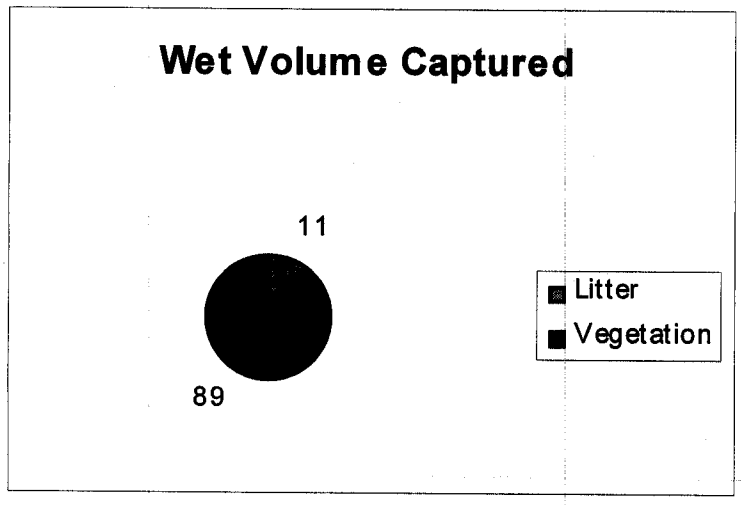
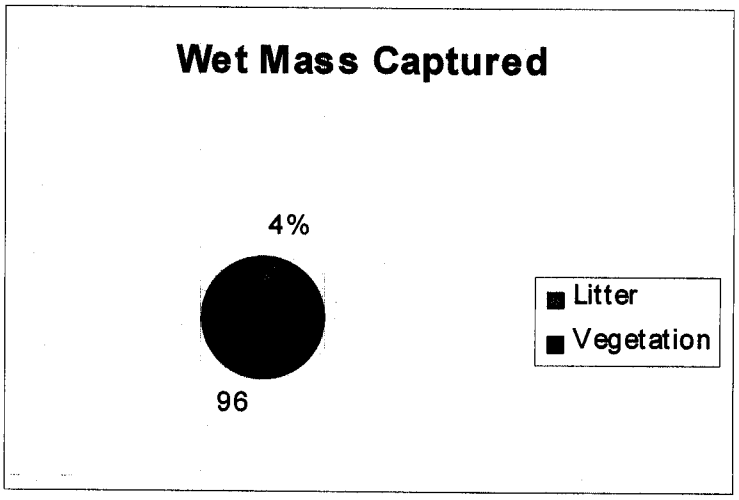


Figure 1-41a: I-210 East of Orcas Avenue CDS Gross Pollutant Characterization

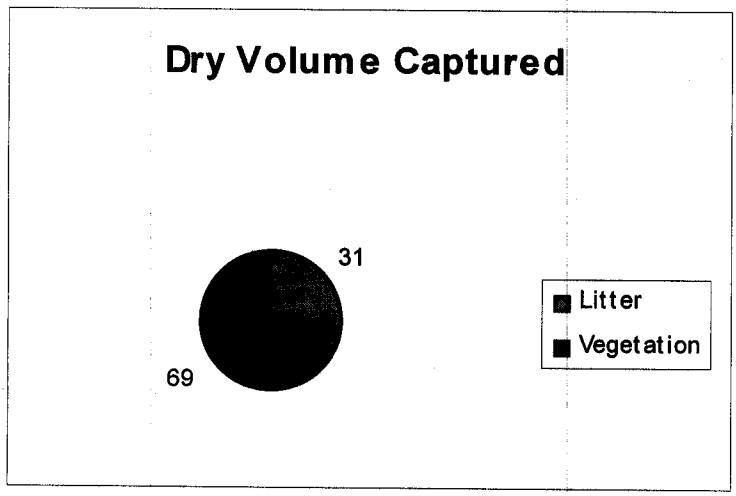
January 16, 2001 through March 12, 2001



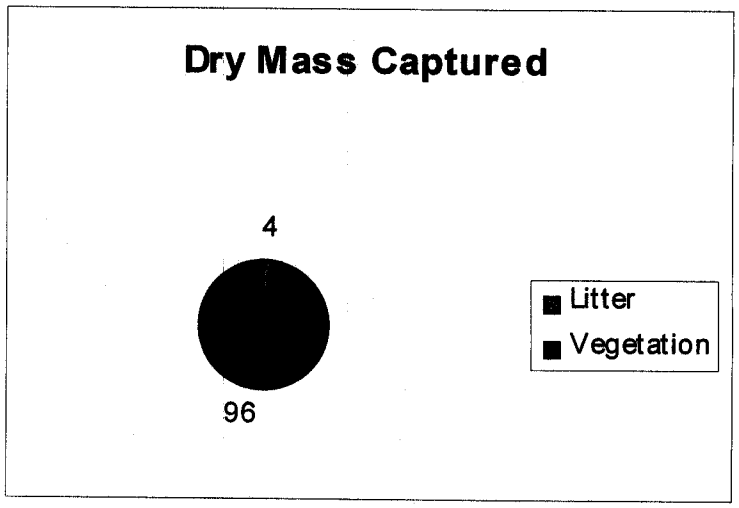
Litter: 23 L Vegetation: 192 L



Litter: 4,664 g Vegetation: 100,305 g



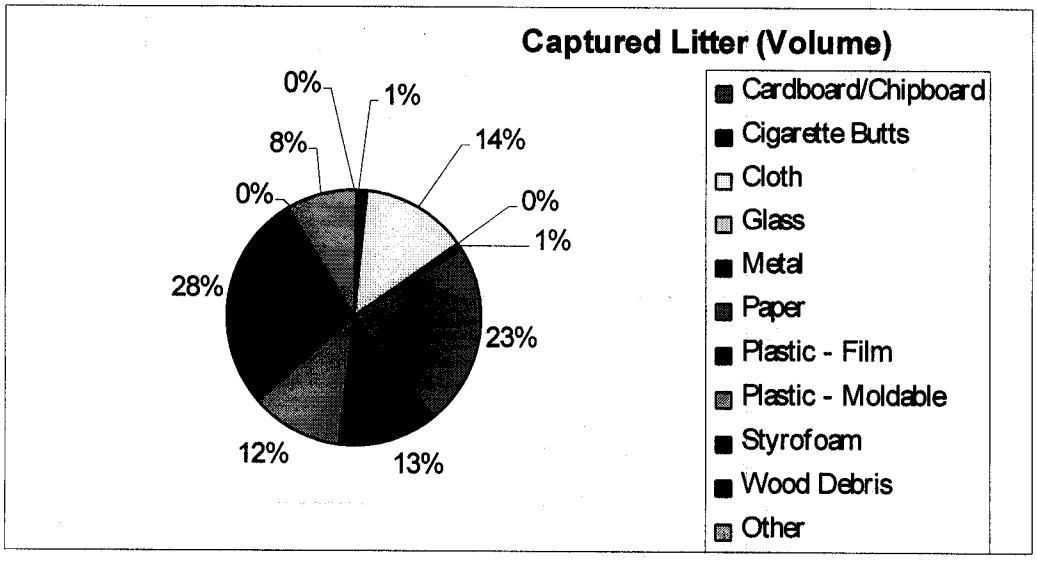
Litter: 25 L Vegetation: 55 L

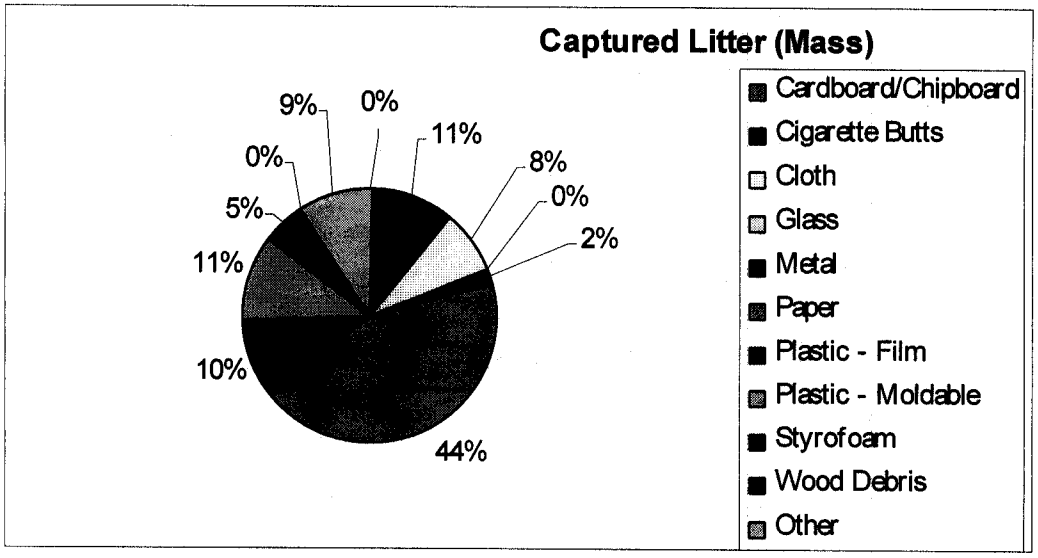


Litter: 1,557 g Vegetation: 36,455 g

Figure 1-41a: I-210 East of Orcas Avenue CDS Gross Pollutant Characterization

January 16, 2001 through March 12, 2001





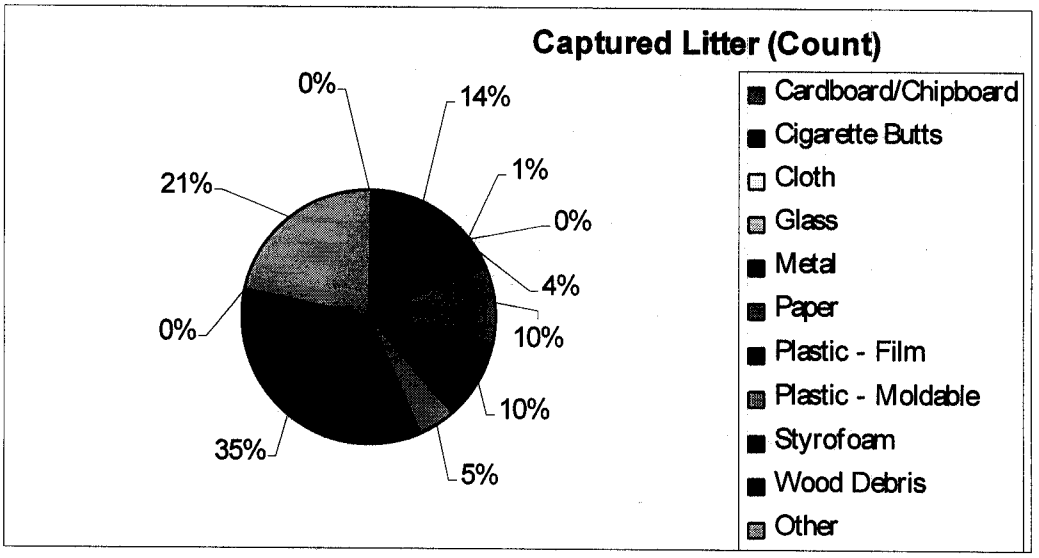
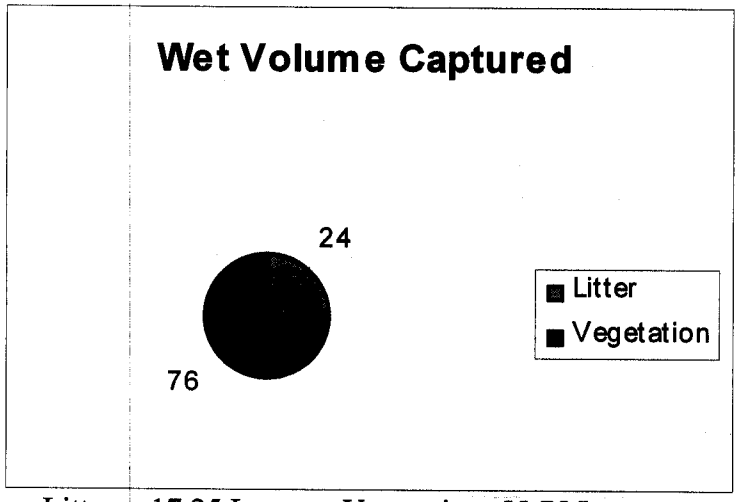
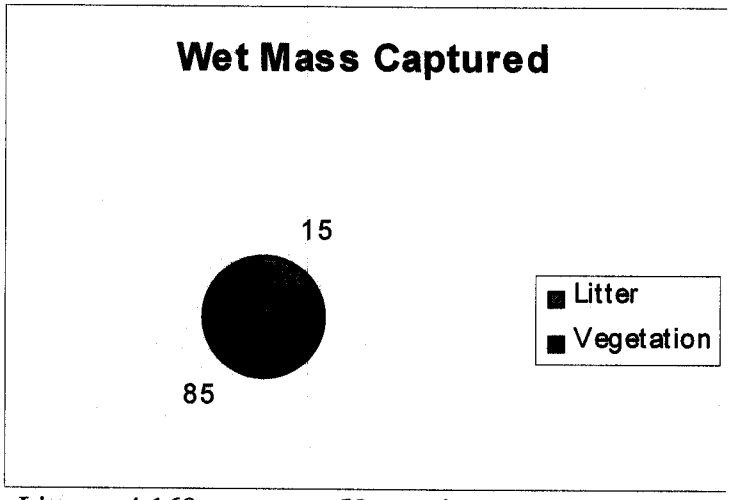


Figure 1-41a: I-210 East of Orcas Avenue CDS Gross Pollutant Characterization

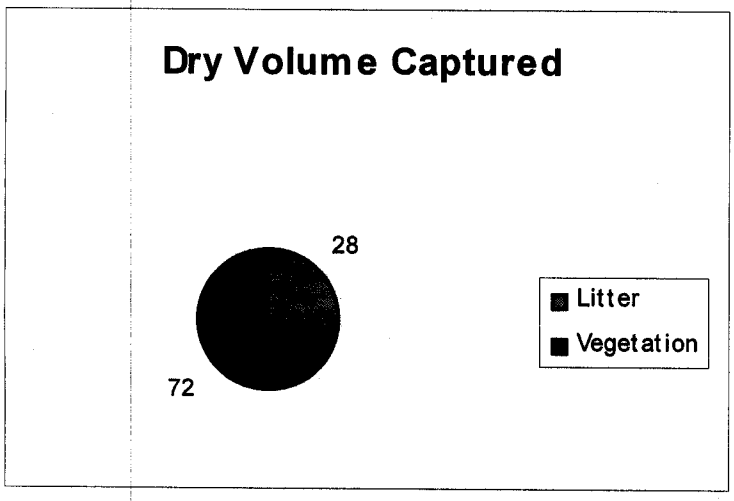
March 12, 2001 through May 2, 2001



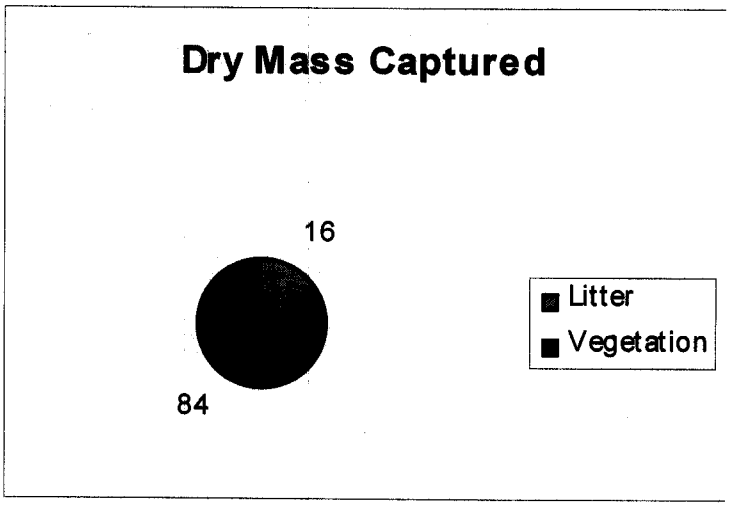
Litter: 17.25 L Vegetation: 55.75 L



Litter: 4,168 g Vegetation: 23,280 g



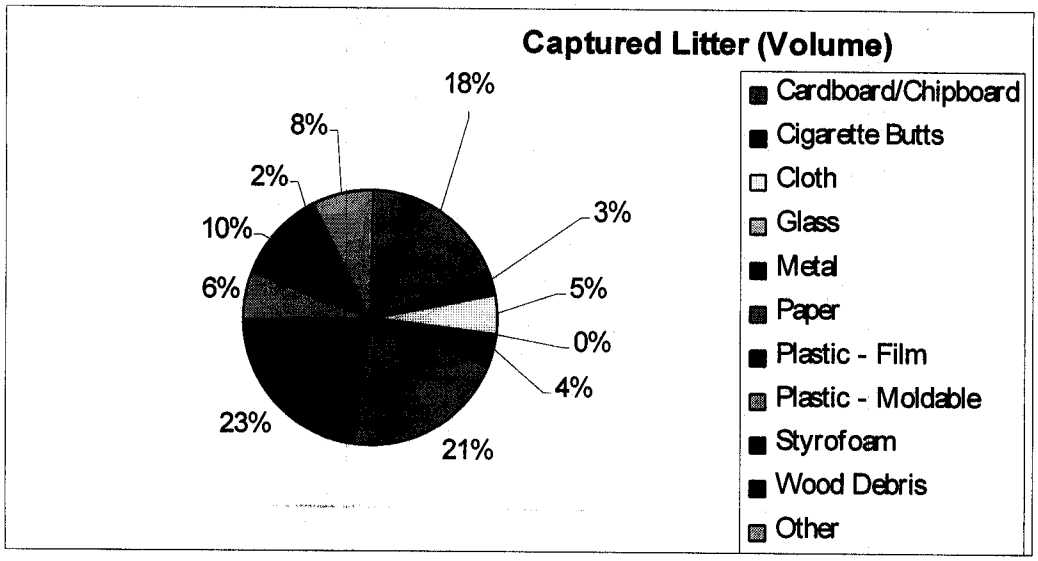
Litter: 22 L Vegetation: 57.75 L

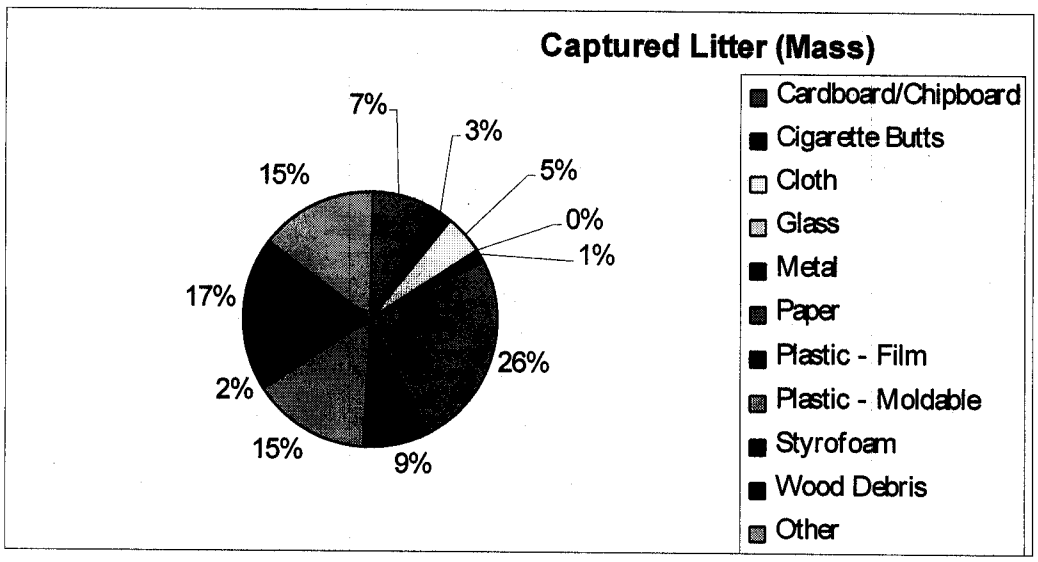


Litter: 2,783 g Vegetation: 15,061 g

Figure 1-41a: I-210 East of Orcas Avenue CDS Gross Pollutant Characterization

March 12, 2001 through May 2, 2001





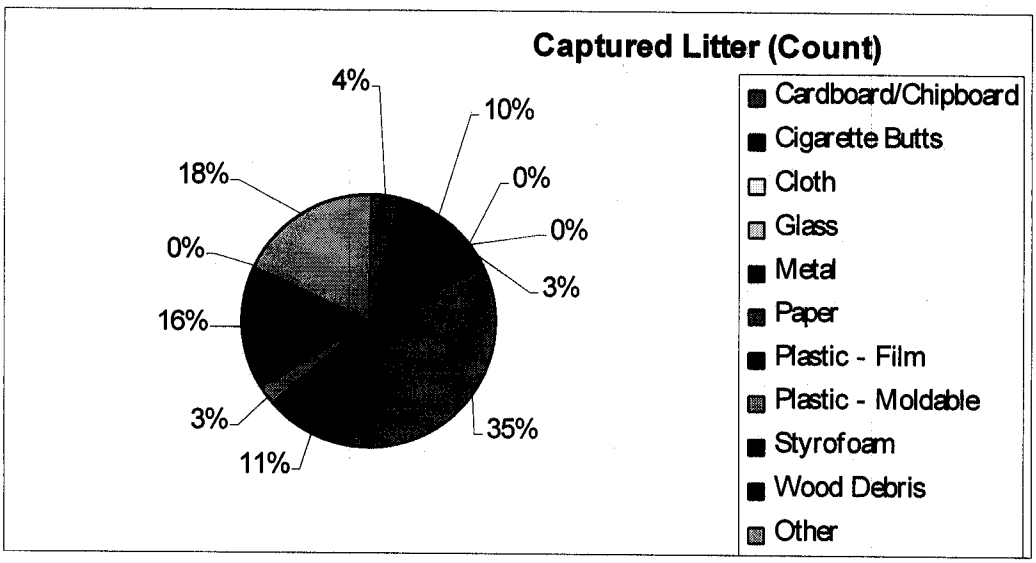
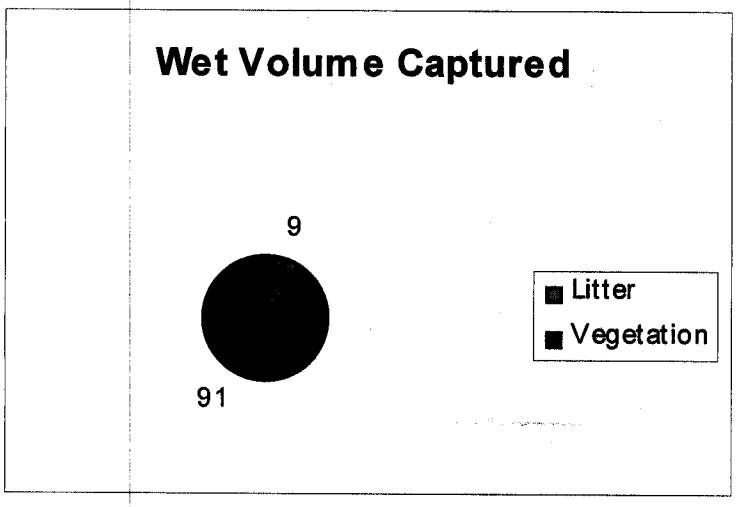
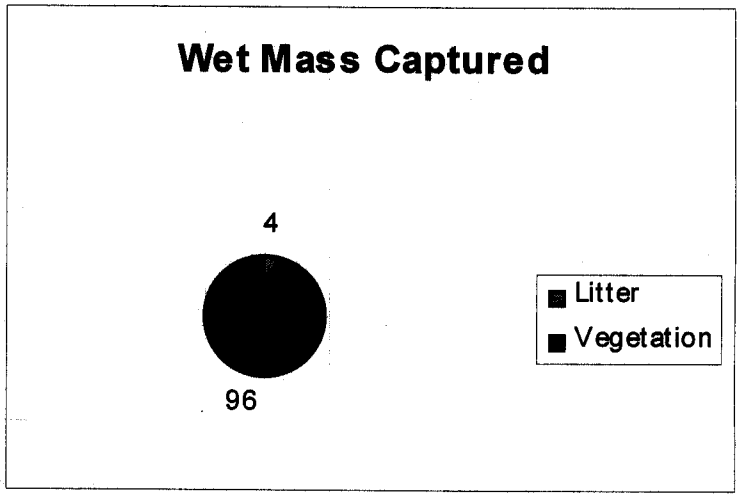


Figure 1-41b: I-210 East of Filmore Street CDS Gross Pollutant Characterization

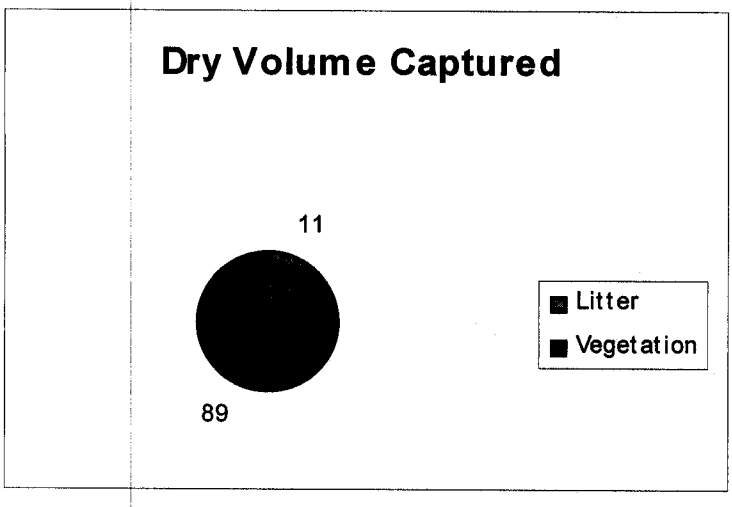
October 1, 2000 through January 16, 2001



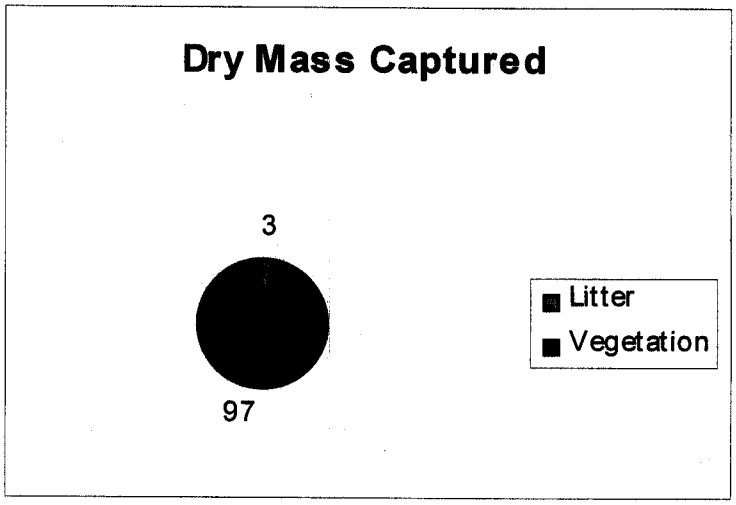
Litter: 10 L Vegetation: 98 L



Litter: 1,949 g Vegetation: 48,359 g



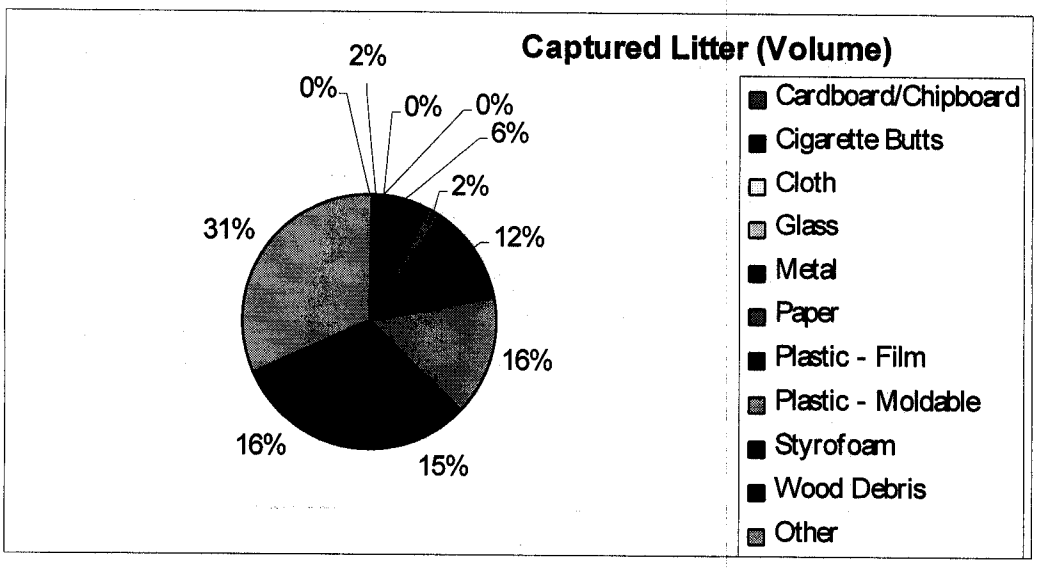
Litter: 12 L Vegetation: 97 L

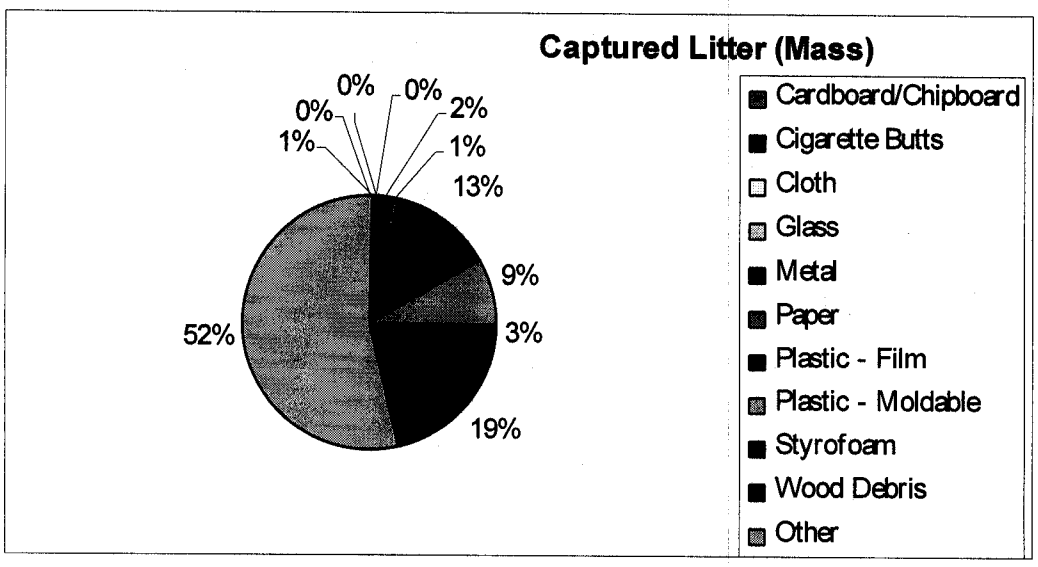


Litter: 1,440 g Vegetation: 45,990 g

Figure 1-41b: I-210 East of Filmore Street CDS Gross Pollutant Characterization

October 1, 2000 through January 16, 2001





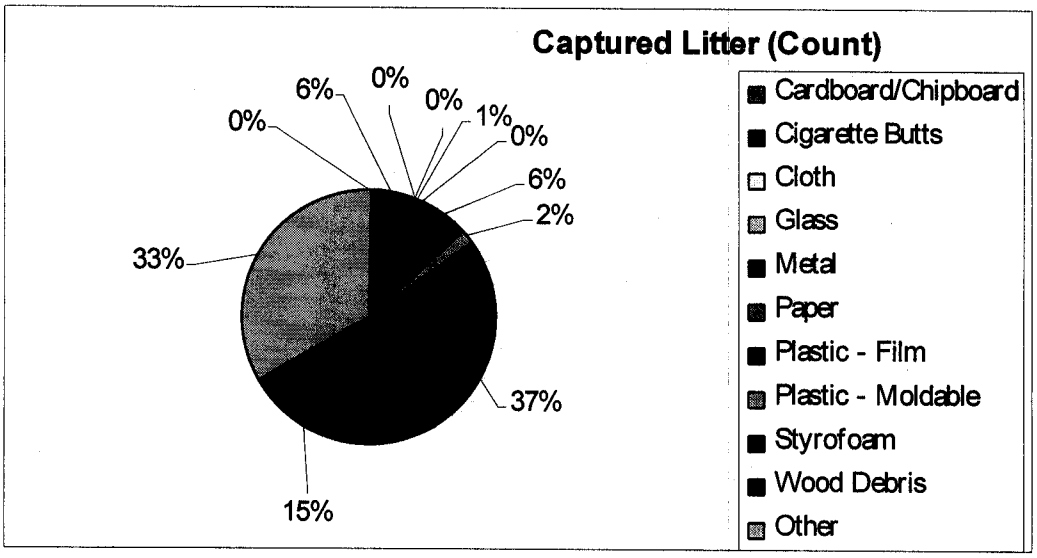
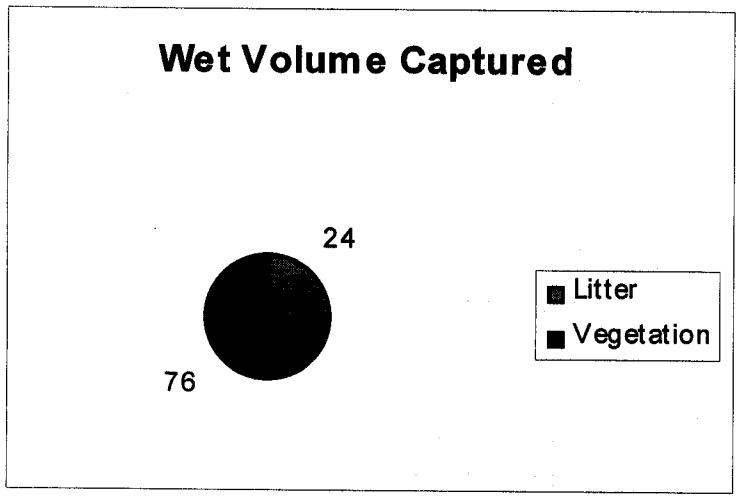
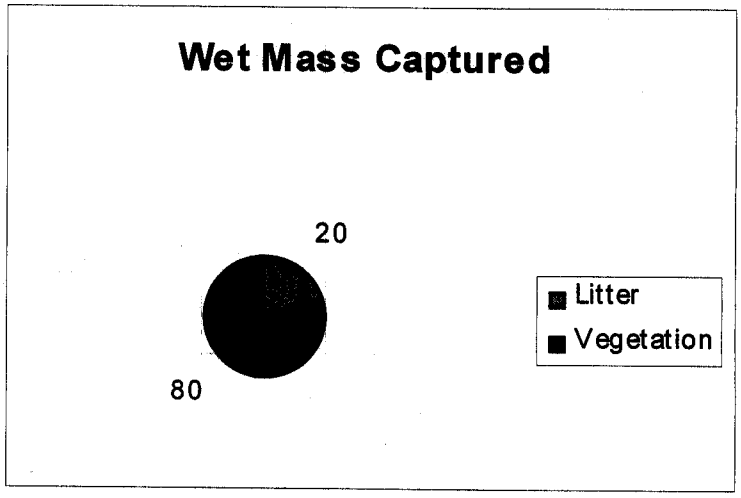


Figure 1-41b: I-210 East of Filmore Street CDS Gross Pollutant Characterization

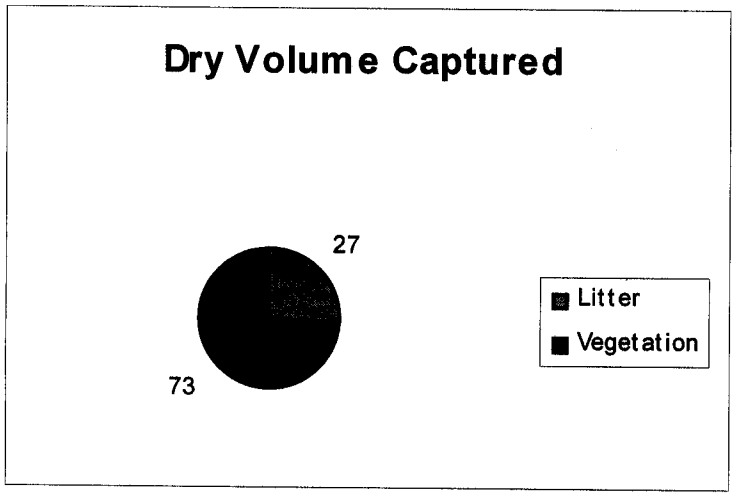
January 16, 2001 through May 2, 2001



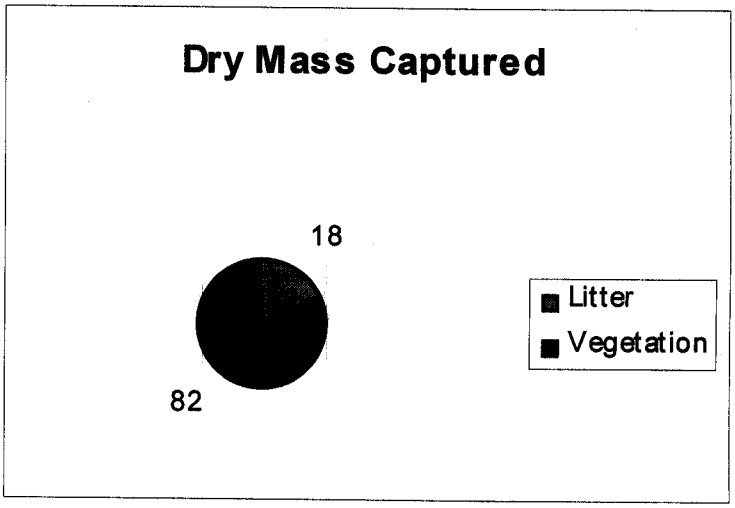
Litter: 23 L Vegetation: 71.5 L



Litter: 8,205 g Vegetation: 32,331 g



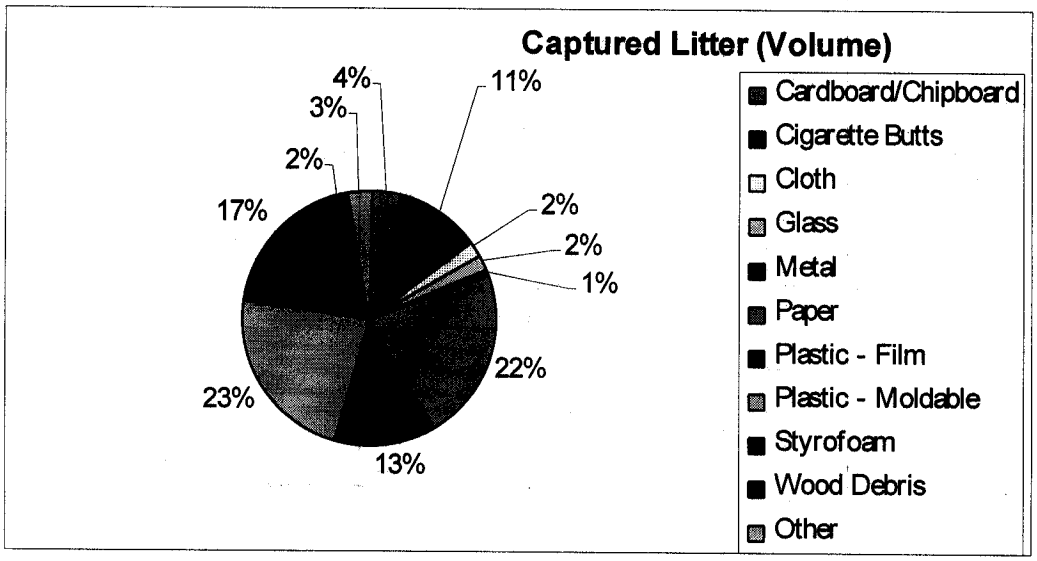
Litter: 26.5 L Vegetation: 73.25 L

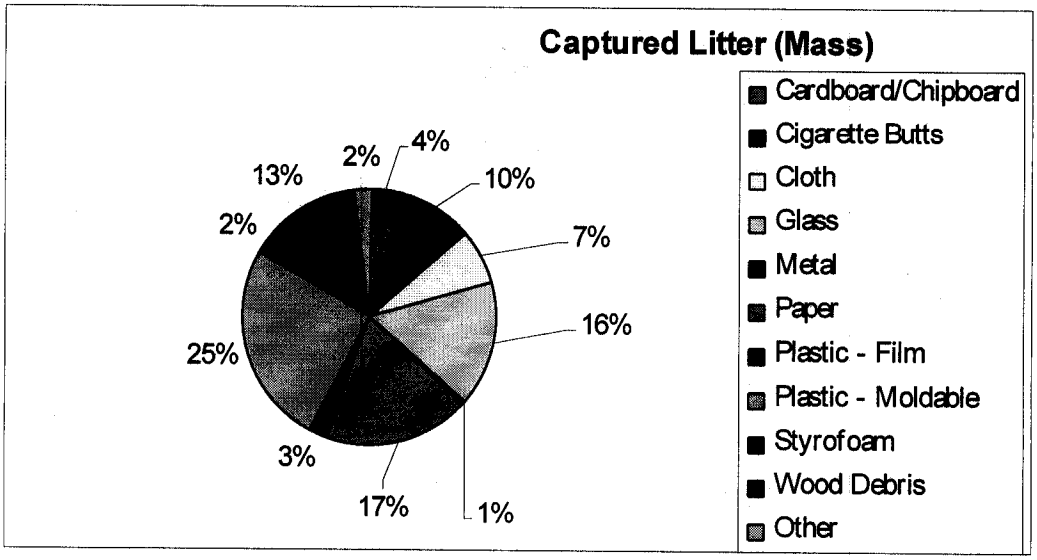


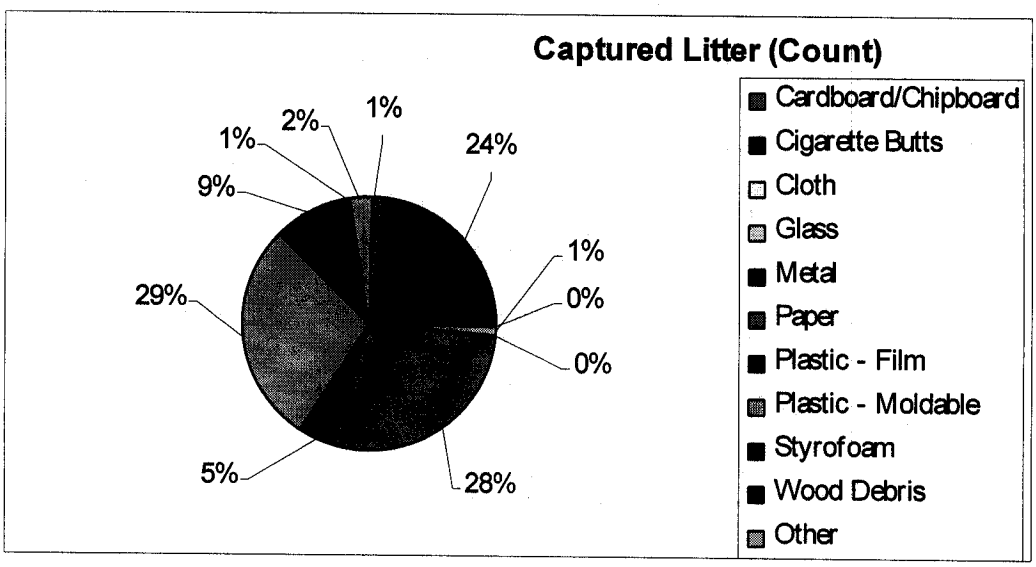
Litter: 5,079 g Vegetation: 22,792 g

Figure 1-41b: I-210 East of Filmore Street CDS Gross Pollutant Characterization

January 16, 2001 through May 2, 2001







Worksheet 1a: I-605/SR-91 Biofiltration Swale

b (ft) =	5.00
Z =	4
s (ft/ft) =	0.020
L (ft) =	131
Q_d (ft^3/s) =	0.064
d_d (ft) =	0.07
A_d (ft^2) =	0.36
V_d (ft/s) =	0.18

	Test 1	Test 2	Test 3	Average
Q_{avg-m} (ft^3/s) =	0.03	0.03	0.01	**0.02**
d_{avg-m} (ft) =	0.03	0.04	0.02	**0.03**
A_c (ft^2) =	0.17	0.19	0.10	**0.15**
V_c (ft/s) =	0.15	0.18	0.11	**0.15**
R_c (ft) =	0.03	0.04	0.02	**0.03**
n_c =	0.14	0.13	0.15	**0.14**
HRT_c (min) =	**14.4**	**12.3**	**20.6**	**15.74**
HRT_m (min) =	**9.6**	**9.2**	**19.6**	**12.80**
r^2 {HRT_c,HRT_m} =	0.96	**Regression line slope =** 1.06		
V_c/V_d =	0.86	1.00	0.60	**0.8**
HRT_d (min) =	8.26	9.24	11.79	**9.8**

Test	Date/Time	Fluorescence (ppm)	Flow Depth (ft)	Flow Rate (cfs)
1-0	2/25/01 16:30	0	0.03	0.026
1-1	2/25/01 16:32	800.2	0.03	0.025
1-2	2/25/01 16:34	963.3	0.03	0.017
1-3	2/25/01 16:36	1062	0.03	0.019
1-4	2/25/01 16:38	1520	0.03	0.019
1-5	2/25/01 16:40	1243	0.03	0.02
1-6	2/25/01 16:42	860	0.03	0.02
1-7	2/25/01 16:44	715.6	0.03	0.017
1-8	2/25/01 16:46	611.9	0.03	0.018
1-9	2/25/01 16:48	466.6	0.03	0.019
1-10	2/25/01 16:50	378.2	0.03	0.026
1-11	2/25/01 16:52	250.8	0.04	0.033
1-12	2/25/01 16:54	206.9	0.04	0.033
1-13	2/25/01 16:56	142.7	0.04	0.036
1-14	2/25/01 16:58	127.5	0.04	0.038
1-15	2/25/01 17:00	107.4	0.04	0.036
		Average	**0.03**	**0.03**
2-0	2/25/01 17:17	0	0.04	0.035
2-1	2/25/01 17:19	317.9	0.04	0.043
2-2	2/25/01 17:21	1748	0.04	0.048
2-3	2/25/01 17:23	3191	0.05	0.05
2-4	2/25/01 17:25	3380	0.05	0.05
2-5	2/25/01 17:27	2389	0.04	0.046
2-6	2/25/01 17:29	2328	0.04	0.041
2-7	2/25/01 17:31	1473	0.04	0.038
2-8	2/25/01 17:33	1344	0.04	0.032
2-9	2/25/01 17:35	1079	0.04	0.03
2-10	2/25/01 17:37	1031	0.03	0.025
2-11	2/25/01 17:39	745.4	0.03	0.025
2-12	2/25/01 17:41	484.9	0.03	0.022
2-13	2/25/01 17:43	477.9	0.03	0.022
2-14	2/25/01 17:45	410.3	0.03	0.022
2-15	2/25/01 17:47	294.7	0.03	0.021
		Average	**0.04**	**0.03**
3-0	2/25/01 18:02	0	0.03	0.017
3-1	2/25/01 18:04	164.8	0.03	0.017
3-2	2/25/01 18:06	253.4	0.03	0.022
3-3	2/25/01 18:08	559.8	0.03	0.02
3-4	2/25/01 18:10	1230	0.03	0.019
3-5	2/25/01 18:12	2190	0.03	0.017
3-6	2/25/01 18:14	2613	0.02	0.012
3-7	2/25/01 18:16	2329	0.02	0.01
3-8	2/25/01 18:18	2030	0.02	0.009
3-9	2/25/01 18:20	1987	0.02	0.007
3-10	2/25/01 18:22	1823	0.02	0.007
3-11	2/25/01 18:24	1906	0.01	0.005
3-12	2/25/01 18:26	1624	0.01	0.005
3-13	2/25/01 18:28	1377	0.01	0.004
3-14	2/25/01 18:30	1380	0.01	0.004
3-15	2/25/01 18:32	1242	0.01	0.003
		Average	**0.02**	**0.01**

Worksheet 1b: Cerritos Maintenance Station

b (ft) =	6.00
Z =	2
s (ft/ft) =	0.021
L (ft) =	65.5
Q_d (ft^3/s) =	0.134
d_d (ft) =	0.11
A_d (ft^2) =	0.63
V_d (ft/s) =	0.21

	Test 1	Test 2	Test 3	Average
Q_{avg-m} (ft^3/s) =	0.06	0.04	0.01	**0.04**
d_{avg-m} (ft) =	0.05	0.05	0.02	**0.04**
A_c (ft^2) =	0.31	0.30	0.14	**0.25**
V_c (ft/s) =	0.20	0.15	0.08	**0.14**
R_c (ft) =	0.05	0.05	0.02	**0.04**
n_c =	0.14	0.19	0.21	**0.18**
HRT_c (min) =	**5.4**	**7.4**	**13.5**	**8.75**
HRT_m (min) =	**2.2**	**5.7**	**10.2**	**6.03**
r^2 {HRT_c,HRT_m} =	0.96	**Regression line slope =** 0.74		
V_c/V_d =	0.95	0.69	0.38	**0.7**
HRT_d (min) =	2.08	3.95	3.89	**3.3**

Test	Date/Time	Fluorescence (ppm)	Flow Depth (ft)	Flow Rate (cfs)
1-0	2/12/01 11:32	0	0.13	0.293
1-1	2/12/01 11:34	3096	0.11	0.211
1-2	2/12/01 11:36	487.9	0.10	0.145
1-3	2/12/01 11:38	212.1	0.08	0.098
1-4	2/12/01 11:40	151.7	0.07	0.066
1-5	2/12/01 11:42	131.9	0.05	0.046
1-6	2/12/01 11:44	105.5	0.05	0.035
1-7	2/12/01 11:46	79.58	0.04	0.028
1-8	2/12/01 11:48	66.17	0.04	0.02
1-9	2/12/01 11:50	59.75	0.03	0.014
1-10	2/12/01 11:52	55.88	0.03	0.01
1-11	2/12/01 11:54	53.26	0.02	0.008
1-12	2/12/01 11:56	52.05	0.02	0.006
1-13	2/12/01 11:58	50.85	0.02	0.005
1-14	2/12/01 12:00	49.59	0.01	0.004
1-15	2/12/01 12:02	49.47	0.01	0.003
		Average	**0.05**	**0.06**
2-0	2/19/01 17:33	0	0.03	0.017
2-1	2/19/01 17:35	1812	0.03	0.016
2-2	2/19/01 17:37	4305	0.03	0.014
2-3	2/19/01 17:39	4393	0.03	0.014
2-4	2/19/01 17:41	2780	0.03	0.015
2-5	2/19/01 17:43	1582	0.03	0.017
2-6	2/19/01 17:45	926	0.04	0.02
2-7	2/19/01 17:47	630.6	0.04	0.021
2-8	2/19/01 17:49	497.6	0.04	0.023
2-9	2/19/01 17:51	303.5	0.04	0.029
2-10	2/19/01 17:53	177.8	0.06	0.049
2-11	2/19/01 17:55	105.4	0.07	0.08
2-12	2/19/01 17:57	40.46	0.08	0.101
2-13	2/19/01 17:59	27.1	0.08	0.103
2-14	2/19/01 18:01	27.35	0.08	0.1
2-15	2/19/01 18:03	25.35	0.08	0.091
		Average	**0.05**	**0.04**
3-0	2/19/01 18:18	0	0.05	0.04
3-1	2/19/01 18:20	3917	0.05	0.032
3-2	2/19/01 18:22	4439	0.04	0.025
3-3	2/19/01 18:24	4965	0.04	0.02
3-4	2/19/01 18:26	3608	0.03	0.015
3-5	2/19/01 18:28	2991	0.03	0.011
3-6	2/19/01 18:30	2564	0.02	0.008
3-7	2/19/01 18:32	2467	0.02	0.007
3-8	2/19/01 18:34	2246	0.02	0.006
3-9	2/19/01 18:36	1944	0.02	0.005
3-10	2/19/01 18:38	1784	0.01	0.004
3-11	2/19/01 18:40	1707	0.01	0.003
3-12	2/19/01 18:42	1635	0.01	0.003
3-13	2/19/01 18:44	1588	0.01	0.002
3-14	2/19/01 18:46	1483	0.01	0.002
3-15	2/19/01 18:48	1383	0.01	0.002
		Average	**0.02**	**0.01**

Worksheet 1c: I-5/I-605 Biofiltration Swale

b (ft) =	6.00
Z =	2
s (ft/ft) =	0.025
L (ft) =	125.5
Q_d (ft^3/s) =	0.265
d_d (ft) =	0.16
A_d (ft^2) =	0.95
V_d (ft/s) =	0.28

	Test 1	Test 2	Test 3	Average
Q_{avg-m} (ft^3/s) =	0.03	0.03	0.03	**0.03**
d_{avg-m} (ft) =	0.03	0.03	0.03	**0.03**
A_c (ft^2) =	0.18	0.19	0.20	**0.19**
V_c (ft/s) =	0.17	0.15	0.15	**0.16**
R_c (ft) =	0.03	0.03	0.03	**0.03**
n_c =	0.13	0.16	0.16	**0.15**
HRT_c (min) =	**12.7**	**14.3**	**13.6**	**13.50**
HRT_m (min) =	**10.0**	**6.2**	**6.0**	**7.40**
r^2 {HRT_c,HRT_m} =	0.76	Regression line slope = -1.96		
V_c/V_d =	0.59	0.53	0.56	**0.6**
HRT_d (min) =	5.95	3.27	3.34	**4.2**

Test	Date/Time	Fluorescence (ppm)	Flow Depth (ft)	Flow Rate (cfs)
1-0	2/12/01 11:39	0	0.05	0.082
1-1	2/12/01 11:41	447.8	0.05	0.077
1-2	2/12/01 11:43	3962	0.05	0.056
1-3	2/12/01 11:45	4227	0.04	0.05
1-4	2/12/01 11:47	3604	0.04	0.041
1-5	2/12/01 11:49	2837	0.03	0.03
1-6	2/12/01 11:51	2309	0.03	0.031
1-7	2/12/01 11:53	1917	0.03	0.023
1-8	2/12/01 11:55	1636	0.03	0.02
1-9	2/12/01 11:57	1467	0.02	0.017
1-10	2/12/01 11:59	1277	0.02	0.01
1-11	2/12/01 12:01	1142	0.02	0.01
1-12	2/12/01 12:03	1133	0.01	0.006
1-13	2/12/01 12:05	948.9	0.01	0.005
1-14	2/12/01 12:07	946.1	0.01	0.003
1-15	2/12/01 12:09	852.5	0.01	0.002
		Average	**0.03**	**0.03**
2-0	2/19/01 16:34	0	0.02	0.015
2-1	2/19/01 16:36	219.3	0.03	0.022
2-2	2/19/01 16:38	2987	0.03	0.027
2-3	2/19/01 16:40	2850	0.04	0.034
2-4	2/19/01 16:42	1660	0.03	0.033
2-5	2/19/01 16:44	914.5	0.04	0.034
2-6	2/19/01 16:46	587.9	0.04	0.043
2-7	2/19/01 16:48	440.8	0.04	0.036
2-8	2/19/01 16:50	234.1	0.03	0.031
2-9	2/19/01 16:52	248.8	0.03	0.03
2-10	2/19/01 16:54	205.3	0.03	0.031
2-11	2/19/01 16:56	176.3	0.03	0.027
2-12	2/19/01 16:58	154.3	0.03	0.024
2-13	2/19/01 17:00	140.6	0.03	0.022
2-14	2/19/01 17:02	125.1	0.03	0.023
2-15	2/19/01 17:04	114.8	0.03	0.022
		Average	**0.03**	**0.03**
3-0	2/19/01 17:15	0	0.03	0.027
3-1	2/19/01 17:17	420.8	0.03	0.03
3-2	2/19/01 17:19	3098	0.03	0.028
3-3	2/19/01 17:21	2966	0.03	0.031
3-4	2/19/01 17:23	1780	0.04	0.036
3-5	2/19/01 17:25	945.4	0.04	0.039
3-6	2/19/01 17:27	485.1	0.04	0.046
3-7	2/19/01 17:29	303.1	0.04	0.046
3-8	2/19/01 17:31	245.2	0.04	0.036
3-9	2/19/01 17:33	200.5	0.04	0.038
3-10	2/19/01 17:35	159.7	0.03	0.027
3-11	2/19/01 17:37	151.3	0.03	0.026
3-12	2/19/01 17:39	150.2	0.03	0.026
3-13	2/19/01 17:41	133.4	0.03	0.024
3-14	2/19/01 17:43	125.3	0.03	0.022
3-15	2/19/01 17:45	111.3	0.03	0.024
		Average	**0.03**	**0.03**

Worksheet 1d: I-605 @ Carson Biofiltration Swale

b (ft) =	4.50
Z =	2
s (ft/ft) =	0.020
L (ft) =	131
Q_d (ft^3/s) =	0.212
d_d (ft) =	0.22
A_d (ft^2) =	1.00
V_d (ft/s) =	0.21

	Test 1	Test 2	Test 3	Average
Q_{avg-m} (ft^3/s) =	0.04	0.10	0.01	**0.05**
d_{avg-m} (ft) =	0.07	0.12	0.04	**0.08**
A_c (ft^2) =	0.34	0.55	0.20	**0.37**
V_c (ft/s) =	0.12	0.17	0.07	**0.12**
R_c (ft) =	0.07	0.11	0.04	**0.07**
n_c =	0.29	0.28	0.37	**0.31**
HRT_c (min) =	**17.9**	**12.5**	**32.2**	**20.86**
HRT_m (min) =	**10.5**	**7.9**	**22.6**	**13.67**
r^2 {HRT_c,HRT_m} =	0.99	Regression line slope = 0.61		
V_c/V_d =	0.58	0.82	0.32	**0.6**
HRT_d (min) =	6.05	6.49	7.23	**6.6**

Test	Date/Time	Fluorescence (ppm)	Flow Depth (ft)	Flow Rate (cfs)
1-0	2/12/01 11:42	0	0.02	0.002
1-1	2/12/01 11:44	443.4	0.02	0.002
1-2	2/12/01 11:46	693.8	0.09	0.058
1-3	2/12/01 11:48	665.7	0.10	0.069
1-4	2/12/01 11:50	520.2	0.10	0.069
1-5	2/12/01 11:52	454	0.10	0.067
1-6	2/12/01 11:54	335.8	0.09	0.058
1-7	2/12/01 11:56	327.7	0.09	0.058
1-8	2/12/01 11:58	280.1	0.08	0.048
1-9	2/12/01 12:00	208	0.08	0.044
1-10	2/12/01 12:02	327.5	0.08	0.042
1-11	2/12/01 12:04	179.1	0.08	0.039
1-12	2/12/01 12:06	173.3	0.07	0.036
1-13	2/12/01 12:08	156	0.07	0.03
1-14	2/12/01 12:10	144.8	0.06	0.025
1-15	2/12/01 12:12	131.2	0.06	0.027
		Average	**0.07**	**0.04**
2-0	2/24/01 13:30	0	0.14	0.144
2-1	2/24/01 13:32	190.9	0.14	0.141
2-2	2/24/01 13:34	941.6	0.13	0.121
2-3	2/24/01 13:36	4654	0.12	0.109
2-4	2/24/01 13:38	1747	0.12	0.097
2-5	2/24/01 13:40	1492	0.11	0.092
2-6	2/24/01 13:42	1127	0.11	0.086
2-7	2/24/01 13:44	789.9	0.11	0.089
2-8	2/24/01 13:46	530.6	0.11	0.084
2-9	2/24/01 13:48	358.3	0.11	0.086
2-10	2/24/01 13:50	468.5	0.11	0.089
2-11	2/24/01 13:52	353.4	0.11	0.089
2-12	2/24/01 13:54	288.7	0.11	0.086
2-13	2/24/01 13:56	224.3	0.11	0.084
2-14	2/24/01 13:58	191.6	0.11	0.076
2-15	2/24/01 14:00	131.3	0.10	0.074
		Average	**0.12**	**0.10**
3-0	2/24/01 14:35	0	0.06	0.022
3-1	2/24/01 14:37	125.3	0.05	0.02
3-2	2/24/01 14:39	677.3	0.05	0.017
3-3	2/24/01 14:41	1275	0.05	0.017
3-4	2/24/01 14:43	1732	0.05	0.016
3-5	2/24/01 14:45	1976	0.05	0.016
3-6	2/24/01 14:47	2155	0.05	0.015
3-7	2/24/01 14:49	2328	0.04	0.014
3-8	2/24/01 14:51	2214	0.04	0.012
3-9	2/24/01 14:53	2170	0.04	0.011
3-10	2/24/01 14:55	2050	0.04	0.01
3-11	2/24/01 14:57	1980	0.03	0.009
3-12	2/24/01 14:59	1946	0.04	0.009
3-13	2/24/01 15:01	1740	0.03	0.009
3-14	2/24/01 15:03	1698	0.03	0.008
3-15	2/24/01 15:05	1625	0.03	0.008
		Average	**0.04**	**0.01**

Worksheet 2a
Foothill Maintenance Station StreamGuard DII % Removal Efficiency Calculations (Storm-by-Storm Method)

Analyte	Media	Concentration (mg/kg)	Mass (grams)	Event Mean Concentration (ug/L)	Runoff Volume (ft^3)	Load (lbs)
Copper	Used StreamGuard Geotextile Fabric	66.5	1338.12	—	—	0.000196
Copper	Used StreamGuard Absorbent Material	14.8	583.4	—	—	0.000019
Copper	Used StreamGuard Debris/litter/sediment	89.9	2517.48	—	—	0.000496
Copper	*Used Media Subtotal*					*0.000713*
Copper	Unused StreamGuard Geotextile Fabric	0.22	943.9	—	—	0.000000
Copper	Unused StreamGuard Absorbent Material	0.24	443.15	—	—	0.000000
Copper	*Unused Media Subtotal*					*0.000001*
Copper	Effluent Water from 27 October 2000 storm event	—	—	30	1995	0.003728
Copper	Effluent Water from 12 January 2001 storm event	—	—	11	10548	0.007228
Copper	Effluent Water from 24 January 2001 storm event	—	—	14	797	0.000695
Copper	Effluent Water from 10 February 2001 storm event	—	—	15	818	0.000764
Copper	Estimated effluent from unsampled storm events	—	—	17.5	42014	0.045804
Copper	*Effluent Subtotal*					*0.058220*
Copper	Estimated Influent Load					0.058932
Copper	Efficiency (%)					1%
Copper	Efficiency w/o Litter Removal (%)					0%

Analyte	Media	Concentration (mg/kg)	Mass (grams)	Event Mean Concentration (ug/L)	Runoff Volume (ft^3)	Load (lbs)
Lead	Used StreamGuard Geotextile Fabric	132	1338.12	—	—	0.000389
Lead	Used StreamGuard Absorbent Material	26.1	583.4	—	—	0.000033
Lead	Used StreamGuard Debris/litter/sediment	126	2517.48	—	—	0.000698
Lead	*Used Media Subtotal*					*0.001120*
Lead	Unused StreamGuard Geotextile Fabric	0.1	943.9	—	—	0.000000
Lead	Unused StreamGuard Absorbent Material	0.1	443.15	—	—	0.000000
Lead	*Unused Media Subtotal*					*0.000000*
Lead	Effluent Water from 27 October 2000 storm event	—	—	6.0	1995	0.000746
Lead	Effluent Water from 12 January 2001 storm event	—	—	1.8	10548	0.001183
Lead	Effluent Water from 24 January 2001 storm event	—	—	3.9	797	0.000194
Lead	Effluent Water from 10 February 2001 storm event	—	—	6.8	818	0.000347
Lead	Estimated effluent from unsampled storm events	—	—	4.6	42014	0.012105
Lead	*Effluent Subtotal*					*0.014574*
Lead	Estimated Influent Load					0.015693
Lead	Efficiency (%)					7%
Lead	Efficiency w/o Litter Removal (%)					3%

Analyte	Media	Concentration (mg/kg)	Mass (grams)	Event Mean Concentration (ug/L)	Runoff Volume (ft^3)	Load (lbs)
Zinc	Used StreamGuard Geotextile Fabric	1160	1338.12	—	—	0.003415
Zinc	Used StreamGuard Absorbent Material	86.5	583.4	—	—	0.000111
Zinc	Used StreamGuard Debris/litter/sediment	1140	2517.48	—	—	0.006314
Zinc	*Used Media Subtotal*					*0.009840*
Zinc	Unused StreamGuard Geotextile Fabric	3.8	943.9	—	—	0.000008
Zinc	Unused StreamGuard Absorbent Material	0.6	443.15	—	—	0.000001
Zinc	*Unused Media Subtotal*					*0.000008*
Zinc	Effluent Water from 27 October 2000 storm event	—	—	406	1995	0.050459
Zinc	Effluent Water from 12 January 2001 storm event	—	—	138	10548	0.090661
Zinc	Effluent Water from 24 January 2001 storm event	—	—	137	797	0.006802
Zinc	Effluent Water from 10 February 2001 storm event	—	—	260	818	0.013249
Zinc	Estimated effluent from unsampled storm events	—	—	*211.4*	42014	0.553204
Zinc	*Effluent Subtotal*					*0.714396*
Zinc	Estimated Influent Load					0.724227
Zinc	Efficiency (%)					1%
Zinc	Efficiency w/o Litter Removal (%)					0%

Analyte	Media	Concentration (mg/kg)	Mass (grams)	Event Mean Concentration (ug/L)	Runoff Volume (ft^3)	Load (lbs)
Petroleum Hydrocarbons	Used StreamGuard Geotextile Fabric	333	1338.12	—	—	0.000980
Petroleum Hydrocarbons	Used StreamGuard Absorbent Material	6950	583.4	—	—	0.011487
Petroleum Hydrocarbons	Used StreamGuard Debris/litter/sediment	10800	2517.48	—	—	0.060369
Petroleum Hydrocarbons	*Used Media Subtotal*					*0.072837*
Petroleum Hydrocarbons	Unused StreamGuard Geotextile Fabric	684	943.9	—	—	0.001420
Petroleum Hydrocarbons	Unused StreamGuard Absorbent Material	1970	443.15	—	—	0.001921
Petroleum Hydrocarbons	*Unused Media Subtotal*					*0.003341*
Petroleum Hydrocarbons	Effluent Water from 27 October 2000 storm event	—	—	916	1995	0.113843
Petroleum Hydrocarbons	Effluent Water from 12 January 2001 storm event	—	—	500	10548	0.328554
Petroleum Hydrocarbons	Effluent Water from 24 January 2001 storm event	—	—	500	797	0.024825
Petroleum Hydrocarbons	Effluent Water from 10 February 2001 storm event	—	—	500	818	0.025479
Petroleum Hydrocarbons	Estimated effluent from unsampled storm events	—	—	604	42014	1.580876
Petroleum Hydrocarbons	*Effluent Subtotal*					*2.073578*
Petroleum Hydrocarbons	Estimated Influent Load					2.143073
Petroleum Hydrocarbons	Efficiency (%)					3%
Petroleum Hydrocarbons	Efficiency w/o Litter Removal (%)					0%

Analyte	Media	Concentration (mg/kg)	Mass (grams)	Event Mean Concentration (mg/L)	Runoff Volume (ft^3)	Load (lbs)
Sediment[1]	Used StreamGuard Geotextile Fabric	—	1338.12	—	—	2.950019
Sediment[1]	Used StreamGuard Absorbent Material	—	583.4	—	—	1.286164
Sediment	Used StreamGuard Debris/litter/sediment	—	2517.48	—	—	5.550036
Sediment	*Used Media Subtotal*					*9.786219*
Sediment	Unused StreamGuard Geotextile Fabric	—	943.9	—	—	2.080922
Sediment	Unused StreamGuard Absorbent Material	—	443.15	—	—	0.976968
Sediment	*Unused Media Subtotal*					*3.057890*
Sediment	Effluent Water from 27 October 2000 storm event	—	—	8	1995	0.994259
Sediment	Effluent Water from 12 January 2001 storm event	—	—	13	10548	8.542408
Sediment	Effluent Water from 24 January 2001 storm event	—	—	4	797	0.198603
Sediment	Effluent Water from 10 February 2001 storm event	—	—	33	818	1.681644
Sediment	Estimated effluent from unsampled storm events	—	—	15	42014	37.951495
Sediment	*Effluent Subtotal*					*49.368410*
Sediment	Estimated Influent Load					56.096739
Sediment	Efficiency (%)					12%
Sediment	Efficiency w/o Litter Removal (%)					2%

[1] Mass of unused DII element subtracted from mass of used DII element.

Note 1: Dissolved solids fraction and gross solids fraction of effluent not accounted for in mass balance.

Note 2: Efficiencies include sediment/debris entrapped by the DII. Extensive maintenance was conducted before, during, and after storm events to clear sediment and debris from the DII. Sediment and debis removed from the DII was temporarily stored onsite and then analyzed at the same time as DII.

Note 3: Where the individual storm EMCs showed evidence of normality, the unsampled effluent concentration was estimated by averaging individual storm EMCs.

Note 4: Where the individual storm EMCs showed evidence of non-normality, the unsampled effluent concentration was estimated by log-transforming individual storm EMCs, averaging, and then transforming back. These EMCs are italicized.

Note 5: Flow measured continuously while DII was installed.

Note 6: Reporting Limit was used where results were "<" Reporting Limit.

Calculated by: Ed Othmer

Checked by: Chris Knoche

Worksheet 2b
Las Flores Maintenance Station First StreamGuard DII % Removal Efficiency Calculations (Storm-by-Storm Method)

Analyte	Media	Concentration (mg/kg)	Mass (grams)	Event Mean Concentration (ug/L)	Runoff Volume (ft^3)	Load (lbs)
Copper	Used StreamGuard Geotextile Fabric	31	1315.44	---	---	0.000090
Copper	Used StreamGuard Absorbent Material	8.8	544.32	---	---	0.000011
Copper	Used StreamGuard Debris/litter/sediment	13.2	4853.52	---	---	0.000141
Copper	*Used Media Subtotal*					*0.000241*
Copper	Unused StreamGuard Geotextile Fabric	0.22	943.9	---	---	0.000000
Copper	Unused StreamGuard Absorbent Material	0.24	443.15	---	---	0.000000
Copper	*Unused Media Subtotal*					*0.000001*
Copper	Effluent Water from 27 October 2000 storm event	---	---	15.7	217	0.000212
Copper	Effluent Water from 12 January 2001 storm event	---	---	6.1	933	0.000355
Copper	Estimated effluent from unsampled storm events	---	---	10.9	132	0.000090
Copper	*Effluent Subtotal*					*0.000656*
Copper	Estimated Influent Load					0.000897
Copper	Efficiency (%)					27%
Copper	Efficiency w/o Litter Removal (%)					13%

Analyte	Media	Concentration (mg/kg)	Mass (grams)	Event Mean Concentration (ug/L)	Runoff Volume (ft^3)	Load (lbs)
Lead	Used StreamGuard Geotextile Fabric	33.6	1315.44	---	---	0.000097
Lead	Used StreamGuard Absorbent Material	6.7	544.32	---	---	0.000008
Lead	Used StreamGuard Debris/litter/sediment	13.5	4853.52	---	---	0.000144
Lead	*Used Media Subtotal*					*0.000249*
Lead	Unused StreamGuard Geotextile Fabric	0.1	943.9	---	---	0.000000
Lead	Unused StreamGuard Absorbent Material	0.1	443.15	---	---	0.000000
Lead	*Unused Media Subtotal*					*0.000000*
Lead	Effluent Water from 27 October 2000 storm event	---	---	5.9	217	0.000080
Lead	Effluent Water from 12 January 2001 storm event	---	---	1.4	933	0.000061
Lead	Estimated effluent from unsampled storm events	---	---	3.7	132	0.000030
Lead	*Effluent Subtotal*					*0.000191*
Lead	Estimated Influent Load					0.000440
Lead	Efficiency (%)					57%
Lead	Efficiency w/o Litter Removal (%)					35%

Analyte	Media	Concentration (mg/kg)	Mass (grams)	Event Mean Concentration (ug/L)	Runoff Volume (ft^3)	Load (lbs)
Zinc	Used StreamGuard Geotextile Fabric	175	1315.44	---	---	0.000506
Zinc	Used StreamGuard Absorbent Material	47.2	544.32	---	---	0.000057
Zinc	Used StreamGuard Debris/litter/sediment	88.3	4853.52	---	---	0.000943
Zinc	*Used Media Subtotal*					*0.001506*
Zinc	Unused StreamGuard Geotextile Fabric	3.8	943.9	---	---	0.000008
Zinc	Unused StreamGuard Absorbent Material	0.8	443.15	---	---	0.000001
Zinc	*Unused Media Subtotal*					*0.000008*
Zinc	Effluent Water from 27 October 2000 storm event	---	---	123	217	0.001663
Zinc	Effluent Water from 12 January 2001 storm event	---	---	52	933	0.003022
Zinc	Estimated effluent from unsampled storm events	---	---	80.0	132	0.000658
Zinc	*Effluent Subtotal*					*0.005343*
Zinc	Estimated Influent Load					0.006840
Zinc	Efficiency (%)					22%
Zinc	Efficiency w/o Litter Removal (%)					9%

Analyte	Media	Concentration (mg/kg)	Mass (grams)	Event Mean Concentration (ug/L)	Runoff Volume (ft^3)	Load (lbs)
Petroleum Hydrocarbons	Used StreamGuard Geotextile Fabric	4700	1315.44	---	---	0.013802
Petroleum Hydrocarbons	Used StreamGuard Absorbent Material	36600	544.32	---	---	0.043829
Petroleum Hydrocarbons	Used StreamGuard Debris/litter/sediment	4270	4853.52	---	---	0.045594
Petroleum Hydrocarbons	*Used Media Subtotal*					*0.103024*
Petroleum Hydrocarbons	Unused StreamGuard Geotextile Fabric	684	943.9	---	---	0.001420
Petroleum Hydrocarbons	Unused StreamGuard Absorbent Material	1970	443.15	---	---	0.001921
Petroleum Hydrocarbons	*Unused Media Subtotal*					*0.003341*
Petroleum Hydrocarbons	Effluent Water from 27 October 2000 storm event	---	---	1174	217	0.015871
Petroleum Hydrocarbons	Effluent Water from 12 January 2001 storm event	---	---	500	933	0.029082
Petroleum Hydrocarbons	Estimated effluent from unsampled storm events	---	---	837	132	0.006863
Petroleum Hydrocarbons	*Effluent Subtotal*					*0.051815*
Petroleum Hydrocarbons	Estimated Influent Load					0.151496
Petroleum Hydrocarbons	Efficiency (%)					66%
Petroleum Hydrocarbons	Efficiency w/o Litter Removal (%)					51%

Analyte	Media	Concentration (mg/kg)	Mass (grams)	Event Mean Concentration (mg/L)	Runoff Volume (ft^3)	Load (lbs)
Sediment[1]	Used StreamGuard Geotextile Fabric	---	1315.44	---	---	2.900019
Sediment[1]	Used StreamGuard Absorbent Material	---	544.32	---	---	1.200008
Sediment	Used StreamGuard Debris/litter/sediment	---	4853.52	---	---	10.700070
Sediment	*Used Media Subtotal*					*14.800097*
Sediment	Unused StreamGuard Geotextile Fabric	---	943.9	---	---	2.080922
Sediment	Unused StreamGuard Absorbent Material	---	443.15	---	---	0.976968
Sediment	*Unused Media Subtotal*					*3.057890*
Sediment	Effluent Water from 27 October 2000 storm event	---	---	22	217	0.297406
Sediment	Effluent Water from 12 January 2001 storm event	---	---	89	933	5.172953
Sediment	Estimated effluent from unsampled storm events	---	---	56	132	0.456388
Sediment	*Effluent Subtotal*					*5.926746*
Sediment	Estimated Influent Load					17.868953
Sediment	Efficiency (%)					84%
Sediment	Efficiency w/o Litter Removal (%)					18%

[1] Mass of unused DII element subtracted from mass of used DII element.

Note 1: Dissolved solids fraction and gross solids fraction of effluent not accounted for in mass balance.

Note 2: Efficiencies include sediment/debris entrapped by the DII. Extensive maintenance was conducted before, during, and after storm events to clear sediment and debris from the DII. Sediment and debis removed from the DII was temporarily stored onsite and then analyzed at the same time as DII.

Note 3: Where the individual storm EMCs showed evidence of normality, the unsampled effluent concentration was estimated by averaging individual storm EMCs.

Note 4: Where the individual storm EMCs showed evidence of non-normality, the unsampled effluent concentration was estimated by log-transforming individual storm EMCs, averaging, and then transforming back. These EMCs are italicized.

Note 5: Flow measured continuously while DII was installed.

Note 6: Reporting Limit was used where results were "<" Reporting Limit.

Calculated by: Ed Ohmer

Checked by: Chris Knoche

Worksheet 2c
Las Flores Maintenance Station Second StreamGuard DII % Removal Efficiency Calculations (Storm-by-Storm Method)

Analyte	Media	Concentration (mg/kg)	Mass (grams)	Event Mean Concentration (ug/L)	Runoff Volume (ft^3)	Load (lbs)
Copper	Used StreamGuard Geotextile Fabric	21.4	1905.12	—	—	0.000090
Copper	Used StreamGuard Absorbent Material	7.7	751	—	—	0.000013
Copper	Used StreamGuard Debris/litter/sediment	12.1	11067.84	—	—	0.000295
Copper	*Used Media Subtotal*					*0.000397*
Copper	Unused StreamGuard Geotextile Fabric	0.22	943.9	—	—	0.000000
Copper	Unused StreamGuard Absorbent Material	0.24	443.15	—	—	0.000000
Copper	*Unused Media Subtotal*					*0.000001*
Copper	Effluent Water from 24 January 2001 storm event	—	—	18	517	0.000515
Copper	Effluent Water from 11 February 2001 storm event	—	—	7.2	190	0.000085
Copper	Estimated effluent from unsampled storm events	—	—	11.6	4710	0.003404
Copper	*Effluent Subtotal*					*0.004004*
Copper	Estimated Influent Load					0.004401
Copper	Efficiency (%)					9%
Copper	Efficiency w/o Litter Removal (%)					2%

Analyte	Media	Concentration (mg/kg)	Mass (grams)	Event Mean Concentration (ug/L)	Runoff Volume (ft^3)	Load (lbs)
Lead	Used StreamGuard Geotextile Fabric	23.8	1905.12	—	—	0.000100
Lead	Used StreamGuard Absorbent Material	13	751	—	—	0.000021
Lead	Used StreamGuard Debris/litter/sediment	12.1	11067.84	—	—	0.000295
Lead	*Used Media Subtotal*					*0.000416*
Lead	Unused StreamGuard Geotextile Fabric	0.1	943.9	—	—	0.000000
Lead	Unused StreamGuard Absorbent Material	0.1	443.15	—	—	0.000000
Lead	*Unused Media Subtotal*					*0.000000*
Lead	Effluent Water from 24 January 2001 storm event	—	—	2.4	517	0.000077
Lead	Effluent Water from 11 February 2001 storm event	—	—	1.7	190	0.000020
Lead	Estimated effluent from unsampled storm events	—	—	2.1	4710	0.000602
Lead	*Effluent Subtotal*					*0.000699*
Lead	Estimated Influent Load					0.001114
Lead	Efficiency (%)					37%
Lead	Efficiency w/o Litter Removal (%)					18%

Analyte	Media	Concentration (mg/kg)	Mass (grams)	Event Mean Concentration (ug/L)	Runoff Volume (ft^3)	Load (lbs)
Zinc	Used StreamGuard Geotextile Fabric	143	1905.12	—	—	0.090599
Zinc	Used StreamGuard Absorbent Material	46.4	751	—	—	0.000077
Zinc	Used StreamGuard Debris/litter/sediment	86.3	11067.84	—	—	0.002101
Zinc	*Used Media Subtotal*					*0.002777*
Zinc	Unused StreamGuard Geotextile Fabric	3.8	943.9	—	—	0.000008
Zinc	Unused StreamGuard Absorbent Material	0.6	443.15	—	—	0.000001
Zinc	*Unused Media Subtotal*					*0.000008*
Zinc	Effluent Water from 24 January 2001 storm event	—	—	59	517	0.001900
Zinc	Effluent Water from 11 February 2001 storm event	—	—	57	190	0.000675
Zinc	Estimated effluent from unsampled storm events	—	—	*58.0*	4710	0.017016
Zinc	*Effluent Subtotal*					*0.019591*
Zinc	Estimated Influent Load					0.022380
Zinc	Efficiency (%)					12%
Zinc	Efficiency w/o Litter Removal (%)					3%

Analyte	Media	Concentration (mg/kg)	Mass (grams)	Event Mean Concentration (ug/L)	Runoff Volume (ft^3)	Load (lbs)
Petroleum Hydrocarbons	Used StreamGuard Geotextile Fabric	333	1905.12	—	—	0.001396
Petroleum Hydrocarbons	Used StreamGuard Absorbent Material	50600	751	—	—	0.083601
Petroleum Hydrocarbons	Used StreamGuard Debris/litter/sediment	333	11067.84	—	—	0.008108
Petroleum Hydrocarbons	*Used Media Subtotal*					*0.093105*
Petroleum Hydrocarbons	Unused StreamGuard Geotextile Fabric	684	943.9	—	—	0.001420
Petroleum Hydrocarbons	Unused StreamGuard Absorbent Material	1970	443.15	—	—	0.001921
Petroleum Hydrocarbons	*Unused Media Subtotal*					*0.003341*
Petroleum Hydrocarbons	Effluent Water from 24 January 2001 storm event	—	—	500	517	0.016104
Petroleum Hydrocarbons	Effluent Water from 11 February 2001 storm event	—	—	500	190	0.005918
Petroleum Hydrocarbons	Estimated effluent from unsampled storm events	—	—	500	4710	0.146709
Petroleum Hydrocarbons	*Effluent Subtotal*					*0.168731*
Petroleum Hydrocarbons	Estimated Influent Load					0.258496
Petroleum Hydrocarbons	Efficiency (%)					35%
Petroleum Hydrocarbons	Efficiency w/o Litter Removal (%)					33%

Analyte	Media	Concentration (mg/kg)	Mass (grams)	Event Mean Concentration (mg/L)	Runoff Volume (ft^3)	Load (lbs)
Sediment[1]	Used StreamGuard Geotextile Fabric	—	1905.12	—	—	4.200028
Sediment[1]	Used StreamGuard Absorbent Material	—	751	—	—	1.655655
Sediment	Used StreamGuard Debris/litter/sediment	—	11067.84	—	—	24.400180
Sediment	*Used Media Subtotal*					*30.255842*
Sediment	Unused StreamGuard Geotextile Fabric	—	943.9	—	—	2.080922
Sediment	Unused StreamGuard Absorbent Material	—	443.15	—	—	0.976968
Sediment	*Unused Media Subtotal*					*3.057890*
Sediment	Effluent Water from 24 January 2001 storm event	—	—	41	517	1.320509
Sediment	Effluent Water from 11 February 2001 storm event	—	—	52	190	0.615494
Sediment	Estimated effluent from unsampled storm events	—	—	47	4710	13.843969
Sediment	*Effluent Subtotal*					*15.579971*
Sediment	Estimated Influent Load					42.777923
Sediment	Efficiency (%)					64%
Sediment	Efficiency w/o Litter Removal (%)					18%

[1] Mass of unused DII element subtracted from mass of used DII element.

Note 1: Dissolved solids fraction and gross solids fraction of effluent not accounted for in mass balance.

Note 2: Efficiencies include sediment/debris entrapped by the DII. Extensive maintenance was conducted before, during, and after storm events to clear sediment and debris from the DII. Sediment and debis removed from the DII was temporarily stored onsite and then analyzed at the same time as DII.

Note 3: Where the individual storm EMCs showed evidence of normality, the unsampled effluent concentration was estimated by averaging individual storm EMCs.

Note 4: Where the individual storm EMCs showed evidence of non-normality, the unsampled effluent concentration was estimated by log-transforming individual storm EMCs, averaging, and then transforming back. These EMCs are italicized.

Note 5: Flow measured continuously while DII was installed.

Note 6: Reporting Limit was used where results were "<" Reporting Limit.

Calculated by: Ed Othmer

Checked by: Chris Knoche

Worksheet 2d
Rosemead Maintenance Station StreamGuard DII % Removal Efficiency Calculations (Storm-by-Storm Method)

Analyte	Media	Concentration (mg/kg)	Mass (grams)	Event Mean Concentration (ug/L)	Runoff Volume (ft^3)	Load (lbs)
Copper	Used StreamGuard Geotextile Fabric	96.7	1610.28	—	—	0.000343
Copper	Used StreamGuard Absorbent Material	24.8	536	—	—	0.000029
Copper	Used StreamGuard Debris/litter/sediment	16.1	10387.44	—	—	0.000368
Copper	*Used Media Subtotal*					*0.000740*
Copper	Unused StreamGuard Geotextile Fabric	0.22	943.9	—	—	0.000000
Copper	Unused StreamGuard Absorbent Material	0.24	443.15	—	—	0.000000
Copper	*Unused Media Subtotal*					*0.000001*
Copper	Effluent Water from 11 October 2000 storm event	—	—	90	434	0.002433
Copper	Effluent Water from 27 October 2000 storm event	—	—	35	3185	0.006945
Copper	Effluent Water from 12 January 2001 storm event	—	—	13	13440	0.010885
Copper	Effluent Water from 24 January 2001 storm event	—	—	31	1754	0.003387
Copper	Effluent Water from 11 February 2001 storm event	—	—	22	1387	0.001901
Copper	Estimated effluent from unsampled storm events	—	—	38.2	54174	0.128920
Copper	*Effluent Subtotal*					*0.154471*
Copper	Estimated Influent Load					0.155210
Copper	Efficiency (%)					0%
Copper	Efficiency w/o Litter Removal (%)					0%

Analyte	Media	Concentration (mg/kg)	Mass (grams)	Event Mean Concentration (ug/L)	Runoff Volume (ft^3)	Load (lbs)
Lead	Used StreamGuard Geotextile Fabric	259	1610.28	—	—	0.000918
Lead	Used StreamGuard Absorbent Material	46.1	536	—	—	0.000054
Lead	Used StreamGuard Debris/litter/sediment	21.6	10387.44	—	—	0.000494
Lead	*Used Media Subtotal*					*0.001466*
Lead	Unused StreamGuard Geotextile Fabric	0.1	943.9	—	—	0.000000
Lead	Unused StreamGuard Absorbent Material	0.1	443.15	—	—	0.000000
Lead	*Unused Media Subtotal*					*0.000000*
Lead	Effluent Water from 11 October 2000 storm event	—	—	50	434	0.001352
Lead	Effluent Water from 27 October 2000 storm event	—	—	25	3185	0.004960
Lead	Effluent Water from 12 January 2001 storm event	—	—	6.0	13440	0.005024
Lead	Effluent Water from 24 January 2001 storm event	—	—	39	1754	0.004261
Lead	Effluent Water from 11 February 2001 storm event	—	—	12	1387	0.001037
Lead	Estimated effluent from unsampled storm events	—	—	26.4	54174	0.089097
Lead	*Effluent Subtotal*					*0.105731*
Lead	Estimated Influent Load					0.107196
Lead	Efficiency (%)					1%
Lead	Efficiency w/o Litter Removal (%)					1%

Analyte	Media	Concentration (mg/kg)	Mass (grams)	Event Mean Concentration (ug/L)	Runoff Volume (ft^3)	Load (lbs)
Zinc	Used StreamGuard Geotextile Fabric	1670	1610.28	—	—	0.005916
Zinc	Used StreamGuard Absorbent Material	229	536	—	—	0.000270
Zinc	Used StreamGuard Debris/litter/sediment	118	10387.44	—	—	0.002697
Zinc	*Used Media Subtotal*					*0.008883*
Zinc	Unused StreamGuard Geotextile Fabric	3.8	943.9	—	—	0.000008
Zinc	Unused StreamGuard Absorbent Material	0.6	443.15	—	—	0.000001
Zinc	*Unused Media Subtotal*					*0.000009*
Zinc	Effluent Water from 11 October 2000 storm event	—	—	1250	434	0.033796
Zinc	Effluent Water from 27 October 2000 storm event	—	—	342	3185	0.067958
Zinc	Effluent Water from 12 January 2001 storm event	—	—	129	13440	0.108006
Zinc	Effluent Water from 24 January 2001 storm event	—	—	239	1754	0.026115
Zinc	Effluent Water from 11 February 2001 storm event	—	—	190	1387	0.016417
Zinc	Estimated effluent from unsampled storm events	—	—	159.8	54174	0.539277
Zinc	*Effluent Subtotal*					*0.791472*
Zinc	Estimated Influent Load					0.800346
Zinc	Efficiency (%)					1%
Zinc	Efficiency w/o Litter Removal (%)					1%

Analyte	Media	Concentration (mg/kg)	Mass (grams)	Event Mean Concentration (ug/L)	Runoff Volume (ft^3)	Load (lbs)
Petroleum Hydrocarbons	Used StreamGuard Geotextile Fabric	457	1610.28	—	—	0.001619
Petroleum Hydrocarbons	Used StreamGuard Absorbent Material	46400	536	—	—	0.054715
Petroleum Hydrocarbons	Used StreamGuard Debris/litter/sediment	333	10387.44	—	—	0.007610
Petroleum Hydrocarbons	*Used Media Subtotal*					*0.063944*
Petroleum Hydrocarbons	Unused StreamGuard Geotextile Fabric	684	943.9	—	—	0.001420
Petroleum Hydrocarbons	Unused StreamGuard Absorbent Material	1970	443.15	—	—	0.001921
Petroleum Hydrocarbons	*Unused Media Subtotal*					*0.003341*
Petroleum Hydrocarbons	Effluent Water from 11 October 2000 storm event	—	—	4290	434	0.115968
Petroleum Hydrocarbons	Effluent Water from 27 October 2000 storm event	—	—	1277	3185	0.253377
Petroleum Hydrocarbons	Effluent Water from 12 January 2001 storm event	—	—	500	13440	0.418636
Petroleum Hydrocarbons	Effluent Water from 24 January 2001 storm event	—	—	500	1754	0.054834
Petroleum Hydrocarbons	Effluent Water from 11 February 2001 storm event	—	—	500	1387	0.043203
Petroleum Hydrocarbons	Estimated effluent from unsampled storm events	—	—	1413	54174	4.770049
Petroleum Hydrocarbons	*Effluent Subtotal*					*5.655887*
Petroleum Hydrocarbons	Estimated Influent Load					5.716490
Petroleum Hydrocarbons	Efficiency (%)					1%
Petroleum Hydrocarbons	Efficiency w/o Litter Removal (%)					1%

Analyte	Media	Concentration (mg/kg)	Mass (grams)	Event Mean Concentration (mg/L)	Runoff Volume (ft^3)	Load (lbs)
Sediment[1]	Used StreamGuard Geotextile Fabric	—	1610.28	—	—	3.550023
Sediment[1]	Used StreamGuard Absorbent Material	—	536	—	—	1.181666
Sediment	Used StreamGuard Debris/litter/sediment	—	10387.44	—	—	22.900150
Sediment	*Used Media Subtotal*					*27.631839*
Sediment	Unused StreamGuard Geotextile Fabric	—	943.9	—	—	2.080922
Sediment	Unused StreamGuard Absorbent Material	—	443.15	—	—	0.976968
Sediment	*Unused Media Subtotal*					*3.057890*
Sediment	Effluent Water from 11 October 2000 storm event	—	—	248	434	6.705146
Sediment	Effluent Water from 27 October 2000 storm event	—	—	51	3185	10.119207
Sediment	Effluent Water from 12 January 2001 storm event	—	—	121	13440	101.309808
Sediment	Effluent Water from 24 January 2001 storm event	—	—	52	1754	5.681981
Sediment	Effluent Water from 11 February 2001 storm event	—	—	46	1387	3.888265
Sediment	Estimated effluent from unsampled storm events	—	—	103	54174	348.982128
Sediment	*Effluent Subtotal*					*476.686535*
Sediment	Estimated Influent Load					501.240484
Sediment	Efficiency (%)					5%
Sediment	Efficiency w/o Litter Removal (%)					0%

[1] Mass of unused DII element subtracted from mass of used DII element.

Note 1: Dissolved solids fraction and gross solids fraction of effluent not accounted for in mass balance.

Note 2: Efficiencies include sediment/debris entrapped by the DII. Extensive maintenance was conducted before, during, and after storm events to clear sediment and debris from the DII. Sediment and debis removed from the DII was temporarily stored onsite and then analyzed at the same time as DII.

Note 3: Where the individual storm EMCs showed evidence of normality, the unsampled effluent concentration was estimated by averaging individual storm EMCs.

Note 4: Where the individual storm EMCs showed evidence of non-normality, the unsampled effluent concentration was estimated by log-transforming individual storm EMCs, averaging, and then transforming back. These EMCs are italicized.

Note 5: Flow measured continuously while DII was installed.

Note 6: Reporting Limit was used where results were "<" Reporting Limit.

Calculated by: Ed Ohmer

Checked by: Chris Knoche

Worksheet 2e
Foothill Maintenance Station StreamGuard DII % Removal Efficiency Calculations (Aggregate Method)

Analyte	Media	Concentration (mg/kg)	Mass (grams)	Event Mean Concentration (ug/L)	Runoff Volume (ft^3)	Load (lbs)
Copper	Used StreamGuard Geotextile Fabric	66.5	1338.12	—	—	0.000196
Copper	Used StreamGuard Absorbent Material	14.8	583.4	—	—	0.000019
Copper	Used StreamGuard Debris/litter/sediment	89.9	2517.48	—	—	0.000498
Copper	*Used Media Subtotal*					*0.000713*
Copper	Unused StreamGuard Geotextile Fabric	0.22	943.9	—	—	0.000000
Copper	Unused StreamGuard Absorbent Material	0.24	443.15	—	—	0.000000
Copper	*Unused Media Subtotal*					*0.000001*
Copper	Effluent Water from 27 October 2000 storm event	—	—	30	1995	
Copper	Effluent Water from 12 January 2001 storm event	—	—	11	10548	
Copper	Effluent Water from 24 January 2001 storm event	—	—	14	797	
Copper	Effluent Water from 10 February 2001 storm event	—	—	15	818	
Copper	Estimated flow volume from unsampled storm events	—	—	—	42014	
Copper	*Effluent Subtotal (Mean EMC x Total Runoff Volume)*			17.5	56172	0.061239
Copper	Estimated Influent Load					0.061951
Copper	Efficiency (%)					1%
Copper	Efficiency w/o Litter Removal (%)					0%

Analyte	Media	Concentration (mg/kg)	Mass (grams)	Event Mean Concentration (ug/L)	Runoff Volume (ft^3)	Load (lbs)
Lead	Used StreamGuard Geotextile Fabric	132	1338.12	—	—	0.000389
Lead	Used StreamGuard Absorbent Material	26.1	583.4	—	—	0.000033
Lead	Used StreamGuard Debris/litter/sediment	126	2517.48	—	—	0.000698
Lead	*Used Media Subtotal*					*0.001120*
Lead	Unused StreamGuard Geotextile Fabric	0.1	943.9	—	—	0.000000
Lead	Unused StreamGuard Absorbent Material	0.1	443.15	—	—	0.000000
Lead	*Unused Media Subtotal*					*0.000000*
Lead	Effluent Water from 27 October 2000 storm event	—	—	6.0	1995	
Lead	Effluent Water from 12 January 2001 storm event	—	—	1.8	10548	
Lead	Effluent Water from 24 January 2001 storm event	—	—	3.9	797	
Lead	Effluent Water from 10 February 2001 storm event	—	—	6.8	818	
Lead	Estimated effluent from unsampled storm events	—	—	—	42014	
Lead	*Effluent Subtotal (Mean EMC x Total Runoff Volume)*			4.6	56172	0.016184
Lead	Estimated Influent Load					0.017304
Lead	Efficiency (%)					6%
Lead	Efficiency w/o Litter Removal (%)					3%

Analyte	Media	Concentration (mg/kg)	Mass (grams)	Event Mean Concentration (ug/L)	Runoff Volume (ft^3)	Load (lbs)
Zinc	Used StreamGuard Geotextile Fabric	1160	1338.12	—	—	0.003415
Zinc	Used StreamGuard Absorbent Material	86.5	583.4	—	—	0.000111
Zinc	Used StreamGuard Debris/litter/sediment	1140	2517.48	—	—	0.006314
Zinc	*Used Media Subtotal*					*0.009840*
Zinc	Unused StreamGuard Geotextile Fabric	3.8	943.9	—	—	0.000008
Zinc	Unused StreamGuard Absorbent Material	0.6	443.15	—	—	0.000001
Zinc	*Unused Media Subtotal*					*0.000008*
Zinc	Effluent Water from 27 October 2000 storm event	—	—	406	1995	
Zinc	Effluent Water from 12 January 2001 storm event	—	—	138	10548	
Zinc	Effluent Water from 24 January 2001 storm event	—	—	137	797	
Zinc	Effluent Water from 10 February 2001 storm event	—	—	260	818	
Zinc	Estimated effluent from unsampled storm events	—	—	—	42014	
Zinc	*Effluent Subtotal (Mean EMC x Total Runoff Volume)*			*211.4*	56172	0.739625
Zinc	Estimated Influent Load					0.749456
Zinc	Efficiency (%)					1%
Zinc	Efficiency w/o Litter Removal (%)					0%

Analyte	Media	Concentration (mg/kg)	Mass (grams)	Event Mean Concentration (ug/L)	Runoff Volume (ft^3)	Load (lbs)
Petroleum Hydrocarbons	Used StreamGuard Geotextile Fabric	333	1338.12	—	—	0.000980
Petroleum Hydrocarbons	Used StreamGuard Absorbent Material	8950	583.4	—	—	0.011487
Petroleum Hydrocarbons	Used StreamGuard Debris/litter/sediment	10900	2517.48	—	—	0.060369
Petroleum Hydrocarbons	*Used Media Subtotal*					*0.072837*
Petroleum Hydrocarbons	Unused StreamGuard Geotextile Fabric	664	943.9	—	—	0.001420
Petroleum Hydrocarbons	Unused StreamGuard Absorbent Material	1970	443.15	—	—	0.001921
Petroleum Hydrocarbons	*Unused Media Subtotal*					*0.003341*
Petroleum Hydrocarbons	Effluent Water from 27 October 2000 storm event	—	—	916	1995	
Petroleum Hydrocarbons	Effluent Water from 12 January 2001 storm event	—	—	500	10548	
Petroleum Hydrocarbons	Effluent Water from 24 January 2001 storm event	—	—	500	797	
Petroleum Hydrocarbons	Effluent Water from 10 February 2001 storm event	—	—	500	818	
Petroleum Hydrocarbons	Estimated effluent from unsampled storm events	—	—	—	42014	
Petroleum Hydrocarbons	*Effluent Subtotal (Mean EMC x Total Runoff Volume)*			604.0	56172	2.113604
Petroleum Hydrocarbons	Estimated Influent Load					2.183100
Petroleum Hydrocarbons	Efficiency (%)					3%
Petroleum Hydrocarbons	Efficiency w/o Litter Removal (%)					0%

Analyte	Media	Concentration (mg/kg)	Mass (grams)	Event Mean Concentration (mg/L)	Runoff Volume (ft^3)	Load (lbs)
Sediment[1]	Used StreamGuard Geotextile Fabric	—	1338.12	—	—	2.950019
Sediment[1]	Used StreamGuard Absorbent Material	—	583.4	—	—	1.286164
Sediment	Used StreamGuard Debris/litter/sediment	—	2517.48	—	—	5.550036
Sediment	*Used Media Subtotal*					*9.786219*
Sediment	Unused StreamGuard Geotextile Fabric	—	943.9	—	—	2.080922
Sediment	Unused StreamGuard Absorbent Material	—	443.15	—	—	0.976968
Sediment	*Unused Media Subtotal*					*3.057890*
Sediment	Effluent Water from 27 October 2000 storm event	—	—	6	1995	
Sediment	Effluent Water from 12 January 2001 storm event	—	—	13	10548	
Sediment	Effluent Water from 24 January 2001 storm event	—	—	4	797	
Sediment	Effluent Water from 10 February 2001 storm event	—	—	33	818	
Sediment	Estimated effluent from unsampled storm events	—	—	—	42014	
Sediment	*Effluent Subtotal (Mean EMC x Total Runoff Volume)*			14.5	56172	50.740500
Sediment	Estimated Influent Load					57.468829
Sediment	Efficiency (%)					12%
Sediment	Efficiency w/o Litter Removal (%)					2%

[1] Mass of unused DII element subtracted from mass of used DII element.

Note 1: Dissolved solids fraction and gross solids fraction of effluent not accounted for in mass balance.

Note 2: Efficiencies include sediment/debris entrapped by the DII. Extensive maintenance was conducted before, during, and after storm events to clear sediment and debris from the DII. Sediment and debis removed from the DII was temporarily stored onsite and then analyzed at the same time as DII.

Note 3: Where the individual storm EMCs showed evidence of normality, the mean EMC effluent concentration was estimated by averaging individual storm EMCs.

Note 4: Where the individual storm EMCs showed evidence of non-normality, the mean EMC effluent concentration was estimated by log-transforming individual storm EMCs, averaging, and then transforming back. These EMCs are italicized.

Note 5: Flow measured continuously while DII was installed.

Note 6: Reporting Limit was used where results were "<" Reporting Limit.

Calculated by: Ed Ohmer

Checked by: Chris Knoche

Worksheet 2f
Las Flores Maintenance Station First StreamGuard DII % Removal Efficiency Calculations (Aggregate Method)

Analyte	Media	Concentration (mg/kg)	Mass (grams)	Event Mean Concentration (ug/L)	Runoff Volume (ft^3)	Load (lbs)
Copper	Used StreamGuard Geotextile Fabric	31	1315.44	—	—	0.000090
Copper	Used StreamGuard Absorbent Material	8.8	544.32	—	—	0.000011
Copper	Used StreamGuard Debris/litter/sediment	13.2	4853.52	—	—	0.000141
Copper	*Used Media Subtotal*					*0.000241*
Copper	Unused StreamGuard Geotextile Fabric	0.22	943.9	—	—	0.000000
Copper	Unused StreamGuard Absorbent Material	0.24	443.15	—	—	0.000000
Copper	*Unused Media Subtotal*					*0.000001*
Copper	Effluent Water from 27 October 2000 storm event	—	—	15.7	217	
Copper	Effluent Water from 12 January 2001 storm event	—	—	6.1	933	
Copper	Estimated flow volume from unsampled storm events	—	—	—	132	
Copper	*Effluent Subtotal (Mean EMC x Total Runoff Volume)*			10.9	1282	0.000871
Copper	Estimated Influent Load					0.001111
Copper	Efficiency (%)					22%
Copper	Efficiency w/o Litter Removal (%)					10%

Analyte	Media	Concentration (mg/kg)	Mass (grams)	Event Mean Concentration (ug/L)	Runoff Volume (ft^3)	Load (lbs)
Lead	Used StreamGuard Geotextile Fabric	33.6	1315.44	—	—	0.000097
Lead	Used StreamGuard Absorbent Material	6.7	544.32	—	—	0.000008
Lead	Used StreamGuard Debris/litter/sediment	13.5	4853.52	—	—	0.000144
Lead	*Used Media Subtotal*					*0.000249*
Lead	Unused StreamGuard Geotextile Fabric	0.1	943.9	—	—	0.000000
Lead	Unused StreamGuard Absorbent Material	0.1	443.15	—	—	0.000000
Lead	*Unused Media Subtotal*					*0.000000*
Lead	Effluent Water from 27 October 2000 storm event	—	—	5.9	217	
Lead	Effluent Water from 12 January 2001 storm event	—	—	1.4	933	
Lead	Estimated effluent from unsampled storm events	—	—	—	132	
Lead	*Effluent Subtotal (Mean EMC x Total Runoff Volume)*			3.7	1282	0.000292
Lead	Estimated Influent Load					0.000541
Lead	Efficiency (%)					46%
Lead	Efficiency w/o Litter Removal (%)					26%

Analyte	Media	Concentration (mg/kg)	Mass (grams)	Event Mean Concentration (ug/L)	Runoff Volume (ft^3)	Load (lbs)
Zinc	Used StreamGuard Geotextile Fabric	175	1315.44	—	—	0.000506
Zinc	Used StreamGuard Absorbent Material	47.2	544.32	—	—	0.000057
Zinc	Used StreamGuard Debris/litter/sediment	88.3	4853.52	—	—	0.000943
Zinc	*Used Media Subtotal*					*0.001506*
Zinc	Unused StreamGuard Geotextile Fabric	3.8	943.9	—	—	0.000008
Zinc	Unused StreamGuard Absorbent Material	0.6	443.15	—	—	0.000001
Zinc	*Unused Media Subtotal*					*0.000008*
Zinc	Effluent Water from 27 October 2000 storm event	—	—	123	217	
Zinc	Effluent Water from 12 January 2001 storm event	—	—	52	933	
Zinc	Estimated effluent from unsampled storm events	—	—	—	132	
Zinc	*Effluent Subtotal (Mean EMC x Total Runoff Volume)*			*80.0*	1282	0.006387
Zinc	Estimated Influent Load					0.007885
Zinc	Efficiency (%)					19%
Zinc	Efficiency w/o Litter Removal (%)					8%

Analyte	Media	Concentration (mg/kg)	Mass (grams)	Event Mean Concentration (ug/L)	Runoff Volume (ft^3)	Load (lbs)
Petroleum Hydrocarbons	Used StreamGuard Geotextile Fabric	4700	1315.44	—	—	0.013802
Petroleum Hydrocarbons	Used StreamGuard Absorbent Material	36600	544.32	—	—	0.043829
Petroleum Hydrocarbons	Used StreamGuard Debris/litter/sediment	4270	4853.52	—	—	0.045594
Petroleum Hydrocarbons	*Used Media Subtotal*					*0.103024*
Petroleum Hydrocarbons	Unused StreamGuard Geotextile Fabric	684	943.9	—	—	0.001420
Petroleum Hydrocarbons	Unused StreamGuard Absorbent Material	1870	443.15	—	—	0.001921
Petroleum Hydrocarbons	*Unused Media Subtotal*					*0.003341*
Petroleum Hydrocarbons	Effluent Water from 27 October 2000 storm event	—	—	1174	217	
Petroleum Hydrocarbons	Effluent Water from 12 January 2001 storm event	—	—	500	933	
Petroleum Hydrocarbons	Estimated effluent from unsampled storm events	—	—	—	132	
Petroleum Hydrocarbons	*Effluent Subtotal (Mean EMC x Total Runoff Volume)*			837.0	1282	0.066847
Petroleum Hydrocarbons	Estimated Influent Load					0.166530
Petroleum Hydrocarbons	Efficiency (%)					60%
Petroleum Hydrocarbons	Efficiency w/o Litter Removal (%)					45%

Analyte	Media	Concentration (mg/kg)	Mass (grams)	Event Mean Concentration (mg/L)	Runoff Volume (ft^3)	Load (lbs)
Sediment[1]	Used StreamGuard Geotextile Fabric	—	1315.44	—	—	2.900019
Sediment[1]	Used StreamGuard Absorbent Material	—	544.32	—	—	1.200008
Sediment	Used StreamGuard Debris/litter/sediment	—	4853.52	—	—	10.700070
Sediment	*Used Media Subtotal*					*14.800097*
Sediment	Unused StreamGuard Geotextile Fabric	—	943.9	—	—	2.080922
Sediment	Unused StreamGuard Absorbent Material	—	443.15	—	—	0.976968
Sediment	*Unused Media Subtotal*					*3.057890*
Sediment	Effluent Water from 27 October 2000 storm event	—	—	22	217	
Sediment	Effluent Water from 12 January 2001 storm event	—	—	89	933	
Sediment	Estimated effluent from unsampled storm events	—	—	—	132	
Sediment	*Effluent Subtotal (Mean EMC x Total Runoff Volume)*			55.5	1282	4.432491
Sediment	Estimated Influent Load					16.174696
Sediment	Efficiency (%)					73%
Sediment	Efficiency w/o Litter Removal (%)					19%

[1] Mass of unused DII element subtracted from mass of used DII element.

Note 1: Dissolved solids fraction and gross solids fraction of effluent not accounted for in mass balance.

Note 2: Efficiencies include sediment/debris entrapped by the DII. Extensive maintenance was conducted before, during, and after storm events to clear sediment and debris from the DII. Sediment and debis removed from the DII was temporarily stored onsite and then analyzed at the same time as DII.

Note 3: Where the individual storm EMCs showed evidence of normality, the mean EMC effluent concentration was estimated by averaging individual storm EMCs.

Note 4: Where the individual storm EMCs showed evidence of non-normality, the mean EMC effluent concentration was estimated by log-transforming individual storm EMCs, averaging, and then transforming back. These EMCs are italicized.

Note 5: Flow measured continuously while DII was installed.

Note 6: Reporting Limit was used where results were "<" Reporting Limit.

Calculated by: Ed Ohmer

Checked by: Chris Knoche

Worksheet 2g

Las Flores Maintenance Station Second StreamGuard DII % Removal Efficiency Calculations (Aggregate Method)

Analyte	Media	Concentration (mg/kg)	Mass (grams)	Event Mean Concentration (ug/L)	Runoff Volume (ft^3)	Load (lbs)
Copper	Used StreamGuard Geotextile Fabric	21.4	1905.12	—	—	0.000090
Copper	Used StreamGuard Absorbent Material	7.7	751	—	—	0.000013
Copper	Used StreamGuard Debris/litter/sediment	12.1	11067.84	—	—	0.000295
Copper	*Used Media Subtotal*					*0.000397*
Copper	Unused StreamGuard Geotextile Fabric	0.22	943.9	—	—	0.000000
Copper	Unused StreamGuard Absorbent Material	0.24	443.15	—	—	0.000000
Copper	*Unused Media Subtotal*					*0.000001*
Copper	Effluent Water from 24 January 2001 storm event	—	—	16	517	
Copper	Effluent Water from 11 February 2001 storm event	—	—	7.2	190	
Copper	Estimated flow volume from unsampled storm event	—	—	—	4710	
Copper	*Effluent Subtotal (Mean EMC x Total Runoff Volume)*			11.6	5417	0.003915
Copper	Estimated Influent Load					0.004311
Copper	**Efficiency (%)**					**9%**
Copper	**Efficiency w/o Litter Removal (%)**					**3%**

Analyte	Media	Concentration (mg/kg)	Mass (grams)	Event Mean Concentration (ug/L)	Runoff Volume (ft^3)	Load (lbs)
Lead	Used StreamGuard Geotextile Fabric	23.8	1905.12	—	—	0.000100
Lead	Used StreamGuard Absorbent Material	13	751	—	—	0.000021
Lead	Used StreamGuard Debris/litter/sediment	12.1	11067.84	—	—	0.000295
Lead	*Used Media Subtotal*					*0.000416*
Lead	Unused StreamGuard Geotextile Fabric	0.1	943.9	—	—	0.000000
Lead	Unused StreamGuard Absorbent Material	0.1	443.15	—	—	0.000000
Lead	*Unused Media Subtotal*					*0.000000*
Lead	Effluent Water from 24 January 2001 storm event	—	—	2.4	517	
Lead	Effluent Water from 11 February 2001 storm event	—	—	1.7	190	
Lead	Estimated effluent from unsampled storm events	—	—	—	4710	
Lead	*Effluent Subtotal (Mean EMC x Total Runoff Volume)*			2.1	5417	0.000692
Lead	Estimated Influent Load					0.001107
Lead	**Efficiency (%)**					**38%**
Lead	**Efficiency w/o Litter Removal (%)**					**18%**

Analyte	Media	Concentration (mg/kg)	Mass (grams)	Event Mean Concentration (ug/L)	Runoff Volume (ft^3)	Load (lbs)
Zinc	Used StreamGuard Geotextile Fabric	143	1905.12	—	—	0.000599
Zinc	Used StreamGuard Absorbent Material	46.4	751	—	—	0.000077
Zinc	Used StreamGuard Debris/litter/sediment	86.3	11067.84	—	—	0.002101
Zinc	*Used Media Subtotal*					*0.002777*
Zinc	Unused StreamGuard Geotextile Fabric	3.8	943.9	—	—	0.000008
Zinc	Unused StreamGuard Absorbent Material	0.6	443.15	—	—	0.000001
Zinc	*Unused Media Subtotal*					*0.000008*
Zinc	Effluent Water from 24 January 2001 storm event	—	—	59	517	
Zinc	Effluent Water from 11 February 2001 storm event	—	—	57	190	
Zinc	Estimated effluent from unsampled storm events	—	—	—	4710	
Zinc	*Effluent Subtotal (Mean EMC x Total Runoff Volume)*			*58.0*	5417	0.019570
Zinc	Estimated Influent Load					0.022339
Zinc	**Efficiency (%)**					**12%**
Zinc	**Efficiency w/o Litter Removal (%)**					**3%**

Analyte	Media	Concentration (mg/kg)	Mass (grams)	Event Mean Concentration (ug/L)	Runoff Volume (ft^3)	Load (lbs)
Petroleum Hydrocarbons	Used StreamGuard Geotextile Fabric	333	1905.12	—	—	0.001396
Petroleum Hydrocarbons	Used StreamGuard Absorbent Material	50600	751	—	—	0.083601
Petroleum Hydrocarbons	Used StreamGuard Debris/litter/sediment	333	11067.84	—	—	0.008108
Petroleum Hydrocarbons	*Used Media Subtotal*					*0.093105*
Petroleum Hydrocarbons	Unused StreamGuard Geotextile Fabric	684	943.9	—	—	0.001420
Petroleum Hydrocarbons	Unused StreamGuard Absorbent Material	1970	443.15	—	—	0.001921
Petroleum Hydrocarbons	*Unused Media Subtotal*					*0.003341*
Petroleum Hydrocarbons	Effluent Water from 24 January 2001 storm event	—	—	500	517	
Petroleum Hydrocarbons	Effluent Water from 11 February 2001 storm event	—	—	500	190	
Petroleum Hydrocarbons	Estimated effluent from unsampled storm events	—	—	—	4710	
Petroleum Hydrocarbons	*Effluent Subtotal (Mean EMC x Total Runoff Volume)*			500.0	5417	0.168731
Petroleum Hydrocarbons	Estimated Influent Load					0.258496
Petroleum Hydrocarbons	**Efficiency (%)**					**35%**
Petroleum Hydrocarbons	**Efficiency w/o Litter Removal (%)**					**33%**

Analyte	Media	Concentration (mg/kg)	Mass (grams)	Event Mean Concentration (mg/L)	Runoff Volume (ft^3)	Load (lbs)
Sediment[1]	Used StreamGuard Geotextile Fabric	—	1905.12	—	—	4.200028
Sediment[1]	Used StreamGuard Absorbent Material	—	751	—	—	1.655655
Sediment	Used StreamGuard Debris/litter/sediment	—	11067.84	—	—	24.400160
Sediment	*Used Media Subtotal*					*30.255842*
Sediment	Unused StreamGuard Geotextile Fabric	—	943.9	—	—	2.080922
Sediment	Unused StreamGuard Absorbent Material	—	443.15	—	—	0.976968
Sediment	*Unused Media Subtotal*					*3.057890*
Sediment	Effluent Water from 24 January 2001 storm event	—	—	41	517	
Sediment	Effluent Water from 11 February 2001 storm event	—	—	52	190	
Sediment	Estimated effluent from unsampled storm events	—	—	—	4710	
Sediment	*Effluent Subtotal (Mean EMC x Total Runoff Volume)*			46.5	5417	15.692012
Sediment	Estimated Influent Load					42.889984
Sediment	**Efficiency (%)**					**63%**
Sediment	**Efficiency w/o Litter Removal (%)**					**15%**

[1] Mass of unused DII element subtracted from mass of used DII element.

Note 1: Dissolved solids fraction and gross solids fraction of effluent not accounted for in mass balance.

Note 2: Efficiencies include sediment/debris entrapped by the DII. Extensive maintenance was conducted before, during, and after storm events to clear sediment and debris from the DII. Sediment and debis removed from the DII was temporarily stored onsite and then analyzed at the same time as DII.

Note 3: Where the individual storm EMCs showed evidence of normality, the mean EMC effluent concentration was estimated by averaging individual storm EMCs.

Note 4: Where the individual storm EMCs showed evidence of non-normality, the mean EMC effluent concentration was estimated by log-transforming individual storm EMCs, averaging, and then transforming back. These EMCs are italicized.

Note 5: Flow measured continuously while DII was installed.

Note 6: Reporting Limit was used where results were "<" Reporting Limit.

Calculated by: Ed Othmer

Checked by: Chris Knoche

Worksheet 2h
Rosemead Maintenance Station StreamGuard DII % Removal Efficiency Calculations (Aggregate Method)

Analyte	Media	Concentration (mg/kg)	Mass (grams)	Event Mean Concentration (ug/L)	Runoff Volume (ft^3)	Load (lbs)
Copper	Used StreamGuard Geotextile Fabric	96.7	1610.28	—	—	0.000343
Copper	Used StreamGuard Absorbent Material	24.8	536	—	—	0.000029
Copper	Used StreamGuard Debris/litter/sediment	16.1	10387.44	—	—	0.000368
Copper	*Used Media Subtotal*					*0.000740*
Copper	Unused StreamGuard Geotextile Fabric	0.22	943.9	—	—	0.000000
Copper	Unused StreamGuard Absorbent Material	0.24	443.15	—	—	0.000000
Copper	*Unused Media Subtotal*					*0.000001*
Copper	Effluent Water from 11 October 2000 storm event	—	—	90	434	
Copper	Effluent Water from 27 October 2000 storm event	—	—	35	3185	
Copper	Effluent Water from 12 January 2001 storm event	—	—	13	13440	
Copper	Effluent Water from 24 January 2001 storm event	—	—	31	1754	
Copper	Effluent Water from 11 February 2001 storm event	—	—	22	1387	
Copper	Estimated flow volume from unsampled storm events	—	—	—	54174	
Copper	*Effluent Subtotal (Mean EMC x Total Runoff Volume)*			36.2	74374	0.176991
Copper	Estimated Influent Load					0.177730
Copper	Efficiency (%)					0%
Copper	Efficiency w/o Litter Removal (%)					0%

Analyte	Media	Concentration (mg/kg)	Mass (grams)	Event Mean Concentration (ug/L)	Runoff Volume (ft^3)	Load (lbs)
Lead	Used StreamGuard Geotextile Fabric	259	1610.28	—	—	0.000918
Lead	Used StreamGuard Absorbent Material	46.1	536	—	—	0.000054
Lead	Used StreamGuard Debris/litter/sediment	21.6	10387.44	—	—	0.000494
Lead	*Used Media Subtotal*					*0.001466*
Lead	Unused StreamGuard Geotextile Fabric	0.1	943.9	—	—	0.000000
Lead	Unused StreamGuard Absorbent Material	0.1	443.15	—	—	0.000000
Lead	*Unused Media Subtotal*					*0.000000*
Lead	Effluent Water from 11 October 2000 storm event	—	—	50	434	0
Lead	Effluent Water from 27 October 2000 storm event	—	—	25	3185	
Lead	Effluent Water from 12 January 2001 storm event	—	—	6.0	13440	
Lead	Effluent Water from 24 January 2001 storm event	—	—	39	1754	
Lead	Effluent Water from 11 February 2001 storm event	—	—	12	1387	
Lead	Estimated effluent from unsampled storm events	—	—	—	54174	
Lead	*Effluent Subtotal (Mean EMC x Total Runoff Volume)*			26.4	74374	0.122318
Lead	Estimated Influent Load					0.123784
Lead	Efficiency (%)					1%
Lead	Efficiency w/o Litter Removal (%)					1%

Analyte	Media	Concentration (mg/kg)	Mass (grams)	Event Mean Concentration (ug/L)	Runoff Volume (ft^3)	Load (lbs)
Zinc	Used StreamGuard Geotextile Fabric	1670	1610.28	—	—	0.005916
Zinc	Used StreamGuard Absorbent Material	229	536	—	—	0.000270
Zinc	Used StreamGuard Debris/litter/sediment	118	10387.44	—	—	0.002697
Zinc	*Used Media Subtotal*					*0.008883*
Zinc	Unused StreamGuard Geotextile Fabric	3.8	943.9	—	—	0.000008
Zinc	Unused StreamGuard Absorbent Material	0.6	443.15	—	—	0.000001
Zinc	*Unused Media Subtotal*					*0.000008*
Zinc	Effluent Water from 11 October 2000 storm event	—	—	1250	434	
Zinc	Effluent Water from 27 October 2000 storm event	—	—	342	3185	
Zinc	Effluent Water from 12 January 2001 storm event	—	—	129	13440	
Zinc	Effluent Water from 24 January 2001 storm event	—	—	239	1754	
Zinc	Effluent Water from 11 February 2001 storm event	—	—	190	1387	
Zinc	Estimated effluent from unsampled storm events	—	—	—	54174	
Zinc	*Effluent Subtotal (Mean EMC x Total Runoff Volume)*			301.8	74374	1.398374
Zinc	Estimated Influent Load					1.407249
Zinc	Efficiency (%)					1%
Zinc	Efficiency w/o Litter Removal (%)					0%

Analyte	Media	Concentration (mg/kg)	Mass (grams)	Event Mean Concentration (ug/L)	Runoff Volume (ft^3)	Load (lbs)
Petroleum Hydrocarbons	Used StreamGuard Geotextile Fabric	457	1610.28	—	—	0.001619
Petroleum Hydrocarbons	Used StreamGuard Absorbent Material	46400	536	—	—	0.054715
Petroleum Hydrocarbons	Used StreamGuard Debris/litter/sediment	333	10387.44	—	—	0.007610
Petroleum Hydrocarbons	*Used Media Subtotal*					*0.063944*
Petroleum Hydrocarbons	Unused StreamGuard Geotextile Fabric	684	943.9	—	—	0.001420
Petroleum Hydrocarbons	Unused StreamGuard Absorbent Material	1970	443.15	—	—	0.001921
Petroleum Hydrocarbons	*Unused Media Subtotal*					*0.003341*
Petroleum Hydrocarbons	Effluent Water from 11 October 2000 storm event	—	—	4290	434	
Petroleum Hydrocarbons	Effluent Water from 27 October 2000 storm event	—	—	1277	3185	
Petroleum Hydrocarbons	Effluent Water from 12 January 2001 storm event	—	—	500	13440	
Petroleum Hydrocarbons	Effluent Water from 24 January 2001 storm event	—	—	500	1754	
Petroleum Hydrocarbons	Effluent Water from 11 February 2001 storm event	—	—	500	1387	
Petroleum Hydrocarbons	Estimated effluent from unsampled storm events	—	—	—	54174	
Petroleum Hydrocarbons	*Effluent Subtotal (Mean EMC x Total Runoff Volume)*			1413.4	74374	6.548670
Petroleum Hydrocarbons	Estimated Influent Load					6.609272
Petroleum Hydrocarbons	Efficiency (%)					1%
Petroleum Hydrocarbons	Efficiency w/o Litter Removal (%)					1%

Analyte	Media	Concentration (mg/kg)	Mass (grams)	Event Mean Concentration (mg/L)	Runoff Volume (ft^3)	Load (lbs)
Sediment[1]	Used StreamGuard Geotextile Fabric	—	1610.28	—	—	3.550023
Sediment[1]	Used StreamGuard Absorbent Material	—	536	—	—	1.181666
Sediment	Used StreamGuard Debris/litter/sediment	—	10387.44	—	—	22.900150
Sediment	*Used Media Subtotal*					27.631839
Sediment	Unused StreamGuard Geotextile Fabric	—	943.9	—	—	2.080922
Sediment	Unused StreamGuard Absorbent Material	—	443.15	—	—	0.976968
Sediment	*Unused Media Subtotal*					3.057890
Sediment	Effluent Water from 11 October 2000 storm event	—	—	248	434	
Sediment	Effluent Water from 27 October 2000 storm event	—	—	51	3185	
Sediment	Effluent Water from 12 January 2001 storm event	—	—	121	13440	
Sediment	Effluent Water from 24 January 2001 storm event	—	—	52	1754	
Sediment	Effluent Water from 11 February 2001 storm event	—	—	45	1387	
Sediment	Estimated effluent from unsampled storm events	—	—	—	54174	
Sediment	*Effluent Subtotal (Mean EMC x Total Runoff Volume)*			103.4	74374	479.080542
Sediment	Estimated Influent Load					503.654491
Sediment	Efficiency (%)					5%
Sediment	Efficiency w/o Litter Removal (%)					0%

[1] Mass of unused DII element subtracted from mass of used DII element.

Note 1: Dissolved solids fraction and gross solids fraction of effluent not accounted for in mass balance.

Note 2: Efficiencies include sediment/debris entrapped by the DII. Extensive maintenance was conducted before, during, and after storm events to clear sediment and debris from the DII. Sediment and debis removed from the DII was temporarily stored onsite and then analyzed at the same time as DII.

Note 3: Where the individual storm EMCs showed evidence of normality, the mean EMC effluent concentration was estimated by averaging individual storm EMCs.

Note 4: Where the individual storm EMCs showed evidence of non-normality, the mean EMC effluent concentration was estimated by log-transforming individual storm EMCs, averaging, and then transforming back. These EMCs are italicized.

Note 5: Flow measured continuously while DII was installed.

Note 6: Reporting Limit was used where results were "<" Reporting Limit.

Calculated by: Ed Othmer

Checked by: Chris Knoche

Worksheet 2i
Foothill Maintenance Station Fossil Filter DII % Removal Efficiency Calculations
(Storm-by-Storm Method)

Analyte	Media	Concentration (mg/kg)	Mass (grams)	Event Mean Concentration (ug/L)	Runoff Volume (ft^3)	Load (lbs)
Copper	Used Fossil Filter Adsorbent	49.9	4898.88	—	—	0.000538
Copper	Used Fossil Filter Debris/litter/sediment	33	3719.52	—	—	0.000270
Copper	Used Media Subtotal					0.000808
Copper	Unused Fossil Filter Adsorbent	0.2	1900	—	—	0.000001
Copper	Effluent Water from 27 October 2000 storm event	—	—	27	1607	0.002703
Copper	Effluent Water from 12 January 2001 storm event	—	—	9.5	12336	0.007301
Copper	Effluent Water from 24 January 2001 storm event	—	—	19	869	0.001029
Copper	Effluent Water from 11 February 2001 storm event	—	—	9.3	7273	0.004214
Copper	Estimated effluent from unsampled storm events	—	—	16.2	10270	0.010365
Copper	Effluent Subtotal					0.025611
Copper	Estimated Influent Load					0.026418
Copper	Efficiency (%)					3%
Copper	Efficiency w/o Litter Removal (%)					2%

Analyte	Media	Concentration (mg/kg)	Mass (grams)	Event Mean Concentration (ug/L)	Runoff Volume (ft^3)	Load (lbs)
Lead	Used Fossil Filter Adsorbent	95.8	4898.88	—	—	0.001032
Lead	Used Fossil Filter Debris/litter/sediment	55.6	3719.52	—	—	0.000455
Lead	Used Media Subtotal					0.001487
Lead	Unused Fossil Filter Adsorbent	1.2	1900	—	—	0.000005
Lead	Effluent Water from 27 October 2000 storm event	—	—	5.1	1607	0.000511
Lead	Effluent Water from 12 January 2001 storm event	—	—	3.5	12336	0.002690
Lead	Effluent Water from 24 January 2001 storm event	—	—	18	869	0.000974
Lead	Effluent Water from 11 February 2001 storm event	—	—	3.0	7273	0.001359
Lead	Estimated effluent from unsampled storm events	—	—	7.4	10270	0.004734
Lead	Effluent Subtotal					0.010268
Lead	Estimated Influent Load					0.011751
Lead	Efficiency (%)					13%
Lead	Efficiency w/o Litter Removal (%)					9%

Analyte	Media	Concentration (mg/kg)	Mass (grams)	Event Mean Concentration (ug/L)	Runoff Volume (ft^3)	Load (lbs)
Zinc	Used Fossil Filter Adsorbent	413	4898.88	—	—	0.004451
Zinc	Used Fossil Filter Debris/litter/sediment	352	3719.52	—	—	0.002880
Zinc	Used Media Subtotal					0.007332
Zinc	Unused Fossil Filter Adsorbent	1.2	1900	—	—	0.000005
Zinc	Effluent Water from 27 October 2000 storm event	—	—	494	1607	0.049455
Zinc	Effluent Water from 12 January 2001 storm event	—	—	127	12336	0.097599
Zinc	Effluent Water from 24 January 2001 storm event	—	—	193	869	0.010448
Zinc	Effluent Water from 11 February 2001 storm event	—	—	53	7273	0.024014
Zinc	Estimated effluent from unsampled storm events	—	—	216.8	10270	0.138674
Zinc	Effluent Subtotal					0.320190
Zinc	Estimated Influent Load					0.327517
Zinc	Efficiency (%)					2%
Zinc	Efficiency w/o Litter Removal (%)					1%

Analyte	Media	Concentration (mg/kg)	Mass (grams)	Event Mean Concentration (ug/L)	Runoff Volume (ft^3)	Load (lbs)
Petroleum Hydrocarbons	Used Fossil Filter Adsorbent	333	4898.88	—	—	0.003589
Petroleum Hydrocarbons	Used Fossil Filter Debris/litter/sediment	333	3719.52	—	—	0.002725
Petroleum Hydrocarbons	Used Media Subtotal					0.006314
Petroleum Hydrocarbons	Unused Fossil Filter Adsorbent	26.6	1900	—	—	0.000111
Petroleum Hydrocarbons	Effluent Water from 27 October 2000 storm event	—	—	955	1607	0.095606
Petroleum Hydrocarbons	Effluent Water from 12 January 2001 storm event	—	—	500	12336	0.384248
Petroleum Hydrocarbons	Effluent Water from 24 January 2001 storm event	—	—	500	869	0.027068
Petroleum Hydrocarbons	Effluent Water from 11 February 2001 storm event	—	—	500	7273	0.226543
Petroleum Hydrocarbons	Estimated effluent from unsampled storm events	—	—	613.8	10270	0.392671
Petroleum Hydrocarbons	Effluent Subtotal					1.126136
Petroleum Hydrocarbons	Estimated Influent Load					1.132338
Petroleum Hydrocarbons	Efficiency (%)					1%
Petroleum Hydrocarbons	Efficiency w/o Litter Removal (%)					0%

Analyte	Media	Concentration (mg/kg)	Mass (grams)	Event Mean Concentration (mg/L)	Runoff Volume (ft^3)	Load (lbs)
Sediment[1]	Used Fossil Filter Adsorbent	—	4898.88	—	—	10.800071
Sediment	Used Fossil Filter Debris/litter/sediment	—	3719.52	—	—	8.200054
Sediment	Used Media Subtotal					19.000125
Sediment	Unused Fossil Filter Adsorbent	—	1900	—	—	4.188740
Sediment	Effluent Water from 27 October 2000 storm event	—	—	24	1607	2.402669
Sediment	Effluent Water from 12 January 2001 storm event	—	—	23	12336	17.675392
Sediment	Effluent Water from 24 January 2001 storm event	—	—	27	869	1.461674
Sediment	Effluent Water from 11 February 2001 storm event	—	—	24	7273	10.874059
Sediment	Estimated effluent from unsampled storm events	—	—	24.5	10270	15.674850
Sediment	Effluent Subtotal					48.088643
Sediment	Estimated Influent Load					62.900028
Sediment	Efficiency (%)					24%
Sediment	Efficiency w/o Litter Removal (%)					12%

[1] Mass of unused DII element subtracted from mass of used DII element.

Note 1: Dissolved solids fraction and gross solids fraction of effluent not accounted for in mass balance.

Note 2: Each Fossil Filter DII used approximately 1900 grams of adsorbent material.

Note 3: Efficiencies include sediment/debris entrapped by the DII. Extensive maintenance was conducted before, during, and after storm events to clear sediment and debris from the DII. Sediment and debis removed from the DII was temporarily stored onsite and then analyzed at the same time as DII.

Note 4: Where the individual storm EMCs showed evidence of normality, the unsampled effluent concentration was estimated by averaging individual storm EMCs.

Note 5: Where the individual storm EMCs showed evidence of non-normality, the unsampled effluent concentration was estimated by log-transforming individual storm EMCs, averaging, and then transforming back. These EMCs are italicized.

Note 6: Flow measured continuously while DII was installed.

Note 7: Reporting Limit was used where results were "<" Reporting Limit.

Calculated by: Ed Othmer

Checked by: Chris Knoche

Worksheet 2j
Las Flores Maintenance Station Fossil Filter DII % Removal Efficiency Calculations (Storm-by-Storm Method)

Analyte	Media	Concentration (mg/kg)	Mass (grams)	Event Mean Concentration (ug/L)	Runoff Volume (ft^3)	Load (lbs)
Copper	Used Fossil Filter Adsorbent	22.2	11816.28	—	—	0.000577
Copper	Used Fossil Filter Debris/litter/sediment	22.3	11589.48	—	—	0.000569
Copper	Used Media Subtotal					0.001146
Copper	Unused Fossil Filter Adsorbent	0.2	1900	—	—	0.000001
Copper	Effluent Water from 27 October 2000 storm event	—	—	25	2533	0.003935
Copper	Effluent Water from 8 January 2001 storm event	—	—	43	619	0.001658
Copper	Effluent Water from 12 January 2001 storm event	—	—	5.9	8222	0.003022
Copper	Effluent Water from 24 January 2001 storm event	—	—	26	3384	0.005481
Copper	Effluent Water from 11 February 2001 storm event	—	—	7.6	984	0.000466
Copper	Estimated effluent from unsampled storm events	—	—	21.5	26686	0.035722
Copper	Effluent Subtotal					0.050284
Copper	Estimated Influent Load					0.051429
Copper	Efficiency (%)					2%
Copper	Efficiency w/o Litter Removal (%)					1%

Analyte	Media	Concentration (mg/kg)	Mass (grams)	Event Mean Concentration (ug/L)	Runoff Volume (ft^3)	Load (lbs)
Lead	Used Fossil Filter Adsorbent	16.2	11816.28	—	—	0.000421
Lead	Used Fossil Filter Debris/litter/sediment	24.1	11589.48	—	—	0.000614
Lead	Used Media Subtotal					0.001036
Lead	Unused Fossil Filter Adsorbent	1.2	1900	—	—	0.000005
Lead	Effluent Water from 27 October 2000 storm event	—	—	15	2533	0.002438
Lead	Effluent Water from 8 January 2001 storm event	—	—	8.6	619	0.000332
Lead	Effluent Water from 12 January 2001 storm event	—	—	2.1	8222	0.001076
Lead	Effluent Water from 24 January 2001 storm event	—	—	5.0	3384	0.001054
Lead	Effluent Water from 11 February 2001 storm event	—	—	1.7	984	0.000104
Lead	Estimated effluent from unsampled storm events	—	—	6.6	26686	0.010923
Lead	Effluent Subtotal					0.015927
Lead	Estimated Influent Load					0.016957
Lead	Efficiency (%)					6%
Lead	Efficiency w/o Litter Removal (%)					3%

Analyte	Media	Concentration (mg/kg)	Mass (grams)	Event Mean Concentration (ug/L)	Runoff Volume (ft^3)	Load (lbs)
Zinc	Used Fossil Filter Adsorbent	147	11816.28	—	—	0.003821
Zinc	Used Fossil Filter Debris/litter/sediment	274	11589.48	—	—	0.006986
Zinc	Used Media Subtotal					0.010808
Zinc	Unused Fossil Filter Adsorbent	1.2	1900	—	—	0.000005
Zinc	Effluent Water from 27 October 2000 storm event	—	—	358	2533	0.056478
Zinc	Effluent Water from 8 January 2001 storm event	—	—	460	619	0.017738
Zinc	Effluent Water from 12 January 2001 storm event	—	—	46	8222	0.023561
Zinc	Effluent Water from 24 January 2001 storm event	—	—	59	3384	0.012438
Zinc	Effluent Water from 11 February 2001 storm event	—	—	57	984	0.003494
Zinc	Estimated effluent from unsampled storm events	—	—	196.0	26686	0.325812
Zinc	Effluent Subtotal					0.439521
Zinc	Estimated Influent Load					0.450324
Zinc	Efficiency (%)					2%
Zinc	Efficiency w/o Litter Removal (%)					1%

Analyte	Media	Concentration (mg/kg)	Mass (grams)	Event Mean Concentration (ug/L)	Runoff Volume (ft^3)	Load (lbs)
Petroleum Hydrocarbons	Used Fossil Filter Adsorbent	333	11816.28	—	—	0.008857
Petroleum Hydrocarbons	Used Fossil Filter Debris/litter/sediment	360	11589.48	—	—	0.009179
Petroleum Hydrocarbons	Used Media Subtotal					0.017835
Petroleum Hydrocarbons	Unused Fossil Filter Adsorbent	26.6	1900	—	—	0.000111
Petroleum Hydrocarbons	Effluent Water from 27 October 2000 storm event	—	—	1283	2533	0.202379
Petroleum Hydrocarbons	Effluent Water from 8 January 2001 storm event	—	—	1897	619	0.073152
Petroleum Hydrocarbons	Effluent Water from 12 January 2001 storm event	—	—	500	8222	0.256103
Petroleum Hydrocarbons	Effluent Water from 24 January 2001 storm event	—	—	500	3384	0.105406
Petroleum Hydrocarbons	Effluent Water from 11 February 2001 storm event	—	—	500	984	0.030650
Petroleum Hydrocarbons	Estimated effluent from unsampled storm events	—	—	935.9	26686	1.555900
Petroleum Hydrocarbons	Effluent Subtotal					2.223590
Petroleum Hydrocarbons	Estimated Influent Load					2.241314
Petroleum Hydrocarbons	Efficiency (%)					1%
Petroleum Hydrocarbons	Efficiency w/o Litter Removal (%)					0%

Analyte	Media	Concentration (mg/kg)	Mass (grams)	Event Mean Concentration (mg/L)	Runoff Volume (ft^3)	Load (lbs)
Sediment[1]	Used Fossil Filter Adsorbent	—	11816.28	—	—	26.050171
Sediment	Used Fossil Filter Debris/litter/sediment	—	11589.48	—	—	25.550168
Sediment	Used Media Subtotal					51.600338
Sediment	Unused Fossil Filter Adsorbent	—	1900	—	—	4.188740
Sediment	Effluent Water from 27 October 2000 storm event	—	—	157	2533	24.821949
Sediment	Effluent Water from 8 January 2001 storm event	—	—	98	619	3.779058
Sediment	Effluent Water from 12 January 2001 storm event	—	—	73	8222	37.391009
Sediment	Effluent Water from 24 January 2001 storm event	—	—	76	3384	16.021761
Sediment	Effluent Water from 11 February 2001 storm event	—	—	48	984	2.942410
Sediment	Estimated effluent from unsampled storm events	—	—	90.5	26686	150.386446
Sediment	Effluent Subtotal					235.342653
Sediment	Estimated Influent Load					282.754251
Sediment	Efficiency (%)					17%
Sediment	Efficiency w/o Litter Removal (%)					8%

[1] Mass of unused DII element subtracted from mass of used DII element.

Note 1: Dissolved solids fraction and gross solids fraction of effluent not accounted for in mass balance.

Note 2: Each Fossil Filter DII used approximately 1900 grams of adsorbent material.

Note 3: Efficiencies include sediment/debris entrapped by the DII. Extensive maintenance was conducted before, during, and after storm events to clear sediment and debris from the DII. Sediment and debis removed from the DII was temporarily stored onsite and then analyzed at the same time as DII.

Note 4: Where the individual storm EMCs showed evidence of normality, the unsampled effluent concentration was estimated by averaging individual storm EMCs.

Note 5: Where the individual storm EMCs showed evidence of non-normality, the unsampled effluent concentration was estimated by log-transforming individual storm EMCs, averaging, and then transforming back. These EMCs are italicized.

Note 6: Flow measured continuously while DII was installed.

Note 7: Reporting Limit was used where results were "<" Reporting Limit.

Calculated by: Ed Othmer

Checked by: Chris Knoche

Worksheet 2k
Rosemead Maintenance Station Fossil Filter DII % Removal Efficiency Calculations (Storm-by-Storm Method)

Analyte	Media	Concentration (mg/kg)	Mass (grams)	Event Mean Concentration (ug/L)	Runoff Volume (ft^3)	Load (lbs)
Copper	Used Fossil Filter Adsorbent	41.3	5601.96	—	—	0.000509
Copper	Used Fossil Filter Debris/litter/sediment	53.7	14356.44	—	—	0.001696
Copper	Used Media Subtotal					0.002205
Copper	Unused Fossil Filter Adsorbent	0.2	1900	—	—	0.000001
Copper	Effluent Water from 11 October 2000 storm event	—	—	68	79	0.000433
Copper	Effluent Water from 27 October 2000 storm event	—	—	45	737	0.002066
Copper	Effluent Water from 12 January 2001 storm event	—	—	14	3974	0.003466
Copper	Effluent Water from 24 January 2001 storm event	—	—	24	383	0.000573
Copper	Effluent Water from 11 February 2001 storm event	—	—	16	236	0.000235
Copper	Estimated effluent from unsampled storm events	—	—	37.4	18243	0.042504
Copper	Effluent Subtotal					0.049277
Copper	Estimated Influent Load					0.051482
Copper	Efficiency (%)					4%
Copper	Efficiency w/o Litter Removal (%)					1%

Analyte	Media	Concentration (mg/kg)	Mass (grams)	Event Mean Concentration (ug/L)	Runoff Volume (ft^3)	Load (lbs)
Lead	Used Fossil Filter Adsorbent	74.6	5601.96	—	—	0.000919
Lead	Used Fossil Filter Debris/litter/sediment	60.4	14356.44	—	—	0.001908
Lead	Used Media Subtotal					0.002827
Lead	Unused Fossil Filter Adsorbent	1.2	1900	—	—	0.000005
Lead	Effluent Water from 11 October 2000 storm event	—	—	55	79	0.000271
Lead	Effluent Water from 27 October 2000 storm event	—	—	25	737	0.001148
Lead	Effluent Water from 12 January 2001 storm event	—	—	6.9	3974	0.001708
Lead	Effluent Water from 24 January 2001 storm event	—	—	12	383	0.000286
Lead	Effluent Water from 11 February 2001 storm event	—	—	9.0	236	0.000132
Lead	Estimated effluent from unsampled storm events	—	—	21.6	18243	0.024525
Lead	Effluent Subtotal					0.028071
Lead	Estimated Influent Load					0.030893
Lead	Efficiency (%)					9%
Lead	Efficiency w/o Litter Removal (%)					3%

Analyte	Media	Concentration (mg/kg)	Mass (grams)	Event Mean Concentration (ug/L)	Runoff Volume (ft^3)	Load (lbs)
Zinc	Used Fossil Filter Adsorbent	543	5601.96	—	—	0.006692
Zinc	Used Fossil Filter Debris/litter/sediment	755	14356.44	—	—	0.023846
Zinc	Used Media Subtotal					0.030538
Zinc	Unused Fossil Filter Adsorbent	1.2	1900	—	—	0.000005
Zinc	Effluent Water from 11 October 2000 storm event	—	—	1070	79	0.005266
Zinc	Effluent Water from 27 October 2000 storm event	—	—	522	737	0.023967
Zinc	Effluent Water from 12 January 2001 storm event	—	—	212	3974	0.052484
Zinc	Effluent Water from 24 January 2001 storm event	—	—	329	383	0.007850
Zinc	Effluent Water from 11 February 2001 storm event	—	—	255	236	0.003749
Zinc	Estimated effluent from unsampled storm events	—	—	477.6	18243	0.542784
Zinc	Effluent Subtotal					0.636100
Zinc	Estimated Influent Load					0.666633
Zinc	Efficiency (%)					5%
Zinc	Efficiency w/o Litter Removal (%)					1%

Analyte	Media	Concentration (mg/kg)	Mass (grams)	Event Mean Concentration (ug/L)	Runoff Volume (ft^3)	Load (lbs)
Petroleum Hydrocarbons	Used Fossil Filter Adsorbent	333	5601.96	—	—	0.004104
Petroleum Hydrocarbons	Used Fossil Filter Debris/litter/sediment	333	14356.44	—	—	0.010518
Petroleum Hydrocarbons	Used Media Subtotal					0.014622
Petroleum Hydrocarbons	Unused Fossil Filter Adsorbent	26.6	1900	—	—	0.000111
Petroleum Hydrocarbons	Effluent Water from 11 October 2000 storm event	—	—	895	79	0.004405
Petroleum Hydrocarbons	Effluent Water from 27 October 2000 storm event	—	—	692	737	0.031772
Petroleum Hydrocarbons	Effluent Water from 12 January 2001 storm event	—	—	500	3974	0.123784
Petroleum Hydrocarbons	Effluent Water from 24 January 2001 storm event	—	—	500	383	0.011930
Petroleum Hydrocarbons	Effluent Water from 11 February 2001 storm event	—	—	500	236	0.007351
Petroleum Hydrocarbons	Estimated effluent from unsampled storm events	—	—	617.4	18243	0.701665
Petroleum Hydrocarbons	Effluent Subtotal					0.880906
Petroleum Hydrocarbons	Estimated Influent Load					0.895417
Petroleum Hydrocarbons	Efficiency (%)					2%
Petroleum Hydrocarbons	Efficiency w/o Litter Removal (%)					0%

Analyte	Media	Concentration (mg/kg)	Mass (grams)	Event Mean Concentration (mg/L)	Runoff Volume (ft^3)	Load (lbs)
Sediment[1]	Used Fossil Filter Adsorbent	—	5601.96	—	—	12.350081
Sediment	Used Fossil Filter Debris/litter/sediment	—	14356.44	—	—	31.650208
Sediment	Used Media Subtotal					44.000289
Sediment	Unused Fossil Filter Adsorbent	—	1900	—	—	4.188740
Sediment	Effluent Water from 11 October 2000 storm event	—	—	150	79	0.738219
Sediment	Effluent Water from 27 October 2000 storm event	—	—	42	737	1.928340
Sediment	Effluent Water from 12 January 2001 storm event	—	—	94	3974	23.271403
Sediment	Effluent Water from 24 January 2001 storm event	—	—	18	383	0.429475
Sediment	Effluent Water from 11 February 2001 storm event	—	—	44	236	0.646892
Sediment	Estimated effluent from unsampled storm events	—	—	69.6	18243	79.099248
Sediment	Effluent Subtotal					106.113577
Sediment	Estimated Influent Load					145.925125
Sediment	Efficiency (%)					27%
Sediment	Efficiency w/o Litter Removal (%)					7%

[1] Mass of unused DII element subtracted from mass of used DII element.

Note 1: Dissolved solids fraction and gross solids fraction of effluent not accounted for in mass balance.

Note 2: Each Fossil Filter DII used approximately 1900 grams of adsorbent material.

Note 3: Efficiencies include sediment/debris entrapped by the DII. Extensive maintenance was conducted before, during, and after storm events to clear sediment and debris from the DII. Sediment and debis removed from the DII was temporarily stored onsite and then analyzed at the same time as DII.

Note 4: Where the individual storm EMCs showed evidence of normality, the unsampled effluent concentration was estimated by averaging individual storm EMCs.

Note 5: Where the individual storm EMCs showed evidence of non-normality, the unsampled effluent concentration was estimated by log-transforming individual storm EMCs, averaging, and then transforming back. These EMCs are italicized.

Note 6: Flow measured continuously while DII was installed.

Note 7: Reporting Limit was used where results were "<" Reporting Limit.

Calculated by: Ed Ohmer

Checked by: Chris Knoche

Worksheet 2I
Foothill Maintenance Station Fossil Filter DII % Removal Efficiency Calculations
(Aggregate Method)

Analyte	Media	Concentration (mg/kg)	Mass (grams)	Event Mean Concentration (ug/L)	Runoff Volume (ft^3)	Load (lbs)
Copper	Used Fossil Filter Adsorbent	49.9	4898.88	—	—	0.000538
Copper	Used Fossil Filter Debris/litter/sediment	33	3719.52	—	—	0.000270
Copper	Used Media Subtotal					0.000808
Copper	Unused Fossil Filter Adsorbent	0.2	1900	—	—	0.000001
Copper	Effluent Water from 27 October 2000 storm event	—	—	27	1607	
Copper	Effluent Water from 12 January 2001 storm event	—	—	9.5	12336	
Copper	Effluent Water from 24 January 2001 storm event	—	—	19	869	
Copper	Effluent Water from 11 February 2001 storm event	—	—	9.3	7273	
Copper	Estimated effluent from unsampled storm events	—	—	—	10270	
Copper	Effluent Subtotal (Mean EMC x Total Runoff Volume)			16.2	32355	0.032653
Copper	Estimated Influent Load					0.033460
Copper	Efficiency (%)					2%
Copper	Efficiency w/o Litter Removal (%)					2%

Analyte	Media	Concentration (mg/kg)	Mass (grams)	Event Mean Concentration (ug/L)	Runoff Volume (ft^3)	Load (lbs)
Lead	Used Fossil Filter Adsorbent	95.8	4898.88	—	—	0.001032
Lead	Used Fossil Filter Debris/litter/sediment	55.6	3719.52	—	—	0.000455
Lead	Used Media Subtotal					0.001487
Lead	Unused Fossil Filter Adsorbent	1.2	1900	—	—	0.000005
Lead	Effluent Water from 27 October 2000 storm event	—	—	5.1	1607	
Lead	Effluent Water from 12 January 2001 storm event	—	—	3.5	12336	
Lead	Effluent Water from 24 January 2001 storm event	—	—	18	869	
Lead	Effluent Water from 11 February 2001 storm event	—	—	3.0	7273	
Lead	Estimated effluent from unsampled storm events	—	—	—	10270	
Lead	Effluent Subtotal (Mean EMC x Total Runoff Volume)			7.4	32355	0.014916
Lead	Estimated Influent Load					0.016398
Lead	Efficiency (%)					9%
Lead	Efficiency w/o Litter Removal (%)					6%

Analyte	Media	Concentration (mg/kg)	Mass (grams)	Event Mean Concentration (ug/L)	Runoff Volume (ft^3)	Load (lbs)
Zinc	Used Fossil Filter Adsorbent	413	4898.88	—	—	0.004451
Zinc	Used Fossil Filter Debris/litter/sediment	352	3719.52	—	—	0.002880
Zinc	Used Media Subtotal					0.007332
Zinc	Unused Fossil Filter Adsorbent	1.2	1900	—	—	0.000005
Zinc	Effluent Water from 27 October 2000 storm event	—	—	494	1607	
Zinc	Effluent Water from 12 January 2001 storm event	—	—	127	12336	
Zinc	Effluent Water from 24 January 2001 storm event	—	—	193	869	
Zinc	Effluent Water from 11 February 2001 storm event	—	—	53	7273	
Zinc	Estimated effluent from unsampled storm events	—	—	—	10270	
Zinc	Effluent Subtotal (Mean EMC x Total Runoff Volume)			216.8	32355	0.436885
Zinc	Estimated Influent Load					0.444212
Zinc	Efficiency (%)					2%
Zinc	Efficiency w/o Litter Removal (%)					1%

Analyte	Media	Concentration (mg/kg)	Mass (grams)	Event Mean Concentration (ug/L)	Runoff Volume (ft^3)	Load (lbs)
Petroleum Hydrocarbons	Used Fossil Filter Adsorbent	333	4898.88	—	—	0.003589
Petroleum Hydrocarbons	Used Fossil Filter Debris/litter/sediment	333	3719.52	—	—	0.002725
Petroleum Hydrocarbons	Used Media Subtotal					0.006314
Petroleum Hydrocarbons	Unused Fossil Filter Adsorbent	26.6	1900	—	—	0.000111
Petroleum Hydrocarbons	Effluent Water from 27 October 2000 storm event	—	—	955	1607	
Petroleum Hydrocarbons	Effluent Water from 12 January 2001 storm event	—	—	500	12336	
Petroleum Hydrocarbons	Effluent Water from 24 January 2001 storm event	—	—	500	869	
Petroleum Hydrocarbons	Effluent Water from 11 February 2001 storm event	—	—	500	7273	
Petroleum Hydrocarbons	Estimated effluent from unsampled storm events	—	—	—	10270	
Petroleum Hydrocarbons	Effluent Subtotal (Mean EMC x Total Runoff Volume)			613.8	32355	1.237086
Petroleum Hydrocarbons	Estimated Influent Load					1.243288
Petroleum Hydrocarbons	Efficiency (%)					0%
Petroleum Hydrocarbons	Efficiency w/o Litter Removal (%)					0%

Analyte	Media	Concentration (mg/kg)	Mass (grams)	Event Mean Concentration (mg/L)	Runoff Volume (ft^3)	Load (lbs)
Sediment[1]	Used Fossil Filter Adsorbent	—	4898.88	—	—	10.800071
Sediment	Used Fossil Filter Debris/litter/sediment	—	3719.52	—	—	8.200054
Sediment	Used Media Subtotal					19.000125
Sediment	Unused Fossil Filter Adsorbent	—	1900	—	—	4.188740
Sediment	Effluent Water from 27 October 2000 storm event	—	—	24	1607	
Sediment	Effluent Water from 12 January 2001 storm event	—	—	23	12336	
Sediment	Effluent Water from 24 January 2001 storm event	—	—	27	869	
Sediment	Effluent Water from 11 February 2001 storm event	—	—	24	7273	
Sediment	Estimated effluent from unsampled storm events	—	—	—	10270	
Sediment	Effluent Subtotal (Mean EMC x Total Runoff Volume)			24.5	32355	49.382644
Sediment	Estimated Influent Load					64.194029
Sediment	Efficiency (%)					23%
Sediment	Efficiency w/o Litter Removal (%)					12%

[1] Mass of unused DII element subtracted from mass of used DII element.

Note 1: Dissolved solids fraction and gross solids fraction of effluent not accounted for in mass balance.

Note 2: Each Fossil Filter DII used approximately 1900 grams of adsorbent material.

Note 3: Efficiencies include sediment/debris entrapped by the DII. Extensive maintenance was conducted before, during, and after storm events to clear sediment and debris from the DII. Sediment and debis removed from the DII was temporarily stored onsite and then analyzed at the same time as DII.

Note 4: Where the individual storm EMCs showed evidence of normality, the mean EMC effluent concentration was estimated by averaging individual storm EMCs.

Note 5: Where the individual storm EMCs showed evidence of non-normality, the mean EMC effluent concentration was estimated by log-transforming individual storm EMCs, averaging, and then transforming back. These EMCs are italicized.

Note 6: Flow measured continuously while DII was installed.

Note 7: Reporting Limit was used where results were "<" Reporting Limit.

Calculated by: Ed Othmer

Checked by: Chris Knoche

Worksheet 2m
Las Flores Maintenance Station Fossil Filter DII % Removal Efficiency Calculations (Aggregate Method)

Analyte	Media	Concentration (mg/kg)	Mass (grams)	Event Mean Concentration (ug/L)	Runoff Volume (ft^3)	Load (lbs)
Copper	Used Fossil Filter Adsorbent	22.2	11816.28	—	—	0.000577
Copper	Used Fossil Filter Debris/litter/sediment	22.3	11589.48	—	—	0.000569
Copper	Used Media Subtotal					0.001146
Copper	Unused Fossil Filter Adsorbent	0.2	1900	—	—	0.000001
Copper	Effluent Water from 27 October 2000 storm event	—	—	25	2533	
Copper	Effluent Water from 8 January 2001 storm event	—	—	43	619	
Copper	Effluent Water from 12 January 2001 storm event	—	—	5.9	8222	
Copper	Effluent Water from 24 January 2001 storm event	—	—	26	3384	
Copper	Effluent Water from 11 February 2001 storm event	—	—	7.6	984	
Copper	Estimated effluent from unsampled storm events	—	—	—	26686	
Copper	Effluent Subtotal (Mean EMC x Total Runoff Volume)			21.5	42428	0.056794
Copper	Estimated Influent Load					0.057939
Copper	Efficiency (%)					2%
Copper	Efficiency w/o Litter Removal (%)					1%

Analyte	Media	Concentration (mg/kg)	Mass (grams)	Event Mean Concentration (ug/L)	Runoff Volume (ft^3)	Load (lbs)
Lead	Used Fossil Filter Adsorbent	16.2	11816.28	—	—	0.000421
Lead	Used Fossil Filter Debris/litter/sediment	24.1	11589.48	—	—	0.000614
Lead	Used Media Subtotal					0.001036
Lead	Unused Fossil Filter Adsorbent	1.2	1900	—	—	0.000005
Lead	Effluent Water from 27 October 2000 storm event	—	—	15	2533	
Lead	Effluent Water from 8 January 2001 storm event	—	—	8.6	619	
Lead	Effluent Water from 12 January 2001 storm event	—	—	2.1	8222	
Lead	Effluent Water from 24 January 2001 storm event	—	—	5.0	3384	
Lead	Effluent Water from 11 February 2001 storm event	—	—	1.7	984	
Lead	Estimated effluent from unsampled storm events	—	—	—	26686	
Lead	Effluent Subtotal (Mean EMC x Total Runoff Volume)			6.6	42428	0.017366
Lead	Estimated Influent Load					0.018397
Lead	Efficiency (%)					6%
Lead	Efficiency w/o Litter Removal (%)					2%

Analyte	Media	Concentration (mg/kg)	Mass (grams)	Event Mean Concentration (ug/L)	Runoff Volume (ft^3)	Load (lbs)
Zinc	Used Fossil Filter Adsorbent	147	11816.28	—	—	0.003821
Zinc	Used Fossil Filter Debris/litter/sediment	274	11589.48	—	—	0.006986
Zinc	Used Media Subtotal					0.010808
Zinc	Unused Fossil Filter Adsorbent	1.2	1900	—	—	0.000005
Zinc	Effluent Water from 27 October 2000 storm event	—	—	358	2533	
Zinc	Effluent Water from 8 January 2001 storm event	—	—	460	619	
Zinc	Effluent Water from 12 January 2001 storm event	—	—	46	8222	
Zinc	Effluent Water from 24 January 2001 storm event	—	—	59	3384	
Zinc	Effluent Water from 11 February 2001 storm event	—	—	57	984	
Zinc	Estimated effluent from unsampled storm events	—	—	—	26686	
Zinc	Effluent Subtotal (Mean EMC x Total Runoff Volume)			196.0	42428	0.518007
Zinc	Estimated Influent Load					0.528810
Zinc	Efficiency (%)					2%
Zinc	Efficiency w/o Litter Removal (%)					1%

Analyte	Media	Concentration (mg/kg)	Mass (grams)	Event Mean Concentration (ug/L)	Runoff Volume (ft^3)	Load (lbs)
Petroleum Hydrocarbons	Used Fossil Filter Adsorbent	333	11816.28	—	—	0.008657
Petroleum Hydrocarbons	Used Fossil Filter Debris/litter/sediment	360	11589.48	—	—	0.009179
Petroleum Hydrocarbons	Used Media Subtotal					0.017835
Petroleum Hydrocarbons	Unused Fossil Filter Adsorbent	26.6	1900	—	—	0.000111
Petroleum Hydrocarbons	Effluent Water from 27 October 2000 storm event	—	—	1283	2533	
Petroleum Hydrocarbons	Effluent Water from 8 January 2001 storm event	—	—	1897	619	
Petroleum Hydrocarbons	Effluent Water from 12 January 2001 storm event	—	—	500	8222	
Petroleum Hydrocarbons	Effluent Water from 24 January 2001 storm event	—	—	500	3384	
Petroleum Hydrocarbons	Effluent Water from 11 February 2001 storm event	—	—	500	984	
Petroleum Hydrocarbons	Estimated effluent from unsampled storm events	—	—	—	26686	
Petroleum Hydrocarbons	Effluent Subtotal (Mean EMC x Total Runoff Volume)			935.9	42428	2.473721
Petroleum Hydrocarbons	Estimated Influent Load					2.491445
Petroleum Hydrocarbons	Efficiency (%)					1%
Petroleum Hydrocarbons	Efficiency w/o Litter Removal (%)					0%

Analyte	Media	Concentration (mg/kg)	Mass (grams)	Event Mean Concentration (mg/L)	Runoff Volume (ft^3)	Load (lbs)
Sediment[1]	Used Fossil Filter Adsorbent	—	11816.28	—	—	26.050171
Sediment	Used Fossil Filter Debris/litter/sediment	—	11589.48	—	—	25.550168
Sediment	Used Media Subtotal					51.600338
Sediment	Unused Fossil Filter Adsorbent	—	1900	—	—	4.188740
Sediment	Effluent Water from 27 October 2000 storm event	—	—	157	2533	
Sediment	Effluent Water from 8 January 2001 storm event	—	—	98	619	
Sediment	Effluent Water from 12 January 2001 storm event	—	—	73	8222	
Sediment	Effluent Water from 24 January 2001 storm event	—	—	76	3384	
Sediment	Effluent Water from 11 February 2001 storm event	—	—	48	984	
Sediment	Estimated effluent from unsampled storm events	—	—	—	26686	
Sediment	Effluent Subtotal (Mean EMC x Total Runoff Volume)			90.5	42428	239.099007
Sediment	Estimated Influent Load					286.510606
Sediment	Efficiency (%)					17%
Sediment	Efficiency w/o Litter Removal (%)					8%

[1] Mass of unused DII element subtracted from mass of used DII element.

Note 1: Dissolved solids fraction and gross solids fraction of effluent not accounted for in mass balance.

Note 2: Each Fossil Filter DII used approximately 1900 grams of adsorbent material.

Note 3: Efficiencies include sediment/debris entrapped by the DII. Extensive maintenance was conducted before, during, and after storm events to clear sediment and debris from the DII. Sediment and debis removed from the DII was temporarily stored onsite and then analyzed at the same time as DII.

Note 4: Where the individual storm EMCs showed evidence of normality, the mean EMC effluent concentration was estimated by averaging individual storm EMCs.

Note 5: Where the individual storm EMCs showed evidence of non-normality, the mean EMC effluent concentration was estimated by log-transforming individual storm EMCs, averaging, and then transforming back. These EMCs are italicized.

Note 6: Flow measured continuously while DII was installed.

Note 7: Reporting Limit was used where results were "<" Reporting Limit.

Calculated by: Ed Othmer

Checked by: Chris Knoche

Worksheet 2n
Rosemead Maintenance Station Fossil Filter DII % Removal Efficiency Calculations (Aggregate Method)

Analyte	Media	Concentration (mg/kg)	Mass (grams)	Event Mean Concentration (ug/L)	Runoff Volume (ft^3)	Load (lbs)
Copper	Used Fossil Filter Adsorbent	41.3	5601.96	—	—	0.000509
Copper	Used Fossil Filter Debris/litter/sediment	53.7	14356.44	—	—	0.001696
Copper	Used Media Subtotal					0.002205
Copper	Unused Fossil Filter Adsorbent	0.2	1900	—	—	0.000001
Copper	Effluent Water from 11 October 2000 storm event	—	—	88	79	
Copper	Effluent Water from 27 October 2000 storm event	—	—	45	737	
Copper	Effluent Water from 12 January 2001 storm event	—	—	14	3974	
Copper	Effluent Water from 24 January 2001 storm event	—	—	24	383	
Copper	Effluent Water from 11 February 2001 storm event	—	—	16	236	
Copper	Estimated effluent from unsampled storm events	—	—	—	18243	
Copper	Effluent Subtotal (Mean EMC x Total Runoff Volume)			37.4	23652	0.055107
Copper	Estimated Influent Load					0.057311
Copper	Efficiency (%)					4%
Copper	Efficiency w/o Litter Removal (%)					1%

Analyte	Media	Concentration (mg/kg)	Mass (grams)	Event Mean Concentration (ug/L)	Runoff Volume (ft^3)	Load (lbs)
Lead	Used Fossil Filter Adsorbent	74.6	5601.96	—	—	0.000919
Lead	Used Fossil Filter Debris/litter/sediment	60.4	14356.44	—	—	0.001908
Lead	Used Media Subtotal					0.002827
Lead	Unused Fossil Filter Adsorbent	1.2	1900	—	—	0.000005
Lead	Effluent Water from 11 October 2000 storm event	—	—	55	79	
Lead	Effluent Water from 27 October 2000 storm event	—	—	25	737	
Lead	Effluent Water from 12 January 2001 storm event	—	—	6.9	3974	
Lead	Effluent Water from 24 January 2001 storm event	—	—	12	383	
Lead	Effluent Water from 11 February 2001 storm event	—	—	9.0	236	
Lead	Estimated effluent from unsampled storm events	—	—	—	18243	
Lead	Effluent Subtotal (Mean EMC x Total Runoff Volume)			21.6	23652	0.031797
Lead	Estimated Influent Load					0.034619
Lead	Efficiency (%)					8%
Lead	Efficiency w/o Litter Removal (%)					3%

Analyte	Media	Concentration (mg/kg)	Mass (grams)	Event Mean Concentration (ug/L)	Runoff Volume (ft^3)	Load (lbs)
Zinc	Used Fossil Filter Adsorbent	543	5601.96	—	—	0.006692
Zinc	Used Fossil Filter Debris/litter/sediment	755	14356.44	—	—	0.023846
Zinc	Used Media Subtotal					0.030538
Zinc	Unused Fossil Filter Adsorbent	1.2	1900	—	—	0.000005
Zinc	Effluent Water from 11 October 2000 storm event	—	—	1070	79	
Zinc	Effluent Water from 27 October 2000 storm event	—	—	522	737	
Zinc	Effluent Water from 12 January 2001 storm event	—	—	212	3974	
Zinc	Effluent Water from 24 January 2001 storm event	—	—	329	383	
Zinc	Effluent Water from 11 February 2001 storm event	—	—	255	236	
Zinc	Estimated effluent from unsampled storm events	—	—	—	18243	
Zinc	Effluent Subtotal (Mean EMC x Total Runoff Volume)			477.6	23652	0.703719
Zinc	Estimated Influent Load					0.734252
Zinc	Efficiency (%)					4%
Zinc	Efficiency w/o Litter Removal (%)					1%

Analyte	Media	Concentration (mg/kg)	Mass (grams)	Event Mean Concentration (ug/L)	Runoff Volume (ft^3)	Load (lbs)
Petroleum Hydrocarbons	Used Fossil Filter Adsorbent	333	5601.96	—	—	0.004104
Petroleum Hydrocarbons	Used Fossil Filter Debris/litter/sediment	333	14356.44	—	—	0.010518
Petroleum Hydrocarbons	Used Media Subtotal					0.014622
Petroleum Hydrocarbons	Unused Fossil Filter Adsorbent	26.6	1900	—	—	0.000111
Petroleum Hydrocarbons	Effluent Water from 11 October 2000 storm event	—	—	895	79	
Petroleum Hydrocarbons	Effluent Water from 27 October 2000 storm event	—	—	692	737	
Petroleum Hydrocarbons	Effluent Water from 12 January 2001 storm event	—	—	500	3974	
Petroleum Hydrocarbons	Effluent Water from 24 January 2001 storm event	—	—	500	383	
Petroleum Hydrocarbons	Effluent Water from 11 February 2001 storm event	—	—	500	236	
Petroleum Hydrocarbons	Estimated effluent from unsampled storm events	—	—	—	18243	
Petroleum Hydrocarbons	Effluent Subtotal (Mean EMC x Total Runoff Volume)			617.4	23652	0.909707
Petroleum Hydrocarbons	Estimated Influent Load					0.924217
Petroleum Hydrocarbons	Efficiency (%)					2%
Petroleum Hydrocarbons	Efficiency w/o Litter Removal (%)					0%

Analyte	Media	Concentration (mg/kg)	Mass (grams)	Event Mean Concentration (mg/L)	Runoff Volume (ft^3)	Load (lbs)
Sediment[1]	Used Fossil Filter Adsorbent	—	5601.96	—	—	12.350081
Sediment	Used Fossil Filter Debris/litter/sediment	—	14356.44	—	—	31.650208
Sediment	Used Media Subtotal					44.000289
Sediment	Unused Fossil Filter Adsorbent	—	1900	—	—	4.188740
Sediment	Effluent Water from 11 October 2000 storm event	—	—	150	79	
Sediment	Effluent Water from 27 October 2000 storm event	—	—	42	737	
Sediment	Effluent Water from 12 January 2001 storm event	—	—	94	3974	
Sediment	Effluent Water from 24 January 2001 storm event	—	—	18	383	
Sediment	Effluent Water from 11 February 2001 storm event	—	—	44	236	
Sediment	Estimated effluent from unsampled storm events	—	—	—	18243	
Sediment	Effluent Subtotal (Mean EMC x Total Runoff Volume)			69.6	23652	102.551960
Sediment	Estimated Influent Load					142.363308
Sediment	Efficiency (%)					28%
Sediment	Efficiency w/o Litter Removal (%)					7%

[1] Mass of unused DII element subtracted from mass of used DII element.

Note 1: Dissolved solids fraction and gross solids fraction of effluent not accounted for in mass balance.

Note 2: Each Fossil Filter DII used approximately 1900 grams of adsorbent material.

Note 3: Efficiencies include sediment/debris entrapped by the DII. Extensive maintenance was conducted before, during, and after storm events to clear sediment and debris from the DII. Sediment and debis removed from the DII was temporarily stored onsite and then analyzed at the same time as DII.

Note 4: Where the individual storm EMCs showed evidence of normality, the mean EMC effluent concentration was estimated by averaging individual storm EMCs.

Note 5: Where the individual storm EMCs showed evidence of non-normality, the mean EMC effluent concentration was estimated by log-transforming individual storm EMCs, averaging, and then transforming back. These EMCs are italicized.

Note 6: Flow measured continuously while DII was installed.

Note 7: Reporting Limit was used where results were "<" Reporting Limit.

Calculated by: Ed Ohmer

Checked by: Chris Knoche

2.0 BMP OPERATIONS

Performance assessments of BMP operations were determined using empirical observations (Form H of the OMM Volume II *Field Guidance Notebooks*). Empirical observations were taken at variable times during monitored events. Field crews assessed BMP operations at the beginning, middle and end of a storm event. Traffic, weather and sufficient light sometimes limited these observations.

Observations generally provided information on the following:

- Present meteorological characteristics;
- Rainfall (start times and intensity indication);
- Hydrologic and hydraulic characteristics (flowing and/or standing water, channelization);
- Water level;
- Inlet conditions (problems affecting performance);
- Evidence of debris (organic or trash), scouring, resuspension or erosion ;
- Description of amount and location of sediment accumulation;
- Water quality appearance (visual, olfactory);
- Vegetation condition;
- Outlet conditions (problems affecting performance); and
- Structural condition of facility.

Other site-specific observations were taken according to the checklists present in Form H.

2.1 BMPs Evaluated

Tables 2-1a through 2-1e summarize empirical observations of BMP performance. An overall review of each BMP is provided following each table. More detail on BMP operations is available at the following web site: http://www.rbf.com/caltrans/.

2.1.1 Biofiltration Strips

Table 2-1a: Comparison of Biofiltration Strip Operational Performance

Site	No. of Observed Events	Hydrologic/ Hydraulic Characteristics	Inlet Conditions	Water Quality	Solids Deposition/ Resuspension	Erosion	Vegetation	Outlet	Comments
Altadena Maintenance Station Strip (73211a)	7	Functioned as designed.	During peak flow rates, runoff flowed from facility directly into spreader ditch bypassing the flume.	Less suspended solids were observed in the effluent compared to influent.	Sediment was deposited in the spreader ditch.	No notable observations.	Vegetation met the 90% coverage requirement.	Functioned as designed.	Spreader ditch required dewatering after each rain event.
I-605/SR-91 Strip (73222a)	6	Functioned as designed. No outlet flow occurred during 1 of 6 observed events due to infiltration.	Functioned as designed.	Less suspended solids were observed in the effluent compared to influent.	Trash and debris accumulated at the asphalt/vegetation interface.	No notable observations.	Vegetation met the 90% coverage requirement. Gophers caused a few small bare patches. Two transplanted areas had good coverage of vegetation.	Functioned as designed.	Majority of runoff entering the strip infiltrated.

Overall Review of Biofiltration Strips

During various periods, vegetation color changed from green to yellow and then to brown in some cases but density was always maintained. As of May 2000, all the strips had over 90 percent cover of vegetation. However, both strips, specifically the one at Altadena Maintenance Stations were overrun with either weedy species and/or species form the erosion control mix. This year the above average rainfall favored weedy species over the saltgrass at sites with any adjacent fast-growing vegetation such as weeds or the designated erosion control species. Disturbance within the strips also allowed weedy species to invade. The exception to this pattern was the I-605/SR-91 strip, where the saltgrass remained dense with only minimal weeds.

While saltgrass is an excellent competitor in moist saline soils, saltgrass does not appear to be a good competitor against winter weeds in soils that are not saline and that are not naturally moist or irrigated. Therefore, it is likely that winter weeds such as annual grasses would eventually out-compete saltgrass without intensive maintenance in the non saline soils generally found in the strips.

Saltgrass needs irrigation to establish at a minimum during initial planting. Once established, saltgrass continues to grow without irrigation mainly in the more coastal areas where temperatures are cooler and foggy conditions allow the grass to persist through the summer months.

The erosion control mix contained many of the species that were originally considered for the strips before the issue of timing and achieving the 90 percent cover requirement forced the saltgrass sod specification. The erosion control mix was designed to germinate quickly and is composed of both annual and perennial species. With modification, this mix may prove to be more effective over a broader range of conditions than saltgrass.

Altadena Maintenance Station Biofiltration Strip

During September 2000 the salt grass was brown. This was probably due to inland sites being drier and hotter. The vegetation consultant visited the site on May 2, 2001. The consultant noted that this strip had been over run by weedy species. The site was mowed per the maintenance schedule in January before the majority of rain fell this season. Thus, the timing of the rains and maintenance favored the annual grasses and weedy broadleaf species more than the saltgrass. Approximately half of the site was vegetated by weedy annual grasses (Bromus diandrus, Hordeum leporinum, Bromus mollis, Lolium sp, Avena sp.) as well as broadleaf weeds (Sonchus oleraceus and Cornopus didymus). The remainder of the strip was covered in bermuda grass (Cyndon dactylon). There were two small areas of saltgrass left in the middle of the strip. With the weedy species included, the strip met the vegetation cover requirements.

One of the necessary design features of the Altadena Maintenance Station Strip is a spreader ditch, which collects and uniformly distributes water across the strip. To prevent mosquito breeding, stormwater that remained in the collector ditch was drained following each storm event.

During each monitored event, flow was uniformly distributed across the strip. No channelization or ponding was observed. At the beginning of the wet season, there was more infiltration than at the end; this is attributed to soil moisture and rainfall/runoff intensity.

I-605/SR-91 Biofiltration Strip

During the September 11, 2000 site visit the vegetation consultant noted that the strip met the required vegetative cover with virtually all the strip being vegetated. Approximately 80 percent of the vegetation was in an active green growing condition. The other 20 percent of the salt grass had some green blades and but was likely dormant. Following the May 2, 2001 site visit, the consultant noted that the strip had the required vegetative cover with virtually all of the strip vegetated with saltgrass. There were some annual grasses in the strip that appeared to develop around disturbed soil from gopher activity. No other species were immediately upwind of the strip, which may have been the main difference in relation to saltgrass cover between this strip and the two swales in the nearby vicinity. It should be noted that this site had fewer weeds that could be wind blown into the strip since it was immediately adjacent to the roadway. The prevailing wind from weather and traffic came from the direction of the roadway, thus few weed seeds were either wind blown or washed into the strip.

Errant drivers running off the I-605/SR-91 connector continued to be a problem. On at least one occasion, a vehicle ran off the road (accidentally) and drove across the strip before the beginning of the storm season. Following the accident, the site was inspected. Other than the salt grass being compacted by the tires, no other damage to the strip was observed.

During each monitored event, flow was uniformly distributed across the strip. Throughout the wet season, most of the runoff infiltrated before reaching the strip's outlet. When flow was perceptible across the strip, no channelization or ponding was observed. During intense rainfall, flow would bypass down the side channel and flow was not uniform into the strip. During intense rainfall period's flow favored the middle and southern areas of the strip. During period's of low rainfall intensity the thick vegetation along the asphalt/biofilter interface prevented flow from passing into the strip; instead flow would be channeled along the asphalt/biofilter interface. Also of note is that trash and debris tended to collect at the asphalt/biofilter interface.

2.1.2 Biofiltration Swales

Table 2-1b: Comparison of Biofiltration Swale Operational Performance

Site	No. of Observed Events	Hydrologic/ Hydraulic Characteristics	Inlet Conditions	Water Quality	Solids Deposition/ Resuspension	Erosion	Vegetation	Outlet	Comments
I-605/SR-91 Swale (73222b)	7	Functioned as designed; flow would only reach the effluent end of the swale during intense rainfall. No outlet flow occurred during 4 of 7 events observed due to infiltration. Flow bypassed the effluent end of the swale due to numerous gopher burrows. Flow would exit after the monitoring flume.	Functioned as designed.	Less suspended solids were observed in the effluent compared to influent.	Trash and debris accumulated in the energy dissipater and at the concrete spreader/biofilter interface inlet. Generally trash and debris accumulated in the upper quarter of the swale.	Soil above the headwall of the inlet pipe eroded and accumulated into the energy dissipater.	Vegetation met the 90% coverage requirement. Side slope coverage was >70%. Gophers caused a few small bare patches.	Growth of vegetation in channel downstream of swale constricted flow causing backflow towards swale outlet.	Runoff infiltrated through gopher holes near the effluent area.

Table 2-1b: Comparison of Biofiltration Swale Operational Performance (continued)

Site	No. of Observed Events	Hydrologic/ Hydraulic Characteristics	Inlet Conditions	Water Quality	Solids Deposition/ Resuspension	Erosion	Vegetation	Outlet	Comments
Cerritos Maintenance Station Swale (73223)	7	Flow bypassed through gopher holes in the side slope and invert during 5 of 7 events. There was preferential flow through portions of the swale because of lacking vegetation. No outlet flow occurred during 2 of 7 events due to infiltration and bypass through gopher holes.	Operated normally.	More suspended solids observed in effluent during some events because of bare areas caused by gophers.	Trash and debris accumulated in the energy dissipater and in the first quarter of the swale. Most sediment was deposited in the energy dissipater.	Erosion within the swale and along the north side slope caused by gophers. Eroded areas were further aggravated during storm events when runoff bypassed through gopher holes.	Vegetation met the 90% coverage requirement through December. Coverage has been less than 90% from January to end of season due to erosion caused by gopher activity but has grown back to over 90% coverage. Additionally, side slope coverage had less than 70% due to gopher activity.	Gopher holes at biofilter/ concrete collector channel caused flow bypass.	In general the structural integrity of the swale was compromised because of gopher problem. To mitigate gopher problems, a steel screen was installed in the middle of the berm to a depth of two feet to serve as a gopher barrier. The steel screen did not mitigate the gopher problem. Installed erosion control blanket on the berm side slopes and top and seeded to control erosion.

Table 2-1b: Comparison of Biofiltration Swale Operational Performance (concluded)

I-5/I-605 Swale (73224)	7	Flow bypassed through gopher hole near middle of the swale. No outlet flow occurred during 1 of 7 observed events.	Functioned as designed.	Less suspended solids were observed in the effluent compared to influent.	Trash and debris accumulated in the energy dissipater and at the concrete spreader/biofilter interface. Sediment accumulated in the energy dissipater.	Erosion occurred down the middle of the swale during the large storm event of January, 10, 2001 which was enhanced because of gopher activity.	Vegetation met the 90% coverage requirement through December 2000 but fell below 90% from January through the end of the season but has since grown back to over 90% coverage. Side slope coverage > 70%. A few small bare spots in swale caused by gophers.	Gopher hole near effluent end caused flow bypass during last event.	Runoff infiltrated through gopher holes. Gopher holes were repaired routinely. Erosion of the side slope was repaired.
I-605 at Carson Swale (73225)	8	Functioned as designed. Runoff from freeway embankment discharged into swale over the sideslopes of the swale. No outlet flow occurred during 1 of 8 observed events.	Functioned as designed.	Less suspended solids were observed in the effluent compared to influent.	Trash and debris accumulated in the energy dissipater and at the concrete spreader/biofilter interface. Trash usually accumulated in the first quarter of the swale.	None.	Vegetation met the 90% coverage requirement for the bottom and the side slope met the 70% requirement.	Functioned as designed.	None.

Overall Review of Biofiltration Swales

During various periods, vegetation color changed from green to yellow and then to brown in some cases but density was always maintained. As of May 2000, all the swales had over 90 percent cover of vegetation. However, all swales were overrun with either weedy species and/or species form the erosion control mix. This year the above average rainfall favored weedy species over the saltgrass at sites with any adjacent fast-growing vegetation such as weeds or the designated erosion control species. Disturbance within the swales also allowed weedy species to invade.

While saltgrass is an excellent competitor in moist saline soils, saltgrass does not appear to be a good competitor against winter weeds in soils that are not saline and that are not naturally moist or irrigated. Therefore, it is likely that winter weeds such as annual grasses would eventually out-compete saltgrass without intensive maintenance in the non saline soils generally found in the swales.

Saltgrass needs irrigation to establish at a minimum during initial planting. Once established, saltgrass continues to grow without irrigation mainly in the more coastal areas where temperatures are cooler and foggy conditions allow the grass to persist through the summer months.

The erosion control mix contained many of the species that were originally considered for the swales before the issue of timing and achieving the 90 percent cover requirement forced the saltgrass sod specification. The erosion control mix was designed to germinate quickly and is composed of both annual and perennial species. With modification, this mix may prove to be more effective over a broader range of conditions than saltgrass.

I-605/SR-91 Biofiltration Swale

In September of 2000 the vegetation consultant noted the swale had the required vegetative cover and less than one percent of the swale was not vegetated. Approximately 60 percent of the vegetation was in an active green growing condition. The area of the swale at the downstream end had the most green vegetation, but the rhizomes in other areas appeared to be alive and were likely dormant. In May of 2001 the vegetation consultant noted that the swale had the required vegetative cover including saltgrass, erosion control species and weedy species. Saltgrass persisted throughout the swale; however, there were dense areas of annual weeds in the center of the swale. Erosion control species (Hordeum californicum, Hordeum vulgare, and Bromus arizonicus) occurred mainly at either end of the swale. Weedy species, mainly annual grasses (Bromus diandrus, Hordeum leporinum, Bromus mollis, Lolium sp, Avena sp.) and some broadleaf weeds (Sonchus oleraceus, Latuca serriola and Chenopodium album) were found throughout the swale.

At the I-605/SR-91 Swale, gophers persistently burrowed through the swale. To minimize channelization and/or ponding, the gopher burrows were filled and compacted.

During each monitored event, flow was uniformly distributed across the swale. Throughout the wet season, most of the runoff infiltrated before reaching the swale's outlet. When flow was perceptible across the swale, no channelization or ponding was

observed. The vegetation in the downstream channel had grown enough to restrict flow, causing flow to backflow towards the swale. A team of technicians promptly enlarged the downstream channel and cut-back the vegetation so the flow was not restricted. Also of note is that trash and debris tended to collect in the energy dissipater and at the concrete spreader/biofilter interface.

Cerritos Maintenance Station Biofiltration Swale

In September of 2000, the vegetation consultant noted that the swale had the required vegetative coverage and approximately 70 percent of the vegetation was in an active green growing condition. The majority of the vegetation was bermuda grass (Cyndon dactylon) with some saltgrass. The bermuda grass had been weeded from the swale but continued to invade the site and had out-competed the saltgrass. In May of 2001, the vegetation consultant noted species from the erosion mix and weedy species. As noted during the last inspection, the majority of the vegetation was bermuda grass (Cyndon dactylon) with only a small amount of saltgrass. Additionally, species from the erosion control mix (Hordeum californicum, Hordeum vulgare, and Bromus arizonicus) as well as weedy species were found in the site (Bromus diandrus, Hordeum leporinum, Bromus mollis, Lolium sp, Avena sp., Malva parviflora). Saltgrass was out-competed at this site mainly by the bermuda grass.

At the Cerritos Maintenance Station Swale, gophers persistently burrowed through the swale. Damaged caused by the gophers was so extensive that the swale's structural integrity was compromised. During storm events, the gopher problem became worse because runoff infiltrated through previously filled in gopher holes causing extensive erosion. In addition to the swale's structural problems, vegetation cover fell below the 90 percent criteria during portions of the wet season because of the gopher problem. Unlike other swales in the BMP Pilot Study, the Cerritos Maintenance Station Swale was constructed in fill material to establish an appropriate flow line. Instead of the swale's side slopes being at lower elevation than the surrounding topography (as at the other swales), one of the swale's side slopes was constructed completely of fill material.

During each monitored event, flow was uniformly distributed across the swale in vegetated areas. Where there was lacking vegetation preferential flow was observed. Also of note is that trash and debris tended to collect in the energy dissipater and in the first quarter of the swale, with most of the sediment settling out in the energy dissipater.

I-5/I-605 Biofiltration Swale

In September of 2000, the vegetation consultant noted that the site was mainly vegetated by bermuda grass. Approximately 10 percent of the site was in an active growing state and approximately 5 percent of the area was bare. All the actively growing grass was bermuda grass. Approximately 50 percent of the saltgrass rhizomes sampled were dead. In May of 2001, the vegetation consultant noted that the site was still mainly vegetated by bermuda grass and other weedy species including annual grasses (Bromus diandrus, Hordeum leporinum, Bromus mollis, Lolium sp, Avena sp.) and broadleaf weeds (Sonchus oleraceus, Chenopodium album and Erodium cicutarium). Additionally, species from the erosion mix (Nassella pulchra, Hordeum californicum, and Bromus arizonicus) appeared throughout the swale.

At the I-5/I-605 Swale, gophers persistently burrowed through the swale. Consequently, flow would bypass through these holes and enhance erosion of the central area of the swale. To minimize channelization and/or ponding, the gopher burrows were backfilled and compacted.

During each monitored event, flow was uniformly distributed across the swale. Throughout the first portion of the wet season, most of the runoff infiltrated before reaching the swale's outlet. When flow was perceptible across the swale, no channelization or ponding was observed. Also of note is that trash and debris tended to collect in the energy dissipater and at the concrete spreader/biofilter interface.

I-605 at Carson Biofiltration Swale

In September of 2000, the vegetation consultant noted that the swale met the required vegetative cover and less than one percent of the swale was not covered. Approximately 80 percent of the vegetation was in an active green growing condition. The lower half of the swale had the most green vegetation, but rhizomes in other areas appeared to be alive and are likely dormant. There was some bermuda grass in the swale toward the middle and at the outlet end. There were several species of weeds along the edges of the swale, but none were a problem at that time. In May of 2001, the vegetation consultant noted that the swale met the required vegetative cover including weedy species. The bermuda grass noted in the last site review had increased in cover, while the saltgrass had decreased. Additionally, some of the species from the erosion control mix (Nassella pulchra, Hordeum californicum, and Bromus arizonicus) developed in the swale. Other weedy species included annual grasses and broadleaf weeds (Sonchus oleraceus and Malva parviflora).

During each monitored event, flow was uniformly distributed across the swale. Throughout the first portion of the wet season, most of the runoff infiltrated before reaching the swale's outlet. When flow was perceptible across the swale, no channelization or ponding was observed. Also of note is that trash and debris tended to collect in the energy dissipater and at the concrete spreader/biofilter.

2.1.3 Extended Detention Basins

Table 2-1c: Comparison of Extended Detention Basin Operational Performance

Site	No. of Observed Events	Hydrologic/ Hydraulic Characteristics	Inlet Conditions	Water Quality	Solids Deposition/ Resuspension	Erosion	Vegetation	Outlet	Comments
I-5/I-605 EDB (074101)	7	Functioned as designed; Overflow occurred during 1 of 7 observed events.	Functioned as designed.	Less suspended solids were observed in the effluent compared to influent.	Trash and debris accumulated in the southern area of the EDB basin. Resuspension of sediment during storms because of lack of inlet energy dissipation. Localized deposits of sediment accumulated near the northwest corner and southern end of the basin. During overflow conditions floatables had the opportunity to discharge through the effluent structure.	Soil at the eastern slope near the I-5 had eroded and accumulated into the EDB basin due to lack of vegetative cover..	Grasses covered approximately 95 to 100% of the top of the berm and slopes. Gophers caused a few small bare patches.	Functioned as designed.	The outlet structure was modified to prevent standing water conditions.

Table 2-1c: Comparison of Extended Detention Basin Operational Performance (concluded)

Site	No. of Observed Events	Hydrologic/ Hydraulic Characteristics	Inlet Conditions	Water Quality	Solids Deposition/ Resuspension	Erosion	Vegetation	Outlet	Comments
I-605/SR-91 EDB (074102)	8	Functioned as designed; Overflow occurred during 1 of 8 observed events. Some of the flow infiltrated.	Functioned as designed.	Less suspended solids were observed in the effluent compared to influent.	Trash and debris accumulated in the rock energy dissipater.	None.	A few small bare spots in the EDB and slopes were caused by gophers.	Functioned as designed.	None.

Overall Review of EDBs

I-5/I-605 EDB

During each monitored event, flow was uniformly distributed across the basin. When flow was perceptible across the basin ponding was not observed. Also of note is that trash and debris tended to collect in the southern end of the basin near the outlet structure and its rock energy dissipater. During periods of heavy rainfall trash and debris discharged out of the EDB through the effluent overflow.

The quantity of trash and debris, left in the southern end of the EDB basin near the effluent outlet structure, had increased dramatically following the January 10, 2001 storm event.

On January 31, 2001, the outlet structure was modified to prevent ponding water.

I-605/SR-91 EDB

During each monitored event, flow was uniformly distributed across the EDB basin. During smaller storms, most of the runoff infiltrated before reaching the EDB outlet. When flow was perceptible across the EDB, no channelization or ponding was observed. Also of note is that trash and debris tended to collect in the rock energy dissipater.

2.1.4 Sand Filters – Austin Type

Table 2-1d: Comparison of Sand Filter – Austin Type Operational Performance

Site	No. of Observed Events	Hydrologic/ Hydraulic Characteristics	Inlet Conditions	Water Quality	Solids Deposition/ Resuspension	Erosion	Vegetation	Outlet	Comments
Eastern Sand Filter (074202)	7	Generally functioned as designed. Bypass was observed during 1 of 7 events because of BMP capacity being exceeded during large storm events. As sediment accumulated on the filer media, the loading rate decreased and the drain times increased. A noticeable increase in loading rate was observed during events after the sediment had been removed from the sand bed.	Functioned as designed.	Inlet water conditions commonly had a scummy film and oily sheen and was brown. Less suspended solids were observed in the effluent compared to influent.	Due to turbulence, resuspension of solids was common below the inlet discharge pipe of the sedimentation basin. Very little trash and debris accumulated in the sedimentation basin.	None.	A few small weeds grew in the filter media. They were removed during regularly scheduled maintenance activities.	Functioned as designed; however, the pump failed during one storm event and was replaced.	The effluent sump pump was replace once. Replaced gunnysacks and added new gravel. To avoid vapor lock, a 1/8 inch hole was drilled in the effluent discharge pipe. The orifices located in the standpipe that allowed stormwater to flow from the sedimentation basin to the filter media were enlarged from 1/2 inch to 5/8 inch to increase the flow rate and minimize blocking.

Table 2-1d: Comparison of Sand Filter – Austin Type Operational Performance (continued)

Site	No. of Observed Events	Hydrologic/ Hydraulic Characteristics	Inlet Conditions	Water Quality	Solids Deposition/ Resuspension	Erosion	Vegetation	Outlet	Comments
Foothill Sand Filer (074203)	8	Generally functioned as designed. Bypass was observed during 1 of 8 events because of BMP capacity being exceeded during large storm events. As sediment accumulated on the filer media, the loading rate decreased and the drain times increased. A noticeable increase in loading rate was observed during events after the sediment had been removed from the sand bed.	Functioned as designed.	Inlet water conditions commonly had a scummy film and oily sheen. Less suspended solids were observed in the effluent compared to influent.	Due to turbulence, resuspension of solids was common below the inlet discharge pipe of the sedimentation basin. Sediment, small twigs and leaves blocked the orifices of the standpipe on numerous occasions. The orifices were cleared of debris several times during the last two storm events.	None.	A few small weeds grew in the filter media. They were removed during regularly scheduled maintenance activities.	Functioned as designed.	Replaced gunnysacks and new gravel. Vapor lock of the sump pump occurred during the January 11, 2001 storm event. This was later corrected by drilling a 1/8 inch hole in the discharge pipe. The orifices located in the standpipe that allowed stormwater to flow from the sedimentation basin to the filter media were enlarged from 1/2 inch to 5/8 inch to increase the flow rate and minimize blocking.

Table 2-1d: Comparison of Sand Filter – Austin Type Operational Performance (concluded)

Site	No. of Observed Events	Hydrologic/ Hydraulic Characteristics	Inlet Conditions	Water Quality	Solids Deposition/ Resuspension	Erosion	Vegetation	Outlet	Comments
Termination Sand Filter (074204)	7	Generally functioned as designed. Bypass was observed during 4 of 7 events because of BMP capacity being exceeded during large storm events. As sediment accumulated on the filer media, the loading rate decreased and the drain times increased. A noticeable increase in loading rate was observed during events after the sediment had been removed from the sand bed.	Functioned as designed. Initially flow was not always uniformly distributed due to the build up of sediment and debris in the sedimentation basin.	Inlet water conditions commonly had a scummy film. Less suspended solids were observed in the effluent compared to influent. Small pockets of oil floated to the surface and spread out in the sedimentation basin.	Due to turbulence, resuspension of solids was common below the inlet discharge pipe of the sedimentation basin. Compared to the other two sand filter sites, Termination had the most accumulated sediment and leaves, however blockages of the orifices was not as common as Foothill. Fruit was thrown into the basin by pedestrians walking by the facility.	None.	A few small weeds grew in the filter media. They were removed during regularly scheduled maintenance activities.	Functioned as designed; however, the pump failed during the January 8, 2001 storm event and was replaced but the replacement pump also failed. The pump was eventually replaced on January 15, 2001.	A new power source for the sump pump was established to eliminate power fluctuations. Replaced gunnysacks and added new gravel. To avoid vapor lock, a 1/8 inch hole was drilled in the effluent discharge pipe. The orifices located in the standpipe that allows stormwater to flow from the sedimentation basin to the filter media were enlarged from 1/2 inch to 5/8 inch to increase the flow rate and minimize blocking.

Overall Review of Sand Filters – Austin Type

Initial operational problems with the sand filters included several occasions of sump pump failures during storm events and one site had a power supply problem due to fluctuating current and below normal power levels. Where pumps had failed standing water conditions occurred and the stormwater would equalize between the basins. On one occasion at the Foothill Sand Filter, the pump failed, however it was determined that the pump had experienced a condition known as vapor lock. To avoid this from occurring in the future a small hole was drilled in the effluent pipe at each sand filter site to allow the treated stormwater to drop back into the sump when the sump pump was not operational. Vapor lock problems were not observed during the remainder of the season at all the sand filter sites.

Gunnysacks were replaced and new gravel added and replaced around the standpipes to prevent debris from blocking the drain holes on November 2, 2001. A modification that enhanced the performance of the sand filter included enlarging the drain holes in the standpipe from 1/2 inch to 5/8 inch on February 9, 2001.

Additionally, as the wet season progressed and sediment accumulated on the filter media, the loading rate decreased and the drain times increased. When the loading rate decreased standing water was usually present on the sand filter and the v-notched weir plate would typically become partially or fully submerged. Due to the drainage time exceeding 48 hours and/or the loading rate dropping below 9 feet per day, the upper 2 inches of sand and the crust were removed from the top of the filter media at all three filter media sites from April 2 through April 3, 2001. Follow these maintenance activities the loading rate increased and the drainage time decreased to fall below the MID thresholds.

During large storm events the capacity of the sand filters were exceeded and bypass would occur. Some residual stormwater was present in each filter media between storm events. The residual stormwater would collect in the sump and was pumped out prior to each storm event.

The treated water quality appearance was generally good. The solids, high turbidity, scummy films and oil and grease sheen observed in the influent stormwater was not observed in the effluent stream.

Eastern Regional Maintenance Station Sand Filter

This sand filter received the least amount of trash and debris and sediment in the sedimentation basin. Also of note is that sediment tended to collect near the standpipe. The sump pump failed once during the season and was replaced with a rebuilt pump.

Foothill Maintenance Station Sand Filter

Small twigs and leaves blocked the drain holes in the standpipe at this site. Subsequently, the drain holes were cleaned several times during the last two storm events. Other than the vapor lock, the pump was operational during the remainder of the wet season.

Termination Park & Ride Sand Filter

A new sump pump was installed at the beginning of the wet season. The sump pump failed during the January 8, 2001 storm event and was replaced with a rebuilt pump but it also failed. Eventually the pump was replaced with another rebuilt pump on January 15, 2001; this pump did not fail during the remainder of the stormwater season.

To provide adequate power to the sump pump, a new power source was established on November 10, 2000. Since this change, the sump pump has been operational with the exception that on a few occasions the circuit breaker had "tripped" during operation of the BMP.

2.1.5 Multi-chambered Treatment Trains

Table 2-1e: Comparison of Multi-chambered Treatment Train Operational Performance

Site	No. of Observed Events	Hydrologic/ Hydraulic Characteristics	Inlet Conditions	Water Quality	Solids Deposition/ Resuspension	Erosion	Vegetation	Outlet	Comments
Via Verde MCTT (074206)	5	Generally functioned as designed. Bypass did not occur during the season. By pass may not have occurred possibly due to the leak in the sedimentation chamber and pipe from the grit chamber to the sedimentation chamber.	Functioned as designed. Grit chamber was modified by removing the plastic packing and replacing it with a 1/4 inch mesh screen to prevent trash and debris from entering the sedimentation chamber.	Inlet water conditions commonly had a scummy film and oily sheen and was brown. Less suspended solids were observed in the effluent compared to influent.	Very little trash and debris accumulated in the sedimentation chamber.	No erosion occurred; however the slope adjacent to the BMP was inspected for instability potential due to stormwater leaking from the BMP.	None.	Functioned as designed. Due to over hanging branches, tree trimmings and leaves were often found on the filter media. Material was removed during regularly scheduled maintenance activities.	New absorbent booms were installed at the beginning of the storm season. The BMP had a leak at the beginning of the season. The outlet of the inlet pipe to the sedimentation chamber was sealed in an attempt to repair the leak. The BMP still leaked so the sedimentation chamber was waterproofed. After waterproofing the sedimentation chamber, the pipe connecting the grit chamber and the sedimentation chamber was tested. This pipe leaked. The pipe was slip-lined on 3/17/00 and was back online on 3/19/01. To prevent mosquito breeding, an aluminum cover was installed over the sedimentation chamber.

Table 2-1e: Comparison of Multi-chambered Treatment Train Operational Performance (Concluded)

Site	No. of Observed Events	Hydrologic/ Hydraulic Characteristics	Inlet Conditions	Water Quality	Solids Deposition/ Resuspension	Erosion	Vegetation	Outlet	Comments
Lakewood MCTT (074208)	6	Generally functioned as designed. Bypass was observed during 1 of 6 events because of BMP capacity being exceeded during large storm events.	Functioned as designed. Grit chamber was modified by removing the plastic packing and replacing it with a 1/4 inch mesh screen to prevent trash and debris from entering the sedimentation chamber.	Inlet water conditions commonly had a scummy film and oily sheen and was brown. Less suspended solids were observed in the effluent compared to influent.	Trash and debris would commonly accumulate in the sedimentation chamber. The trash and debris did not enter the sedimentation chamber through the grit chamber, but would instead enter the sedimentation chamber by the wind or from people throwing trash into it. During one large storm event, the force of the influent stormwater coming from the grit chamber dislodged one settling tube located adjacent to the inlet pipe.	None.	Wetland weeds grew on the absorbent booms in the settling basin. They were removed during regularly scheduled maintenance activities.	Functioned as designed; however, the pump would fail during the evening while the Park & Ride lights were on.	New absorbent booms were installed at the beginning of the storm season. Transfer of stormwater from the sedimentation chamber to the filter media basin could only be performed during day light hours. No upgrades were performed on the electrical system. To prevent mosquito breeding, an aluminum cover was installed over the sedimentation chamber..

Overall Review of MCTTs

Because these devices are designed to retain water in the sedimentation chamber for proper operation, residual stormwater from previous storm events was always present in each BMP. The level of the residual water was maintained approximately one foot above the settling tubes to facilitate mosquito monitoring by the vector control agencies. To prevent mosquito breeding in the sedimentation chamber, aluminum covers were installed at each site during February. During large rainfall events overflow weirs in the diversion structures routed bypass flow to the storm drain as designed.

Water quality improved following treatment. The effluent water was generally free of solids and visible oil and grease sheen.

Via Verde MCTT

During each monitored event, the Via Verde MCTT generally operated according to design. However the BMP had a leak. The outlet of the inlet pipe to the sedimentation chamber was sealed in an attempt to stop the leak. Following that repair the BMP still leaked. The sedimentation chamber was subsequently lined with a waterproof coating. The inlet pipe was also tested and was found to leak. The inlet pipe was slip-lined. Since the pipe was slip-lined, the basin has not leaked.

Lakewood MCTT

During each monitored event, the Lakewood MCTT generally operated according to design. However, due to power and current fluctuations the BMP pumps could only be operated during day light hours. The settling basin always had trash, due mostly to being wind-blown or thrown in by people.

2.1.6 CDS Units

Table 2-f: Comparison of CDS Unit Operational Performance

Site	No. of Observed Events	Hydrologic/ Hydraulic Characteristics	Inlet Conditions	Water Quality	Solids Deposition/ Resuspension	Erosion	Vegetation	Outlet	Comments
Orcas CDS (073102)	9	Generally functioned as designed. Bypass was observed during 1 of 9 events because the downstream mosquito-proofing bag impeded flow through the CDS unit.	Functioned as designed during designed flows. Due to the small inlet from the weir box to the CDS unit, relatively large pieces of debris, such as a foam plate, would create a blockage. This generally occurred during long dry periods between storm events.	Inlet water conditions commonly had a scummy film and oily sheen and was brown. On a few occasions an oily sheen was observed to a lesser extent in the effluent. Less suspended solids were observed in the effluent compared to influent.	Due to site-specific conditions of the drainage area, trash and debris would generally consist of organic materials. During one large storm event, the quantity of debris and trash in the downstream mosquito-proofing bag had blocked flow out of the CDS unit causing stormwater to bypass the CDS unit through the top of the weir box. Sediment would accumulate in the weir box. Very fine sediment would accumulate in the H-flume.	None.	None.	Function as designed. Large quantities of debris, which had collected in the downstream mosquito-proofing bag impeded flow through the CDS unit. Modification to the mosquito-proofing bag prevented this from re-occurring.	Several modifications were made to prevent mosquitoes from breeding. See below for details.

Table 2-1f: Comparison of CDS Unit Operational Performance (Concluded)

Site	No. of Observed Events	Hydrologic/ Hydraulic Characteristics	Inlet Conditions	Water Quality	Solids Deposition/ Resuspension	Erosion	Vegetation	Outlet	Comments
Filmore CDS (073103)	9	Generally functioned as designed. Bypass was observed during 1 of 9 events because the downstream mosquito-proofing bag impeded flow through the CDS unit.	Functioned as designed. Due to the small inlet from the weir box to the CDS unit, relatively large pieces of debris, such as a foam plate, would create a blockage. This generally occurred during long dry periods between storm events. Smaller quantities of trash and debris were observed in the latter part of the wet season.	Inlet water conditions commonly had a scummy film and oily sheen and was brown. On a few occasions an oily sheen was observed to a lesser extent in the effluent. Less suspended solids were observed in the effluent compared to influent.	During one large storm event, the quantity of debris and trash in the downstream mosquito-proofing bag had blocked flow out of the CDS unit causing stormwater to bypass the CDS unit through the top of the weir box. Sediment would accumulate in the weir box. Very fine sediment would accumulate in the H-flume.	Erosion around the outside of the CDS unit occurred from water overtopping the CDS unit during the large storm event on January 10, 2001.	None.	Functioned as designed.	Several modifications were made to prevent mosquitoes from breeding. See below for details.

Overall Review of the CDS Units

During the early part of the wet season several significant modifications were completed. These included removing the CDS screens and installing CDS separation screens with larger openings. In early October 2000, CDS Technologies replaced the existing screen at Orcas with a 2.4-mm opening screen and replaced the existing screen at Filmore with a 4.7-mm opening screen.

Because these devices are designed to retain water in the sump for proper operation, residual stormwater was always present in each BMP prior to each stormwater event. The residual water also facilitated the vector control agencies to monitor mosquito populations. During the early part of the storm monitoring season both CDS units breeded mosquitoes. To prevent mosquitoes from entering the CDS units to breed, the bypass litterbags were changed to a finer mesh, the lids of each CDS unit were sealed with foam and bolts and any other openings were sealed with silicon on November 8, 2000. During one large storm event on January 10, 2001, debris had filled the mosquito-proofing bags, which caused each CDS unit to overflow through the top of the weir box. The ends of the mosquito-proofing bags were subsequently cut off to prevent flow impedance and litter bypass baskets were installed at the discharge ends of the H-flumes on February 9, 2001. This improved the hydraulic characteristics but due to the stiffness of the netting, mosquitoes could enter the CDS unit. Weights were added to the ends of the mosquito-proofing but openings still existed, which would have allowed mosquitoes to enter the units. On March 15, 2001, new, more pliable mosquito bags with chain weighted ends were installed at each CDS unit. During subsequent storms, these bags did not impede the flow of stormwater and they allowed trash and debris that bypassed the CDS unit to be captured in the downstream litter bypass baskets. Following these changes, mosquitoes have not been observed at the CDS units.

Orcas CDS Unit

During each monitored event, the CDS unit generally operated according to design. However, due to site-specific characteristics of the area there was more organic debris that entered this Orcas site than the Filmore site, resulting in additional maintenance. The weir opening to the CDS unit was small allowing debris such as foam plates to block the entrance to the CDS unit.

Sediment would settle in the corners of the weir box. Sediment in suspension would pass into the CDS unit and settle in the sump litter basket. Very fine sediment would bypass through the CDS unit and deposit in the H-flume.

In general the water quality appearance was improved. The effluent stormwater was generally clearer than the influent water. When oil and grease sheen was observed in the influent runoff, it was observed to a lesser extent in the effluent.

Filmore CDS Unit

The weir opening to the CDS unit was small allowing debris such as foam plates to block the entrance to the CDS unit.

Sediment would settle in the corners of the weir box. Sediment would pass into the CDS unit and settle in the sump litter basket. Very fine sediment would bypass through the CDS unit and deposit in the H-flume.

In general the water quality appearance was improved. The effluent stormwater was generally clearer than the influent water. When oil and grease sheen was observed in the influent runoff, it was observed to a lesser extent in the effluent.

2.1.7 Drain Inlet Inserts

Table 2-1g: Comparison of StreamGuard ä DII Operational Performance

Site	No. of Observed Events	Hydrologic/Hydraulic Characteristics	Inlet Conditions	Water Quality	Solids Deposition/ Resuspension	Outlet	Comments
Foothill Maintenance Station (73216N)	8	Bypass through the DII's bypass cut-outs was observed during 3 of 8 events.	No gaps observed between inlet and insert.	Oil sheen in effluent observed during 2 of 8 events.	Organic materials and sediment collected in DII during 4 of 8 events.	Functioned as designed.	Bypass occurred when water filled the cone and exited through the overflow cut-outs because the capacity of the DII was exceeded.
Las Flores Maintenance Station (73217N)	8	Bypass through the DII's bypass cut-outs was observed during 2 of 8 events.	No gaps observed between inlet and insert.	Oil sheen in effluent observed during 3 of 8 events.	Organic materials, trash and debris, and/or sediment collected in DII during each event.	Functioned as designed.	Bypass occurred when water filled the cone and exited through the overflow cut-outs because the capacity of the DII was exceeded. A tear was observed in the fabric during one inspection. The insert was replaced. During the 10/26/00 storm the DII had slipped into the drain inlet and had to be re-installed.
Rosemead Maintenance Station (73218S)	9	Bypass through the DII's bypass cut-outs was observed during 5 of 9 events. Flooding was observed during three events because of the DII's hydraulic capacity being exceeded.	No gaps observed between inlet and insert.	Oil sheen in effluent observed during 6 of 9 events.	Organic materials, trash and debris, and/or sediment collected in DII during 7 of 9 events.	Functioned as designed.	Bypass occurred when water filled the cone and exited through the overflow cut-outs because the capacity of the DII was exceeded. During the 10/26/00 storm the DII had slipped into the drain inlet and had to be re-installed. During three storms, the overflow cut-outs were not large enough to accommodate incoming runoff; onsite flooding resulted.

Overall Review of StreamGuardä Inserts

Pieces of wood were inserted into the area between the insert and inlet edge at all three inserts when they were installed at the beginning of the season to prevent the insert from slipping down into the drain inlet. To address the concern of runoff directly entering the monitoring vaults, the rubber berm installed around each vault was maintained throughout the 2000/01 storm season.

During the 2000/01 season, flow bypass was observed at each StreamGuard™ DII site. The reason for this is the hydraulic capacity of each DII was exceeded. Runoff filled the cone and flowed through the overflow cutouts. The cone of the StreamGuard™ DIIs is 24 inches in depth. When standing water in the cone reaches a depth of approximately 22 inches, bypass can occur through the two overflow cut-outs on the sides.

The reason for bypass could also occur due to variations of the fabric during the manufacturing process. Research into the manufacturing process of the filter fabric indicated that fabric pore size can vary from roll to roll. Even though the manufacturing process is the same for each roll of fabric, variation in pore size is normal and is not subject to control. It is possible that the inserts used this year were constructed with a fabric having a smaller pore size, thereby potentially reducing flow rate through the filter fabric and consequently increasing the potential for standing water in the insert or increasing the potential for bypass.

Generally, standing water in the cones resulted in flow bypass only. However, during the January 10, 2001 storm at the Rosemead Maintenance Station, flooding was observed.

Table 2-1h: Comparison of Fossil Filterä DII Operational Performance

Site	No. of Observed Events	Hydrologic/Hydraulic Characteristics	Inlet Conditions	Water Quality	Solids Deposition/ Resuspension	Outlet	Comments
Foothill Maintenance Station (73216S)	8	Bypass was observed during 4 of 8 events.	No gaps observed between inlet and insert.	Oil sheen in effluent observed during 3 of 8 events.	Organic material, trash and debris, and or sediment collected in DII during 6 of 8 events.	Functioned as designed.	Bypass generally due to flow rates exceeding hydraulic capacity of the insert. During the 1/10/01 storm, the stainless steel flange holding the FF cartridges bent upward due to the weight of water and bypass occurred.
Las Flores Maintenance Station (73217S)	8	Bypass was observed during 4 of 8 events.	No gaps observed between inlet and insert.	Oil sheen in effluent observed during 3 of 8 events.	Organic materials, trash and debris, and/or sediment collected in DII during each event.	Functioned as designed.	Bypass due to (a) sediment deposition on filter cartridges, which impeded flow through the filter cartridges or (b) exceedance of hydraulic capacity.
Rosemead Maintenance Station (73218N)	9	Bypass was observed during 4 of 9 events.	No gaps observed between inlet and insert.	Oil sheen in effluent observed during 4 of 9 events.	Organic materials, trash and debris, and/or sediment collected in DII during 8 of 9 events.	Functioned as designed.	Bypass due to (a) deposition of organic material, trash and debris, or sediment on top of the filter cartridges, which impeded flow through the filter cartridges or (b) exceedance of hydraulic capacity.

Overall Review of Fossil Filterä Inserts

During the 2000/01 wet season, three reasons for flow bypass in Fossil Filter™ DIIs were observed:

1. Fit of the DII in the drain inlet;
2. Hydraulic capacity; and
3. Blockage and clogging of cartridges.

To eliminate or minimize flow bypass around the peripheral of the Fossil Filter™ DII the interface between the DII and the inlet was sealed at the beginning of the wet season, immediately after installation of the new units. Additionally, to promote flow into the DII at Rosemead Maintenance Station, a section of rubber was attached along interface of the curb inlet and the insert. To address the concern of runoff directly entering the monitoring vaults, the rubber berms installed around each vault were maintained.

Hydraulic capacity of the units is an inherent limiting factor in the performance of the DIIs. The Fossil Filter™ DIIs are designed to not impede flows (due to flood control considerations). During higher discharge rates, runoff has sufficient velocity and/or volume to pass over the lip of the cartridges and go directly into the storm drain system. No alterations in the design of the units were undertaken to eliminate this factor.

The third factor that caused flow bypass was blockage and clogging of the DII. Blockage occurred from the accumulation of trash, debris, and/or sediment on top of the filter cartridge screens. This accumulation blocked the filter cartridge screens so that stormwater runoff could not pass through the screens. The resultant standing water pooled and eventually achieved a depth where it spilled over the cartridge lip into the storm drain. Clogging occurred when sediment passed through the cartridge screens and settled in the pore spaces between the adsorbent granules. This appeared to cause a slowing in the infiltration of water through the adsorbent. Water pooled and reached a depth where it spilled over the cartridge lip into the storm drain.

During the 2000/01 wet season, the maintenance of the units to lessen the impact of blockage and clogging was continued. Trash/debris and/or sediment were removed from the units once prior to a storm event, once during a storm event and once after each storm event. The removed trash/debris and sediment removed from the DII was placed in an on-site storage container designed to emulate ambient conditions at the top of the cartridges. To improve the flow rate through the cartridges, the cartridges were removed and agitated to loosen and remove the sediment that were deposed between the absorbent granules.

The result of the additional structural work and increased maintenance during the 2000/01 wet season was that no flow bypass due to interface gaps was observed. Hence, flow bypass was observed due to the following reasons:

1. Hydraulic capacity. This was observed at all three maintenance station insert sites. Based on several observations of hydraulic capacity exceedance at the Foothill Maintenance Station,

bypass at the Foothill Maintenance Station Fossil Filter™ DII generally was observed to occur when a flow rate of 0.07 cfs (31 gpm) was reached.

2. Blockage and clogging of cartridges. Despite removing trash/debris/sediment prior to a storm event and once during a storm event, bypass continued to be observed. Typically, after the trash/debris/sediment removal occurred, more trash/debris/sediment would be deposited during the course of the storm, again leading to more bypass. This was most prevalent at the Rosemead Maintenance Station.

3. During the January 10, 2001 storm at Foothill Maintenance Station, the stainless steel flange holding the cartridges bent upward due to the weight of water, and bypass occurred underneath the cartridges.

Despite the flow bypass and flooding that occurred, the thresholds required for replacement of the unit (adsorbent granules dark gray or darker, or structural integrity problems) were not reached. The units were removed at the end of the storm season for analysis.

On October 5, 2000, a diesel spill occurred up-slope of the Foothill Fossil DII. Some fuel, approximately six gallons, had entered the drain inlet but was prevented to continue downstream by the Palmer-Bowlus flume. The area was cleaned using absorbent material on the asphalt and within the BMP and cleaned with a high-pressure steam cleaner. The drain inlet was washed and the BMP material was disposed of with the absorbent material. New adsorbent material was installed in the DII.

2.1.8 Oil/Water Separator

Table 2-1I: Comparison of Oil/Water Separator Operational Performance

Site	No. of Observed Events	Hydrologic/ Hydraulic Characteristics	Inlet Conditions	Water Quality	Solids Deposition/ Resuspension	Erosion	Vegetation	Outlet	Comments
Alameda OWS (074201)	5	Functioned as designed. In-situ water present for each monitoring event (normal operating conditions).	Functioned as designed.	Surface film and oily sheen were commonly observed in the influent water. Influent water ranged from colorless to brown with a musty odor. Effluent water ranged from colorless to black. There was generally an oily sheen with a surface film. On one occasion the effluent water had an emulsion. The effluent generally had a hydrogen sulfide odor. Initial flows generally had heavy cloudiness and suspended solids.	Less suspended solids were observed in the effluent compared to influent.	None.	None.	Functioned as designed.	The coalescing screens were inspected and were found to be clean throughout the 2000/2001 season.

Overall Review of the Alameda Oil/Water Separator

Because these devices are designed to retain water in the oil/water separator for proper operation, residual stormwater was always present in the BMP prior to each stormwater event. The influent water generally exhibited a surface film and/or scum and oil and grease sheen with a musty odor. In general the effluent water quality was somewhat variable. During initial flows the effluent water had some resuspended solids with visible oil and grease sheen and on one occasion an emulsion was observed. In addition the effluent had a hydrogen sulfide odor. During the 2000/2001 season, the oil/water separator coalescing screens were inspected and found to be clean.

2.1.9 Infiltration Basin

Table 2-1j: Comparison of Infiltration Basin Operational Performance

Site	No. of Observed Events	Hydrologic/ Hydraulic Characteristics	Inlet Conditions	Water Quality	Solids Deposition/ Resuspension	Erosion	Vegetation	Outlet	Comments
I-605/SR-91 Infiltration Basin (73101)	7	Influent bypass was observed 2 times due to the flow depth overtopping the overflow weir. The IB drained within 72 hours during all storm events.	Functioned as designed.	No notable observations.	Some sediment deposition near inlets. No noticeable deposition in other areas.	Minor erosion noted on north side slope beneath asphalt swales on access road.	Vegetation coverage met threshold requirement after being established in February 2000.	Functioned as designed.	Overflow weir plate height increased to maximum height to minimize flow bypass during the previous season.

Overall Review of the I-605/SR-91Infiltration Basin

During small rain events of the 2000/2001 wet season, runoff immediately infiltrated into the areas surrounding the inlets and prior to any runoff ponding within the infiltration basin. During larger storms, water would accumulate in the infiltration basin for during the storm and then infiltrate. The maximum depth of water observed in the infiltration basin was approximately 11 inches. During each event, the infiltration basin infiltrated runoff within 72 hours. During larger storms, as designed, some flow bypassed the infiltration basin by flowing over the overflow weir in the junction.

2.1.10 Infiltration Trench

Table 2-1k: Comparison of Infiltration Trench Operational Performance

Site	No. of Observed Events	Hydrologic/Hydraulic Characteristics	Inlet Conditions	Water Quality	Solids Deposition/ Resuspension	Overflow	Comments
Altadena Maintenance Station (73211b)	7	Functioned as designed; bypass of IT was observed during 1 of 7 events because of the IT's capacity being exceeded.	Functioned as designed.	No notable observations.	No notable observations.	No notable observations.	None.

Overall Review of the Altadena Maintenance Station Infiltration Trench

Stormwater runoff effectively infiltrated into the infiltration trench, never taking more than approximately 36 hours for complete infiltration. During larger storms, as designed, the infiltration trench filled and discharged through the overflow pipe.

3.0 BMP AND SITE MAINTENANCE

The primary objective of BMP maintenance is to ensure that each site is properly maintained to achieve optimum performance. Preventive and corrective maintenance measures were undertaken in accordance with the OMM Plan and the Maintenance Indicator Document (MID). These measures included:

- Removal of standing water;
- Sediment erosion control and removal;
- Structural integrity;
- Landscape management;
- Graffiti removal;
- Vector control;
- Trash and debris removal; and
- General facility maintenance.

Regularly scheduled maintenance inspections were conducted monthly, with weekly surveys being performed during extended periods of wet weather. Maintenance visits were also conducted after each large storm event (greater that 0.5 inches). During the visits, maintenance observations and needs were documented on the "BMP Site Inspection Checklist" (Form C of the OMM Plan Volume II Field Guidance Notebooks). Based on this documentation, any immediate maintenance needs were arranged and documented on the "BMP Site Maintenance Form" (Form E of the OMM Plan Volume II Field Guidance Notebooks).

3.1 Summary of Inspection and Maintenance Activities

The following sections describe maintenance activities performed at each BMP site between July 2000 and May 2001. A comparison of maintenance requirements (frequencies and average times to perform) is graphically shown in Figures 3-1a through 3-9b. More detail on BMP maintenance is available at the following web site: http://www.rbf.com/caltrans/. Please note, however, that the maintenance times provided in the database are times required for each maintenance activity to be conducted, and do not distinguish whether one or more persons had performed the task (i.e., sometimes one person does a task while other times more than one person is involved). The average maintenance times illustrated in the figures have been adjusted to account for this.

3.1.1 Biofiltration Strips

Overall Review of Maintenance Activities at the Biofiltration Strips

Maintenance activities at the Biofiltration Strips consisted of unscheduled and routine maintenance.

Routine inspections were conducted on a monthly basis and weekly during extended periods of wet weather. In accordance with the MID and OMM Plan, routine maintenance activities at both the Altadena Maintenance Station and I-605/SR-91 Biofiltration Strips consisted of the following:

1. Cutting the salt grass once to a nominal height of 6 inches and removing the cuttings. When cutting the salt grass, it first needs to be "fluffed up" so that it could be cut to the appropriate height. After the salt grass was cut, the cuttings were removed with a soft rake and disposed.

2. Manually removing weeds from the strips.

3. Removing trash and debris from the strips.

Overall Review of Maintenance Activities at the Altadena Maintenance Station Biofiltration Strip (73211a)

Site-specific maintenance activities at the Altadena Maintenance Station Biofiltration Strip consisted of routine maintenance, as follows:

1. Installing the spreader ditch plug in preparation for the start of the wet season.

2. Dewatering the strip's spreader ditch following each storm event to eliminate ponding water conditions, which could promote mosquito breeding. At the end of the wet season, the bypass plug from the spreader ditch to the Infiltration Trench was opened to allow runoff from summer storm events to drain directly into the Infiltration Trench.

3. Realigning the gate with the fence.

Figure 3-1a summarizes the frequency of maintenance activities (i.e., number of times maintenance was conducted at the BMP) and Figure 3-1b summarizes the average amount of time spent performing each activity.

Overall Review of Maintenance Activities at the I-605/SR-91 Biofiltration Strip (73222a)

Site-specific maintenance activities at the I-605/SR-91 Biofiltration Strip consisted of the following:

Unscheduled maintenance included:

1. Replacing traffic channelizers which had been destroyed by passing traffic.

Routine maintenance activities at the strip included:

1. Cutting surrounding erosion control vegetation, which was located within the BMP's maintenance boundary. After the erosion control vegetation was cut, the cuttings were removed and disposed.

2. Gopher inspection and abatement.

Figure 3-1a summarizes the frequency of maintenance activities (i.e., number of times maintenance was conducted at the BMP) and Figure 3-1b summarizes the average amount of time spent performing each activity.

Figure 3-1a: Frequency of Maintenance Activities at the Biofiltration Strips

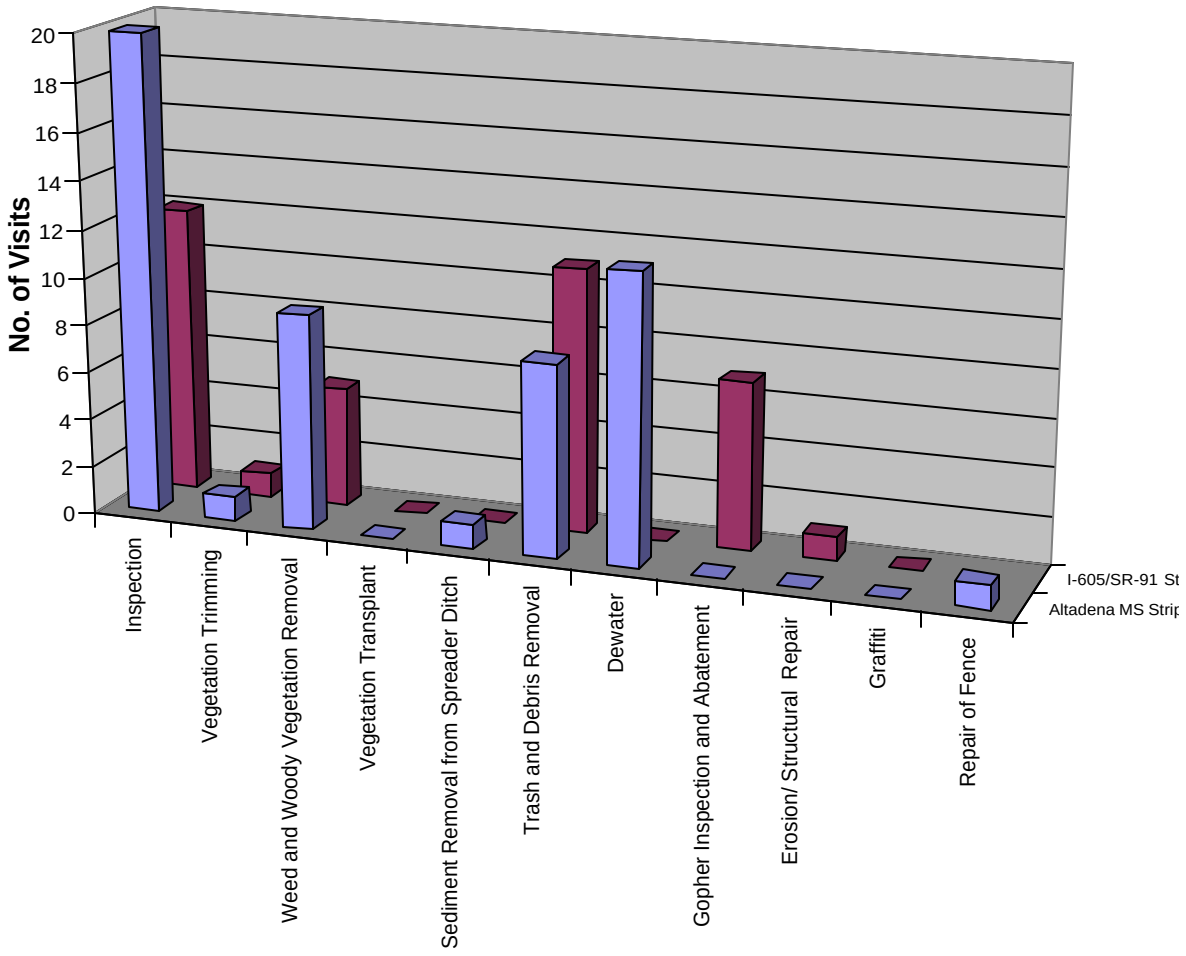
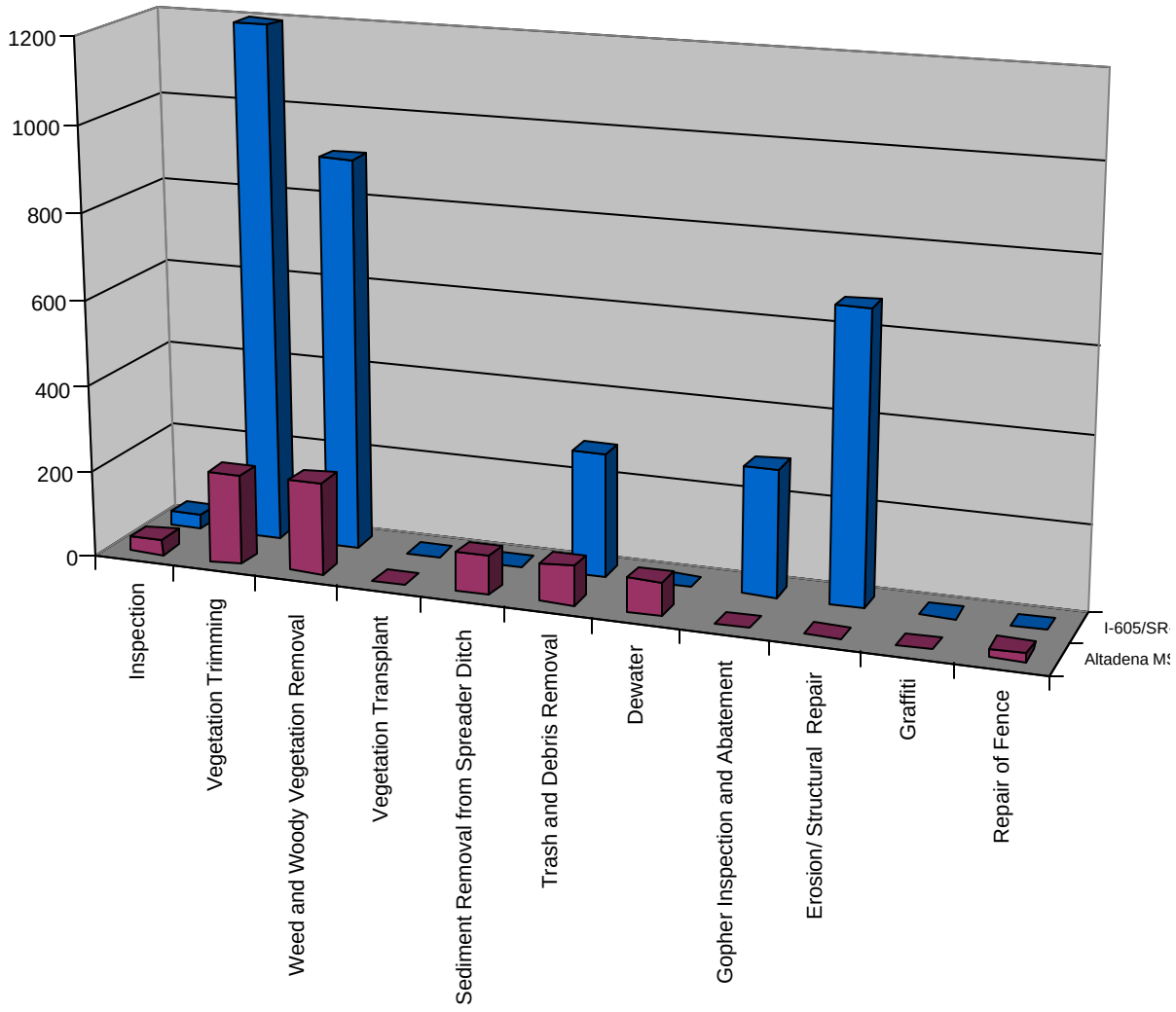


Figure 3-1b: Average Maintenance Times at the Biofiltration Strips



3.1.2 Biofiltration Swales

Overall Review of Maintenance Activities at the Biofiltration Swales

Maintenance activities at the Biofiltration Swales consisted of unscheduled and routine maintenance.

Routine inspections were conducted on a monthly basis and weekly during extended periods of wet weather. In accordance with the MID and OMM Plan, routine maintenance activities at each Biofiltration Swale consisted of the following:

1. Cutting the salt grass once to a nominal height of 6 inches and removing the cuttings. When cutting the salt grass, it first needed to be "fluffed up" so that it could be cut to the appropriate height. After the salt grass was cut, the cuttings were removed with a soft rake and disposed.

2. Cutting surrounding erosion control vegetation, which was located within the BMP's maintenance boundary. After the erosion control vegetation was cut, the cuttings were removed and disposed.

3. Manually removing weeds from the swale.

4. Removing trash and debris from the swale.

Overall Review of Maintenance Activities at the I-605/SR-91 Biofiltration Swale (73222b)

Site-specific maintenance activities at the I-605/SR-91 Biofiltration Swale consisted of unscheduled and routine maintenance.

Unscheduled maintenance at the swale consisted of the following:

1. Removing eroded soil from the energy dissipater. On one occasion, minor erosion occurred at the headwall of the inlet pipe. Soil had eroded from the freeway embankment and deposited in the energy dissipater. Subsequently, the soil was removed from the energy dissipater.

2. Clearing the natural channel downstream of the swale to prevent backwater conditions in the swale. During the January 8, 2001 event, a team of technicians dug a deeper trench in the downstream channel to allow free flowing conditions from the swale.

Routine maintenance activities at the swale included:

1. Backfilling and compacting gopher burrows and ground squirrel holes with onsite soil.

Figure 3-2a summarizes the frequency of maintenance activities (i.e., number of times maintenance was conducted at the BMP) and Figure 3-2b summarizes the average amount of time spent performing each activity.

Overall Review of Maintenance Activities at the Cerritos Maintenance Station Biofiltration Swale (73223)

Site-specific maintenance activities at the Cerritos Maintenance Station Biofiltration Swale consisted of unscheduled and routine maintenance.

Unscheduled maintenance at the swale consisted of the following:

1. Repaired structural damage caused by gophers. Despite three previous strategies for gopher abatement, gophers continued to burrow through the swale, causing structural damage. In July 2000, a fourth strategy of installing wire fabric as a gopher barrier along the north side slope was attempted. However, this proved to be ineffective, as gopher burrows continued to appear, causing flow bypass during storms and subsequent erosion. The burrows were backfilled and compacted with onsite soil, and erosion areas were repaired using additional fill, which was compacted.

2. Another problem caused by gophers and the subsequent repairs was the reduction in vegetation cover on the slopes below the MID requirement of 70 percent. In accordance with the MID, the bare areas were reseeded with erosion control mix in November 2000, and an erosion control blanket was installed.

3. During March 2001, Caltrans maintenance crew members inadvertently cut the vegetation within the BMP maintenance boundary to a height of less than six inches.

Routine maintenance activities at the swale included:

1. Backfilling and compacting gopher burrows and ground squirrel holes with onsite soil.

Figure 3-2a summarizes the frequency of maintenance activities (i.e., number of times maintenance was conducted at the BMP) and Figure 3-2b summarizes the average amount of time spent performing each activity.

Overall Review of Maintenance Activities at the I-5/I-605 Biofiltration Swale (73224)

Site-specific maintenance activities at the I-5/I-605 Biofiltration Swale consisted of routine maintenance.

Routine maintenance at the swale consisted of the following:

1. Backfilling and compacting gopher burrows and ground squirrel holes with onsite soil.

2. Removing woody vegetation.

3. Removing graffiti from the influent enclosure's concrete pad.

4. Repairing minor erosion on the southern slope of the swale.

5. Repairing scouring down the middle of the swale, which occurred during the January 10-12, 2001 storm event. The scouring was enhanced by gopher burrowing activities.

Figure 3-2a summarizes the frequency of maintenance activities (i.e., number of times maintenance was conducted at the BMP) and Figure 3-2b summarizes the average amount of time spent performing each activity.

Overall Review of Maintenance Activities at the I-605 at Carson Biofiltration Swale (73225)

Site-specific maintenance activities at the I-605 at Carson Biofiltration Swale consisted of routine maintenance.

Routine maintenance activities at the swale included:

1. Removing woody vegetation.
2. Backfilling and compacting ground squirrel holes with onsite soil.

Figure 3-2a summarizes the frequency of maintenance activities (i.e., number of times maintenance was conducted at the BMP) and Figure 3-2b summarizes the average amount of time spent performing each activity.

Figure 3-2a: Frequency of Maintenance Activities at the Biofiltration Swales

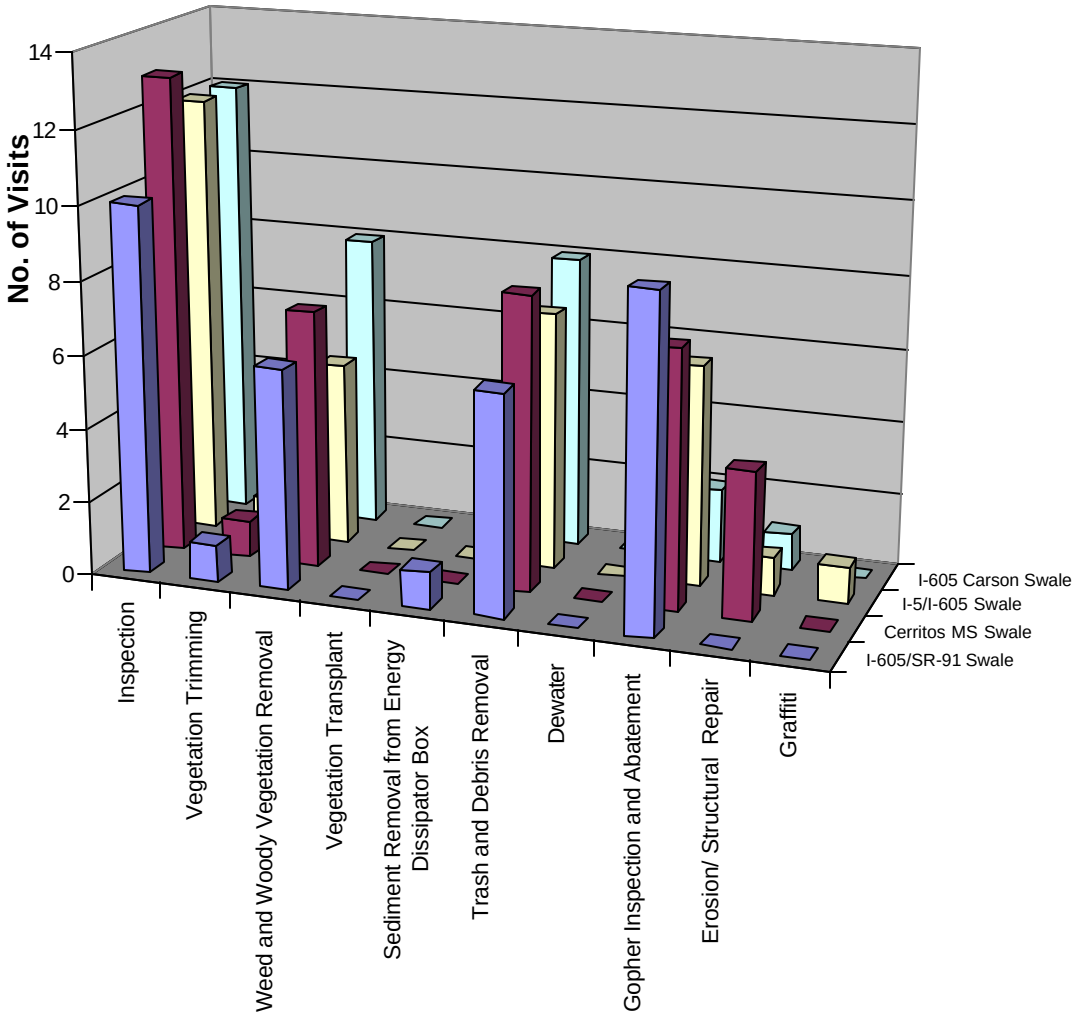
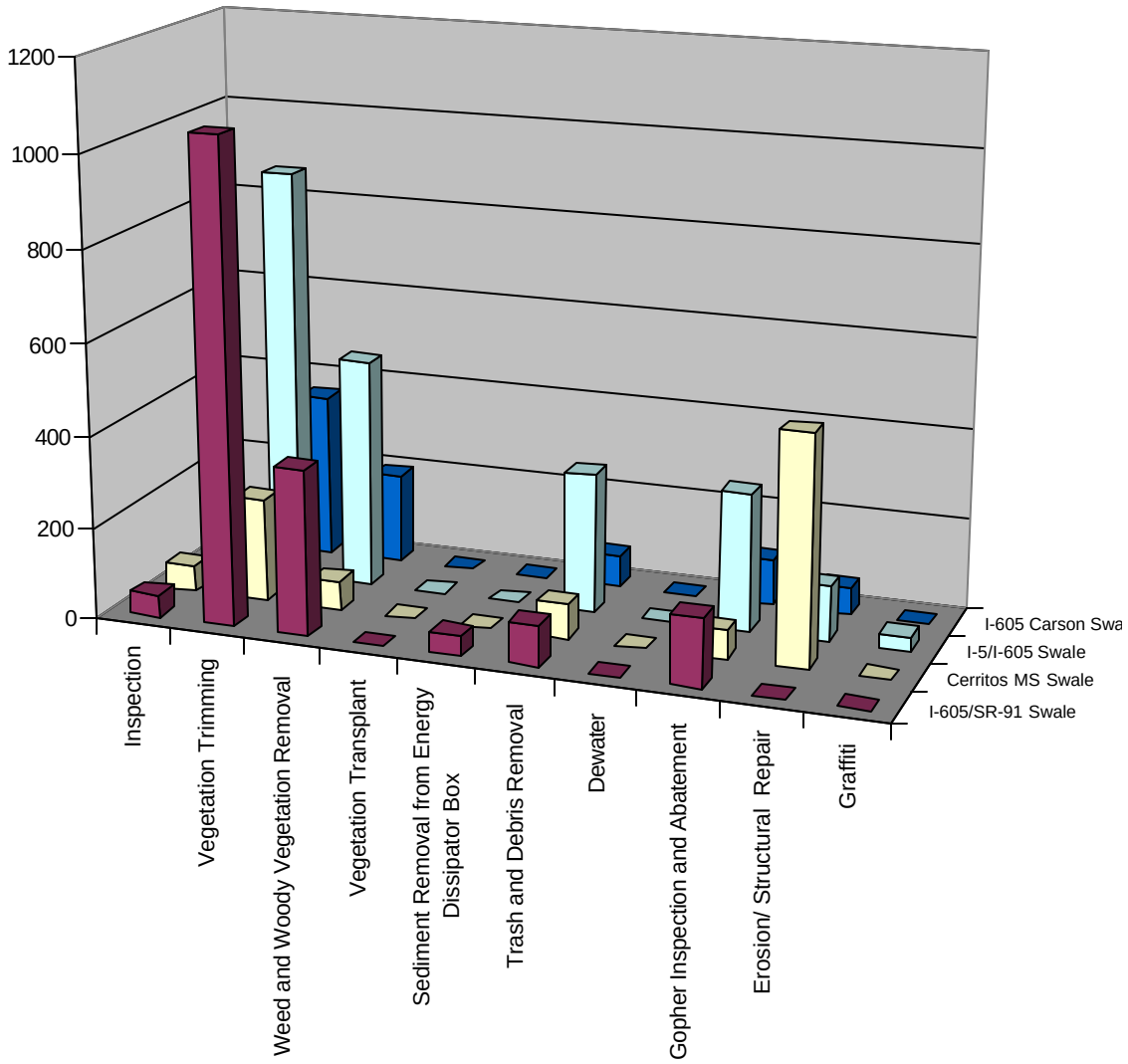


Figure 3-2b: Average Maintenance Times at the Biofiltration Swales



3.1.3 Extended Detention Basins

Overall Review of Maintenance Activities at the Extended Detention Basins

Maintenance activities at the Extended Detention Basins consisted of unscheduled and routine maintenance.

Routine inspections were conducted on a monthly basis and weekly during extended periods of wet weather. In accordance with the MID and OMM Plan, routine maintenance activities at each Extended Detention Basin consisted of the following:

1. Backfilling and compacting gopher burrows and ground squirrel holes with onsite soil.
2. Removing woody vegetation.
3. Removing trash and debris.
4. Cutting the vegetation three times at the I-5/I-605 EDB and twice at the I-605/SR-91 EDB to a nominal height of 8 or 12 inches, according to the MID, and removing the cuttings. After the vegetation was cut, the cuttings were removed with a soft rake and disposed.

Overall Review of Maintenance Activities at the I-5/I-605 Extended Detention Basin (74101)

Site-specific maintenance activities at the I-5/I-605 Extended Detention Basin consisted of unscheduled maintenance.

Unscheduled maintenance at the Extended Detention Basin consisted of the following:

1. Modifying the outlet structure to prevent ponding water. Mosquitoes were breeding in ponded water, which collected in the outlet structure following storms. The outlet structure was modified by core hole drilling the outlet structure, installing stainless steel orifice plates, and grouting the sump.

Overall Review of Maintenance Activities at the I-605/SR-91 Extended Detention Basin (74102)

There were no site-specific maintenance activities at the I-605/SR-91 Extended Detention Basin.

Figure 3-3a summarizes the frequency of maintenance activities (i.e., number of times maintenance was conducted at the BMP) and Figure 3-3b summarizes the average amount of time spent performing each activity.

Figure 3-3a: Frequency of Maintenance Activities at the Extended Detention Basins

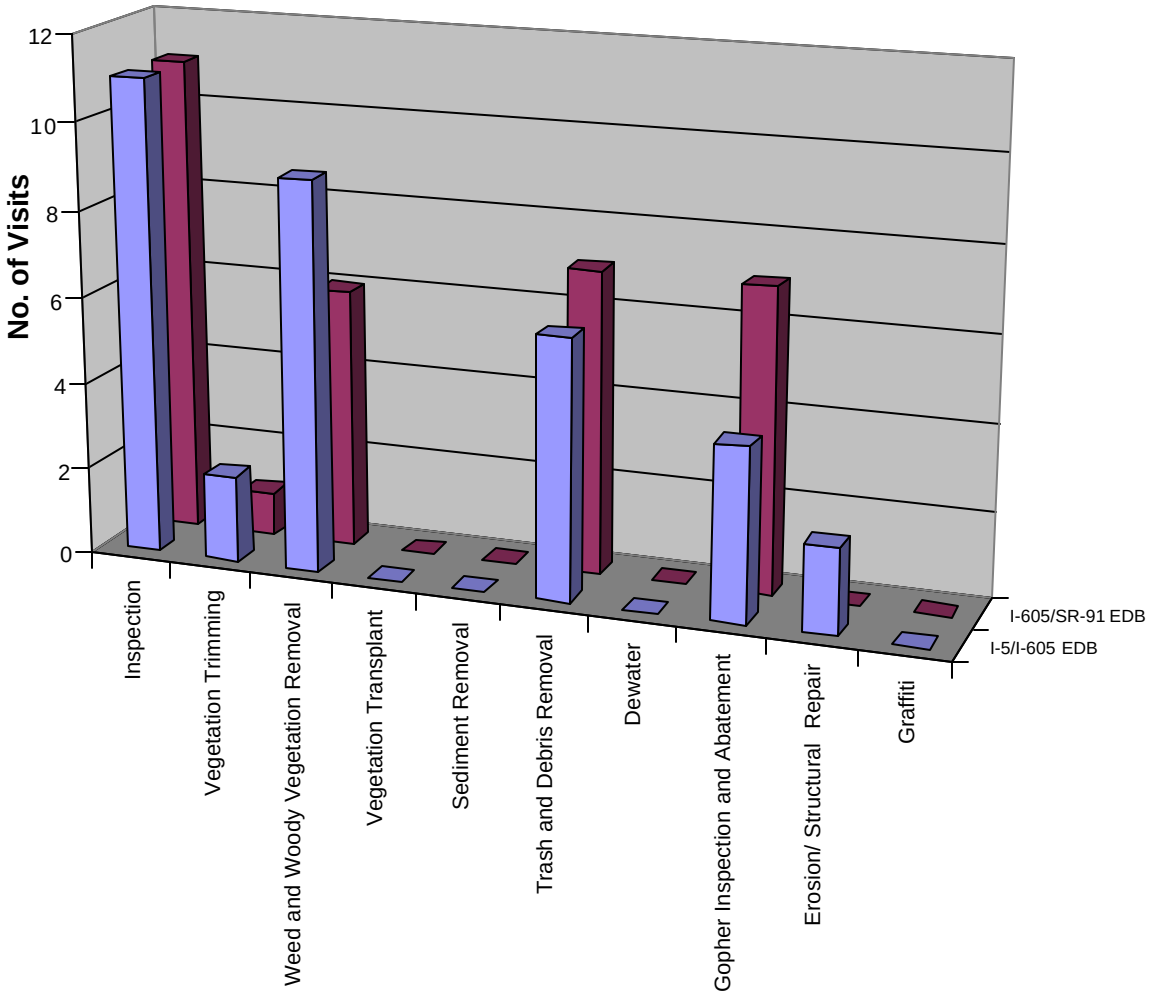
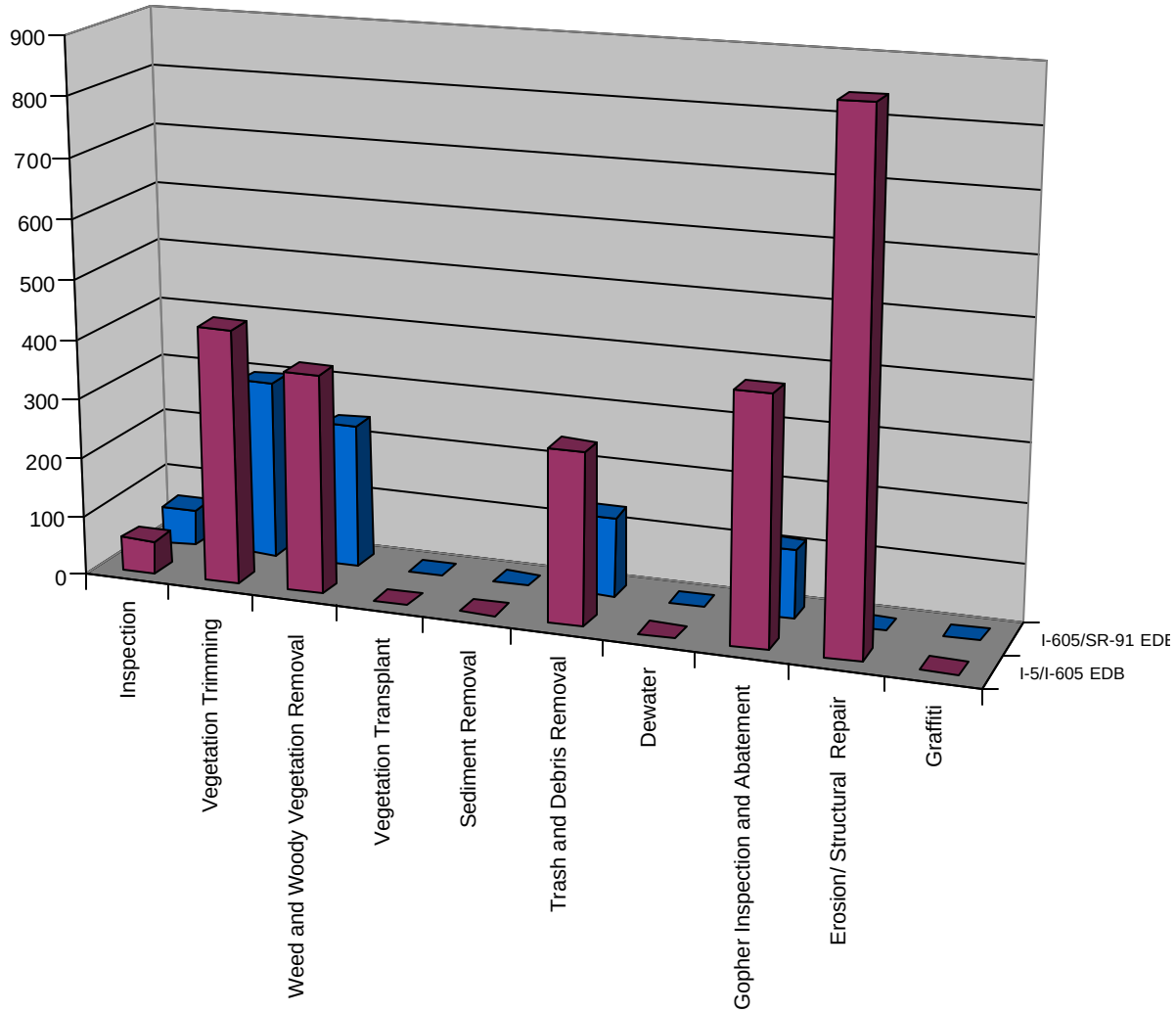


Figure 3-3b: Average Maintenance Times at the Extended Detention Basins



3.1.4 Sand Filters – Austin Type

Overall Review of Maintenance Activities at the Sand Filters – Austin Type

Maintenance activities at the Sand Filters consisted of unscheduled and routine maintenance. Unscheduled maintenance at each Sand Filter consisted of the following:

1. Drilling an 1/8 inch hole in the discharge pipe to avoid vapor lock in the pump. Vapor lock occurred at Foothill Maintenance Station Sand Filter during the January 10-12, 2001 storm event. Consequently, all sand filter site discharge pipes were drilled to avoid this problem.

2. Enlarged existing standpipe orifices from ½ inch to 5/8 inch, since drain time of the sand filters was found to be up to five days, following the January 2001 storms, exceeding the 48 hour threshold defined in the OMM Plan. In addition to increasing the orifice size, the three gravel bags covering the upper orifices were removed. The aim was to increase flow from the sedimentation chamber to the sand filter, and to minimize the chance of blockage. A hard, crusty layer of silt was observed on top of the sand up to a depth of 1¼ inches, depending on the site.

Routine inspections were conducted on a monthly basis and weekly during extended periods of wet weather. In accordance with the MID and OMM Plan, routine maintenance activities at each Sand Filter consisted of the following:

1. Removing trash and debris.

2. Inspecting pumps per manufacturers guidelines, at the beginning of the wet season.

3. Replacing used, rotting gravel bags, covering the two lower standpipe orifices, with new gravel bags.

4. Characterizing sediment deposits and sand in the sand filter basin. Following the orifice size increase, drain times of the sand filters did reduce initially. However, following the March 5-7, 2001 storm event, loading rates were calculated for the Sand Filter sites and all were found to be below the 9ft per day threshold specified in the MID. In terms of drainage time, only the Foothill Sand Filter took over 48 hours to drain, but the MID thresholds are for 1 inch storms, hence with higher rainfall, the sand filters were likely to take more than 48 hours to drain. Actual rainfall at the sand filters ranged from 0.42 to 0.71 inches. Thus, sampling and maintenance was required at the sand filter sites, as follows:

   On April 2-3, 2001, nine cores were collected from each location on an equilateral grid, superimposed over the sand filter, to quantify sediment accumulation and quality data. The cores were driven 15 inches below the sediment surface and recovered. A log was used to document depth of penetration and recovery, location, and lithological characteristics. Each core was then subdivided into four sections as follows:

   - Section 1: 0-2 inches (i.e., mostly sediment crust)
   - Section 2: 2 to 5 inches
   - Section 3: 5 to 10 inches

- Section 4: 10 to 15 inches

Each Section of the nine cores was homogenized to create four samples at each site to represent the four different depths. The four samples were separated according to the analyses required, deposited into wide-mouth glass amber jars, and sent to the appropriate laboratory for analyses, accompanied by the chain-of-custody forms. The analyses run on these samples are listed in Table 1-4c. After the sampling was completed, the sediment layer from each sand filter was removed, drummed, and ultimately disposed. The analytical results are presented in Table 1-5b.

5. Replacing mosquito netting over the sump.

Overall Review of Maintenance Activities at the Eastern Regional Maintenance Station Sand Filter (74202)

Site-specific maintenance activities at the Eastern Regional Maintenance Station Sand Filter consisted of unscheduled and routine maintenance.

Unscheduled maintenance at the Sand Filter consisted of the following:

1. Upgrading the electrical ground and panel to meet the appropriate code. During pump inspection, a subcontracted electrician also discovered that there were electrical wiring problems at the site. The electrical wiring problems to the pump were subsequently fixed.

2. Removing a section of the fence adjacent to the sump, and adding safety chains, to allow easier access to the sump.

Routine maintenance activities at the sand filter included:

1. Replacing a faulty pump. Pump failure occurred during the October 26, 2000 storm event. Subsequently, a subcontracted electrician confirmed that the pump was faulty and needed to be replaced. Water was pumped from the BMP using a temporary pump. A replacement pump was then installed.

2. Repairing a leak in the discharge pipe.

3. Repairing the wooden cover over the sampling vault.

Overall Review of Maintenance Activities at the Foothill MS Sand Filter (74203)

Site-specific maintenance activities at the Foothill Maintenance Station Sand Filter consisted of unscheduled and routine maintenance.

Unscheduled maintenance at the sand filter consisted of the following:

1. Upgrading the electrical ground and panel to meet the appropriate code. During pump inspection, a subcontracted electrician discovered that there were electrical wiring problems at the site. The electrical wiring problems to the pump were fixed.

Routine maintenance activities at the sand filter included:

Removing woody vegetation, weeds and grass from the sand filter.

Overall Review of Maintenance Activities at the Termination Park & Ride Sand Filter (74204)

Site-specific maintenance activities at the Termination Park & Ride Sand Filter consisted of unscheduled and routine maintenance.

Unscheduled maintenance at the sand filter consisted of the following:

1. Providing an adequate power source to the site. Power was found to be inadequate on October 6, 2000, when the pump was tested under load i.e., while the Park and Ride lights were on. The pump failed during the October 26, 2000 storm event due to the lack of power, and subsequently, the pump was operated during daylight hours to drain the BMP. In November 2000, a 100 amp 120/240/single phase/3w temporary 25 foot pole with overhead feed was installed and connections were made to an existing meter pedestal, in order to provide adequate power.
2. Removing a section of the fence adjacent to the sump, and adding safety chains, to allow easier access to the sump.

Routine maintenance activities at the sand filter included:

1. Replacing a faulty pump. Pump failure occurred during the January 8, 2001 storm event, due to bearings, which had gone bad. A refurbished replacement pump was checked before installation on January 11, 2001, but it too was found to be faulty, and both were sent for repair. A tested rebuilt pump was then installed on January 15, 2001.
2. Securing the bottom float in the sump.
3. Repairing the BMP perimeter fence, which was damaged by a vehicle.

Figure 3-4a summarizes the frequency of maintenance activities (i.e., number of times maintenance was conducted at the BMP) and Figure 3-4b summarizes the average amount of time spent performing each activity.

Figure 3-4a: Frequency of Maintenance Activities at the Sand Filters

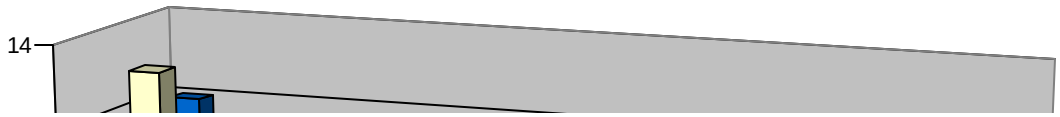
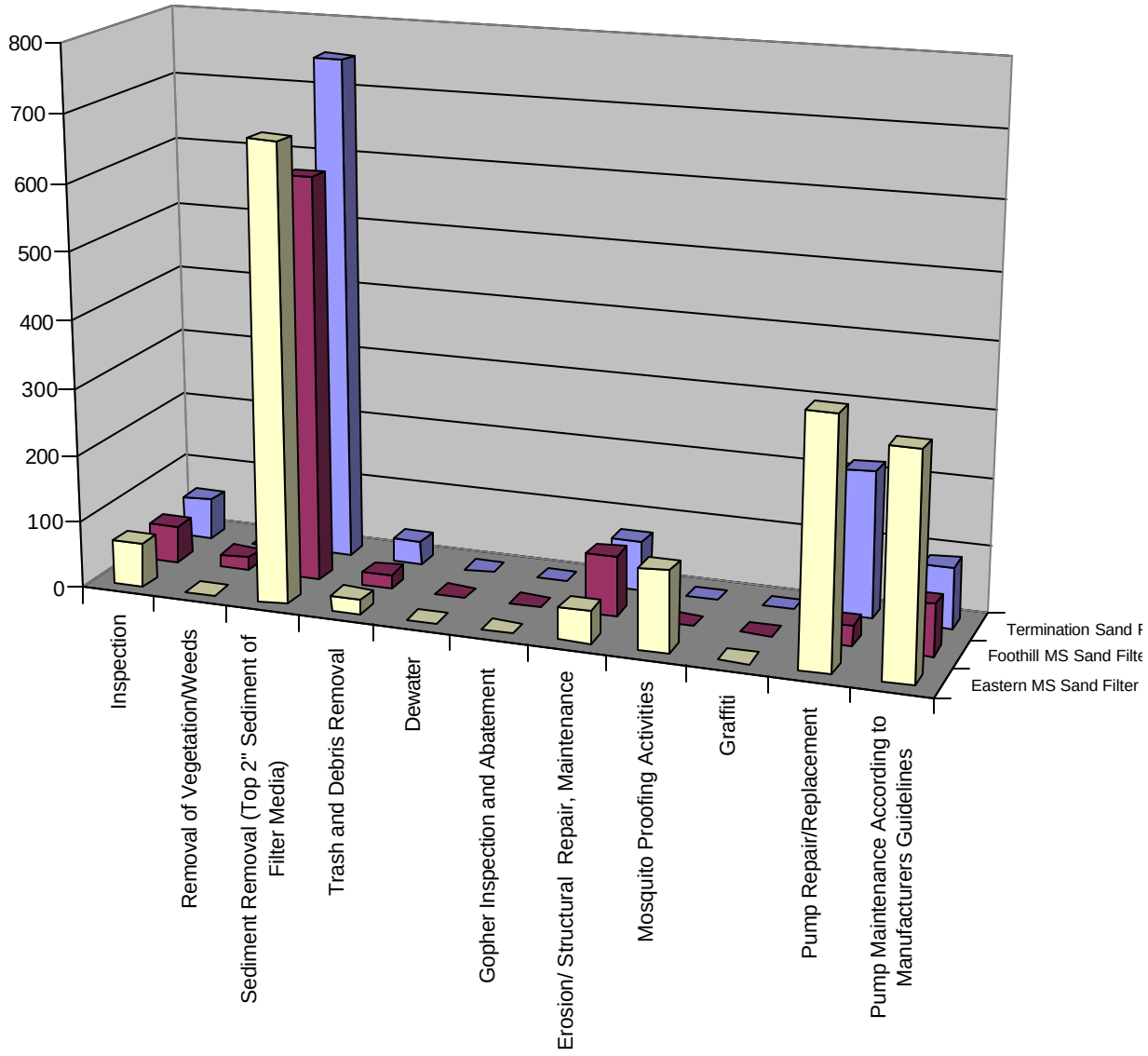


Figure 3-4b: Average Maintenance Times at the Sand Filters



3.1.5 Multi-chambered Treatment Trains

Overall Review of Maintenance Activities at the Multi-chambered Treatment Trains

Maintenance activities at the Multi-chambered Treatment Trains consisted of unscheduled and routine maintenance. Unscheduled maintenance at each Multi-chambered Treatment Train consisted of the following:

1. Modifying the grit chamber to allow easier sampling access for Vector Control District (VCD) personnel. The plastic packing balls were removed and containerized in 55-gallon drums. A 0.22-inch polyethylene mesh screen was attached to the grit chamber grate using nylon zip ties. The grated floor was hinged with stainless steel hinges and fasteners for VCD access. The plastic packing balls were sampled for purposes of disposal, drummed, and subsequently disposed. The analytical results are presented in Table 1-5b.

2. Installing aluminum covers to reduce the potential for mosquitoes entering and breeding in the BMP. A bid package was sent out to prospective manufacturers in November 2000, and the final bid was awarded in December 2000. The cover manufacturer surveyed the site for preparation of shop drawings for the MCTT cover in January 2001. Shop drawings for the MCTT covers were prepared, revised and approved. From mid-January to mid-February, 2001, the MCTT covers were fabricated, including non-destructive testing of structural welds. Finally, the covers were installed and smoke tested by the end of February 2001.

Routine inspections were conducted on a monthly basis and weekly during extended periods of wet weather. In accordance with the MID and OMM Plan, routine maintenance activities at each Multi-chambered Treatment Train consisted of the following:

1. Removing trash and debris.

2. Replacing the transfer pump following the previous (i.e., 1999-2000) wet season.

3. Inspecting pumps per manufacturers guidelines, at the beginning of the 2000/01 wet season.

4. Replacing sump mosquito netting.

5. Installing new skimmer booms in the sedimentation basin during the summer.

6. Pumping water from the sedimentation chamber to the filter chamber. Following a storm event, water in the sedimentation chamber was left for a period of 24 to 36 hours to allow suspended particles to settle. The water was then transferred manually, using the transfer pump, to the filter chamber where the effluent pump functioned automatically. Water was pumped from the sedimentation chamber to a water level of one foot above the settling tubes. This water level was maintained to allow the Vector Control District personnel easy access for sampling. At the Lakewood Park and Ride Multi-chambered Treatment Train, a power source problem was discovered in October 2000 while testing the pumps under load i.e., while the Park and Ride lights were on. The solution was to run the pumps during daylight hours only.

Overall Review of Maintenance Activities at the Via Verde Park & Ride Multi-chambered Treatment Train (74206)

Site-specific maintenance activities at the Via Verde Park & Ride Multi-chambered Treatment Train consisted of unscheduled and routine maintenance.

Unscheduled maintenance at the Multi-chambered Treatment Train consisted of the following:

1. Repairing leaks in the sedimentation basin and inlet pipe into the sedimentation basin, from the grit chamber. During the 1999-2000 wet season, the BMP was observed to be leaking. In August 2000, sealant was injected around the inlet pipe to the sedimentation chamber. Additionally, gravel and cobbles left over from the installation of the concrete walls were removed from the same pipe. However, the BMP continued to leak following the January 11, 2001 storm event. The BMP was taken offline while the leak was investigated. Geotechnical reconnaissance was performed at the site to evaluate areas of potential leakage from the sedimentation chamber and to visually assess slope stability. There were no indications that the slope adjacent to the BMP had experienced any visible downslope movement, but it did have an increased moisture content compared to similar adjacent slopes, and hence an increased potential for instability. The sedimentation chamber exhibited indications of seepage, and it appeared that one possible source for leakage was from the contact between the walls and floor. Additionally, one-half inch diameter, three inch deep holes had been bored at the bottom of the concrete walls, possibly exposing steel reinforcements to water. Waterproofing the chamber would prevent further seepage and exposure of reinforcement members. Waterproofing work was done from January 18 to 30, 2001, after evacuating water out of the sedimentation chamber, removing the sludge at the bottom of the chamber, and removing all hardware. The sludge was sampled for purposes of disposal, drummed, and subsequently disposed. The analytical results are presented in Table 1-5b.

   Materials used for waterproofing are commonly used for water storage tanks. The scope of work for the waterproofing was as follows:

   - Sandblast walls and floors
   - Remove sand and debris, and stage in barrels for proper disposal by others
   - Clean walls and floor slab per material manufacturers recommendations
   - Rout all joints and cracks ¼" x ¼" and seal with Sikaflex 15LM Elastomeric Sealant
   - Fill all large rock pockets and holes with waterplug (hydraulic cement)
   - Prime walls and floors with Elasto-Poxy Primer
   - Apply first coat of Elasto-Deck B.T. 1000
   - Within 24 hours, apply second coat of Elasto-Deck B.T. 1000.

   The sandblast residue was sampled for purposes of disposal, drummed, and subsequently disposed. The analytical results are presented in Table 1-5b.

   Following this work, the pipe from the grit chamber to the sedimentation chamber was tested for leaks. The pipe was found to leak. Consequently, the water in the grit chamber was pumped out and a closed circuit television survey of the pipe was conducted. Some evidence

of infiltration near the lower joints was observed. On March 17, 2001, the pipe between the grit chamber and the sedimentation chamber was slip-lined to repair the leak. The settling tubes were reinstalled and the site was put back online on March 19, 2001.

Routine maintenance activities at the Multi-chambered Treatment Train included:

1. Securing the bottom float in the sump.

Overall Review of Maintenance Activities at the Lakewood Park & Ride Multi-chambered Treatment Train (74208)

Site-specific maintenance activities at the Lakewood Park & Ride Multi-chambered Treatment Train consisted of unscheduled and routine maintenance.

Unscheduled maintenance at the Multi-chambered Treatment Train consisted of the following:

1. Installing a 2 inch pipe extension on the transfer pump discharge pipe.

Routine maintenance activities at the Multi-chambered Treatment Train included:

1. Repairing the grit chamber cover.
2. Removing weeds from the filter chamber and the sedimentation chamber.
3. Removing vegetation from the skimmer booms.
4. Reconnecting or tightening grommets for float valves.

Figure 3-5a summarizes the frequency of maintenance activities (i.e., number of times maintenance was conducted at the BMP) and Figure 3-5b summarizes the average amount of time spent performing each activity.

Figure 3-5a: Frequency of Maintenance Activities at the Multi-chambered Treatment Trains

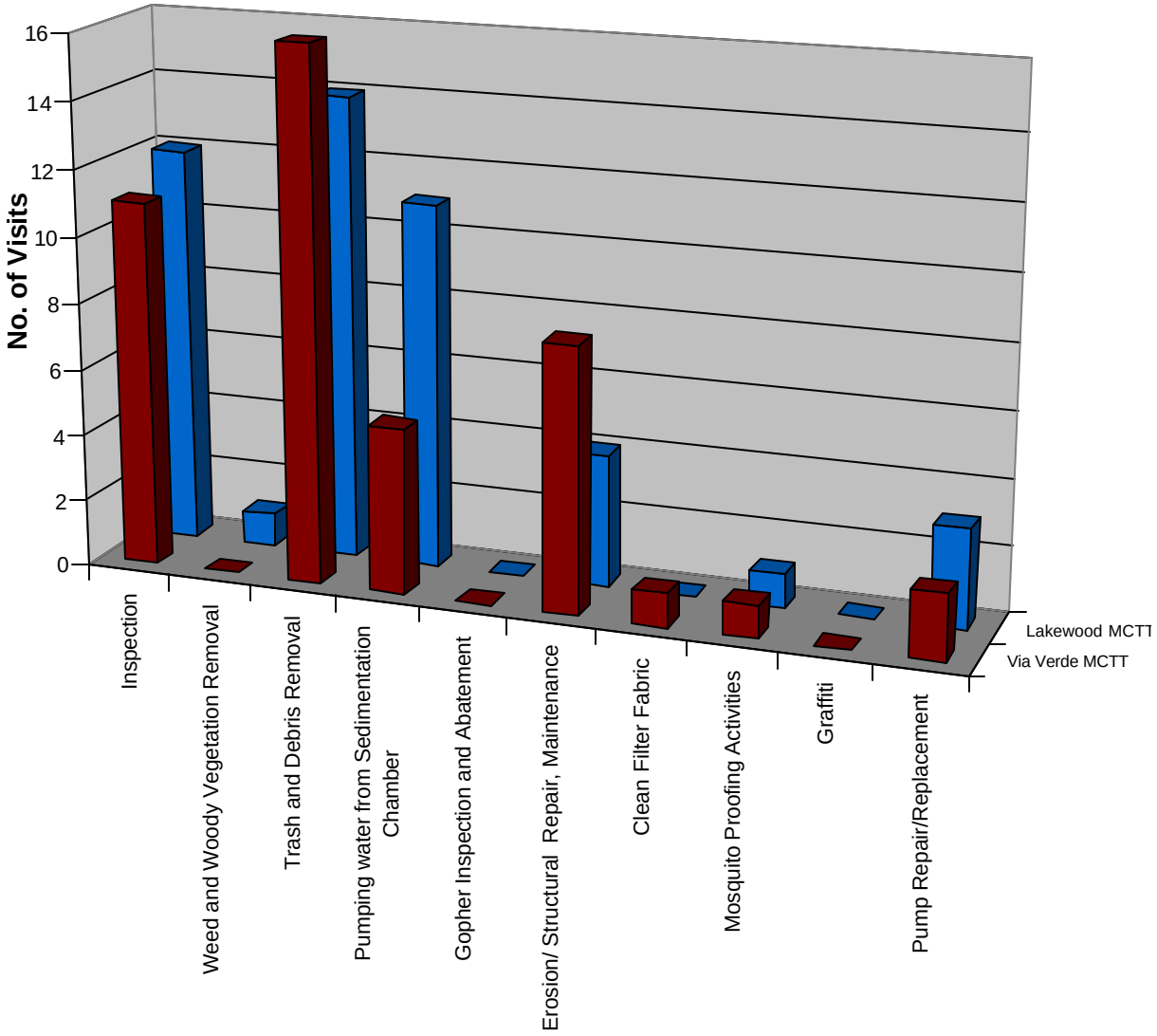
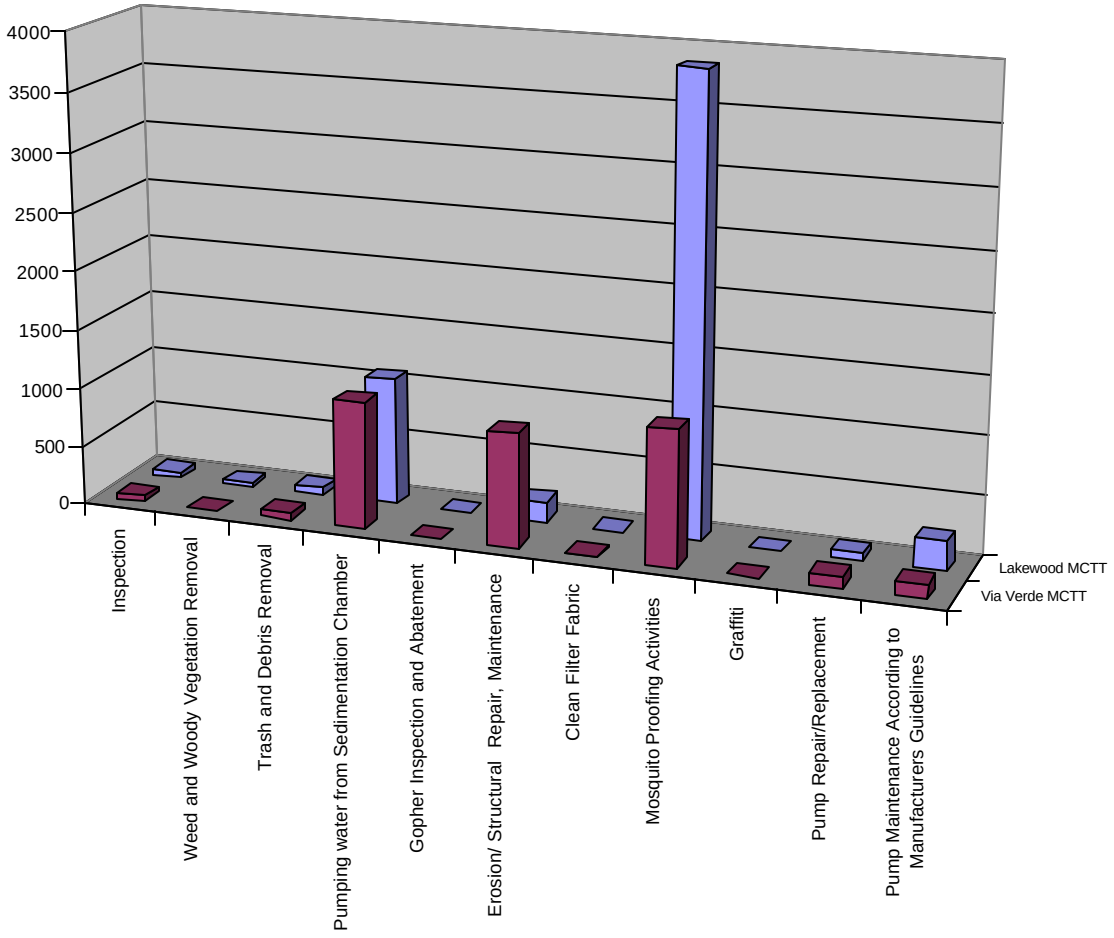


Figure 3-5b: Average Maintenance Times at the Multi-chambered Treatment Trains



3.1.6 CDS Units

Overall Review of Maintenance Activities at the Continuous Deflective Separation Units

Maintenance activities at the Continuous Deflective Separation Units consisted of unscheduled and routine maintenance. Unscheduled maintenance at each Continuous Deflective Separation Unit consisted of the following:

1. Grouting the weir box to eliminate the sump in July 2000.

2. Installing a riser section above the separation screen in July 2000.

3. Installing a new separation screen with larger openings in October 2000. Due to clogging problems experienced by the manufacturer, resulting in unreasonably high maintenance requirements, the original screen size will no longer be made. It was replaced with one with larger openings and hence less clogging potential.

4. Mosquito-proofing the unit. A series of modifications were made to improve the mosquito-proofing of the litter bypass bag, after Vector Control District personnel observed breeding in the units:

   In November 2000:

   - The original bypass bag was replaced with a white plankton screen mosquito proof bag.
   - Weather stripping was installed on the CDS cover and on the weir box cover.
   - The CDS cover was secured with bolts.
   - Holes were sealed with silicone.

   In February 2001:

   - The end of the white litter bypass/mosquito proofing bag was cut off in order to prevent impedance of flow from the CDS unit, which was observed during the January 10-12, 2001 storm event. The end of the bag was weighted down to prevent mosquitoes entering. A new litter bypass collection basket was fabricated and installed downstream of the H-flume.

   In March 2001:

   - The white mosquito proof bag was replaced with a new mosquito screen, which was a more flexible material and is UV protected. It is woven with holes smaller in size than typical mosquito screens. A tube was made by sewing (double-stitching) the screen with monofilament i.e., fishing line. A peripheral pocket was also sewn on the outlet to encase a chain, which is used to help close the end.

Routine inspections were conducted on a monthly basis and weekly during extended periods of wet weather. In accordance with the MID and OMM Plan, routine maintenance activities at each Continuous Deflective Separation Unit consisted of the following:

1. Removing trash and debris from the BMP area.

2. Clearing the weir box of sediment and debris by pushing it into the sump.

3. Cleaning out gross pollutants (litter and vegetation) from the sump, weir box and bypass bag, in accordance with the MID. The maintenance threshold for gross pollutants in the sump was set at 85% full, which was reached in January and March 2001 at the Orcas site, and in January 2001 at the Filmore site. Both units were also cleaned out in May 2001, in accordance with the MID. The following table shows the accumulation over time of floatable and settable material in the sump at both CDS sites:

Table 3-1: Depth of Settable and Floatable Gross Pollutants in CDS Units

Date	Settlables (inches)		Floatables (inches)	
	Orcas	**Filmore**	**Orcas**	**Filmore**
11/7/00	5.75	7.5	8-9	1
12/8/00	9.5	13.75	4	1
1/15/01	42	26	12	3
1/16/01	**MAINTENANCE**			
2/6/01	1	1.5	1	0.5
2/15/01	14	4	4	1.5
2/24/01	13	7.5	1	1
3/2/01	17	4.5	2-3	1-2.5
3/4/01	18	8	1	1
3/6/01	18	8	ND[1]	ND
3/7/01	19-19.5	8	ND	ND
3/12/01	19-20.75	<85% full	ND	ND
3/12/01	**MAINTENANCE**	<85% full	**MAINTENANCE**	ND
4/7/01	3	10	ND	ND
4/20/01	3	8.5	1	0.5
5/3/01	**MAINTENANCE**			

[1]ND = No Data

The total wet weight and volume of floatables, settlables, weir box material and bypass material were measured following each clean out. The litter and vegetation were separated and similarly measured. They were then left to dry on separate drying racks for a minimum period of 24 hours. The racks were photographed. Dry weights and volumes of floatables, settlables, weir box material and bypass material were measured for litter and for vegetation. The vegetation was then disposed of, and the litter was segregated into the following categories:

- Cardboard/Chipboard
- Cigarette Butts
- Cloth
- Glass
- Metal (foil and molded)
- Paper
- Plastic-Film
- Plastic-Moldable

- Styrofoam
- Wood Debris
- Other

Those categories were further segregated into the following usages:

- Smoking-related
- Food-related
- General unknown

Finally, each type of litter category within floatables, settlables, weir box material and bypass material was measured, weighed, and counted, and the litter was then disposed of. The breakdown of litter versus vegetation, and types of litter can be seen in Figures 41a and 41b.

Overall Review of Maintenance Activities at the I-210/East of Orcas Avenue Continuous Deflective Separation Unit (73102)

Site-specific maintenance activities at the I-210/East of Orcas Avenue Continuous Deflective Separation Unit consisted of routine maintenance.

Routine maintenance at the Continuous Deflective Separation Unit consisted of the following:

1. Trimming trees, which had damaged the barbed wire at the top of the fence surrounding the site.

2. Repairing the damaged barbed wire.

3. Removing sediment from the concrete ditch adjacent to the CDS unit. The sediment was a result of the embankment eroding.

4. Removing weeds from the BMP area.

Overall Review of Maintenance Activities at the I-210/East of Filmore Street Continuous Deflective Separation Unit (73103)

Site-specific maintenance activities at the I-210/East of Filmore Street Continuous Deflective Separation Unit consisted of routine maintenance.

Routine maintenance at the Continuous Deflective Separation Unit consisted of the following:

1. Removing graffiti from the enclosure and flume.

Figure 3-6a summarizes the frequency of maintenance activities (i.e., number of times maintenance was conducted at the BMP) and Figure 3-6b summarizes the average amount of time spent performing each activity.

Figure 3-6a: Frequency of Maintenance Activities at the Continuous Deflective Separation Units

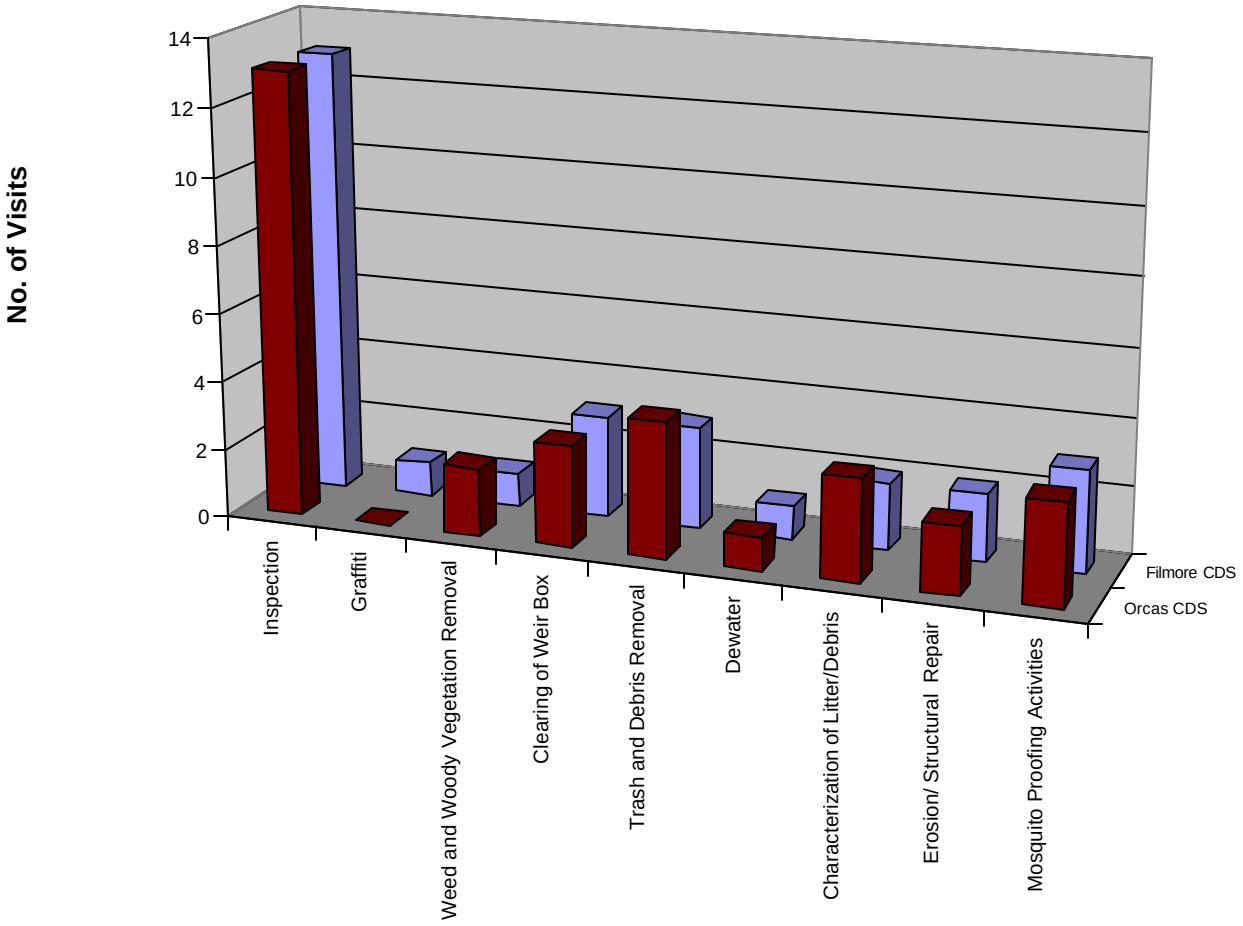
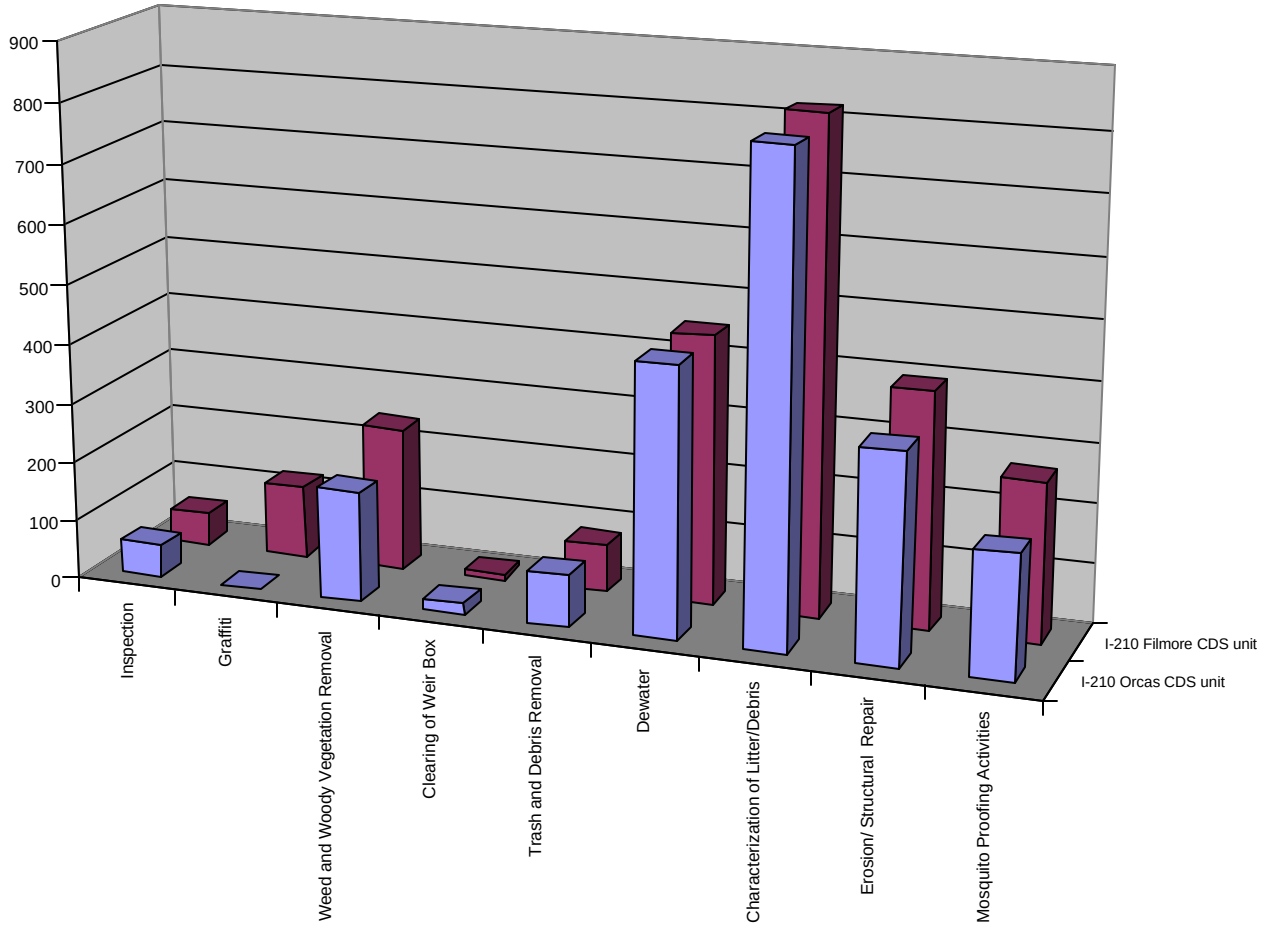


Figure 3-6b: Average Maintenance Times at the Continuous Deflective Separation Units



3.1.7 Drain Inlet Inserts

Overall Review of Maintenance Activities at the Foothill Maintenance Station StreamGuardä DII (73216N)

Maintenance activities at the Foothill Maintenance Station StreamGuard™ DII consisted of one-time maintenance activities.

One-time maintenance activities conducted at the site include the following:

1. Prior to the 2000/01 wet season, the DII was installed and the interface gap between the DII fabric and the drain inlet was eliminated using wood shims to compress the DII fabric against the drain inlet walls.

Routine inspections were conducted at the site prior to and during each storm event. The thresholds for replacement of the DII provided in the MID were not reached. The DII was removed during the first week of May 2001 and subsequently analyzed.

Figure 3-7a summarizes the frequency of maintenance activities (i.e., number of times maintenance was conducted at the BMP) and Figure 3-7b summarizes the average amount of time spent performing each activity.

Overall Review of Maintenance Activities at the Las Flores Maintenance Station StreamGuardä DII (73217N)

Maintenance activities at the Las Flores Maintenance Station StreamGuard™ DII consisted of routine maintenance activities.

Routine maintenance activities conducted at the site include the following:

1. Prior to the 2000/01 wet season, the DII was installed and the interface gap between the DII fabric and the drain inlet was eliminated using wood shims to compress the DII fabric against the drain inlet walls.

The rubber berm surrounding the sampling chamber was repaired five times.

1. The DII slipped in one location along the inlet edge, creating a gap between the DII and the drain inlet wall. The DII was subsequently returned to its original position and the inlet-DII interface was tightened using additional wood shims.

Routine inspections were conducted at the site prior to and during each storm event, and the thresholds for replacement of the DII provided in the MID were reached once, due to a rip being discovered in the StreamGuard fabric. The DII was replaced on January 23, 2001, and removed during the first week in May 2001. The DII materials were subsequently analyzed on both occasions.

Figure 3-7a summarizes the frequency of maintenance activities (i.e., number of times maintenance was conducted at the BMP) and Figure 3-7b summarizes the average amount o time spent performing each activity.

Overall Review of Maintenance Activities at the Rosemead Maintenance Station StreamGuardä DII (73218S)

Maintenance activities at the Rosemead Maintenance Station StreamGuard™ DII consisted of one-time maintenance activities and routine maintenance activities.

One-time/routine maintenance activities conducted at the site include the following:

1. Prior to the 2000/01 wet season, the DII was installed and the interface gap between the DII fabric and the drain inlet was eliminated using wood shims to compress the DII fabric against the drain inlet walls.

2. Removed leaves from the top of the inlet grate, to avoid impedance of flow into the DII, and stored in an on-site storage container designed to emulate DII conditions.

3. The DII slipped in one location along the inlet edge, creating a gap between the DII and the drain inlet wall. The DII was subsequently returned to its original position and the inlet-DII interface was tightened using additional wood shims. On another occasion, the inlet-DII interface was tightened using additional wood shims to prevent slippage.

Routine inspections were conducted at the site prior to and during each storm event. The thresholds for replacement of the DII provided in the MID were not reached. The DII was removed during the first week in May 2001 and subsequently analyzed.

Figure 3-7a summarizes the frequency of maintenance activities (i.e., number of times maintenance was conducted at the BMP) and Figure 3-7b summarizes the average amount of time spent performing each activity.

Overall Review of Maintenance Activities at the Foothill Maintenance Station Fossil Filterä DII (73216S)

Maintenance activities at the Foothill Maintenance Station Fossil Filter™ DII consisted of routine and unscheduled maintenance activities.

Routine maintenance activities conducted at the site include the following:

1. Prior to the 2000/01 wet season, the DII adsorbent material was installed.

2. The interface between the DII and the inlet was checked for gaps prior to the beginning of the 2000/01 wet season and throughout the wet season; no gaps were found.

3. The stainless steel screws holding the caps on the ends of the cartridges had come loose and were replaced.

4. The rubber berm surrounding the sampling chamber was repaired once.

Routine inspections were conducted at the site prior to, during, and after each storm event. Generally, small amounts of trash, debris, and sediment were removed from the DII both before and once during a storm event, and sometimes after the storm event. Removed trash, debris, and sediment were placed in an on-site storage container designed to emulate DII conditions.

Unscheduled maintenance activities conducted at the site include the following:

1. Cleanup of the site and replacement of the adsorbent granules following a diesel spill on October 5, 2000. Caltrans soaked up the diesel fuel using a super-fine absorbent material on the asphalt and within the BMP. The DII was removed and the adsorbent material was disposed of with the diesel fuel. The fuel had drained through the subsurface pipe to the monitoring vault. The Palmer-Bowlus flume apparently prevented the fuel from entering the storm drain. Caltrans placed a barrier at this point to prevent fuel from entering the storm drain. A high pressure steam cleaner was used to wash down the concrete/asphalt pavement, the DII, the drain inlet, and, as much as possible, the concrete pipe connecting the drain inlet to the monitoring vault. A vacuum truck was used to vacuum out the fuel and rinse water as it entered this chamber. Steam cleaning was continued until there was no longer an oil sheen in the rinse water. No detergents were used during the cleaning, only high-pressure steam. The Fossil Filter DII cartridges appeared to be adequately clean so new adsorbent material was replaced and the DII was reinstalled.

The thresholds for replacement of the DII provided in the MID were not reached after the reinstallation following the diesel spill. The adsorbent granules were removed during the first week in May 2001. Subsequently, the adsorbent granules from the cartridges and trash, debris, and sediment collected during the 2000/01 wet season were sent to the laboratory for analysis.

Figure 3-7a summarizes the frequency of maintenance activities (i.e., number of times maintenance was conducted at the BMP) and Figure 3-7b summarizes the average amount of time spent performing each activity.

Overall Review of Maintenance Activities at the Las Flores Maintenance Station Fossil Filterä DII (73217S)

Maintenance activities at the Las Flores Maintenance Station Fossil Filter™ DII consisted of one-time maintenance activities and routine maintenance activities.

One-time/routine maintenance activities conducted at the site include the following:

1. Prior to the 2000/01 wet season, the DII adsorbent material was installed.

2. The interface between the DII and the inlet was checked for gaps prior to the beginning of the 2000/01 wet season and throughout the wet season; a gap was found one time and sealed with spray foam.

3. The stainless steel screws holding the caps on the ends of the cartridges had come loose and were replaced.

4. The rubber berm surrounding the sampling chamber was repaired twice.

Routine inspections were conducted at the site prior to, during, and after each storm event. Generally, small amounts of trash, debris, and sediment were removed from the DII both before and once during a storm event, and sometimes after the storm event. Removed trash, debris, and sediment were placed in an on-site storage container designed to emulate DII conditions.

The thresholds for replacement of the DII provided in the MID were not reached. The adsorbent granules were removed during the first week in May 2001. Subsequently, the adsorbent granules from the cartridges and trash, debris, and sediment collected during the 2000/01 wet season were sent to the laboratory for analysis.

Figure 3-7a summarizes the frequency of maintenance activities (i.e., number of times maintenance was conducted at the BMP) and Figure 3-7b summarizes the average amount of time spent performing each activity.

Overall Review of Maintenance Activities at the Rosemead Maintenance Station Fossil Filterä DII (73218N)

Maintenance activities at the Rosemead Maintenance Station Fossil Filter™ DII consisted of one-time maintenance activities and routine maintenance activities.

One-time/routine maintenance activities conducted at the site include the following:

1. Prior to the 2000/01 wet season, the DII adsorbent material was installed.
2. The interface between the DII and the inlet was checked for gaps prior to the beginning of the 2000/01 wet season and throughout the wet season; a gap was found one time and repaired by securing a loose piece of rubber.
3. The stainless steel screws holding the caps on the ends of the cartridges had come loose and were replaced.
4. The rubber berm surrounding the sampling chamber was repaired twice.

Routine inspections were conducted at the site prior to, during, and after each storm event. Generally, small amounts of trash, debris, and sediment were removed from the DII both before and once during a storm event, and sometimes after the storm event. Removed trash, debris, and sediment were placed in an on-site storage container designed to emulate DII conditions.

The thresholds for replacement of the DII provided in the MID were not reached. The adsorbent granules were removed during the first week in May 2001. Subsequently, the adsorbent granules from the cartridges and trash, debris, and sediment collected during the 2000/01 wet season were sent to the laboratory for analysis.

Figure 3-7a summarizes the frequency of maintenance activities (i.e., number of times maintenance was conducted at the BMP) and Figure 3-7b summarizes the average amount of time spent performing each activity.

Figure 3-7a: Frequency of Maintenance Activities at the DII Sites

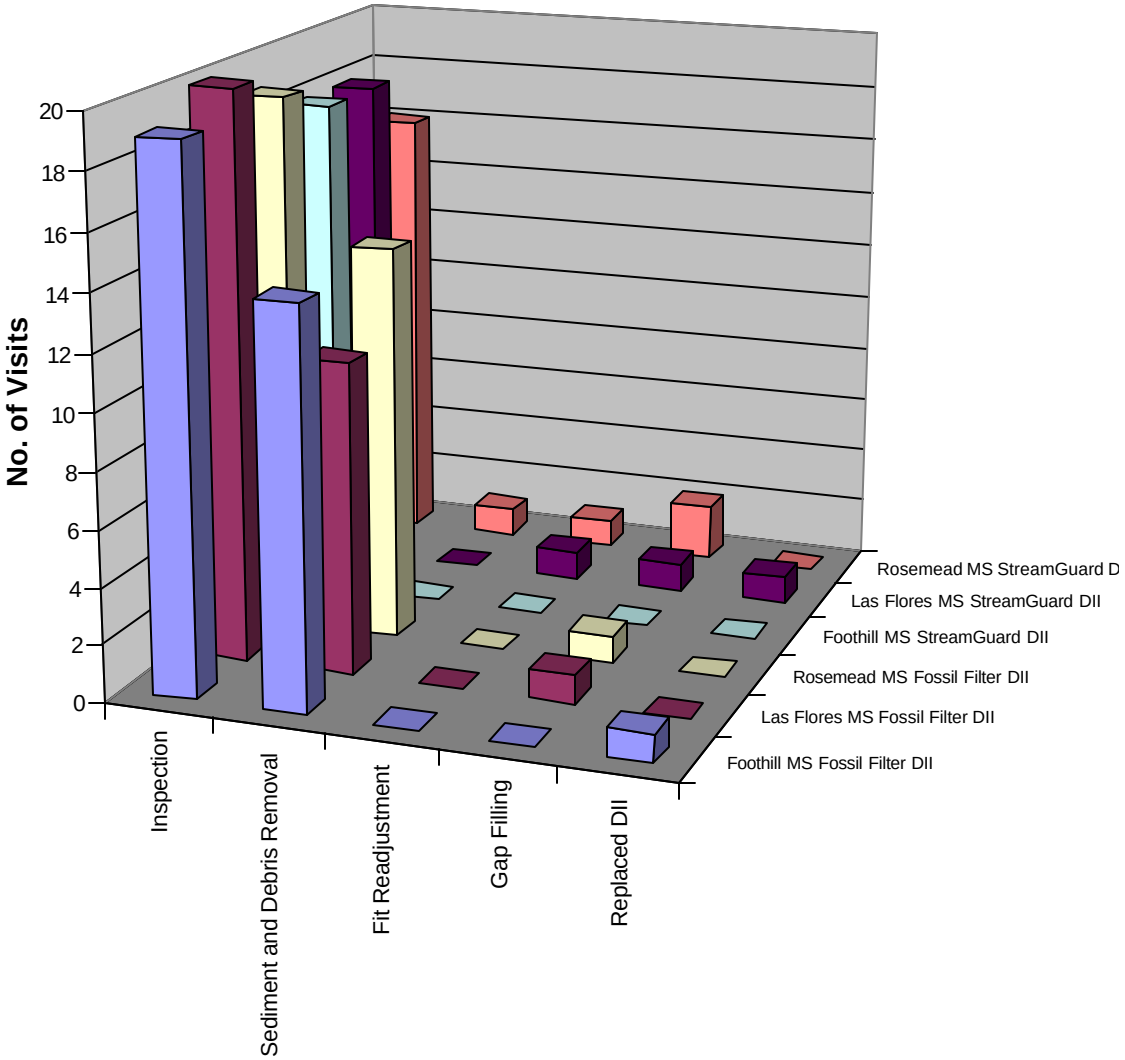
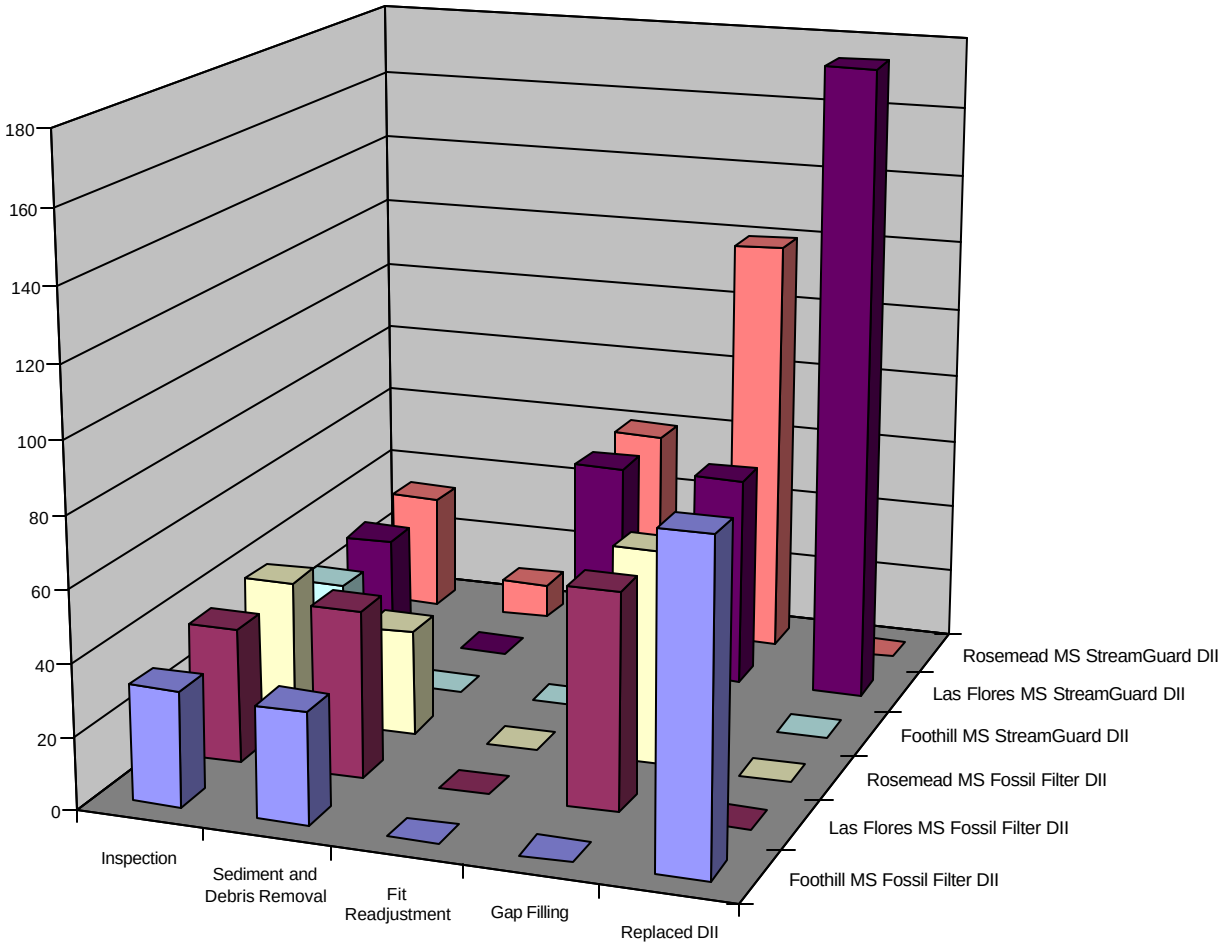


Figure 3-7b: Average Maintenance Times at the DII Sites



3.1.8 Oil/Water Separator

Overall Review of Maintenance Activities at the Alameda Maintenance Station Oil/Water Separator (74201)

Maintenance activities at the Alameda Maintenance Station Oil/Water Separator consisted of routine maintenance activities.

Routine maintenance activities conducted at the site include the following:

1. Removing trash and debris from the BMP area.
2. Removing graffiti.
3. Sediment removed from the trench drain and drummed during the 1999-2000 wet season, was characterized and disposed of. The analytical results are presented in Table 1-5b.

Routine inspections were conducted per the OMM Plan and MID. The MID was revised on October 19, 2000, incorporating a change in frequency of sediment and oil inspection in the chambers of the Oil/Water Separator from monthly to quarterly.

Figure 3-8a summarizes the frequency of maintenance activities (i.e., number of times maintenance was conducted at the BMP) and Figure 3-8b summarizes the average amount of time spent performing each activity.

Figure 3-8a: Frequency of Maintenance Activities at the Oil/Water Separator

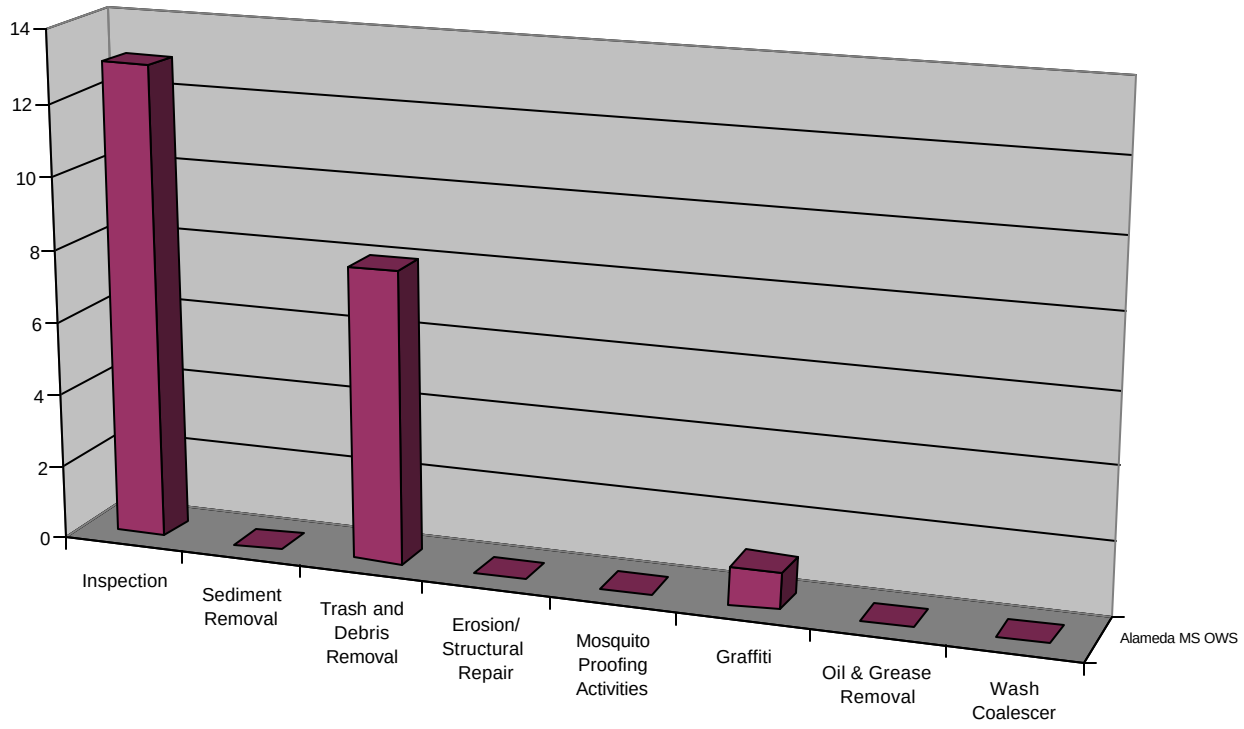
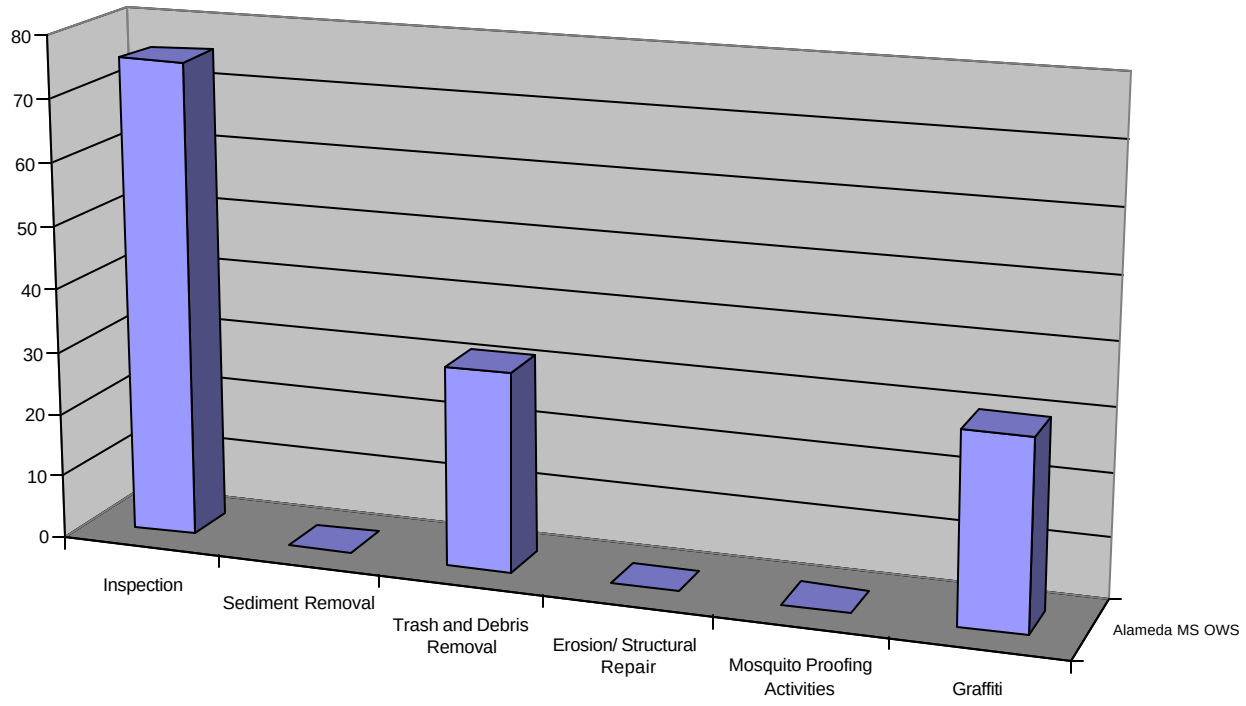


Figure 3-8b: Average Maintenance Times at the Oil/Water Separator



3.1.9 Infiltration Basin

Overall Review of Maintenance Activities at the I-605/SR-91 Infiltration Basin (73101)

Maintenance activities at the I-605/SR-91 Infiltration Basin (IB) consisted of routine maintenance activities.

Routine inspections were conducted per the OMM Plan and MID. Routine maintenance included removal of trash and debris, removal of woody vegetation, cutting the vegetation to a height of approximately six inches and removing and disposing of the cuttings, repairing erosion downstream of the access road asphalt swale, repairing the cover to the overflow junction box, and compaction of ground squirrel holes and gopher burrows.

Figure 3-9a summarizes the frequency of maintenance activities (i.e., number of times maintenance was conducted at the BMP) and Figure 3-9b summarizes the average amount of time spent performing each activity.

Figure 3-9a: Frequency of Maintenance Activities at the Infiltration Basin

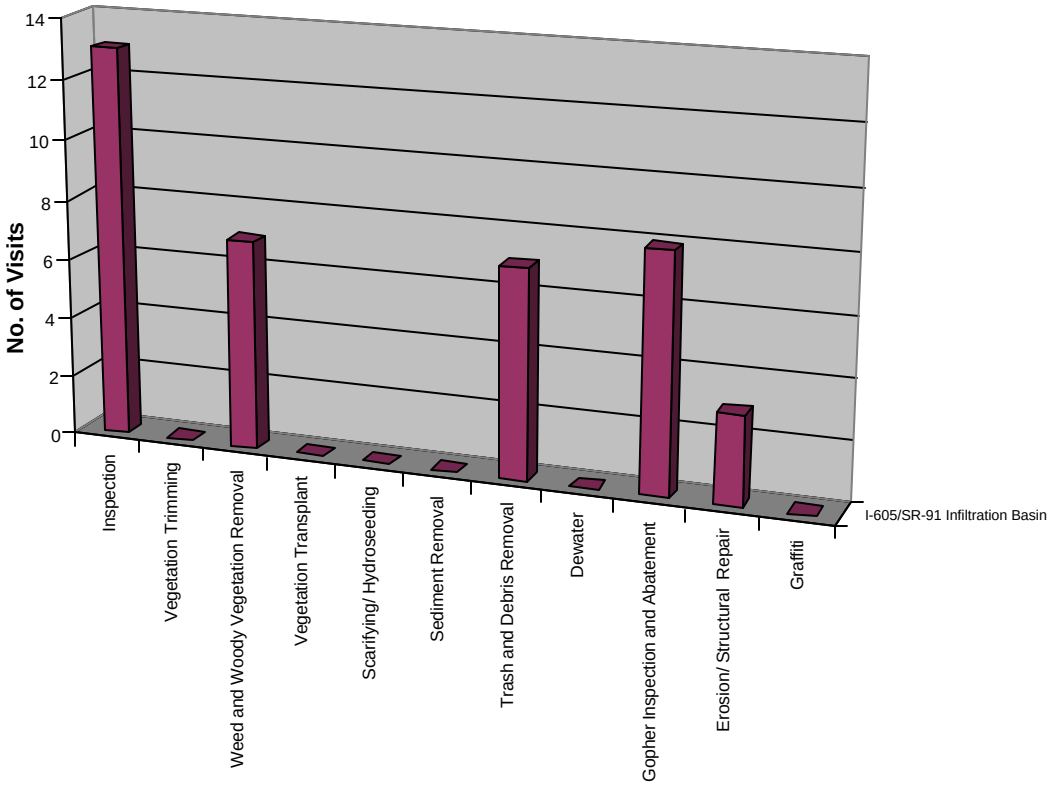
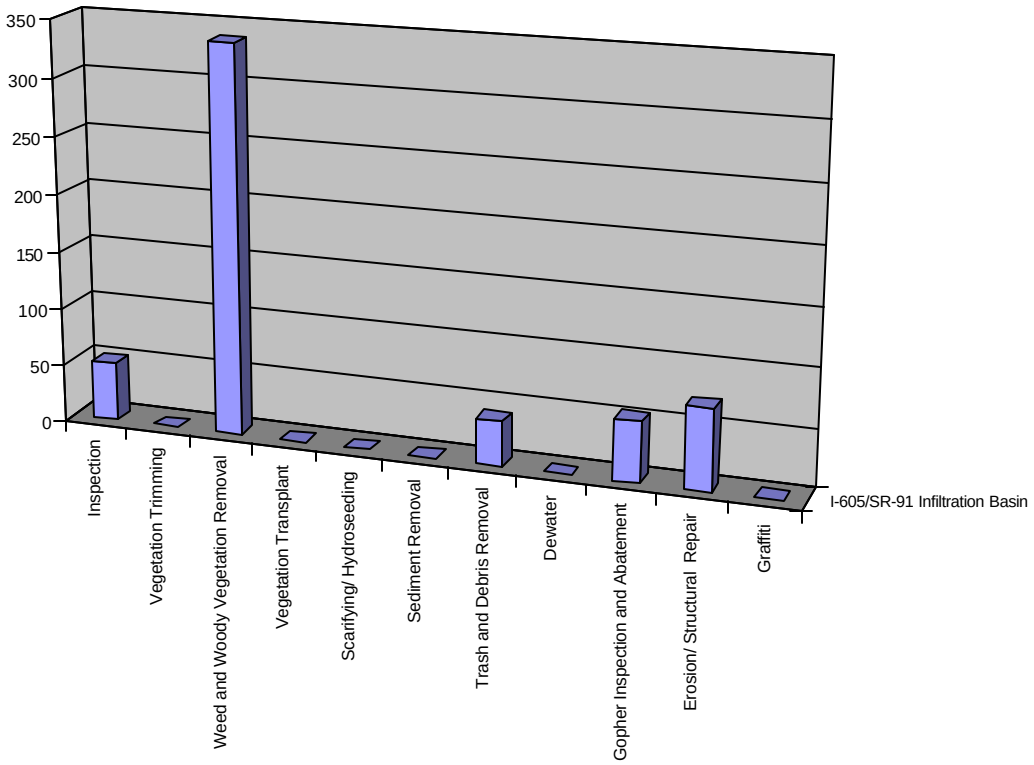


Figure 3-9b: Average Maintenance Times at the Infiltration Basin



3.1.10 Infiltration Trench

Overall Review of Maintenance Activities at the Altadena Maintenance Station Infiltration Trench (73211b)

Very little maintenance activity was conducted at the Altadena Maintenance Station Infiltration Trench. Routine inspections, required by the OMM Plan and MID, were conducted. Routine maintenance activities included the removal of small amounts of trash and debris, and some weeds, plus realigning the gate with the fence.

Figure 3-9a summarizes the frequency of maintenance activities (i.e., number of times maintenance was conducted at the BMP) and Figure 3-9b summarizes the average amount of time spent performing each activity.

Figure 3-10a: Frequency of Maintenance Activities at the Infiltration Trench

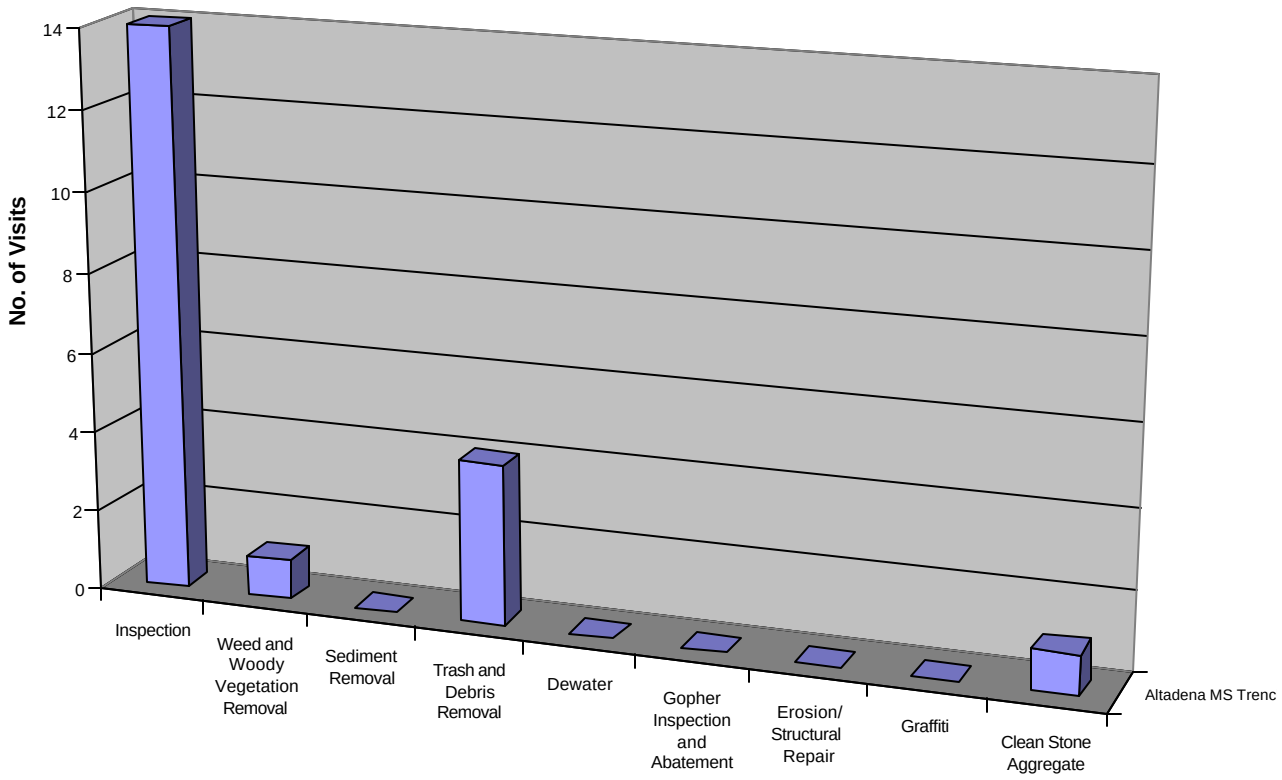
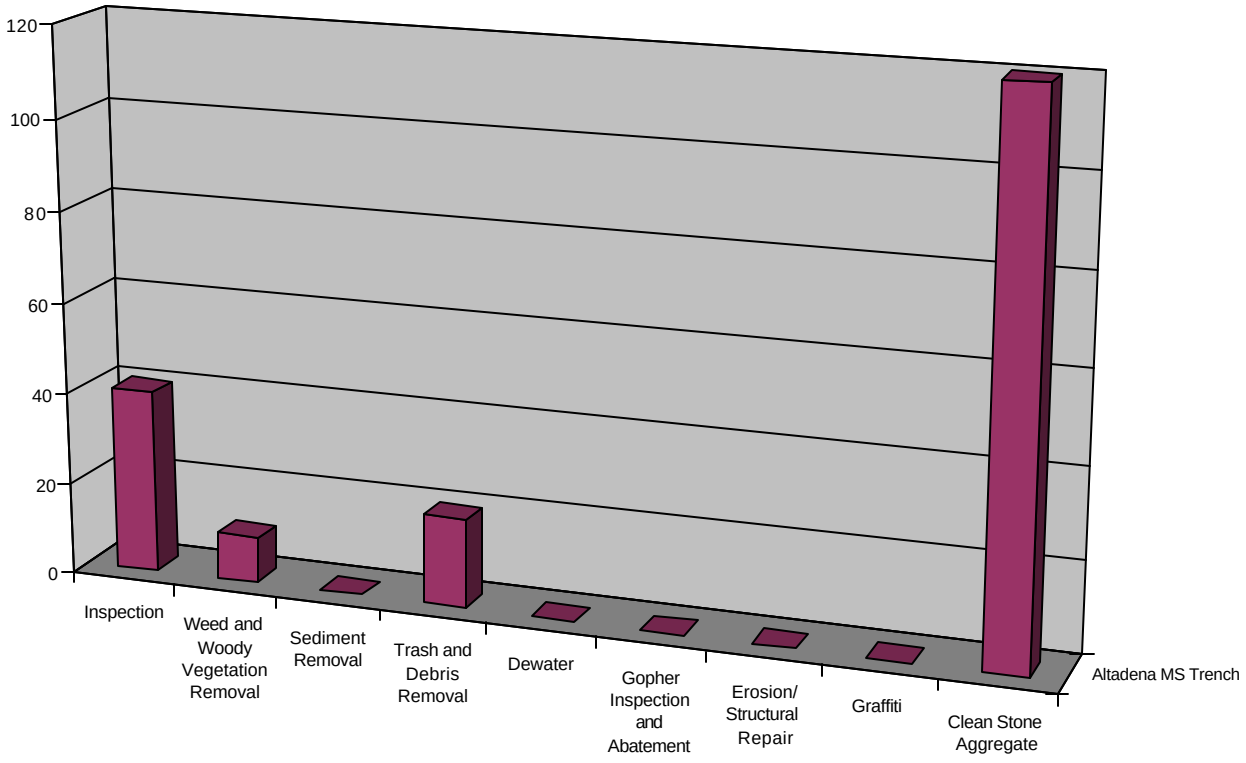


Figure 3-10b: Average Maintenance Times at the Infiltration Trench



4.0 COST SUMMARY

A cost summary for maintenance of the BMPs during the 2000/2001 year is provided in the following spreadsheets, covering the period from July 2000 to June 2001. These cost summaries provided maintenance hours with generic rates.

BMP Retrofit Pilot Program
Maintenance Operation
Cost Accounting Summary, 2000-01

DISTRICT: 7 | LOCATION: I-805/SR-51 Interchange | SITE NO: 73101 | BMP TYPE: Infiltration Basin

	TASK	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Total (hrs)	Avg Rate	TOTAL $
Labor (hours)	*Administration*															
	General program support/Follow-up	6.2	5.3	4.4	3.1	5.2	10.7	1.9	6.5	9.6	4.3	12.5	17.5	87.0	$120	$ 10,444
	Encroachment Permits	0.5												0.5	$87	$ 44
	Travel	2.3	4.3	4.7	1.2	3.0	6.1	1.7	7.6	4.6	1.9	12.2	7.1	56.6	$87	$ 4,922
	Unscheduled events													0.0	$87	$ -
	Monthly Subtotal (hours)	9.0	9.6	9.1	4.2	8.2	16.8	3.6	14.1	14.3	6.2	24.7	24.5	144.1		
	Monthly Subtotal ($)	$989	$1,005	$935	$467	$883	$1,810	$373	$1,436	$1,560	$683	$2,558	$2,711	$15,410		
														Task Subtotal =		$15,410
	Operation															
	Wet season inspections				1.0	1.0	0.5	1.0	1.0	1.5	1.0			7.0	$55	$ 385
	Dry season inspections	1.0	0.5	1.0								1.0	0.5	4.0	$55	$ 220
	Unscheduled inspections/field calls									0.5				0.5	$60	$ 30
	Monthly Subtotal (hours)	1	0.5	1	1.0	1.0	0.5	1.0	1.0	2.0	1.0	1.0	0.5	11.5		
	Monthly Subtotal ($)	$55	$28	$55	$55	$55	$28	$55	$55	$113	$55	$55	$28	$635		
														Task Subtotal =		$635
	Maintenance															
	Scheduled maintenance	2.0	1.0	9.5		1.0	28.3		25.5	2.0	0.3	55.8	33.0	158.3	$55	$ 8,704
	Unscheduled maintenance													0.0	$55	$ -
	Vandalism													0.0	$55	$ -
	Acts of God													0.0	$55	$ -
	Landscape Maintenance Contractor													0.0	$0	$ -
	Sediment Removal Contractor													0.0	$0	$ -
	Vegetation Consultant													0.0	$75	$ -
	Other Contractor													0.0	$0	$ -
	Other Contractor													0.0	$0	$ -
	Monthly Subtotal (hours)	2.0	1.0	9.5	0.0	1.0	28.3	0.0	25.5	2.0	0.3	55.8	33.0	158.3		
	Monthly Subtotal ($)	$110	$55	$523	$0	$55	$1,554	$0	$1,403	$110	$14	$3,066	$1,815	$8,704		
														Task Subtotal =		$8,704
	Vector Control															
	Contract & General administration	0.2	0.1	0.10	0.1	0.1	0.1	0.1						0.8	$120	$ 96
	Vector prevention maint. (consultant)													0.0	$65	$ -
	Response to VCD calls (consultant)													0.0	$55	$ -
	VCD efforts (contracted)	3.4	5.4	4.7	6.5	5.8	5.1	3.5	3.3	3.2	3.9	3.2	4.1	52.1	$46	$ 2,418
	Monthly Subtotal (hours)	3.6	5.5	4.8	6.6	5.9	5.2	3.6	3.3	3.2	3.9	3.2	4.1	52.9		
	Monthly Subtotal ($)	$181	$264	$230	$312	$281	$247	$176	$154	$149	$179	$150	$192	$2,514		
														Task Subtotal =		$2,514
Non-Recurring Equipment (hours)	*Equipment*															
	Weedwacker											26.5	10.0	36.5	$5	$ 183
	Piece of Equipment 2													0.0	$0	$ -
	Piece of Equipment 3													0.0	$0	$ -
	Piece of Equipment 4													0.0	$0	$ -
	Piece of Equipment 5													0.0	$0	$ -
	Piece of Equipment 6													0.0	$0	$ -
	Piece of Equipment 7													0.0	$0	$ -
	Monthly Subtotal (hours)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	26.5	10.0	36.5		
	Monthly Subtotal ($)	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$133	$50	$183		
														Equipment Subtotal =		$183

Dollars ($)	*Direct Costs*													Total $
	VCD supplies (direct costs less labor)													$ -
	Reproduction	$ 1	$ 1	$ 2	$ 1	$ 1	$ 1	$ 1						$ 7.31
	Postage/FedEx	$ 2	$ 1	$ 2	$ 2	$ 2	$ 3	$ 2	$ 2	$ 6		$ 14	$ 0.5	$ 36.18
	Lodging		$ 7	$ 3	$ 11		$ 10	$ 11	$ 9			$ 2		$ 53.04
	Per Diem		$ 3	$ 2	$ 5		$ 5	$ 5	$ 5			$ 0.4		$ 24.71
	Incidentals	$ 3	$ 5	$ 4	$ 9	$ 34	$ 1	$ 1						$ 57.35
	Vehicle Rental/Lease	$ 92	$ 24	$ 53	$ 8	$ 25	$ 28	$ 13	$ 79	$ 41	$ 9	$ 340	$ 124	$ 835.75
	Airfare													$ -
	Field Supp./Expendables	$ 13	$ 3	$ 4	$ 4	$ 1	$ 4	$ 1	$ 1	$ 3	$ 11	$ 3	$ 5	$ 54.23
	Equipment Rental													$ -
	Sediment Analyses													$ -
	Sediment Disposal													$ -
	Weed Wacker													$ -
	Vegetation Disposal													$ -
	Scarifying/Hydroseeding													$ -
	Monthly Subtotal	$ 111	$ 46	$ 69	$ 40	$ 63	$ 52	$ 33	$ 95	$ 50	$ 20	$ 360	$ 130	$ 1,069

MONTHLY TOTAL	$1,446	$1,397	$1,812	$874	$1,337	$3,690	$636	$3,143	$1,982	$950	$6,321	$4,925	2000/2001 TOTA	$28,513

BMP Retrofit Pilot Program
Maintenance Operation
Cost Accounting Summary, 2000-01

DISTRICT: 7 | LOCATION: I-210/East of Orcas Avenue | SITE NO: 73102 | BMP TYPE: Continuous Deflective Separation Unit

	TASK	2000 Jul	Aug	Sep	Oct	Nov	Dec	2001 Jan	Feb	Mar	Apr	May	Jun	Total (hrs)	Avg. Rate	TOTAL $
Labor (hours)	*Administration*															
	General program support/Follow-up	9.9	14.0	42.2	4.0	9.5	4.7	5.2	3.7	16.9	5.7	8.9	3.5	128.2	$120	$ 15,379
	Encroachment Permits	1.0	-											1.0	$87	$ 87
	Travel	3.8	3.2	3.7	1.7	6.0	2.6	5.2	4.7	14.9	1.9	8.4	0.8	57.0	$87	$ 4,957
	Unscheduled events													0.0	$87	$ -
	Monthly Subtotal (hours)	14.8	17.2	45.9	5.8	15.5	7.3	10.3	8.4	31.7	7.7	17.4	4.3	186.1		
	Monthly Subtotal ($)	$1,611	$1,956	$5,386	$633	$1,667	$793	$1,070	$850	$3,314	$854	$1,804	$485	$20,423		
														Task Subtotal =		$20,423
	Operation															
	Wet season inspections				0.5	0.8	1.0	1.0	1.5	1.0	0.5			6.3	$55	$ 344
	Dry season inspections		0.5	1.0								1.0	0.3	2.8	$55	$ 151
	Unscheduled inspections/field calls									3.0				3.0	$60	$ 180
	Monthly Subtotal (hours)	0.0	0.5	1.0	0.5	0.8	1.0	1.0	1.5	4.0	0.5	1.0	0.3	12.0		
	Monthly Subtotal ($)	$0	$28	$55	$28	$41	$55	$55	$83	$235	$28	$55	$14	$675		
														Task Subtotal =		$675
	Maintenance															
	Scheduled maintenance	7.3		1.0	0.5	0.5	0.3	4.3	4.3	27.0	4.3	41.8		91.0	$55	$ 5,005
	Unscheduled maintenance		1.0		8.8	9.0				2.3				21.0	$55	$ 1,155
	Vandalism													0.0	$55	$ -
	Acts of God													0.0	$55	$ -
	Landscape Maintenance Contractor													0.0	$0	$ -
	Sediment Removal Contractor													0.0	$0	$ -
	Vegetation Consultant													0.0	$75	$ -
	Other Contractor													0.0	$0	$ -
	Other Contractor													0.0	$0	$ -
	Monthly Subtotal (hours)	7.3	1.0	1.0	9.3	9.5	0.3	4.3	4.3	29.3	4.3	41.8	0.0	112.0		
	Monthly Subtotal ($)	$399	$55	$55	$509	$523	$14	$234	$234	$1,609	$234	$2,296	$0	$6,160		
														Task Subtotal =		$6,160
	Vector Control															
	Contract & General administration	0.2	1.0	0.10	0.1	0.1	0.1	0.1						1.7	$120	$ 204
	Vector prevention maint. (consultant)													0.0	$65	$ -
	Response to VCD calls (consultant)													0.0	$55	$ -
	VCD efforts (contracted)	4.9	6.4	6.0	9.8	10.0	7.6	4.3	4.1	3.9	4.5	3.9	4.8	70.0	$46	$ 3,251
	Monthly Subtotal (hours)	5.1	7.4	6.1	9.9	10.1	7.7	4.4	4.1	3.9	4.5	3.9	4.8	71.7		
	Monthly Subtotal ($)	$251	$415	$289	$465	$477	$365	$211	$192	$181	$209	$179	$221	$3,455		
														Task Subtotal =		$3,455
Non-Recurring Equipment (hours)	*Equipment*															
	Generator											7.5		7.5	$5	$ 38
	Compressor pump											7.5		7.5	$5	$ 38
	Piece of Equipment 3													0.0	$0	$ -
	Piece of Equipment 4													0.0	$0	$ -
	Piece of Equipment 5													0.0	$0	$ -
	Piece of Equipment 6													0.0	$0	$ -
	Monthly Subtotal (hours)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	15.0	0.0	15.0		
	Monthly Subtotal ($)	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$75	$0	$75		
														Equipment Subtotal =		$75
Dollars ($)	*Direct Costs*															Total $
	VCD supplies (direct costs less labor)															$ -
	Reproduction	$ 1	$ 27	$ 97	$ 2	$ 1	$ 1	$ 1								$ 129
	Postage/FedEx	$ 2	$ 27	$ 97	$ 3	$ 2	$ 3	$ 2	$ 2	$ 6		$ 14	$ 0.5			$ 158
	Lodging		$ 7	$ 3	$ 11		$ 10	$ 11	$ 9			$ 2				$ 53
	Per Diem		$ 3	$ 2	$ 5		$ 5	$ 5	$ 5			$ 0.4				$ 25
	Incidentals	$ 3	$ 31	$ 99	$ 10	$ 34	$ 1	$ 1								$ 179
	Vehicle Rental/Lease	$ 153	$ 18	$ 42	$ 12	$ 50	$ 12	$ 40	$ 49	$ 131	$ 9	$ 235	$ 14			$ 766
	Airfare															$ -
	Field Supp./Expendables	$ 13	$ 3	$ 4	$ 4	$ 1	$ 4	$ 1	$ 1	$ 33	$ 11	$ 3	$ 5			$ 84
	Equipment Rental															$ -
	Sediment Analyses															$ -
	Sediment Disposal															$ -
	Weed Wacker															$ -
	Vegetation Disposal															$ -
	Storage Container															$ -
	Monthly Subtotal	$ 172	$ 116	$ 343	$ 48	$ 88	$ 36	$ 60	$ 66	$ 170	$ 20	$ 255	$ 19	$ 1,393		
	MONTHLY TOTAL	$2,433	$2,570	$6,128	$1,682	$2,795	$1,263	$1,630	$1,423	$5,508	$1,344	$4,665	$739	2000/2001 TOTAL =		$32,181

BMP Retrofit Pilot Program
Maintenance Operation
Cost Accounting Summary, 2000-01

DISTRICT: 7 | LOCATION: I-215/East of Pingree Street | SITE NO. 73103 | BMP TYPE: Continuous Deflective Separation Unit

	TASK	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Total (hrs)	Avg Rate	TOTAL $
Labor (hours)	*Administration*															
	General program support/Follow-up	9.9	14.0	42.2	4.0	9.5	4.7	5.2	3.7	13.5	5.7	8.9	3.5	124.8	$120	$ 14,977
	Encroachment Permits	1.0												1.0	$87	$ 87
	Travel	3.1	3.2	1.9	2.3	5.3	2.6	5.2	3.8	6.5	3.2	8.4	0.8	46.2	$87	$ 4,016
	Unscheduled events													0.0	$87	$ -
	Monthly Subtotal (hours)	14.0	17.2	44.0	6.3	14.8	7.3	10.3	7.4	20.0	8.9	17.4	4.3	172.0		
	Monthly Subtotal ($)	$1,544	$1,956	$5,223	$683	$1,602	$793	$1,070	$767	$2,186	$967	$1,804	$485	$19,080		
														Task Subtotal =		$19,080
	Operation															
	Wet season inspections				0.5	0.8	1.0	1.0	1.5	1.0	0.5			6.3	$55	$ 344
	Dry season inspections		0.5	1.0								1.0	0.3	2.8	$55	$ 151
	Unscheduled inspections/field calls									3.5				3.5	$60	$ 210
	Monthly Subtotal (hours)	0.0	0.5	1.0	0.5	0.8	1.0	1.0	1.5	4.5	0.5	1.0	0.3	12.5		
	Monthly Subtotal ($)	$0	$28	$55	$28	$41	$55	$55	$83	$265	$28	$55	$14	$705		
														Task Subtotal =		$705
	Maintenance															
	Scheduled maintenance	7.5	0.3		0.5	0.5	0.3	7.0	1.5		3.8	40.8		62.0	$55	$ 3,410
	Unscheduled maintenance				10.0	8.0				2.3				20.3	$55	$ 1,114
	Vandalism													0.0	$55	$ -
	Acts of God													0.0	$55	$ -
	Landscape Maintenance Contractor													0.0	$0	$ -
	Sediment Removal Contractor													0.0	$0	$ -
	Vegetation Consultant													0.0	$75	$ -
	Other Contractor													0.0	$0	$ -
	Other Contractor													0.0	$0	$ -
	Monthly Subtotal (hours)	7.5	0.3	0.0	10.5	8.5	0.3	7.0	1.5	2.3	3.8	40.8	0.0	82.3		
	Monthly Subtotal ($)	$413	$14	$0	$578	$468	$14	$385	$83	$124	$206	$2,241	$0	$4,524		
														Task Subtotal =		$4,524
	Vector Control															
	Contract & General administration	0.2	1.0	0.10	0.1	0.1	0.1	0.1						1.7	$120	$ 204
	Vector prevention maint. (consultant)													0.0	$65	$ -
	Response to VCD calls (consultant)													0.0	$55	$ -
	VCD efforts (contracted)	3.9	5.6	5.4	9.1	7.2	6.2	4.0	4.1	3.9	4.7	3.8	4.8	62.7	$46	$ 2,911
	Monthly Subtotal (hours)	4.1	6.6	5.5	9.2	7.3	6.3	4.1	4.1	3.9	4.7	3.8	4.8	64.4		
	Monthly Subtotal ($)	$207	$381	$262	$435	$344	$300	$198	$191	$179	$217	$176	$224	$3,115		
														Task Subtotal =		$3,115
Non-Recurring Equipment (hours)	*Equipment*															
	Generator											5.0		5.0	$5	$ 25
	Compressor pump											5.0		5.0	$5	$ 25
	Piece of Equipment 3													0.0	$0	$ -
	Piece of Equipment 4													0.0	$0	$ -
	Piece of Equipment 5													0.0	$0	$ -
	Piece of Equipment 6													0.0	$0	$ -
	Monthly Subtotal (hours)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	10.0	0.0	10.0		
	Monthly Subtotal ($)	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$50	$0	$50		
														Equipment Subtotal =		$50
Dollars ($)	*Direct Costs*													Total $		
	VCD supplies (direct costs less labor)													$ -		
	Reproduction	$ 1	$ 27	$ 97	$ 2	$ 1	$ 1	$ 1						$ 129		
	Postage/FedEx	$ 2	$ 27	$ 97	$ 3	$ 2	$ 3	$ 2	$ 2	$ 6		$ 14	$ 0.5	$ 158		
	Lodging		$ 7	$ 3	$ 11		$ 10	$ 11	$ 9			$ 2		$ 53		
	Per Diem		$ 3	$ 2	$ 5		$ 5	$ 5	$ 5			$ 0.4		$ 25		
	Incidentals	$ 3	$ 31	$ 99	$ 10	$ 34	$ 1	$ 1						$ 179		
	Vehicle Rental/Lease	$ 122	$ 18	$ 21	$ 16	$ 43	$ 12	$ 40	$ 40	$ 57	$ 15	$ 235	$ 14	$ 635		
	Airfare													$ -		
	Field Supp./Expendables	$ 13	$ 3	$ 4	$ 4	$ 1	$ 4	$ 1	$ 1	$ 33	$ 11	$ 3	$ 5	$ 84		
	Equipment Rental													$ -		
	Sediment Analyses													$ -		
	Sediment Disposal													$ -		
	Weed Wacker													$ -		
	Vegetation Disposal													$ -		
	Storage Container													$ -		
	Monthly Subtotal	$ 142	$ 116	$ 322	$ 52	$ 82	$ 36	$ 60	$ 56	$ 96	$ 26	$ 255	$ 19	$ 1,262		
	MONTHLY TOTAL	$2,306	$2,495	$5,862	$1,775	$2,536	$1,198	$1,768	$1,179	$2,849	$1,443	$4,582	$742	2000/2001 TOTAL =		$28,735

BMP Retrofit Pilot Program
Maintenance Operation
Cost Accounting Summary, 2000-01

DISTRICT: 7 | LOCATION: I-5/I-405 Intersection | SITE NO. 74101 | BMP TYPE: Extended Detention Basin

	TASK	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Total (hrs)	Avg. Rate	TOTAL $
Labor (hours)	*Administration*															
	General program support/Follow-up	9.6	7.0	3.3	1.9	13.7	9.7	6.6	8.9	10.1	14.8	10.3	16.6	112.4	$120	$ 13,492
	Encroachment Permits	0.5												0.5	$87	$ 44
	Travel	5.4	6.4	4.7	1.2	8.3	7.9	6.9	10.4	5.6	8.4	9.3	6.3	80.6	$87	$ 7,009
	Unscheduled events													0.0	$87	$ -
	Monthly Subtotal (hours)	15.5	13.4	7.9	3.0	21.9	17.5	13.5	19.3	15.7	23.2	19.6	22.9	193.5		
	Monthly Subtotal ($)	$1,663	$1,395	$796	$325	$2,361	$1,842	$1,394	$1,975	$1,701	$2,507	$2,046	$2,538	$20,544		
														Task Subtotal =		$20,544
	Operation															
	Wet season inspections				1.0	1.0	1.0	1.5	1.5	3.5	0.8			10.3	$45	$ 461
	Dry season inspections	1.5	1.8	1.0								1.5	0.5	6.3	$45	$ 281
	Unscheduled inspections/field calls													0.0	$90	$ -
	Monthly Subtotal (hours)	1.5	1.8	1.0	1.0	1.0	1.0	1.5	1.5	3.5	0.8	1.5	0.5	16.5		
	Monthly Subtotal ($)	$68	$79	$45	$45	$45	$45	$68	$68	$158	$34	$68	$23	$743		
														Task Subtotal =		$743
	Maintenance															
	Scheduled maintenance	21.0	14.3	4.8		9.5	18.0		14.3	9.8	32.3	38.75	9	171.5	$45	$ 7,718
	Unscheduled maintenance					13.5		30.0	15.0					58.5	$45	$ 2,633
	Vandalism													0.0	$45	$ -
	Acts of God													0.0	$45	$ -
	Landscape Maintenance Contractor													0.0	$45	$ -
	Sediment Removal Contractor													0.0	$45	$ -
	Other Contractor													0.0	$45	$ -
	Other Contractor													0.0	$45	$ -
	Other Contractor													0.0	$45	$ -
	Monthly Subtotal (hours)	21.0	14.3	4.8	0.0	23.0	18.0	30.0	29.3	9.8	32.3	38.8	9.0	230.0		
	Monthly Subtotal ($)	$945	$641	$214	$0	$1,035	$810	$1,350	$1,316	$439	$1,451	$1,744	$405	$10,350		
														Task Subtotal =		$10,350
	Vector Control															
	Contract & General administration													0.0	$120	$ -
	Vector prevention maint. (consultant)													0.0	$65	$ -
	Response to VCD calls (consultant)													0.0	$80	$ -
	VCD efforts (contracted)					8.2	7.5	4.3	3.3	3.3	3.9	3.3	4.1	37.8	$49	$ 1,854
	Monthly Subtotal (hours)	0.0	0.0	0.0	0.0	8.2	7.5	4.3	3.3	3.3	3.9	3.3	4.1	37.8		
	Monthly Subtotal ($)	$0	$0	$0	$0	$401	$367	$212	$163	$159	$191	$160	$202	$1,854		
														Task Subtotal =		$1,854
Non-Recurring Equipment (hours)	*Equipment*															
	Generator							7.0						7.0	$5	$ 35
	Shop vacuum							7.0						7.0	$5	$ 35
	Hammer drill							7.0						7.0	$5	$ 35
	Concrete hole corer							7.0						7.0	$5	$ 35
	Mounted Weed Eater	6.0												0.0	$7	$ -
	Weed Wacker	11.8		0.5								18.0		18.0	$5	$ 90
	Piece of Equipment 7													0.0	$0	$ -
	Piece of Equipment 8													0.0	$0	$ -
	Monthly Subtotal (hours)	17.8	0.0	0.5	0.0	0.0	0.0	28.0	0.0	0.0	0.0	18.0	0.0	46.0		
	Monthly Subtotal ($)	$101	$0	$3	$0	$0	$0	$140	$0	$0	$0	$90	$0	$230		
														Equipment Subtotal =		$230
Dollars ($)	*Direct Costs*													Total $		
	VCD supplies (direct costs less labor)													$ -		
	Reproduction													$ -		
	Postage/FedEx	$ 1	$ 0.3		$ 1	$ 1	$ 2	$ 1	$ 2	$ 6		$ 14	$ 0.5	$ 27		
	Lodging		$ 7	$ 3	$ 11		$ 10	$ 11	$ 9			$ 2		$ 43		
	Per Diem		$ 3	$ 2	$ 5		$ 5	$ 5	$ 5			$ 0.4		$ 20		
	Incidentals	$ 2	$ 4	$ 2	$ 8	$ 34								$ 41		
	Vehicle Rental/Lease	$ 214	$ 37	$ 53	$ 8	$ 68	$ 36	$ 54	$ 109	$ 49	$ 39	$ 261	$ 110	$ 735		
	Airfare													$ -		
	Field Supp./Expendables	$ 13	$ 3	$ 4	$ 4	$ 1	$ 4	$ 1	$ 416	$ 3	$ 11	$ 3	$ 5	$ 449		
	Equipment Rental													$ -		
	Sediment Analyser													$ -		
	Sediment Disposal													$ -		
	Other Direct Costs													$ -		
	Transfer Pump Replacement/Repair													$ -		
	Other Direct Costs													$ -		
	Monthly Subtotal	$ 230	$ 55	$ 63	$ 38	$ 105	$ 57	$ 71	$ 540	$ 58	$ 50	$ 281	$ 116	$ 1,316		
	MONTHLY TOTAL	$3,006	$2,170	$1,120	$408	$3,946	$3,121	$3,235	$4,061	$2,515	$4,232	$4,388	$3,284	2000/2001 TOTAL		$35,036

BMP Retrofit Pilot Program
Maintenance Operation
Cost Accounting Summary, 2000-01

DISTRICT: 2 | LOCATION: I-405/SR-91 Interchange | SITE NO.: 74102 | BMP TYPE: Extended Detention Basin

	TASK	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Total (hrs)	Avg. Rate	TOTAL $
Labor (hours)	***Administration***															
	General program support/Follow-up	9.6	7.0	3.3	1.9	7.5	9.7	1.7	8.1	10.1	14.8	10.3	16.6	100.4	$120	$ 12,053
	Encroachment Permits	0.5												0.5	$87	$ 44
	Travel	3.1	6.4	3.7	1.2	4.5	3.5	1.7	9.5	3.7	6.4	10.3	7.1	61.0	$87	$ 5,309
	Unscheduled events													0.0	$87	$ -
	Monthly Subtotal (hours)	13.2	13.4	7.0	3.0	12.0	13.2	3.4	17.6	13.9	21.3	20.6	23.7	162.0		
	Monthly Subtotal ($)	$1,463	$1,395	$715	$325	$1,288	$1,463	$349	$1,795	$1,540	$2,339	$2,128	$2,606	$17,405		
														Task Subtotal =		$17,405
	Operation															
	Wet season inspections				1.0	1.0	1.0	1.5	1.5	3.5	0.8			10.3	$45	$ 461
	Dry season inspections	1.5	1.5	1.0								1.5	0.5	6.0	$45	$ 270
	Unscheduled inspections/field calls													0.0	$90	$ -
	Monthly Subtotal (hours)	1.5	1.5	1.0	1.0	1.0	1.0	1.5	1.5	3.5	0.8	1.5	0.5	16.3		
	Monthly Subtotal ($)	$68	$68	$45	$45	$45	$45	$68	$68	$158	$34	$68	$23	$731		
														Task Subtotal =		$731
	Maintenance															
	Scheduled maintenance	6.0	3.5	3.0		5.5	2.0		8.3		21.0	32	9	90.3	$45	$ 4,061
	Unscheduled maintenance													0.0	$45	$ -
	Vandalism													0.0	$45	$ -
	Acts of God													0.0	$45	$ -
	Landscape Maintenance Contractor													0.0	$45	$ -
	Sediment Removal Contractor													0.0	$45	$ -
	Other Contractor													0.0	$45	$ -
	Other Contractor													0.0	$45	$ -
	Other Contractor													0.0	$45	$ -
	Monthly Subtotal (hours)	6.0	3.5	3.0	0.0	5.5	2.0	0.0	8.3	0.0	21.0	32.0	9.0	90.3		
	Monthly Subtotal ($)	$270	$158	$135	$0	$248	$90	$0	$371	$0	$945	$1,440	$405	$4,061		
														Task Subtotal =		$4,061
	Vector Control															
	Contract & General administration													0.0	$120	$ -
	Vector prevention maint. (consultant)													0.0	$65	$ -
	Response to VCD calls (consultant)													0.0	$80	$ -
	VCD efforts (contracted)					6.1	5.5	4.0	3.9	3.6	4.3	3.5	4.4	35.2	$49	$ 1,725
	Monthly Subtotal (hours)	0.0	0.0	0.0	0.0	6.1	5.5	4.0	3.9	3.6	4.3	3.5	4.4	35.2		
	Monthly Subtotal ($)	$0	$0	$0	$0	$297	$271	$194	$191	$174	$210	$171	$218	$1,725		
														Task Subtotal =		$1,725
Non-Recurring Equipment (hours)	***Equipment***															
	Mounted Weed Eater	2.0												2.0	$7	$ 14
	Weed Wacker	3.0	0.5	0.5								14.0		18.0	$5	$ 90
	Piece of Equipment 3													0.0	$0	$ -
	Piece of Equipment 4													0.0	$0	$ -
	Piece of Equipment 5													0.0	$0	$ -
	Piece of Equipment 6													0.0	$0	$ -
	Piece of Equipment 7													0.0	$0	$ -
	Piece of Equipment 8													0.0	$0	$ -
	Monthly Subtotal (hours)	5.0	0.5	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	14.0	0.0	20.0		
	Monthly Subtotal ($)	$29	$3	$3	$0	$0	$0	$0	$0	$0	$0	$70	$0	$104		
														Equipment Subtotal =		$104
Dollars ($)	***Direct Costs***															Total $
	VCD supplies (direct costs less labor)															$ -
	Reproduction															$ -
	Postage/FedEx	$ 1	$ 0.3		$ 1	$ 1	$ 2	$ 1	$ 2	$ 6		$ 14	$ 0.5			$ 28.87
	Lodging		$ 7	$ 3	$ 11		$ 10	$ 11	$ 9			$ 2				$ 53.04
	Per Diem		$ 3	$ 2	$ 5		$ 5	$ 5	$ 5			$ 0.4				$ 24.71
	Incidentals	$ 2	$ 4	$ 2	$ 8	$ 34										$ 50.04
	Vehicle Rental/Lease	$ 122	$ 37	$ 42	$ 8	$ 37	$ 16	$ 13	$ 99	$ 33	$ 30	$ 288	$ 124			$ 848.69
	Airfare															$ -
	Field Supp./Expendables	$ 13	$ 3	$ 4	$ 4	$ 1	$ 4	$ 1	$ 1	$ 3	$ 11	$ 3	$ 5			$ 54.23
	Equipment Rental															$ -
	Sediment Analyses															$ -
	Sediment Disposal															$ -
	Other Direct Costs															$ -
	Transfer Pump Replacement/Repair															$ -
	Other Direct Costs															$ -
	Monthly Subtotal	$ 139	$ 55	$ 52	$ 38	$ 74	$ 37	$ 31	$ 115	$ 41	$ 41	$ 307	$ 130			$ 1,060
	MONTHLY TOTAL	$1,968	$1,677	$950	$408	$1,951	$1,906	$641	$2,539	$1,913	$3,569	$4,184	$3,381	2000/2001 TOTA		$25,086

BMP Retrofit Pilot Program
Maintenance Operation
Cost Accounting Summary, 2000-01

DISTRICT: 7 | LOCATION: Alameda Maintenance Station | SITE NO. 74201 | BMP TYPE: Oil/Water Separator

	TASK	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Total (hrs)	Avg. Rate	TOTAL $
Labor (hours)	*Administration*															
	General program support/Follow-up	10.9	5.0	2.9	2.8	5.0	4.5	1.7	3.2	3.9	4.3	0.9	3.5	48.4	$120	$ 5,808
	Encroachment Permits	0.5												0.5	$87	$ 44
	Travel	3.8	4.3	3.7	2.9	3.0	2.6	1.7	3.8	1.9	1.9		0.8	30.4	$87	$ 2,647
	Unscheduled events													0.0	$87	$ -
	Monthly Subtotal (hours)	15.2	9.3	6.6	5.7	8.0	7.1	3.4	7.0	5.7	6.2	0.9	4.3	79.3		
	Monthly Subtotal ($)	$1,681	$969	$672	$587	$859	$763	$349	$718	$625	$683	$107	$487	$8,499		
														Task Subtotal =		$8,499
	Operation															
	Wet season inspections				0.5	3.0	0.5	0.5	2.8	1.5	3.8			12.5	$45	$ 563
	Dry season inspections	1.5	4.8	0.5									0.3	7.0	$45	$ 315
	Unscheduled inspections/field calls													0.0	$90	$ -
	Monthly Subtotal (hours)	1.5	4.8	0.5	0.5	3.0	0.5	0.5	2.8	1.5	3.8	0.0	0.3	19.5		
	Monthly Subtotal ($)	$68	$214	$23	$23	$135	$23	$23	$124	$68	$169	$0	$11	$878		
														Task Subtotal =		$878
	Maintenance															
	Scheduled maintenance			0.5	0.8		0.5		0.3		0.8			2.8	$45	$ 124
	Unscheduled maintenance													0.0	$45	$ -
	Vandalism													0.0	$45	$ -
	Acts of God													0.0	$45	$ -
	Landscape Maintenance Contractor													0.0	$45	$ -
	Sediment Removal Contractor													0.0	$45	$ -
	Other Contractor													0.0	$45	$ -
	Other Contractor													0.0	$45	$ -
	Other Contractor													0.0	$45	$ -
	Monthly Subtotal (hours)	0.0	0.0	0.5	0.8	0.0	0.5	0.0	0.3	0.0	0.8	0.0	0.0	2.8		
	Monthly Subtotal ($)	$0	$0	$23	$34	$0	$23	$0	$11	$0	$34	$0	$0	$124		
														Task Subtotal =		$124
	Vector Control															
	Contract & General administration													0.0	$120	$ -
	Vector prevention maint. (consultant)													0.0	$65	$ -
	Response to VCD calls (consultant)													0.0	$80	$ -
	VCD efforts (contracted)					5.8	5.1	3.4	3.8	3.2	3.9	3.3	4.1	32.5	$49	$ 1,593
	Monthly Subtotal (hours)	0.0	0.0	0.0	0.0	5.8	5.1	3.4	3.8	3.2	3.9	3.3	4.1	32.51		
	Monthly Subtotal ($)	$0	$0	$0	$0	$282	$248	$167	$186	$157	$189	$162	$202	$1,593		
														Task Subtotal =		$1,593
Non-Recurring Equipment (hours)	*Equipment*															
	Piece of Equipment 1													0.0	$0	$ -
	Piece of Equipment 2													0.0	$0	$ -
	Piece of Equipment 3													0.0	$0	$ -
	Piece of Equipment 4													0.0	$0	$ -
	Piece of Equipment 5													0.0	$0	$ -
	Piece of Equipment 6													0.0	$0	$ -
	Monthly Subtotal (hours)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
	Monthly Subtotal ($)	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0		
														Equipment Subtotal =		$0
Dollars ($)	*Direct Costs*													Total $		
	VCD supplies (direct costs less labor)													$ -		
	Reproduction													$ -		
	Postage/FedEx	$ 1	$ 0.3		$ 1	$ 1	$ 2	$ 1	$ 2	$ 6		$ 14	$ 0.5	$ 28.87		
	Lodging		$ 7	$ 3	$ 11		$ 10	$ 11	$ 9			$ 2		$ 53.04		
	Per Diem		$ 3	$ 2	$ 5		$ 5	$ 5	$ 5			$ 0.4		$ 24.71		
	Incidentals	$ 2	$ 4	$ 2	$ 8	$ 34								$ 50.04		
	Vehicle Rental/Lease	$ 153	$ 24	$ 42	$ 20	$ 25	$ 12	$ 13	$ 40	$ 16	$ 9		$ 14	$ 368.41		
	Airfare													$ -		
	Field Supp./Expendables	$ 13	$ 3	$ 4	$ 4	$ 1	$ 4	$ 1	$ 1	$ 3	$ 11	$ 3	$ 5	$ 54.23		
	Equipment Rental													$ -		
	Sediment Analyses													$ -		
	Sediment Disposal													$ -		
	Other Direct Costs													$ -		
	Transfer Pump Replacement/Repair													$ -		
	Other Direct Costs													$ -		
	Monthly Subtotal	$ 169	$ 43	$ 52	$ 50	$ 61	$ 33	$ 31	$ 56	$ 25	$ 20	$ 20	$ 19	$ 579		
	MONTHLY TOTAL	$1,917	$1,226	$769	$693	$1,337	$1,089	$569	$1,094	$875	$1,094	$288	$720	2000/2001 TOTA		$11,672

BMP Retrofit Pilot Program
Maintenance Operation
Cost Accounting Summary, 2000-01

DISTRICT: 7 | LOCATION: Eastern Regional Maintenance Station | SITE NO: 74202 | BMP TYPE: Media Filter (Sand)

	TASK	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Total (hrs)	Avg. Rate	TOTAL $
Labor (hours)	*Administration*															
	General program support/Follow-up	9.4	10.3	2.7	6.5	13.7	3.5	4.1	6.2	9.6	11.4	2.7	5.2	85.3	$120	$ 10,241
	Encroachment Permits	0.5												0.5	$87	$ 44
	Travel	4.6	7.5	4.7	3.5	8.3	2.6	1.7	7.6	5.6	5.2	1.9	1.6	54.5	$87	$ 4,743
	Unscheduled events													0.0	$87	$ -
	Monthly Subtotal (hours)	14.5	17.8	7.3	10.0	21.9	6.1	5.9	13.8	15.2	16.6	4.6	6.8	140.4		
	Monthly Subtotal ($)	$1,566	$1,885	$724	$1,087	$2,361	$644	$646	$1,404	$1,641	$1,820	$484	$765	$15,028		
														Task Subtotal =		$15,028
	Operation															
	Wet season inspections				0.7	1.0	0.5	0.6	1.8	2.4	1.5			8.5	$45	$ 383
	Dry season inspections	1.5	1.7	0.8								1.5	0.5	6.0	$45	$ 270
	Unscheduled inspections/field calls								1.0					1.0	$90	$ 90
	Monthly Subtotal (hours)	1.5	1.7	0.8	0.7	1.0	0.5	0.6	2.8	2.4	1.5	1.5	0.5	15.5		
	Monthly Subtotal ($)	$68	$75	$37	$30	$45	$23	$27	$172	$109	$68	$68	$23	$743		
														Task Subtotal =		$743
	Maintenance															
	Scheduled maintenance	3.8	9.3	0.8	15.0	23.5	1.0	0.8	3.0	3.3	21.3			81.5	$45	$ 3,668
	Unscheduled maintenance					1.0			2.8					3.8	$45	$ 172
	Vandalism													0.0	$45	$ -
	Acts of God													0.0	$45	$ -
	Landscape Maintenance Contractor													0.0	$45	$ -
	Sediment Removal Contractor													0.0	$45	$ -
	Other Contractor													0.0	$45	$ -
	Other Contractor													0.0	$45	$ -
	Other Contractor													0.0	$45	$ -
	Monthly Subtotal (hours)	3.8	9.3	0.8	15.0	24.5	1.0	0.8	5.8	3.3	21.3	0.0	0.0	85.3		
	Monthly Subtotal ($)	$169	$416	$34	$675	$1,103	$45	$34	$262	$146	$956	$0	$0	$3,840		
														Task Subtotal =		$3,840
	Vector Control															
	Contract & General administration													0.0	$120	$ -
	Vector prevention maint. (consultant)													0.0	$65	$ -
	Response to VCD calls (consultant)													0.0	$80	$ -
	VCD efforts (contracted)					8.0	5.0	4.1	3.7	3.6	4.0	3.2	4.1	35.8	$49	$ 1,752
	Monthly Subtotal (hours)	0.0	0.0	0.0	0.0	8.0	5.0	4.1	3.7	3.6	4.0	3.2	4.1	35.8		
	Monthly Subtotal ($)	$0	$0	$0	$0	$394	$245	$199	$179	$178	$197	$158	$202	$1,752		
														Task Subtotal =		$1,752
Non-Recurring Equipment (hours)	*Equipment*															
	Crane										1.5			1.5	$85	$ 127
	Ladder (rented)		1.8											1.8	$29	$ 51
	Piece of Equipment 3													0.0	$0	$ -
	Piece of Equipment 4													0.0	$0	$ -
	Piece of Equipment 5													0.0	$0	$ -
	Piece of Equipment 6													0.0	$0	$ -
	Monthly Subtotal (hours)	0.0	1.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.5	0.0	0.0	3.3		
	Monthly Subtotal ($)	$0	$51	$0	$0	$0	$0	$0	$0	$0	$127	$0	$0	$178		
														Equipment Subtotal =		$178
Dollars ($)	*Direct Costs*															Total $
	VCD supplies (direct costs less labor)															$ -
	Reproduction															$ -
	Postage/FedEx	$ 1	$ 0.3		$ 1	$ 1	$ 2	$ 1	$ 2	$ 6		$ 14	$ 0.5			$ 28.87
	Lodging		$ 7	$ 3	$ 11		$ 10	$ 11	$ 9			$ 2				$ 53.04
	Per Diem		$ 3	$ 2	$ 5		$ 5	$ 5	$ 5			$ 0.4				$ 24.71
	Incidentals	$ 2	$ 4	$ 2	$ 8	$ 34										$ 50.04
	Vehicle Rental/Lease	$ 183	$ 43	$ 53	$ 25	$ 68	$ 12	$ 13	$ 79	$ 49	$ 24	$ 52	$ 28			$ 628.65
	Airfare															$ -
	Field Supp./Expendables	$ 13	$ 3	$ 4	$ 4	$ 1	$ 4	$ 1	$ 201	$ 3	$ 11	$ 3	$ 5			$ 254.23
	Equipment Rental															$ -
	Sediment Analyses															$ -
	Sediment Disposal															$ -
	Other Direct Costs															$ -
	Transfer Pump Replacement/Repair															$ -
	Other Direct Costs															$ -
	Monthly Subtotal	$ 200	$ 61	$ 63	$ 54	$ 105	$ 33	$ 31	$ 295	$ 58	$ 35	$ 72	$ 33			$ 1,040
	MONTHLY TOTAL	$2,002	$2,488	$858	$1,846	$4,007	$990	$937	$2,313	$2,133	$3,203	$782	$1,024	2000/2001 TOTA		$22,580

BMP Retrofit Pilot Program
Maintenance Operation
Cost Accounting Summary, 2000-01

DISTRICT: 7 | LOCATION: Foothill Maintenance Station | SITE NO. 74203 | BMP TYPE: Media Filter (Sand)

	TASK	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Total (hrs)	Avg Rate	TOTAL $
Labor (hours)	***Administration***															
	General program support/Follow-up	9.4	10.3	2.7	4.7	10.0	3.5	4.1	6.2	9.6	11.4	2.7	5.2	79.7	$120	$ 9,569
	Encroachment Permits	0.5												0.5	$87	$ 44
	Travel	3.1	7.5	1.9	2.9	6.0	1.8	5.2	7.6	4.6	5.2	1.9	1.6	49.0	$87	$ 4,264
	Unscheduled events													0.0	$87	$ -
	Monthly Subtotal (hours)	12.9	17.8	4.5	7.6	16.0	5.2	9.3	13.8	14.3	16.6	4.6	6.8	129.3		
	Monthly Subtotal ($)	$1,433	$1,885	$481	$812	$1,717	$569	$946	$1,404	$1,560	$1,820	$484	$765	$13,876		
														Task Subtotal =		$13,876
	Operation															
	Wet season inspections				0.7	0.8	0.5	0.6	1.8	2.4	1.5			8.3	$45	$ 372
	Dry season inspections		1.7	0.8								1.5	0.5	4.5	$45	$ 203
	Unscheduled inspections/field calls								1.0					1.0	$90	$ 90
	Monthly Subtotal (hours)	0.0	1.7	0.8	0.7	0.8	0.5	0.6	2.8	2.4	1.5	1.5	0.5	13.8		
	Monthly Subtotal ($)	$0	$75	$37	$30	$34	$23	$27	$172	$109	$68	$68	$23	$665		
														Task Subtotal =		$665
	Maintenance															
	Scheduled maintenance	4.0	5.0		1.8	3.3	0.5	3.0	0.3	2.0	20.8			40.5	$45	$ 1,823
	Unscheduled maintenance					11.0			2.8					13.8	$45	$ 622
	Vandalism													0.0	$45	$ -
	Acts of God													0.0	$45	$ -
	Landscape Maintenance Contractor													0.0	$45	$ -
	Sediment Removal Contractor													0.0	$45	$ -
	Electrical Contractor								6.2					6.2	$45	$ 279
	Other Contractor													0.0	$45	$ -
	Other Contractor													0.0	$45	$ -
	Monthly Subtotal (hours)	4.0	5.0	0.0	1.8	14.3	0.5	3.0	9.3	2.0	20.8	0.0	0.0	60.5		
	Monthly Subtotal ($)	$180	$225	$0	$79	$641	$23	$135	$418	$90	$934	$0	$0	$2,724		
														Task Subtotal =		$2,724
	Vector Control															
	Contract & General administration													0.0	$120	$ -
	Vector prevention maint. (consultant)													0.0	$65	$ -
	Response to VCD calls (consultant)													0.0	$80	$ -
	VCD efforts (contracted)							0.7	0.7	0.9				2.3	$68	$ 155
	Monthly Subtotal (hours)	0.0	0.0	0.0	0.0	0.0	0.0	0.7	0.7	0.9	0.0	0.0	0.0	2.3		
	Monthly Subtotal ($)	$0	$0	$0	$0	$0	$0	$48	$45	$62	$0	$0	$0	$155		
														Task Subtotal =		$155
Non-Recurring Equipment (hours)	***Equipment***															
	Crane										2.0			2.0	$85	$ 170
	Ladder (rented)		1.0											1.0	$29	$ 29
	Piece of Equipment 3													0.0	$0	$ -
	Piece of Equipment 4													0.0	$0	$ -
	Piece of Equipment 5													0.0	$0	$ -
	Piece of Equipment 6													0.0	$0	$ -
	Monthly Subtotal (hours)	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.0	0.0	0.0	3.0		
	Monthly Subtotal ($)	$0	$29	$0	$0	$0	$0	$0	$0	$0	$170	$0	$0	$199		
														Equipment Subtotal =		$199
Dollars ($)	***Direct Costs***															Total $
	VCD supplies (direct costs less labor)															$ -
	Reproduction															$ -
	Postage/FedEx	$ 1	$ 0.3		$ 1	$ 1	$ 2	$ 1	$ 2	$ 6		$ 14	$ 0.5			$ 28.87
	Lodging		$ 7	$ 3	$ 11		$ 10	$ 11	$ 9			$ 2				$ 53.04
	Per Diem		$ 3	$ 2	$ 5		$ 5	$ 5	$ 5			$ 0.4				$ 24.71
	Incidentals	$ 2	$ 4	$ 2	$ 8	$ 34										$ 50.04
	Vehicle Rental/Lease	$ 122	$ 43	$ 21	$ 20	$ 50	$ 8	$ 44	$ 83	$ 45	$ 24	$ 52	$ 28			$ 539.59
	Airfare															$ -
	Field Supp./Expendables	$ 13	$ 3	$ 4	$ 4	$ 1	$ 4	$ 1	$ 201	$ 3	$ 11	$ 3	$ 5			$ 254.23
	Equipment Rental															$ -
	Sediment Analyses															$ -
	Sediment Disposal															$ -
	Other Direct Costs															$ -
	Transfer Pump Replacement/Repair															$ -
	VCD Mileage Costs															$ -
	Monthly Subtotal	$ 139	$ 61	$ 31	$ 50	$ 86	$ 29	$ 61	$ 299	$ 54	$ 35	$ 72	$ 33			$ 950
	MONTHLY TOTAL	$1,751	$2,275	$549	$970	$2,478	$643	$1,218	$2,338	$1,876	$3,025	$624	$821	2000/2001 TOTA		$18,569

BMP Retrofit Pilot Program
Maintenance Operation
Cost Accounting Summary, 2000-01

DISTRICT 7 | LOCATION: Termination Park & Ride | SITE NO. 74204 | BMP TYPE: Media Filter (Sand)

	TASK	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Total (Hrs)	Avg Rate	TOTAL $
Labor (hours)	***Administration***															
	General program support/Follow-up	9.4	10.3	2.7	6.5	14.9	3.5	4.1	6.2	9.6	14.3	2.7	5.2	89.4	$120	$ 10,733
	Encroachment Permits	0.5												0.5	$87	$ 44
	Travel	4.6	14.9	3.7	4.6	9.0	1.8	6.1	6.6	3.7	6.4	1.9	1.6	64.9	$87	$ 5,643
	Unscheduled events													0.0	$87	$ -
	Monthly Subtotal (hours)	14.5	25.2	6.4	11.2	23.9	5.2	10.2	12.8	13.4	20.7	4.6	6.8	154.8		
	Monthly Subtotal ($)	$1,566	$2,534	$643	$1,187	$2,576	$569	$1,022	$1,321	$1,480	$2,273	$484	$765	$16,419		
														Task Subtotal =		$16,419
	Operation															
	Wet season inspections				0.7	1.0	0.5	0.6	1.8	2.4	1.5			8.5	$45	$ 383
	Dry season inspections	1.5	1.7	0.8								1.5	0.5	6.0	$45	$ 270
	Unscheduled inspections/field calls								1.0		1.0			2.0	$90	$ 180
	Monthly Subtotal (hours)	1.5	1.7	0.8	0.7	1.0	0.5	0.6	2.8	2.4	2.5	1.5	0.5	16.5		
	Monthly Subtotal ($)	$68	$75	$37	$30	$45	$23	$27	$172	$109	$158	$68	$23	$833		
														Task Subtotal =		$833
	Maintenance															
	Scheduled maintenance	5.0	10.5	1.0	15.5	2.5	0.5	11.5			33.3			79.8	$45	$ 3,589
	Unscheduled maintenance					13.8			2.8					16.6	$45	$ 746
	Vandalism													0.0	$45	$ -
	Acts of God													0.0	$45	$ -
	Landscape Maintenance Contractor													0.0	$45	$ -
	Sediment Removal Contractor													0.0	$45	$ -
	Electrical Contractor					80.7			13.5					94.2	$45	$ 4,239
	Other Contractor													0.0	$45	$ -
	Other Contractor													0.0	$45	$ -
	Monthly Subtotal (hours)	5.0	10.5	1.0	15.5	97.0	0.5	11.5	16.3	0.0	33.3	0.0	0.0	190.5		
	Monthly Subtotal ($)	$225	$473	$45	$698	$4,363	$23	$518	$735	$0	$1,496	$0	$0	$8,574		
														Task Subtotal =		$8,574
	Vector Control															
	Contract & General administration													0.0	$120	$ -
	Vector prevention maint. (consultant)													0.0	$65	$ -
	Response to VCD calls (consultant)													0.0	$80	$ -
	VCD efforts (contracted)					6.9	5.3	6.3	3.9	3.6	4.2	3.2	4.2	37.7	$49	$ 1,847
	Monthly Subtotal (hours)	0.0	0.0	0.0	0.0	6.9	5.3	6.3	3.9	3.6	4.2	3.2	4.2	37.7		
	Monthly Subtotal ($)	$0	$0	$0	$0	$340	$262	$310	$191	$176	$206	$158	$205	$1,847		
														Task Subtotal =		$1,847
Non-Recurring Equipment (hours)	***Equipment***															
	Crane										1.0			1.0	$85	$ 85
	Ladder (rented)		0.5											0.5	$29	$ 14
	Piece of Equipment 3													0.0	$0	$ -
	Piece of Equipment 4													0.0	$0	$ -
	Piece of Equipment 5													0.0	$0	$ -
	Piece of Equipment 6													0.0	$0	$ -
	Monthly Subtotal (hours)	0.0	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	1.5		
	Monthly Subtotal ($)	$0	$14	$0	$0	$0	$0	$0	$0	$0	$85	$0	$0	$99		
														Equipment Subtotal =		$99
Dollars ($)	***Direct Costs***														Total $	
	VCD supplies (direct costs less labor)														$ -	
	Reproduction														$ -	
	Postage/FedEx	$ 1	$ 0.3		$ 1	$ 1	$ 2	$ 1	$ 2	$ 6		$ 14	$ 0.5		$ 28.87	
	Lodging		$ 7	$ 3	$ 11		$ 10	$ 11	$ 9			$ 2			$ 53.04	
	Per Diem		$ 3	$ 2	$ 5		$ 5	$ 5	$ 5			$ 0.4			$ 24.71	
	Incidentals	$ 2	$ 4	$ 2	$ 8	$ 34									$ 50.04	
	Vehicle Rental/Lease	$ 183	$ 86	$ 42	$ 33	$ 74	$ 8	$ 47	$ 69	$ 33	$ 30	$ 52	$ 28		$ 684.72	
	Airfare														$ -	
	Field Supp./Expendables	$ 13	$ 3	$ 4	$ 4	$ 1	$ 4	$ 41	$ 201	$ 3	$ 11	$ 3	$ 5		$ 294.71	
	Equipment Rental														$ -	
	Sediment Analyses														$ -	
	Sediment Disposal														$ -	
	Power supply connection								$ 48		$ 30		$ 10		$ 88.80	
	Transfer Pump Replacement/Repair (man hrs under elec. cntrctr)								$ 63						$ 62.50	
	Other Direct Costs														$ -	
	Monthly Subtotal	$ 200	$ 104	$ 52	$ 62	$ 111	$ 29	$ 105	$ 396	$ 41	$ 71	$ 72	$ 43		$ 1,287	
	MONTHLY TOTAL	$2,058	$3,199	$778	$1,976	$7,434	$905	$1,982	$2,815	$1,806	$4,289	$782	$1,036	2000/2001 TOTA		$29,060

BMP Retrofit Pilot Program
Maintenance Operation
Cost Accounting Summary, 2000-01

DISTRICT: 7 | LOCATION: Via Verde Park & Ride | SITE NO.: [illegible] | BMP TYPE: Multi-chambered Treatment Train

	TASK	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Total (hrs)	Avg Rate	TOTAL $
Labor (hours)	*Administration*															
	General program support/Follow-up	10.3	12.0	2.9	7.5	10.0	18.6	19.8	13.8	28.9	4.3	6.7	5.2	140.0	$120	$ 16,796
	Encroachment Permits	0.5												0.5	$87	$ 44
	Travel	4.6	11.7	4.7	4.6	6.0	10.5	20.7	16.1	13.9	1.9	3.7	1.6	100.0	$87	$ 8,703
	Unscheduled events													0.0	$87	$ -
	Monthly Subtotal (hours)	15.4	23.7	7.6	12.1	16.0	29.1	40.6	29.9	42.8	6.2	10.4	6.8	240.5		
	Monthly Subtotal ($)	$1,685	$2,456	$753	$1,298	$1,717	$3,140	$4,183	$3,051	$4,681	$683	$1,129	$765	$25,543		
														Task Subtotal =		$25,543
	Operation															
	Wet season inspections				0.5	1.0	0.5	0.8	1.3	1.3	0.6			5.9	$45	$ 265
	Dry season inspections	1.5	2.3	1.0								1.0	0.8	6.5	$45	$ 293
	Unscheduled inspections/field calls						31.0							31.0	$90	$ 2,790
	Monthly Subtotal (hours)	1.5	2.3	1.0	0.5	1.0	31.5	0.8	1.3	1.3	0.6	1.0	0.8	43.4		
	Monthly Subtotal ($)	$68	$101	$45	$23	$45	$2,813	$34	$56	$56	$28	$45	$34	$3,347		
														Task Subtotal =		$3,347
	Maintenance															
	Scheduled maintenance	3.5	16.3	1.5	4.0	2.5	0.5	0.8		17.8	6.8	27.5		81.0	$45	$ 3,645
	Unscheduled maintenance				15.0	6.5		137.5	39.5	33.8				232.3	$45	$ 10,451
	Vandalism													0.0	$45	$ -
	Acts of God													0.0	$45	$ -
	Landscape Maintenance Contractor													0.0	$45	$ -
	Sediment Removal Contractor													0.0	$45	$ -
	Waterproofing Contractor (settling chamber)							346.0						346.0	$45	$ 15,570
	Slip-lining Contractor									442.2				442.2	$45	$ 19,899
	Other Contractor													0.0	$45	$ -
	Monthly Subtotal (hours)	3.5	16.3	1.5	19.0	9.0	0.5	484.3	39.5	493.7	6.8	27.5	0.0	1101.5		
	Monthly Subtotal ($)	$158	$731	$68	$855	$405	$23	$21,791	$1,778	$22,217	$304	$1,238	$0	$49,565		
														Task Subtotal =		$49,565
	Vector Control															
	Contract & General administration													0.0	$120	$ -
	Vector prevention maint. (consultant)													0.0	$65	$ -
	Response to VCD calls (consultant)													0.0	$80	$ -
	VCD efforts (contracted)							1.4	1.0	1.3				3.7	$68	$ 248
	Monthly Subtotal (hours)	0.0	0.0	0.0	0.0	0.0	0.0	1.4	1.0	1.3	0.0	0.0	0.0	3.7		
	Monthly Subtotal ($)	$0	$0	$0	$0	$0	$0	$96	$68	$85	$0	$0	$0	$248		
														Task Subtotal =		$248
Non-Recurring Equipment (hours)	*Equipment*															
	LEL/O_2 Meter				5.0							11.5		16.5	$16	$ 260
	Trash pump							8.0	8.0					16.0	$5	$ 80
	Air compressor								6.0					6.0	$5	$ 30
	Electric air blower											11.5		11.5	$1	$ 9
	SCBA											11.5		11.5	$8	$ 91
	2-safety harness											11.5		11.5	$1	$ 13
	Ladder (rented)		3.3											3.3	$29	$ 94
	Tripod with winch											11.5		11.5	$9	$ 98
	Monthly Subtotal (hours)	0.0	3.3	0.0	5.0	0.0	0.0	8.0	14.0	0.0	0.0	57.5	0.0	87.8		
	Monthly Subtotal ($)	$0	$94	$0	$79	$0	$0	$40	$70	$0	$0	$392	$0	$675		
														Equipment Subtotal =		$675
Dollars ($)	*Direct Costs*															Total $
	VCD supplies (direct costs less labor)															$ -
	Reproduction															$ -
	Postage/FedEx	$ 1	$ 0.3		$ 1	$ 1	$ 2	$ 1	$ 2	$ 6		$ 14	$ 0.5			$ 28.87
	Lodging		$ 7	$ 3	$ 11		$ 10	$ 11	$ 9			$ 2				$ 53.04
	Per Diem		$ 3	$ 2	$ 5		$ 5	$ 5	$ 5			$ 0.4				$ 24.71
	Incidentals	$ 2	$ 4	$ 2	$ 8	$ 34										$ 50.04
	Vehicle Rental/Lease	$ 183	$ 67	$ 53	$ 33	$ 50	$ 48	$ 170	$ 176	$ 133	$ 9	$ 105	$ 28			$ 1,052.09
	Airfare															$ -
	Field Supp./Expendables	$ 13	$ 3	$ 4	$ 202	$ 1	$ 4	$ 1	$ 1	$ 3	$ 11	$ 3	$ 5			$ 252.62
	Equipment Rental															$ -
	Sediment Analyses									$ 1,538						$ 1,537.50
	Sediment Disposal															$ -
	Other Direct Costs															$ -
	Transfer Pump Replacement/Repair															$ -
	VCD Mileage Costs															$ -
	Monthly Subtotal	$ 200	$ 85	$ 63	$ 260	$ 86	$ 69	$ 187	$ 192	$ 1,679	$ 20	$ 124	$ 33			$ 2,999
	MONTHLY TOTAL	$2,109	$3,468	$928	$2,515	$2,253	$6,045	$26,331	$5,215	$28,718	$1,035	$2,928	$832	2000/2001 TOTAL		$82,378

BMP Retrofit Pilot Program
Maintenance Operation
Cost Accounting Summary, 2000-01

DISTRICT: 7 | LOCATION: Lakewood Park & Ride | SITE NO. 74208 | BMP: 7-08-6 Multi-Chamber Treatment Train

	TASK	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Total (hrs)	Avg. Rate	TOTAL $
Labor (hours)	***Administration***															
	General program support/Follow-up	10.3	12.0	2.9	9.3	6.2	5.9	1.7	3.2	19.3	4.3	6.7	5.2	87.1	$120	$ 10,453
	Encroachment Permits	0.5												0.5	$87	$ 44
	Travel	4.6	11.7	2.8	5.8	3.8	3.5	1.7	3.8	9.3	1.9	8.4	1.6	58.8	$87	$ 5,118
	Unscheduled events													0.0	$87	$ -
	Monthly Subtotal (hours)	15.4	23.7	5.7	15.1	10.0	9.4	3.4	7.0	28.6	6.2	15.1	6.8	146.4		
	Monthly Subtotal ($)	$1,685	$2,456	$590	$1,624	$1,073	$1,016	$349	$718	$3,121	$683	$1,536	$765	$15,615		
														Task Subtotal =		$15,615
	Operation															
	Wet season inspections				0.5	1.0	0.5	0.5	1.3	1.3	0.6			5.6	$45	$ 253
	Dry season inspections	1.5	2.3	1.0								1.0	0.8	6.5	$45	$ 293
	Unscheduled inspections/field calls													0.0	$90	$ -
	Monthly Subtotal (hours)	1.5	2.3	1.0	0.5	1.0	0.5	0.5	1.3	1.3	0.6	1.0	0.8	12.1		
	Monthly Subtotal ($)	$68	$101	$45	$23	$45	$23	$23	$56	$56	$28	$45	$34	$546		
														Task Subtotal =		$546
	Maintenance															
	Scheduled maintenance	11.8	11.0	0.5	8.3	2.5	1.0	0.5	0.5	18.0	6.5	39.8		100.3	$45	$ 4,511
	Unscheduled maintenance				18.0					3.0				21.0	$45	$ 945
	Vandalism													0.0	$45	$ -
	Acts of God													0.0	$45	$ -
	Landscape Maintenance Contractor													0.0	$45	$ -
	Sediment Removal Contractor													0.0	$45	$ -
	Other Contractor													0.0	$45	$ -
	Other Contractor													0.0	$45	$ -
	Other Contractor													0.0	$45	$ -
	Monthly Subtotal (hours)	11.8	11.0	0.5	26.3	2.5	1.0	0.5	0.5	21.0	6.5	39.8	0.0	121.3		
	Monthly Subtotal ($)	$529	$495	$23	$1,181	$113	$45	$23	$23	$945	$293	$1,789	$0	$5,456		
														Task Subtotal =		$5,456
	Vector Control															
	Contract & General administration													0.0	$120	$ -
	Vector prevention maint. (consultant)													0.0	$65	$ -
	Response to VCD calls (consultant)													0.0	$80	$ -
	VCD efforts (contracted)					13.3	12.3	8.4	4.7	5.4	6.1	5.0	5.0	60.1	$49	$ 2,946
	Monthly Subtotal (hours)	0.0	0.0	0.0	0.0	13.3	12.3	8.4	4.7	5.4	6.1	5.0	5.0	60.1		
	Monthly Subtotal ($)	$0	$0	$0	$0	$651	$603	$410	$230	$262	$300	$245	$245	$2,946		
														Task Subtotal =		$2,946
Non-Recurring Equipment (hours)	***Equipment***															
	LEL/O_2 Meter				6.5							12.5		19.0	$16	$ 300
	Electric air blower											12.5		12.5	$1	$ 9
	SCBA											12.5		12.5	$8	$ 98
	2-safety harness											12.5		12.5	$1	$ 14
	Tripod with winch											12.5		12.5	$9	$ 107
	Ladder (rented)		1.0											1.0	$29	$ 29
	Monthly Subtotal (hours)	0.0	1.0	0.0	6.5	0.0	0.0	0.0	0.0	0.0	0.0	62.5	0.0	70.0		
	Monthly Subtotal ($)	$0	$29	$0	$103	$103	$0	$0	$0	$0	$0	$426	$0	$558		
														Equipment Subtotal =		$558
Dollars ($)	***Direct Costs***															Total $
	VCD supplies (direct costs less labor)															$ -
	Reproduction															$ -
	Postage/FedEx	$ 1	$ 0.3		$ 1	$ 1	$ 2	$ 1	$ 2	$ 6		$ 14	$ 0.5			$ 28.87
	Lodging		$ 7	$ 3	$ 11		$ 10	$ 11	$ 9			$ 2				$ 53.04
	Per Diem		$ 3	$ 2	$ 5		$ 5	$ 5	$ 5			$ 0.4				$ 24.71
	Incidentals	$ 2	$ 4	$ 2	$ 8	$ 34										$ 50.04
	Vehicle Rental/Lease	$ 183	$ 67	$ 32	$ 41	$ 31	$ 16	$ 13	$ 40	$ 82	$ 9	$ 235	$ 28			$ 776.44
	Airfare															$ -
	Field Supp./Expendables	$ 13	$ 3	$ 4	$ 202	$ 1	$ 4	$ 1	$ 1	$ 3	$ 11	$ 3	$ 5			$ 252.62
	Equipment Rental															$ -
	Sediment Analyses									$ 513						$ 512.50
	Sediment Disposal															$ -
	Other Direct Costs															$ -
	Transfer Pump Replacement/Repair															$ -
	Other Direct Costs															$ -
	Monthly Subtotal	$ 200	$ 85	$ 42	$ 269	$ 67	$ 37	$ 31	$ 56	$ 603	$ 20	$ 255	$ 33			$ 1,698
	MONTHLY TOTAL	$2,480	$3,167	$700	$3,199	$2,051	$1,724	$834	$1,082	$4,987	$1,324	$4,295	$1,078	2000/2001 TOTA		$26,819

BMP Retrofit Pilot Program
Maintenance Operation
Cost Accounting Summary, 2000-01

DISTRICT 7 | LOCATION: Altadena Maintenance Station | SITE NO. 73211a | BMP TYPE: Infiltration Trench

	TASK	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Total (hrs)	Avg. Rate	TOTAL $
Labor (hours)	*Administration*															
	General program support/Follow-up	3.2	4.2	1.9	3.1	5.2	4.7	2.7	2.4	3.9	4.3	1.8	3.5	40.7	$120	$ 4,880
	Encroachment Permits	0.5												0.5	$87	$ 44
	Travel	0.8	3.2	1.9	1.2	3.0	2.6	2.6	2.8	1.9	1.9	0.9	0.8	23.5	$87	$ 2,048
	Unscheduled events													0.0	$87	$ -
	Monthly Subtotal (hours)	4.4	7.4	3.7	4.2	8.2	7.3	5.3	5.3	5.7	6.2	2.7	4.3	64.7		
	Monthly Subtotal ($)	$488	$780	$385	$467	$883	$793	$547	$539	$625	$683	$296	$487	$6,972		
														Task Subtotal =		$6,972
	Operation															
	Wet season inspections				0.5	0.3	0.5	0.5	0.8	0.8	0.5			3.8	$55	$ 206
	Dry season inspections	0.3	0.5	0.5								0.5	0.3	2.0	$55	$ 110
	Unscheduled inspections/field calls													0.0	$60	$ -
	Monthly Subtotal (hours)	0.3	0.5	0.5	0.5	0.3	0.5	0.5	0.8	0.8	0.5	0.5	0.3	5.8		
	Monthly Subtotal ($)	$14	$28	$28	$28	$14	$28	$28	$41	$41	$28	$28	$14	$316		
														Task Subtotal =		$316
	Maintenance															
	Scheduled maintenance		0.5			0.3	0.3	0.3			1.8			3.0	$55	$ 165
	Unscheduled maintenance													0.0	$55	$ -
	Vandalism													0.0	$55	$ -
	Acts of God													0.0	$55	$ -
	Landscape Maintenance Contractor													0.0	$55	$ -
	Sediment Removal Contractor													0.0	$0	$ -
	Vegetation Consultant													0.0	$0	$ -
	Other Contractor													0.0	$75	$ -
	Other Contractor													0.0	$0	$ -
														0.0	$0	$ -
	Monthly Subtotal (hours)	0.0	0.5	0.0	0.0	0.3	0.3	0.3	0.0	0.0	1.8	0.0	0.0	3.0		
	Monthly Subtotal ($)	$0	$28	$0	$0	$14	$14	$14	$0	$0	$96	$0	$0	$165		
														Task Subtotal =		$165
	Vector Control															
	Contract & General administration	0.2	0.1	0.10	0.1	0.1	0.1	0.1						0.8	$120	$ 96
	Vector prevention maint. (consultant)													0.0	$65	$ -
	Response to VCD calls (consultant)													0.0	$55	$ -
	VCD efforts (contracted)	1.8	2.7	2.3	3.3	2.9	2.5	1.8	1.7	1.7	2.0	1.6	2.1	26.6	$46	$ 1,234
	Monthly Subtotal (hours)	2.0	2.8	2.4	3.4	3.0	2.6	1.9	1.7	1.7	2.0	1.6	2.1	27.4		
	Monthly Subtotal ($)	$109	$138	$120	$167	$147	$130	$95	$79	$78	$93	$75	$98	$1,330		
														Task Subtotal =		$1,330
Non-Recurring Equipment (hours)	*Equipment*															
	Piece of Equipment 1													0.0	$0	$ -
	Piece of Equipment 2													0.0	$0	$ -
	Piece of Equipment 3													0.0	$0	$ -
	Piece of Equipment 4													0.0	$0	$ -
	Piece of Equipment 5													0.0	$0	$ -
	Piece of Equipment 6													0.0	$0	$ -
	Monthly Subtotal (hours)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
	Monthly Subtotal ($)	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0		
														Equipment Subtotal =		$0

Dollars ($)	*Direct Costs*													Total $
	VCD supplies (direct costs less labor)													$ -
	Reproduction	$ 1	$ 1	$ 1	$ 1	$ 1	$ 1	$ 1						$ 5.97
	Postage/FedEx	$ 2	$ 1	$ 1	$ 2	$ 2	$ 3	$ 2	$ 2	$ 6		$ 14	$ 0.5	$ 34.84
	Lodging		$ 7	$ 3	$ 11		$ 10	$ 11	$ 9			$ 2		$ 53.04
	Per Diem		$ 3	$ 2	$ 5		$ 5	$ 5	$ 5			$ 0.4		$ 24.71
	Incidentals	$ 3	$ 5	$ 3	$ 9	$ 34	$ 1	$ 1						$ 56.01
	Vehicle Rental/Lease	$ 31	$ 18	$ 21	$ 8	$ 25	$ 12	$ 20	$ 30	$ 16	$ 9	$ 26	$ 14	$ 229.99
	Airfare													$ -
	Field Supp./Expendables	$ 13	$ 3	$ 4	$ 4	$ 1	$ 4	$ 1	$ 1	$ 3	$ 11	$ 3	$ 5	$ 54.23
	Equipment Rental													$ -
	Sediment Analyses													$ -
	Sediment Disposal													$ -
	Weed Wacker													$ -
	Vegetation Disposal													$ -
	Storage Container													$ -
	Monthly Subtotal	$ 50	$ 38	$ 35	$ 40	$ 63	$ 36	$ 40	$ 46	$ 25	$ 20	$ 46	$ 19	$ 459

MONTHLY TOTAL	$661	$1,012	$567	$702	$1,121	$1,000	$723	$705	$769	$920	$444	$617	2000/2001 TOTA	$9,242

BMP Retrofit Pilot Program
Maintenance Operation
Cost Accounting Summary, 2000-01

DISTRICT: 7 | LOCATION: Altadena Maintenance Station | SITE NO.: 73211b | BMP TYPE: Biofiltration Strip

	TASK	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Total (hrs)	Avg. Rate	TOTAL $
Labor (hours)	**Administration**															
	General program support/Follow-up	4.8	4.9	3.9	3.5	7.7	7.7	3.1	7.4	8.7	14.8	3.7	9.0	79.3	$120	$ 9,510
	Encroachment Permits	0.5												0.5	$87	$ 44
	Travel	0.8	3.2	2.8	4.0	5.3	7.0	6.9	3.8	2.8	4.5	1.9	2.4	45.2	$87	$ 3,934
	Unscheduled events													0.0	$87	$ -
	Monthly Subtotal (hours)	6.1	8.1	6.7	7.6	12.9	14.7	10.0	11.2	11.5	19.3	5.6	11.4	125.0		
	Monthly Subtotal ($)	$689	$861	$710	$774	$1,377	$1,529	$972	$1,220	$1,291	$2,171	$609	$1,284	$13,488		
														Task Subtotal =		$13,488
	Operation															
	Wet season inspections				1.5	1.1	1.3	1.0	1.1	1.3	0.8			8.1	$55	$ 444
	Dry season inspections	0.8	0.5	0.9								0.8	0.5	3.5	$55	$ 193
	Unscheduled inspections/field calls													0.0	$60	$ -
	Monthly Subtotal (hours)	0.8	0.5	0.9	1.5	1.1	1.3	1.0	1.1	1.3	0.8	0.8	0.5	11.6		
	Monthly Subtotal ($)	$44	$28	$48	$83	$59	$69	$55	$59	$73	$46	$43	$30	$637		
														Task Subtotal =		$637
	Maintenance															
	Scheduled maintenance		0.5	0.5	3.0	1.3	3.8	21.5	7.0	3.0	17.0		4.0	61.5	$55	$ 3,383
	Unscheduled maintenance													0.0	$55	$ -
	Vandalism													0.0	$55	$ -
	Acts of God													0.0	$55	$ -
	Landscape Maintenance Contractor													0.0	$0	$ -
	Sediment Removal Contractor													0.0	$0	$ -
	Vegetation Consultant													0.0	$75	$ -
	Other Contractor													0.0	$0	$ -
	Other Contractor													0.0	$0	$ -
	Monthly Subtotal (hours)	0.0	0.5	0.5	3.0	1.3	3.8	21.5	7.0	3.0	17.0	0.0	4.0	61.5		
	Monthly Subtotal ($)	$0	$28	$28	$165	$69	$206	$1,183	$385	$165	$935	$0	$220	$3,383		
														Task Subtotal =		$3,383
	Vector Control															
	Contract & General administration	0.2	0.1	0.10	0.1	0.1	0.1	0.1						0.8	$120	$ 96
	Vector prevention maint. (consultant)													0.0	$65	$ -
	Response to VCD calls (consultant)													0.0	$55	$ -
	VCD efforts (contracted)	1.8	2.7	2.3	3.3	2.9	2.5	1.8	1.7	1.7	2.0	1.6	2.1	26.6	$46	$ 1,234
	Monthly Subtotal (hours)	2.0	2.8	2.4	3.4	3.0	2.6	1.9	1.7	1.7	2.0	1.6	2.1	27.4		
	Monthly Subtotal ($)	$109	$138	$120	$167	$147	$130	$95	$79	$78	$93	$75	$98	$1,330		
														Task Subtotal =		$1,330
Non-Recurring Equipment (hours)	**Equipment**															
	Weedwacker							5.5	3.5					9.0	$5	$ 45
	Piece of Equipment 2													0.0	$0	$ -
	Piece of Equipment 3													0.0	$0	$ -
	Piece of Equipment 4													0.0	$0	$ -
	Piece of Equipment 5													0.0	$0	$ -
	Piece of Equipment 6													0.0	$0	$ -
	Piece of Equipment 7													0.0	$0	$ -
	Monthly Subtotal (hours)	0.0	0.0	0.0	0.0	0.0	0.0	5.5	3.5	0.0	0.0	0.0	0.0	9.0		
	Monthly Subtotal ($)	$0	$0	$0	$0	$0	$0	$28	$18	$0	$0	$0	$0	$45		
														Equipment Subtotal =		$45
Dollars ($)	**Direct Costs**														Total $	
	VCD supplies (direct costs less labor)														$ -	
	Reproduction	$ 1	$ 1	$ 1	$ 1	$ 1	$ 1	$ 1							$ 5.97	
	Postage/FedEx	$ 2	$ 1	$ 1	$ 2	$ 2	$ 3	$ 2	$ 2	$ 6		$ 14	$ 0.5		$ 34.84	
	Lodging		$ 7	$ 3	$ 11		$ 10	$ 11	$ 9			$ 2			$ 53.04	
	Per Diem		$ 3	$ 2	$ 5		$ 5	$ 5	$ 5			$ 0.4			$ 24.71	
	Incidentals	$ 3	$ 5	$ 3	$ 9	$ 34	$ 1	$ 1							$ 56.01	
	Vehicle Rental/Lease	$ 31	$ 18	$ 32	$ 29	$ 43	$ 32	$ 54	$ 40	$ 25	$ 21	$ 52	$ 41		$ 416.98	
	Airfare														$ -	
	Field Supp./Expendables	$ 13	$ 3	$ 4	$ 4	$ 1	$ 4	$ 1	$ 1	$ 3	$ 11	$ 3	$ 5		$ 54.23	
	Equipment Rental														$ -	
	Sediment Analyses														$ -	
	Sediment Disposal														$ -	
	Weed Wacker														$ -	
	Vegetation Disposal														$ -	
	Storage Container														$ -	
	Monthly Subtotal	$ 50	$ 38	$ 45	$ 60	$ 82	$ 56	$ 74	$ 56	$ 33	$ 32	$ 72	$ 47		$ 646	
	MONTHLY TOTAL	$891	$1,092	$952	$1,249	$1,735	$1,990	$2,406	$1,817	$1,640	$3,277	$800	$1,679	2000/2001 TOTA		$19,528

BMP Retrofit Pilot Program
Maintenance Operation
Cost Accounting Summary, 2000-01

DISTRICT: | LOCATION: Foothill Maintenance Station | SITE NO. 73216a | BMP TYPE: Dry-Inlet Insert (StreamGuard) | CONSULTANT: Montgomery Watson (LAV Consult)

	TASK	Jul	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Total (hrs)	Avg. Rate	TOTAL $
Labor (hours)	*Administration*															
	General program support/Follow-up	1.7	1.2	2.6	4.4	3.5	5.5	4.3	2.4	6.3	6.0	2.7	1.8	42.2	$120	$ 5,064
	Encroachment Permits	0.5												0.5	$87	$ 44
	Travel			2.8	2.3	1.5	2.6	4.3	2.8	2.8	2.6	1.9		23.6	$87	$ 2,054
	Unscheduled events													0.0	$87	$ -
	Monthly Subtotal (hours)	2.2	1.2	5.4	6.7	5.0	8.1	8.7	5.3	9.1	8.5	4.6	1.8	66.3		
	Monthly Subtotal ($)	$245	$144	$552	$724	$553	$882	$895	$539	$995	$938	$484	$210	$7,162		
															Task Subtotal =	$7,162
	Operation															
	Wet season inspections				1.0	0.5	0.8	1.3	0.9	1.0	1.3			6.6	$55	$ 362
	Dry season inspections			0.3								0.5		0.8	$55	$ 41
	Unscheduled inspections/field calls													0.0	$60	$ -
	Monthly Subtotal (hours)	0.0	0.0	0.3	1.0	0.5	0.8	1.3	0.9	1.0	1.3	0.5	0.0	7.3		
	Monthly Subtotal ($)	$0	$0	$14	$55	$28	$41	$69	$48	$53	$69	$28	$0	$403		
															Task Subtotal =	$403
	Maintenance															
	Scheduled maintenance			1.0								1.8		2.8	$55	$ 151
	Unscheduled maintenance													0.0	$55	$ -
	Vandalism													0.0	$55	$ -
	Acts of God													0.0	$55	$ -
	Landscape Maintenance Contractor													0.0	$0	$ -
	Sediment Removal Contractor													0.0	$0	$ -
	Other Contractor													0.0	$0	$ -
	Other Contractor													0.0	$0	$ -
	Other Contractor													0.0	$0	$ -
	Monthly Subtotal (hours)	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.8	0.0	2.8		
	Monthly Subtotal ($)	$0	$0	$55	$0	$0	$0	$0	$0	$0	$0	$96	$0	$151		
															Task Subtotal =	$151
	Vector Control															
	Contract & General administration	0.2	0.1	0.10	0.1	0.1	0.1	0.1						0.8	$120	$ 96
	Vector prevention maint. (consultant)													0.0	$65	$ -
	Response to VCD calls (consultant)													0.0	$55	$ -
	VCD efforts (contracted)	0.6	1.0	0.8	0.8			0.8	0.4	0.6				5.1	$46	$ 236
	Monthly Subtotal (hours)	0.8	1.1	0.9	0.9	0.1	0.1	0.9	0.4	0.6	0.0	0.0	0.0	5.9		
	Monthly Subtotal ($)	$53	$57	$49	$51	$12	$12	$49	$20	$29	$0	$0	$0	$332		
															Task Subtotal =	$332
Non-Recurring Equipment (hours)	*Equipment*															
	Piece of Equipment 1													0.0	$0	$ -
	Piece of Equipment 2													0.0	$0	$ -
	Piece of Equipment 3													0.0	$0	$ -
	Piece of Equipment 4													0.0	$0	$ -
	Piece of Equipment 5													0.0	$0	$ -
	Piece of Equipment 6													0.0	$0	$ -
	Monthly Subtotal (hours)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
	Monthly Subtotal ($)	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0		
															Equipment Subtotal =	$0

	Direct Costs	Jul	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Total $
Dollars ($)	VCD supplies (direct costs less labor)													$ -
	Reproduction	$ 1	$ 1	$ 1	$ 1	$ 1	$ 1	$ 1						$ 6
	Postage/FedEx	$ 2	$ 1	$ 1	$ 2	$ 2	$ 3	$ 2	$ 2	$ 6		$ 14	$ 0.5	$ 35
	Lodging			$ 3	$ 11		$ 10	$ 11	$ 9			$ 2		$ 46
	Per Diem			$ 2	$ 5		$ 5	$ 5	$ 5			$ 0.4		$ 22
	Incidentals	$ 3	$ 5	$ 3	$ 9	$ 34	$ 1	$ 1						$ 56
	Vehicle Rental/Lease	$ 1	$ 2	$ 33	$ 18	$ 12	$ 12	$ 35	$ 31	$ 27	$ 12	$ 52		$ 237
	Airfare													$ -
	Field Supp./Expendables	$ 13	$ 3	$ 4	$ 4	$ 1	$ 4	$ 1	$ 1	$ 3	$ 11	$ 3		$ 49
	Equipment Rental													$ -
	Sediment Analyses													$ -
	Sediment Disposal													$ -
	StreamGuard Drain Inlet Insert			$ 105										$ 105
	Vegetation Disposal													$ -
	Storage Container													$ -
	Monthly Subtotal	$ 21	$ 12	$ 152	$ 50	$ 51	$ 36	$ 55	$ 48	$ 35	$ 23	$ 72	$ 0	$ 556

	Jul	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	
MONTHLY TOTAL	$319	$213	$822	$880	$643	$971	$1,069	$654	$1,113	$1,029	$680	$210	2000/2001 TOTAL = $8,604

BMP Retrofit Pilot Program
Maintenance Operation
Cost Accounting Summary, 2000-01

DISTRICT: 7 | LOCATION: Foothill Maintenance Station | SITE NO: 73216b | BMP TYPE: Drain Inlet Inserts (Fossil Filter)

	TASK	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Total (hrs)	Avg. Rate	TOTAL $
Labor (hours)	*Administration*															
	General program support/Follow-up	1.7	1.2	2.6	5.9	3.5	5.5	4.3	2.4	6.3	6.0	2.7	1.8	43.7	$120	$ 5,243
	Encroachment Permits	0.5												0.5	$87	$ 44
	Travel			2.8	3.5	1.5	2.6	4.3	2.8	2.8	3.2	1.9		25.4	$87	$ 2,212
	Unscheduled events													0.0	$87	$ -
	Monthly Subtotal (hours)	2.2	1.2	5.4	9.3	5.0	8.1	8.7	5.3	9.1	9.2	4.6	1.8	69.6		
	Monthly Subtotal ($)	$245	$144	$552	$1,004	$553	$882	$895	$539	$995	$994	$484	$210	$7,498		
															Task Subtotal =	$7,498
	Operation															
	Wet season inspections				1.3	0.5	0.8	1.3	0.9	1.0	1.5			7.1	$55	$ 390
	Dry season inspections			0.3								0.5		0.8	$55	$ 41
	Unscheduled inspections/field calls				3.0									3.0	$60	$ 180
	Monthly Subtotal (hours)	0.0	0.0	0.3	4.3	0.5	0.8	1.3	0.9	1.0	1.5	0.5	0.0	10.8		
	Monthly Subtotal ($)	$0	$0	$14	$249	$28	$41	$69	$48	$53	$83	$28	$0	$611		
															Task Subtotal =	$611
	Maintenance															
	Scheduled maintenance			1.8	0.8	0.5	0.5	1.3	0.5	0.3	1.0	1.8		8.3	$55	$ 454
	Unscheduled maintenance													0.0	$55	$ -
	Vandalism													0.0	$55	$ -
	Acts of God													0.0	$55	$ -
	Landscape Maintenance Contractor													0.0	$0	$ -
	Sediment Removal Contractor													0.0	$0	$ -
	Other Contractor													0.0	$0	$ -
	Other Contractor													0.0	$0	$ -
	Other Contractor													0.0	$0	$ -
	Monthly Subtotal (hours)	0.0	0.0	1.8	0.8	0.5	0.5	1.3	0.5	0.3	1.0	1.8	0.0	8.3		
	Monthly Subtotal ($)	$0	$0	$96	$41	$28	$28	$69	$28	$14	$55	$96	$0	$454		
															Task Subtotal =	$454
	Vector Control															
	Contract & General administration	0.2	0.1	0.10	0.1	0.1	0.1	0.1						0.8	$120	$ 96
	Vector prevention maint. (consultant)													0.0	$65	$ -
	Response to VCD calls (consultant)													0.0	$55	$ -
	VCD efforts (contracted)	0.6	1.0	0.8	0.8			0.8	0.4	0.6				5.1	$46	$ 236
	Monthly Subtotal (hours)	0.8	1.1	0.9	0.9	0.1	0.1	0.9	0.4	0.6	0.0	0.0	0.0	5.9		
	Monthly Subtotal ($)	$53	$57	$49	$51	$12	$12	$49	$20	$29	$0	$0	$0	$332		
															Task Subtotal =	$332
Non-Recurring Equipment (hours)	*Equipment*															
	Piece of Equipment 1													0.0	$0	$ -
	Piece of Equipment 2													0.0	$0	$ -
	Piece of Equipment 3													0.0	$0	$ -
	Piece of Equipment 4													0.0	$0	$ -
	Piece of Equipment 5													0.0	$0	$ -
	Piece of Equipment 6													0.0	$0	$ -
	Monthly Subtotal (hours)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
	Monthly Subtotal ($)	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0		
															Equipment Subtotal =	$0
Dollars ($)	*Direct Costs*													Total $		
	VCD supplies (direct costs less labor)													$ -		
	Reproduction	$ 1	$ 1	$ 1	$ 1	$ 1	$ 1	$ 1						$ 6		
	Postage/FedEx	$ 2	$ 1	$ 1	$ 2	$ 2	$ 3	$ 2	$ 2	$ 6		$ 14	$ 0.5	$ 35		
	Lodging			$ 3	$ 11		$ 10	$ 11	$ 9			$ 2		$ 46		
	Per Diem			$ 2	$ 5		$ 5	$ 5	$ 5			$ 0.4		$ 22		
	Incidentals	$ 3	$ 5	$ 3	$ 9	$ 34	$ 1	$ 1						$ 56		
	Vehicle Rental/Lease	$ 1	$ 2	$ 33	$ 26	$ 12	$ 12	$ 35	$ 31	$ 27	$ 15	$ 52		$ 248		
	Airfare													$ -		
	Field Supp./Expendables	$ 13	$ 3	$ 4	$ 4	$ 1	$ 4	$ 1	$ 1	$ 3	$ 11	$ 3		$ 49		
	Equipment Rental													$ -		
	Sediment Analyses													$ -		
	Sediment Disposal													$ -		
	Fossil Filter Adsorbent Material ($15/repl)			$ 15										$ 15		
	Vegetation Disposal													$ -		
	Storage Container													$ -		
	Monthly Subtotal	$ 21	$ 12	$ 62	$ 58	$ 51	$ 36	$ 55	$ 48	$ 35	$ 26	$ 72	$ 0	$ 477		
	MONTHLY TOTAL	$319	$213	$773	$1,403	$671	$999	$1,137	$681	$1,127	$1,158	$680	$210	2000/2001 TOTAL =		$9,372

BMP Retrofit Pilot Program
Maintenance Operation
Cost Accounting Summary, 2000-01

DISTRICT: 7 | LOCATION: Lit Flower Maintenance Station | SITE NO: 73217a | BMP: StreamGuard Drain Inlet Insert (StreamGuard)

TASK	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Total (hrs)	Avg. Rate	TOTAL $
Labor (hours)															
Administration															
General program support/Follow-up	1.7	1.2	2.6	4.4	3.5	5.5	4.3	2.4	6.3	6.0	2.7	1.8	42.2	$120	$ 5,064
Encroachment Permits	0.5												0.5	$87	$ 44
Travel			2.8	2.3	1.5	2.6	4.3	2.8	2.8	2.6	1.9		23.6	$87	$ 2,054
Unscheduled events													0.0	$87	$ -
Monthly Subtotal (hours)	2.2	1.2	5.4	6.7	5.0	8.1	8.7	5.3	9.1	8.5	4.6	1.8	66.3		
Monthly Subtotal ($)	$245	$144	$552	$724	$553	$882	$895	$539	$995	$938	$484	$210	$7,162		
Task Subtotal =															$7,162
Operation															
Wet season inspections				1.0	0.5	0.8	1.3	0.9	1.0	1.3			6.6	$55	$ 362
Dry season inspections			0.3								0.5		0.8	$55	$ 41
Unscheduled inspections/field calls									0.5				0.5	$60	$ 30
Monthly Subtotal (hours)	0.0	0.0	0.3	1.0	0.5	0.8	1.3	0.9	1.5	1.3	0.5	0.0	7.8		
Monthly Subtotal ($)	$0	$0	$0	$55	$28	$41	$69	$48	$83	$69	$28	$0	$433		
Task Subtotal =															$433
Maintenance															
Scheduled maintenance			1.0				5.3				1.8		8.0	$55	$ 440
Unscheduled maintenance													0.0	$55	$ -
Vandalism													0.0	$55	$ -
Acts of God													0.0	$55	$ -
Landscape Maintenance Contractor													0.0	$55	$ -
Sediment Removal Contractor													0.0	$0	$ -
Other Contractor													0.0	$0	$ -
Other Contractor													0.0	$0	$ -
Other Contractor													0.0	$0	$ -
													0.0	$0	$ -
Monthly Subtotal (hours)	0.0	0.0	1.0	0.0	0.0	0.0	5.3	0.0	0.0	0.0	1.8	0.0	8.0		
Monthly Subtotal ($)	$0	$0	$55	$0	$0	$0	$289	$0	$0	$0	$96	$0	$440		
Task Subtotal =															$440
Vector General															
Contract & General administration	0.2	0.1	0.10	0.1	0.1	0.1	0.1						0.8	$120	$ 96
Vector prevention maint. (consultant)													0.0	$65	$ -
Response to VCD calls (consultant)													0.0	$55	$ -
VCD efforts (contracted)	4.0	5.0	4.0	4.0	5.0				5.0	4.0	5.0	4.0	40.0	$66	$ 2,621
Monthly Subtotal (hours)	4.2	5.1	4.1	4.1	5.1	0.1	0.1	0.0	5.0	4.0	5.0	4.0	40.8		
Monthly Subtotal ($)	$286	$340	$274	$274	$340	$12	$12	$0	$328	$262	$328	$262	$2,717		
Task Subtotal =															$2,717
Non-Recurring Equipment (hours)															
Equipment															
Piece of Equipment 1													0.0	$0	$ -
Piece of Equipment 2													0.0	$0	$ -
Piece of Equipment 3													0.0	$0	$ -
Piece of Equipment 4													0.0	$0	$ -
Piece of Equipment 5													0.0	$0	$ -
Piece of Equipment 6													0.0	$0	$ -
Monthly Subtotal (hours)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
Monthly Subtotal ($)	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0		
Equipment Subtotal =															$0
Dollars ($)															
Direct Costs															Total $
VCD supplies (direct costs less labor)															$ -
Reproduction	$ 1	$ 1	$ 1	$ 1	$ 1	$ 1	$ 1								$ 6
Postage/FedEx	$ 2	$ 1	$ 1	$ 2	$ 2	$ 3	$ 2	$ 2	$ 6		$ 14	$ 0.5			$ 35
Lodging			$ 3	$ 11		$ 10	$ 11	$ 9			$ 2				$ 46
Per Diem			$ 2	$ 5		$ 5	$ 5	$ 5			$ 0.4				$ 22
Incidentals	$ 3	$ 5	$ 3	$ 9	$ 34	$ 1	$ 1								$ 56
Vehicle Rental/Lease	$ 10	$ 13	$ 42	$ 27	$ 25	$ 12	$ 34	$ 30	$ 37	$ 22	$ 65	$ 10			$ 327
Airfare															$ -
Field Supp./Expendables	$ 13	$ 3	$ 4	$ 4	$ 1	$ 4	$ 1	$ 1	$ 3	$ 11	$ 3				$ 49
Equipment Rental															$ -
Sediment Analyses															$ -
Sediment Disposal															$ -
StreamGuard Drain Inlet Insert			$ 105				$ 105								$ 210
Vegetation Disposal															$ -
Storage Container															$ -
Monthly Subtotal	$ 30	$ 23	$ 161	$ 58	$ 64	$ 36	$ 159	$ 46	$ 46	$ 33	$ 85	$ 11	$ 750		
MONTHLY TOTAL	$561	$506	$1,042	$1,112	$984	$971	$1,424	$633	$1,452	$1,302	$1,020	$483	2000/2001 TOTAL =		$11,502

BMP Retrofit Pilot Program
Maintenance Operation
Cost Accounting Summary, 2000-01

DISTRICT: 7	LOCATION: Las Flores Maintenance Station	SITE NO. 73217b	BMP TYPE: Drain Inlet Insert (Fossil Filter)

	TASK	2000						2001						Total (hrs)	Avg. Rate	TOTAL $
		Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun			
Labor (hours)	*Administration*															
	General program support/Follow-up	1.7	1.2	2.6	4.4	3.5	5.5	4.3	2.4	6.3	6.0	2.7	1.8	42.2	$120	$ 5,064
	Encroachment Permits	0.5												0.5	$87	$ 44
	Travel			2.8	2.9	2.3	2.6	4.3	2.8	2.8	2.6	1.9		24.9	$87	$ 2,170
	Unscheduled events													0.0	$87	$ -
	Monthly Subtotal (hours)	2.2	1.2	5.4	7.3	5.8	8.1	8.7	5.3	9.1	8.5	4.6	1.8	67.6		
	Monthly Subtotal ($)	$245	$144	$552	$775	$618	$882	$895	$539	$995	$938	$484	$210	$7,277		
														Task Subtotal =		$7,277
	Operation															
	Wet season inspections				1.3	0.5	0.8	1.3	0.9	1.0	1.5			7.1	$55	$ 390
	Dry season inspections			0.3								0.5		0.8	$55	$ 41
	Unscheduled inspections/field calls									0.5				0.5	$60	$ 30
	Monthly Subtotal (hours)	0.0	0.0	0.3	1.3	0.5	0.8	1.3	0.9	1.5	1.5	0.5	0.0	8.3		
	Monthly Subtotal ($)	$0	$0	$14	$69	$28	$41	$69	$48	$83	$83	$28	$0	$461		
														Task Subtotal =		$461
	Maintenance															
	Scheduled maintenance			1.5	1.0	1.0	0.5	1.3	0.5	0.5	0.5	1.8		8.5	$55	$ 468
	Unscheduled maintenance													0.0	$55	$ -
	Vandalism													0.0	$55	$ -
	Acts of God													0.0	$55	$ -
	Landscape Maintenance Contractor													0.0	$0	$ -
	Sediment Removal Contractor													0.0	$0	$ -
	Other Contractor													0.0	$0	$ -
	Other Contractor													0.0	$0	$ -
	Other Contractor													0.0	$0	$ -
	Monthly Subtotal (hours)	0.0	0.0	1.5	1.0	1.0	0.5	1.3	0.5	0.5	0.5	1.8	0.0	8.5		
	Monthly Subtotal ($)	$0	$0	$83	$55	$55	$28	$69	$28	$28	$28	$96	$0	$468		
														Task Subtotal =		$468
	Vector Control															
	Contract & General administration	0.2	0.1	0.10	0.1	0.1	0.1	0.1						0.8	$120	$ 96
	Vector prevention maint. (consultant)													0.0	$65	$ -
	Response to VCD calls (consultant)													0.0	$55	$ -
	VCD efforts (contracted)	4.0	5.0	4.0	4.0	5.0				5.0	4.0	5.0	4.0	40.0	$66	$ 2,621
	Monthly Subtotal (hours)	4.2	5.1	4.1	4.1	5.1	0.1	0.1	0.0	5.0	4.0	5.0	4.0	40.8		
	Monthly Subtotal ($)	$286	$340	$274	$274	$340	$12	$12	$0	$328	$262	$328	$262	$2,717		
														Task Subtotal =		$2,717
Non-Recurring Equipment (hours)	*Equipment*															
	Piece of Equipment 1													0.0	$0	$ -
	Piece of Equipment 2													0.0	$0	$ -
	Piece of Equipment 3													0.0	$0	$ -
	Piece of Equipment 4													0.0	$0	$ -
	Piece of Equipment 5													0.0	$0	$ -
	Piece of Equipment 6													0.0	$0	$ -
	Monthly Subtotal (hours)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
	Monthly Subtotal ($)	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0		
														Equipment Subtotal =		$0

	Direct Costs													Total $
Dollars ($)	VCD supplies (direct costs less labor)													$ -
	Reproduction	$ 1	$ 1	$ 1	$ 1	$ 1	$ 1	$ 1						$ 6
	Postage/FedEx	$ 2	$ 1	$ 1	$ 2	$ 2	$ 3	$ 2	$ 2	$ 6		$ 14	$ 0.5	$ 35
	Lodging			$ 3	$ 11		$ 10	$ 11	$ 9			$ 2		$ 46
	Per Diem			$ 2	$ 5		$ 5	$ 5	$ 5			$ 0.4		$ 22
	Incidentals	$ 3	$ 5	$ 3	$ 9	$ 34	$ 1	$ 1						$ 56
	Vehicle Rental/Lease	$ 10	$ 13	$ 42	$ 31	$ 31	$ 12	$ 34	$ 30	$ 37	$ 22	$ 65	$ 10	$ 337
	Airfare													$ -
	Field Supp./Expendables	$ 13	$ 3	$ 4	$ 4	$ 1	$ 4	$ 1	$ 1	$ 3	$ 11	$ 3		$ 49
	Equipment Rental													$ -
	Sediment Analyses													$ -
	Sediment Disposal													$ -
	Fossil Filter Adsorbent Material ($15/repl)			$ 15										$ 15
	Vegetation Disposal													$ -
	Storage Container													$ -
	Monthly Subtotal	$ 30	$ 23	$ 71	$ 63	$ 70	$ 36	$ 53	$ 46	$ 46	$ 33	$ 85	$ 11	$ 565

MONTHLY TOTAL	$561	$506	$993	$1,235	$1,110	$999	$1,098	$660	$1,479	$1,343	$1,020	$483	2000/2001 TOTAL =	$11,488

BMP Retrofit Pilot Program
Maintenance Operation
Cost Accounting Summary, 2000-01

DISTRICT: 7 | LOCATION: Richmond Maintenance Station | SITE NO: 73218a | BMP TYPE: Drain Inlet Insert (StreamGuard)

	TASK	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Total (hrs)	Avg. Rate	TOTAL $
Labor (hours)	***Administration***															
	General program support/Follow-up	1.7	1.2	2.6	4.4	3.5	5.5	4.3	2.4	6.3	6.0	2.7	1.8	42.2	$120	$ 5,064
	Encroachment Permits	0.5												0.5	$87	$ 44
	Travel			2.8	2.3	3.0	3.5	4.3	2.8	2.8	2.6	1.9		26.0	$87	$ 2,260
	Unscheduled events													0.0	$87	$ -
	Monthly Subtotal (hours)	2.2	1.2	5.4	6.7	6.5	8.9	8.7	5.3	9.1	8.5	4.6	1.8	68.7		
	Monthly Subtotal ($)	$245	$144	$552	$724	$683	$958	$895	$539	$995	$938	$484	$210	$7,368		
															Task Subtotal =	$7,368
	Operation															
	Wet season inspections				1.0	0.5	0.8	1.3	0.9	1.0	1.3			6.6	$55	$ 362
	Dry season inspections			0.3								0.5		0.8	$55	$ 41
	Unscheduled inspections/field calls													0.0	$60	$ -
	Monthly Subtotal (hours)	0.0	0.0	0.3	1.0	0.5	0.8	1.3	0.9	1.0	1.3	0.5	0.0	7.3		
	Monthly Subtotal ($)	$0	$0	$14	$55	$28	$41	$69	$48	$53	$69	$28	$0	$403		
															Task Subtotal =	$403
	Maintenance															
	Scheduled maintenance			1.0	0.5	2.5	3.0	0.3				1.8		9.0	$55	$ 495
	Unscheduled maintenance													0.0	$55	$ -
	Vandalism													0.0	$55	$ -
	Acts of God													0.0	$55	$ -
	Landscape Maintenance Contractor													0.0	$0	$ -
	Sediment Removal Contractor													0.0	$0	$ -
	Other Contractor													0.0	$0	$ -
	Other Contractor													0.0	$0	$ -
	Other Contractor													0.0	$0	$ -
	Monthly Subtotal (hours)	0.0	0.0	1.0	0.5	2.5	3.0	0.3	0.0	0.0	0.0	1.8	0.0	9.0		
	Monthly Subtotal ($)	$0	$0	$55	$28	$138	$165	$14	$0	$0	$0	$96	$0	$495		
															Task Subtotal =	$495
	Vector Control															
	Contract & General administration	0.2	0.1	0.10	0.1	0.1	0.1	0.1						0.8	$120	$ 96
	Vector prevention maint. (consultant)													0.0	$65	$ -
	Response to VCD calls (consultant)													0.0	$55	$ -
	VCD efforts (contracted)	0.6	1.2	0.8	0.9			0.8	0.5	0.7				5.4	$46	$ 251
	Monthly Subtotal (hours)	0.8	1.3	0.9	1.0	0.1	0.1	0.9	0.5	0.7	0.0	0.0	0.0	6.2		
	Monthly Subtotal ($)	$51	$66	$49	$55	$12	$12	$48	$23	$30	$0	$0	$0	$347		
															Task Subtotal =	$347
Non-Recurring Equipment (hours)	***Equipment***															
	Piece of Equipment 1													0.0	$0	$ -
	Piece of Equipment 2													0.0	$0	$ -
	Piece of Equipment 3													0.0	$0	$ -
	Piece of Equipment 4													0.0	$0	$ -
	Piece of Equipment 5													0.0	$0	$ -
	Piece of Equipment 6													0.0	$0	$ -
	Monthly Subtotal (hours)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
	Monthly Subtotal ($)	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0		
															Equipment Subtotal =	$0
Dollars ($)	***Direct Costs***															Total $
	VCD supplies (direct costs less labor)															$ -
	Reproduction	$ 1	$ 1	$ 1	$ 1	$ 1	$ 1	$ 1								$ 6
	Postage/FedEx	$ 2	$ 1	$ 1	$ 2	$ 2	$ 3	$ 2	$ 2	$ 6		$ 14	$ 0.5			$ 35
	Lodging			$ 3	$ 11		$ 10	$ 11	$ 9			$ 2				$ 46
	Per Diem			$ 2	$ 5		$ 5	$ 5	$ 5			$ 0.4				$ 22
	Incidentals	$ 3	$ 5	$ 3	$ 9	$ 34	$ 1	$ 1								$ 56
	Vehicle Rental/Lease	$ 3	$ 3	$ 34	$ 19	$ 25	$ 16	$ 36	$ 32	$ 27	$ 12	$ 52				$ 259
	Airfare															$ -
	Field Supp./Expendables	$ 13	$ 3	$ 4	$ 4	$ 1	$ 4	$ 1	$ 1	$ 3	$ 11	$ 3				$ 49
	Equipment Rental															$ -
	Sediment Analyses															$ -
	Sediment Disposal															$ -
	StreamGuard Drain Inlet Insert			$ 105												$ 105
	Vegetation Disposal															$ -
	Storage Container															$ -
	Monthly Subtotal	$ 23	$ 13	$ 153	$ 51	$ 63	$ 40	$ 56	$ 48	$ 36	$ 23	$ 72	$ 0			$ 578
	MONTHLY TOTAL	$319	$223	$822	$912	$924	$1,216	$1,082	$658	$1,115	$1,029	$680	$210	2000/2001 TOTAL =		$9,191

BMP Retrofit Pilot Program
Maintenance Operation
Cost Accounting Summary, 2000-01

DISTRICT: 7 | LOCATION: Rosemead Maintenance Station | SITE NO. 73218b | BMP TYPE: Drain Inlet Insert (Fossil Filter)

	TASK	2000						2001						Total (hrs)	Avg. Rate	TOTAL $
		Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun			
Labor (hours)	*Administration*															
	General program support/Follow-up	1.7	1.2	2.6	4.4	3.5	5.5	4.3	2.4	6.3	6.0	2.7	1.8	42.2	$120	$ 5,064
	Encroachment Permits	0.5												0.5	$87	$ 44
	Travel			2.8	2.9	2.3	4.4	4.3	2.8	2.8	2.6	1.9		26.7	$87	$ 2,321
	Unscheduled events													0.0	$87	$ -
	Monthly Subtotal (hours)	2.2	1.2	5.4	7.3	5.8	9.8	8.7	5.3	9.1	8.5	4.6	1.8	69.4		
	Monthly Subtotal ($)	$245	$144	$552	$775	$618	$1,033	$895	$539	$995	$938	$484	$210	$7,429		
														Task Subtotal =		$7,429
	Operation															
	Wet season inspections				1.3	0.5	0.8	1.3	0.9	1.0	1.5			7.1	$55	$ 390
	Dry season inspections			0.3								0.5		0.8	$55	$ 41
	Unscheduled inspections/field calls													0.0	$60	$ -
	Monthly Subtotal (hours)	0.0	0.0	0.3	1.3	0.5	0.8	1.3	0.9	1.0	1.5	0.5	0.0	7.8		
	Monthly Subtotal ($)	$0	$0	$14	$69	$28	$41	$69	$48	$53	$83	$28	$0	$431		
														Task Subtotal =		$431
	Maintenance															
	Scheduled maintenance			1.8	1.3	0.5	1.8	1.0	1.0	1.3	2.3	1.8		12.5	$55	$ 688
	Unscheduled maintenance													0.0	$55	$ -
	Vandalism													0.0	$55	$ -
	Acts of God													0.0	$55	$ -
	Landscape Maintenance Contractor													0.0	$0	$ -
	Sediment Removal Contractor													0.0	$0	$ -
	Other Contractor													0.0	$0	$ -
	Other Contractor													0.0	$0	$ -
	Other Contractor													0.0	$0	$ -
	Monthly Subtotal (hours)	0.0	0.0	1.8	1.3	0.5	1.8	1.0	1.0	1.3	2.3	1.8	0.0	12.5		
	Monthly Subtotal ($)	$0	$0	$96	$69	$28	$96	$55	$55	$69	$124	$96	$0	$688		
														Task Subtotal =		$688
	Vector Control															
	Contract & General administration	0.2	0.1	0.10	0.1	0.1	0.1	0.1						0.8	$120	$ 96
	Vector prevention maint. (consultant)													0.0	$65	$ -
	Response to VCD calls (consultant)													0.0	$55	$ -
	VCD efforts (contracted)	0.6	1.2	0.8	0.9			0.8	0.5	0.7				5.4	$46	$ 251
	Monthly Subtotal (hours)	0.8	1.3	0.9	1.0	0.1	0.1	0.9	0.5	0.7	0.0	0.0	0.0	6.2		
	Monthly Subtotal ($)	$51	$66	$49	$55	$12	$12	$48	$23	$30	$0	$0	$0	$347		
														Task Subtotal =		$347
Non-Recurring Equipment (hours)	*Equipment*															
	Piece of Equipment 1													0.0	$0	$ -
	Piece of Equipment 2													0.0	$0	$ -
	Piece of Equipment 3													0.0	$0	$ -
	Piece of Equipment 4													0.0	$0	$ -
	Piece of Equipment 5													0.0	$0	$ -
	Piece of Equipment 6													0.0	$0	$ -
	Monthly Subtotal (hours)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
	Monthly Subtotal ($)	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0		
														Equipment Subtotal =		$0
Dollars ($)	*Direct Costs*													Total $		
	VCD supplies (direct costs less labor)													$ -		
	Reproduction	$ 1	$ 1	$ 1	$ 1	$ 1	$ 1	$ 1						$ 6		
	Postage/FedEx	$ 2	$ 1	$ 1	$ 2	$ 2	$ 3	$ 2	$ 2	$ 6		$ 14	$ 0.5	$ 35		
	Lodging			$ 3	$ 11		$ 10	$ 11	$ 9			$ 2		$ 46		
	Per Diem			$ 2	$ 5		$ 5	$ 5	$ 5			$ 0.4		$ 22		
	Incidentals	$ 3	$ 5	$ 3	$ 9	$ 34	$ 1	$ 1						$ 56		
	Vehicle Rental/Lease	$ 3	$ 3	$ 34	$ 23	$ 19	$ 20	$ 36	$ 32	$ 27	$ 12	$ 52		$ 261		
	Airfare													$ -		
	Field Supp./Expendables	$ 13	$ 3	$ 4	$ 4	$ 1	$ 4	$ 1	$ 1	$ 3	$ 11	$ 3		$ 49		
	Equipment Rental													$ -		
	Sediment Analyses													$ -		
	Sediment Disposal													$ -		
	Fossil Filter Adsorbent Material ($15/repl)			$ 15										$ 15		
	Vegetation Disposal													$ -		
	Storage Container													$ -		
	Monthly Subtotal	$ 23	$ 13	$ 63	$ 55	$ 57	$ 44	$ 56	$ 48	$ 36	$ 23	$ 72	$ 0	$ 489		
	MONTHLY TOTAL	$319	$223	$773	$1,021	$742	$1,227	$1,123	$713	$1,183	$1,167	$680	$210	2000/2001 TOTAL =		$9,383

BMP Retrofit Pilot Program
Maintenance Operation
Cost Accounting Summary, 2000-01

DISTRICT: 7	LOCATION: I-605/SR-91 Interchange	SITE NO. 73222a	BMP TYPE: Biofiltration Strip

	TASK	2000 Jul	Aug	Sep	Oct	Nov	Dec	2001 Jan	Feb	Mar	Apr	May	Jun	Total (hrs)	Avg. Rate	TOTAL $
Labor (hours)	*Administration*															
	General program support/Follow-up	4.8	4.9	3.9	3.5	8.9	7.7	3.1	7.4	8.7	14.8	3.7	9.0	80.5	$120	$ 9,659
	Encroachment Permits	0.5												0.5	$87	$ 44
	Travel	2.3	4.3	4.7	2.3	5.3	3.5	1.7	12.3	1.9	14.2	1.9	3.9	58.1	$87	$ 5,056
	Unscheduled events													0.0	$87	$ -
	Monthly Subtotal (hours)	7.6	9.1	8.6	5.8	14.2	11.2	4.8	19.7	10.6	29.0	5.6	12.9	139.1		
	Monthly Subtotal ($)	$822	$954	$873	$623	$1,526	$1,225	$521	$1,962	$1,211	$3,011	$609	$1,421	$14,758		
														Task Subtotal =		$14,758
	Operation															
	Wet season inspections				1.0	1.1	1.0	1.0	1.1	1.3	0.8			7.3	$55	$ 403
	Dry season inspections	0.8	0.5	0.9								0.8	0.5	3.5	$55	$ 193
	Unscheduled inspections/field calls													0.0	$60	$ -
	Monthly Subtotal (hours)	0.8	0.5	0.9	1.0	1.1	1.0	1.0	1.1	1.3	0.8	0.8	0.5	10.8		
	Monthly Subtotal ($)	$44	$28	$48	$55	$59	$55	$55	$59	$73	$46	$43	$30	$596		
														Task Subtotal =		$596
	Maintenance															
	Scheduled maintenance	0.5	1.0	3.0		2.8	3.0		33.3		92.8		7.0	143.3	$55	$ 7,879
	Unscheduled maintenance				2.0	9.8								11.8	$55	$ 646
	Vandalism													0.0	$55	$ -
	Acts of God													0.0	$55	$ -
	Landscape Maintenance Contractor													0.0	$0	$ -
	Sediment Removal Contractor													0.0	$0	$ -
	Vegetation Consultant													0.0	$75	$ -
	Other Contractor													0.0	$0	$ -
	Other Contractor													0.0	$0	$ -
	Monthly Subtotal (hours)	0.5	1.0	3.0	2.0	12.5	3.0	0.0	33.3	0.0	92.8	0.0	7.0	155.0		
	Monthly Subtotal ($)	$28	$55	$165	$110	$688	$165	$0	$1,829	$0	$5,101	$0	$385	$8,525		
														Task Subtotal =		$8,525
	Vector Control															
	Contract & General administration	0.2	0.1	0.10	0.1	0.1	0.1	0.1						0.8	$120	$ 96
	Vector prevention maint. (consultant)													0.0	$65	$ -
	Response to VCD calls (consultant)													0.0	$55	$ -
	VCD efforts (contracted)	1.9	2.9	2.5	3.3	3.1	2.7	2.0	2.0	1.8	2.1	1.7	2.2	28.1	$46	$ 1,305
	Monthly Subtotal (hours)	2.1	3.0	2.6	3.4	3.2	2.8	2.1	2.0	1.8	2.1	1.7	2.2	28.9		
	Monthly Subtotal ($)	$112	$145	$126	$166	$157	$139	$104	$91	$82	$97	$80	$103	$1,401		
														Task Subtotal =		$1,401
Non-Recurring Equipment (hours)	*Equipment*															
	Traffic cones & signs					3.8								3.8	$28	$ 105
	Weedwacker								8.0					8.0	$5	$ 40
	Piece of Equipment 3													0.0	$0	$ -
	Piece of Equipment 4													0.0	$0	$ -
	Piece of Equipment 5													0.0	$0	$ -
	Piece of Equipment 6													0.0	$0	$ -
	Piece of Equipment 7													0.0	$0	$ -
	Piece of Equipment 8													0.0	$0	$ -
	Monthly Subtotal (hours)	0.0	0.0	0.0	0.0	3.8	0.0	0.0	8.0	0.0	0.0	0.0	0.0	11.8		
	Monthly Subtotal ($)	$0	$0	$0	$0	$105	$0	$0	$40	$0	$0	$0	$0	$145		
														Equipment Subtotal =		$145
Dollars ($)	*Direct Costs*													Total $		
	VCD supplies (direct costs less labor)													$ -		
	Reproduction	$ 1	$ 1	$ 1	$ 1	$ 1	$ 1	$ 1						$ 5.97		
	Postage/FedEx	$ 2	$ 1	$ 1	$ 2	$ 2	$ 3	$ 2	$ 2	$ 6		$ 14	$ 0.5	$ 34.84		
	Lodging		$ 7	$ 3	$ 11		$ 10	$ 11	$ 9			$ 2		$ 53.04		
	Per Diem		$ 3	$ 2	$ 5		$ 5	$ 5	$ 5			$ 0.4		$ 24.71		
	Incidentals	$ 3	$ 5	$ 3	$ 9	$ 34	$ 1	$ 1						$ 56.01		
	Vehicle Rental/Lease	$ 92	$ 24	$ 53	$ 16	$ 43	$ 16	$ 13	$ 128	$ 16	$ 66	$ 52	$ 69	$ 589.82		
	Airfare													$ -		
	Field Supp./Expendables	$ 13	$ 3	$ 4	$ 4	$ 195	$ 4	$ 1	$ 1	$ 3	$ 11	$ 3	$ 5	$ 248.00		
	Equipment Rental													$ -		
	Sediment Analyses													$ -		
	Sediment Disposal													$ -		
	Weed Wacker													$ -		
	Vegetation Disposal													$ -		
	Scarifying/Hydroseeding													$ -		
	Monthly Subtotal	$ 111	$ 45	$ 66	$ 48	$ 276	$ 40	$ 33	$ 145	$ 25	$ 77	$ 72	$ 75	$ 1,012		
	MONTHLY TOTAL	$1,116	$1,226	$1,279	$1,003	$2,811	$1,624	$713	$4,125	$1,391	$8,331	$805	$2,013	2000/2001 TOTA		$26,437

BMP Retrofit Pilot Program
Maintenance Operation
Cost Accounting Summary, 2000-01

DISTRICT 7 | LOCATION: Carlton Maintenance Station | SITE NO. 73223 | BMP TYPE: Biofiltration Swale

	TASK	2000 Jul	Aug	Sep	Oct	Nov	Dec	2001 Jan	Feb	Mar	Apr	May	Jun	Total (hrs)	Avg. Rate	TOTAL $
Labor (hours)	*Administration*															
	General program support/Follow-up	9.8	5.0	4.3	3.5	12.7	7.7	3.1	7.4	8.7	14.8	3.7	9.0	89.7	$120	$ 10,760
	Encroachment Permits	0.5												0.5	$87	$ 44
	Travel	6.8	4.3	4.7	2.3	7.5	3.5	1.7	10.4	7.4	5.2	3.7	3.1	60.7	$87	$ 5,278
	Unscheduled events													0.0	$87	$ -
	Monthly Subtotal (hours)	17.1	9.2	9.0	5.8	20.2	11.2	4.8	17.8	16.2	20.0	7.5	12.1	150.8		
	Monthly Subtotal ($)	$1,810	$966	$921	$623	$2,171	$1,225	$521	$1,797	$1,695	$2,228	$772	$1,353	$16,082		
														Task Subtotal =		$16,082
	Operation															
	Wet season inspections				1.0	1.1	1.0	1.0	1.1	1.3	0.8			7.3	$55	$ 403
	Dry season inspections	1.5	0.5	0.9								0.8	0.5	4.2	$55	$ 232
	Unscheduled inspections/field calls									0.5				0.5	$60	$ 30
	Monthly Subtotal (hours)	1.5	0.5	0.9	1.0	1.1	1.0	1.0	1.1	1.8	0.8	0.8	0.5	12.0		
	Monthly Subtotal ($)	$83	$28	$48	$55	$59	$55	$55	$59	$103	$46	$43	$30	$664		
														Task Subtotal =		$664
	Maintenance															
	Scheduled maintenance	0.5	1.0	3.0	1.3	26.5	1.0		14.3	13.5	10.5	1.0	2.0	74.5	$55	$ 4,098
	Unscheduled maintenance	21.0												21.0	$55	$ 1,155
	Vandalism													0.0	$55	$ -
	Acts of God													0.0	$55	$ -
	Landscape Maintenance Contractor													0.0	$0	$ -
	Sediment Removal Contractor													0.0	$0	$ -
	Vegetation Consultant													0.0	$75	$ -
	Other Contractor													0.0	$0	$ -
	Other Contractor													0.0	$0	$ -
	Monthly Subtotal (hours)	21.5	1.0	3.0	1.3	26.5	1.0	0.0	14.3	13.5	10.5	1.0	2.0	95.5		
	Monthly Subtotal ($)	$1,183	$55	$165	$69	$1,458	$55	$0	$784	$743	$578	$55	$110	$5,253		
														Task Subtotal =		$5,253
	Vector Control															
	Contract & General administration	0.2	0.1	0.10	0.1	0.1	0.1	0.1						0.8	$120	$ 96
	Vector prevention maint. (consultant)	4.0												4.0	$65	$ 260
	Response to VCD calls (consultant)													0.0	$55	$ -
	VCD efforts (contracted)	3.3	5.3	4.6	6.5	5.8	5.0	3.6	3.4	3.3	3.8	3.2	4.1	51.8	$46	$ 2,405
	Monthly Subtotal (hours)	7.5	5.4	4.7	6.6	5.9	5.1	3.7	3.4	3.3	3.8	3.2	4.1	56.6		
	Monthly Subtotal ($)	$436	$260	$228	$312	$280	$244	$178	$156	$151	$177	$150	$192	$2,761		
														Task Subtotal =		$2,761
Non-Recurring Equipment (hours)	*Equipment*															
	Weedwacker								2.5					2.5	$5	$ 13
	Trencher	2.0												2.0	$68	$ 135
	Compactor	1.0												1.0	$82	$ 82
	Piece of Equipment 4													0.0	$0	$ -
	Piece of Equipment 5													0.0	$0	$ -
	Piece of Equipment 6													0.0	$0	$ -
	Piece of Equipment 7													0.0	$0	$ -
	Piece of Equipment 8													0.0	$0	$ -
	Piece of Equipment 9													0.0	$0	$ -
	Piece of Equipment 10													0.0	$0	$ -
	Piece of Equipment 11													0.0	$0	$ -
	Monthly Subtotal (hours)	3.0	0.0	0.0	0.0	0.0	0.0	0.0	2.5	0.0	0.0	0.0	0.0	5.5		
	Monthly Subtotal ($)	$217	$0	$0	$0	$0	$0	$0	$13	$0	$0	$0	$0	$230		
														Equipment Subtotal =		$230
Dollars ($)	*Direct Costs*															Total $
	VCD supplies (direct costs less labor)															$ -
	Reproduction	$ 20	$ 1	$ 2	$ 1	$ 1	$ 1	$ 1								$ 26.31
	Postage/FedEx	$ 21	$ 1	$ 2	$ 2	$ 2	$ 3	$ 2	$ 2	$ 6		$ 14	$ 0.5			$ 55.18
	Lodging		$ 7	$ 3	$ 11		$ 10	$ 11	$ 9			$ 2				$ 53.04
	Per Diem		$ 3	$ 2	$ 5		$ 5	$ 5	$ 5			$ 0.4				$ 24.71
	Incidentals	$ 22	$ 5	$ 4	$ 9	$ 34	$ 1	$ 1								$ 76.35
	Vehicle Rental/Lease	$ 241	$ 24	$ 53	$ 16	$ 62	$ 16	$ 13	$ 109	$ 66	$ 24	$ 105	$ 55			$ 783.29
	Airfare															$ -
	Field Supp./Expendables	$ 214	$ 3	$ 4	$ 4	$ 1	$ 4	$ 1	$ 1	$ 3	$ 11	$ 3	$ 5			$ 255.41
	Equipment Rental															$ -
	Sediment Analyses															$ -
	Sediment Disposal															$ -
	Weed Wacker															$ -
	Vegetation Disposal															$ -
	Scarifying/Hydroseeding/Reseeding				$ 203											$ 203.05
	Monthly Subtotal	$ 518	$ 46	$ 69	$ 251	$ 101	$ 40	$ 33	$ 125	$ 74	$ 35	$ 124	$ 61	$ 1,477		
	MONTHLY TOTAL	$4,246	$1,354	$1,431	$1,310	$4,068	$1,619	$787	$2,934	$2,766	$3,062	$1,144	$1,745	2000/2001 TOTAL		$26,467

BMP Retrofit Pilot Program
Maintenance Operation
Cost Accounting Summary, 2000-01

DISTRICT: 7 | LOCATION: 187/45B | SITE NO: 73224 | BMP TYPE: Bioretention Swale

	TASK	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Total (hrs)	Avg. Rate	TOTAL $
Labor (hours)	*Administration*															
	General program support/Follow-up	4.9	5.0	4.3	3.5	7.7	7.7	3.1	7.4	8.7	14.8	3.7	9.0	79.9	$120	$ 9,582
	Encroachment Permits	0.5												0.5	$87	$ 44
	Travel	0.8	3.2	3.7	1.2	4.5	3.5	1.7	12.3	3.7	5.8	3.7	4.7	48.8	$87	$ 4,248
	Unscheduled events													0.0	$87	$ -
	Monthly Subtotal (hours)	6.2	8.2	8.0	4.7	12.2	11.2	4.8	19.7	12.5	20.6	7.5	13.7	129.2		
	Monthly Subtotal ($)	$701	$873	$840	$523	$1,312	$1,225	$521	$1,962	$1,372	$2,283	$772	$1,490	$13,874		
														Task Subtotal =		$13,874
	Operation															
	Wet season inspections				1.0	1.1	1.0	1.0	1.1	1.3	0.8			7.3	$55	$ 403
	Dry season inspections	0.8	0.5	0.9								0.8	0.5	3.5	$55	$ 193
	Unscheduled inspections/field calls													0.0	$60	$ -
	Monthly Subtotal (hours)	0.8	0.5	0.9	1.0	1.1	1.0	1.0	1.1	1.3	0.8	0.8	0.5	10.8		
	Monthly Subtotal ($)	$44	$28	$48	$55	$59	$55	$55	$59	$73	$46	$43	$30	$596		
														Task Subtotal =		$596
	Maintenance															
	Scheduled maintenance	0.5	0.5	2.0		2.0	2.0		20.5	2.5	23.8	1.0	5.5	60.3	$55	$ 3,314
	Unscheduled maintenance													0.0	$55	$ -
	Vandalism													0.0	$55	$ -
	Acts of God													0.0	$55	$ -
	Landscape Maintenance Contractor													0.0	$55	$ -
	Sediment Removal Contractor													0.0	$0	$ -
	Vegetation Consultant													0.0	$0	$ -
	Other Contractor													0.0	$75	$ -
	Other Contractor													0.0	$0	$ -
														0.0	$0	$ -
	Monthly Subtotal (hours)	0.5	0.5	2.0	0.0	2.0	2.0	0.0	20.5	2.5	23.8	1.0	5.5	60.3		
	Monthly Subtotal ($)	$28	$28	$110	$0	$110	$110	$0	$1,128	$138	$1,306	$55	$303	$3,314		
														Task Subtotal =		$3,314
	Vector Control															
	Contract & General administration	0.2	0.1	0.10	0.1	0.1	0.1	0.1						0.8	$120	$ 96
	Vector prevention maint. (consultant)													0.0	$65	$ -
	Response to VCD calls (consultant)													0.0	$55	$ -
	VCD efforts (contracted)	3.4	5.3	4.7	6.4	5.9	5.1	3.5	3.4	3.2	3.9	3.2	4.1	52.2	$46	$ 2,425
	Monthly Subtotal (hours)	3.6	5.4	4.8	6.5	6.0	5.2	3.6	3.4	3.2	3.9	3.2	4.1	53.0		
	Monthly Subtotal ($)	$182	$258	$230	$307	$288	$250	$173	$160	$149	$182	$150	$192	$2,521		
														Task Subtotal =		$2,521
Non-Recurring Equipment (hours)	*Equipment*															
	Weedwacker			0.5					9.0					9.5	$5	$ 48
	Piece of Equipment 2													0.0	$0	$ -
	Piece of Equipment 3													0.0	$0	$ -
	Piece of Equipment 4													0.0	$0	$ -
	Piece of Equipment 5													0.0	$0	$ -
	Piece of Equipment 6													0.0	$0	$ -
	Piece of Equipment 7													0.0	$0	$ -
	Piece of Equipment 8													0.0	$0	$ -
	Monthly Subtotal (hours)	0.0	0.0	0.5	0.0	0.0	0.0	0.0	9.0	0.0	0.0	0.0	0.0	9.5		
	Monthly Subtotal ($)	$0	$0	$3	$0	$0	$0	$0	$45	$0	$0	$0	$0	$48		
														Equipment Subtotal =		$48
Dollars ($)	*Direct Costs*															Total $
	VCD supplies (direct costs less labor)															$ -
	Reproduction	$ 1	$ 1	$ 2	$ 1	$ 1	$ 1	$ 1								$ 7.31
	Postage/FedEx	$ 2	$ 1	$ 2	$ 2	$ 2	$ 3	$ 2	$ 2	$ 6		$ 14	$ 0.5			$ 36.18
	Lodging		$ 7	$ 3	$ 11		$ 10	$ 11	$ 9			$ 2				$ 53.04
	Per Diem		$ 3	$ 2	$ 5		$ 5	$ 5	$ 5			$ 0.4				$ 24.71
	Incidentals	$ 3	$ 5	$ 4	$ 9	$ 34	$ 1	$ 1								$ 57.35
	Vehicle Rental/Lease	$ 31	$ 18	$ 42	$ 8	$ 37	$ 16	$ 13	$ 128	$ 33	$ 27	$ 105	$ 83			$ 541.15
	Airfare															$ -
	Field Supp./Expendables	$ 13	$ 3	$ 4	$ 4	$ 1	$ 4	$ 1	$ 1	$ 3	$ 11	$ 3	$ 5			$ 54.23
	Equipment Rental															$ -
	Sediment Analyses															$ -
	Sediment Disposal															$ -
	Weed Wacker															$ -
	Vegetation Disposal															$ -
	Scarifying/Hydroseeding															$ -
	Monthly Subtotal	$ 50	$ 40	$ 59	$ 40	$ 76	$ 40	$ 33	$ 145	$ 41	$ 38	$ 124	$ 88			$ 774
	MONTHLY TOTAL	$1,005	$1,225	$1,290	$925	$1,845	$1,680	$782	$3,498	$1,773	$3,855	$1,144	$2,102	2000/2001 TOTA		$21,125

BMP Retrofit Pilot Program
Maintenance Operation
Cost Accounting Summary, 2000-01

DISTRICT: 7 | LOCATION: I-405/Carson & Del Amo Avenue | SITE NO: 73233 | BMP TYPE: Biofiltration Swale

	TASK	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Total (hrs)	Avg. Rate	TOTAL $
Labor (hours)	*Administration*															
	General program support/Follow-up	4.9	5.0	4.3	3.5	7.7	7.7	3.1	7.4	8.7	14.8	3.7	9.0	79.9	$120	$ 9,582
	Encroachment Permits	0.5												0.5	$87	$ 44
	Travel	1.5	4.3	6.5	1.2	3.0	5.2	1.7	5.7	0.9	3.9	2.8	3.1	39.9	$87	$ 3,469
	Unscheduled events													0.0	$87	$ -
	Monthly Subtotal (hours)	7.0	9.2	10.8	4.7	10.7	12.9	4.8	13.1	9.7	18.7	6.5	12.1	120.2		
	Monthly Subtotal ($)	$767	$966	$1,084	$523	$1,181	$1,377	$521	$1,386	$1,130	$2,115	$690	$1,353	$13,094		
														Task Subtotal =		$13,094
	Operation															
	Wet season inspections				1.0	1.1	1.0	1.0	1.1	1.3	0.8			7.3	$55	$ 403
	Dry season inspections	0.8	0.5	0.9								0.8	0.5	3.5	$55	$ 193
	Unscheduled inspections/field calls													0.0	$60	$ -
	Monthly Subtotal (hours)	0.8	0.5	0.9	1.0	1.1	1.0	1.0	1.1	1.3	0.8	0.8	0.5	10.8		
	Monthly Subtotal ($)	$44	$28	$48	$55	$59	$55	$55	$59	$73	$46	$43	$30	$596		
														Task Subtotal =		$596
	Maintenance															
	Scheduled maintenance	0.5	1.0	13.3		2.0	6.0		11.8		5.0	0.8	3.0	43.3	$55	$ 2,379
	Unscheduled maintenance													0.0	$55	$ -
	Vandalism													0.0	$55	$ -
	Acts of God													0.0	$55	$ -
	Landscape Maintenance Contractor													0.0	$55	$ -
	Sediment Removal Contractor													0.0	$0	$ -
	Vegetation Consultant													0.0	$0	$ -
	Other Contractor													0.0	$75	$ -
	Other Contractor													0.0	$0	$ -
														0.0	$0	$ -
	Monthly Subtotal (hours)	0.5	1.0	13.3	0.0	2.0	6.0	0.0	11.8	0.0	5.0	0.8	3.0	43.3		
	Monthly Subtotal ($)	$28	$55	$729	$0	$110	$330	$0	$646	$0	$275	$41	$165	$2,379		
														Task Subtotal =		$2,379
	Vector Control															
	Contract & General administration	0.2	0.1	0.10	0.1	0.1	0.1	0.1						0.8	$120	$ 96
	Vector prevention maint. (consultant)													0.0	$65	$ -
	Response to VCD calls (consultant)													0.0	$55	$ -
	VCD efforts (contracted)	3.7	5.8	5.0	6.6	6.0	5.4	3.7	3.5	3.5	4.2	3.5	4.4	55.3	$46	$ 2,567
	Monthly Subtotal (hours)	3.9	5.9	5.1	6.7	6.1	5.5	3.8	3.5	3.5	4.2	3.5	4.4	56.1		
	Monthly Subtotal ($)	$197	$282	$243	$318	$289	$261	$185	$164	$163	$193	$162	$206	$2,663		
														Task Subtotal =		$2,663
Non-Recurring Equipment (hours)	*Equipment*															
	Weedwacker			6.0					3.0					9.0	$5	$ 45
	Piece of Equipment 2													0.0	$0	$ -
	Piece of Equipment 3													0.0	$0	$ -
	Piece of Equipment 4													0.0	$0	$ -
	Piece of Equipment 5													0.0	$0	$ -
	Piece of Equipment 6													0.0	$0	$ -
	Piece of Equipment 7													0.0	$0	$ -
	Monthly Subtotal (hours)	0.0	0.0	6.0	0.0	0.0	0.0	0.0	3.0	0.0	0.0	0.0	0.0	9.0		
	Monthly Subtotal ($)	$0	$0	$30	$0	$0	$0	$0	$15	$0	$0	$0	$0	$45		
														Equipment Subtotal =		$45
Dollars ($)	*Direct Costs*													Total $		
	VCD supplies (direct costs less labor)													$ -		
	Reproduction	$ 1	$ 1	$ 2	$ 1	$ 1	$ 1	$ 1						$ 7.31		
	Postage/FedEx	$ 2	$ 1	$ 2	$ 2	$ 2	$ 3	$ 2	$ 2	$ 6		$ 14	$ 0.5	$ 36.18		
	Lodging		$ 7	$ 3	$ 11		$ 10	$ 11	$ 9			$ 2		$ 53.04		
	Per Diem		$ 3	$ 2	$ 5		$ 5	$ 5	$ 5			$ 0.4		$ 24.71		
	Incidentals	$ 3	$ 5	$ 4	$ 9	$ 34	$ 1	$ 1						$ 57.35		
	Vehicle Rental/Lease	$ 61	$ 24	$ 74	$ 8	$ 25	$ 24	$ 13	$ 59	$ 8	$ 18	$ 78	$ 55	$ 448.51		
	Airfare													$ -		
	Field Supp./Expendables	$ 13	$ 3	$ 4	$ 4	$ 1	$ 4	$ 1	$ 1	$ 3	$ 11	$ 3	$ 5	$ 54.23		
	Equipment Rental													$ -		
	Sediment Analyses													$ -		
	Sediment Disposal													$ -		
	Weed Wacker													$ -		
	Vegetation Disposal													$ -		
	Scarifying/Hydroseeding													$ -		
	Monthly Subtotal	$ 81	$ 46	$ 90	$ 40	$ 63	$ 48	$ 33	$ 76	$ 17	$ 29	$ 98	$ 61	$ 681		
	MONTHLY TOTAL	$1,116	$1,376	$2,225	$936	$1,703	$2,072	$794	$2,345	$1,383	$2,658	$1,035	$1,815	2000/2001 TOTA		$19,458

APPENDIX F:
3RD YEAR MONITORING REPORT-DISTRICT 11

CALTRANS
BMP RETROFIT PILOT PROGRAM

DISTRICT 11, SAN DIEGO

THIRD YEAR 2000-2001 REPORT

BEST MANAGEMENT PRACTICES

OPERATIONS, MONITORING & MAINTENANCE

May 2001

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1.0 STORMWATER DATA

This section discusses the third year of monitoring that occurred during the 2000/2001 wet weather season at the Caltrans District 11 sites involved in the Caltrans Best Management Practices (BMP) Retrofit Pilot Program. The 13 BMPs monitored under the program are summarized in Table 1-1. BMP locations are depicted in Figure 1-1.

This report addresses all the District 11 BMP locations. Sampling and analytical methods including Quality Assurance / Quality Control guidelines for the District 11 BMP Retrofit Pilot Program are located in a comprehensive Volume II Operation, Maintenance, and Monitoring (OMM) Plan.

1.1 Objective

The main objective of the Caltrans BMP Pilot Program is to evaluate the performance of the BMPs. A comprehensive monitoring study has been designed to meet this objective by evaluating the efficiency of each BMP in the removal of contaminants from stormwater runoff and by understanding the level of effort required to maintain each BMP at optimal effectiveness. Data collected from the 2000/2001 wet season are contained in this report and are used to initially evaluate the BMP's performance. Data includes the following:

- Rainfall data from storm events during the study period;
- Water quantity and quality of runoff into and discharged from the BMPs;
- Empirical observations of water quality, traffic, rainfall, and antecedent conditions; and
- Documentation records of inspection and maintenance activities performed.

In addition to the data collected above, the following additional activities and data collection were conducted:

- Soil sampling was performed at the La Costa infiltration basin (IB);
- Sediment removed from the Kearny Mesa Maintenance Station (MS) StormFilter™ (StF) and sand removed from the Escondido MS sand filter (SF) were analyzed;
- Late dry season and wet season groundwater samples were taken at the La Costa IB and the Carlsbad Maintenance Station (MS) biofiltration strip / infiltration trench (strip/IT); and
- Monthly baseline water quality samples of the flow that charges the permanent pool at the La Costa wet basin (WB) were collected and analyzed.

1.2 Hydrology

1.2.1 Precipitation During the Wet Season

Seasonal precipitation totals during the 2000/2001 wet weather season were higher than totals during the 1998/1999 and 1999/2000 seasons. The 2000/2001 wet weather season was the first season during the three monitoring years where the annual precipitation was greater than normal. Mean yearly precipitation for San Diego is 10.04-inches, as compiled from the National Weather Service Lindbergh Field rain gauge for 1851-1999. Cumulative totals for the 2000/2001 season ranged from 10.34-inches at the Kearny Mesa StF to 12.06-inches at the I-15/SR-78 extended detention basin (EDB), Escondido SF, and Melrose swale. Precipitation totals ranged from 5.43-inches to 7.50-inches during the 1998/1999 season and 4.87-inches to 8.74-inches during the 1999/2000 season.

Rainfall data collection at most sites began October 1, 2000. Figure 1-2a, b, and c illustrate daily precipitation totals and yearly accumulation for the 2000/2001 wet season within the northern (Escondido), mid (La Costa) and southern (Kearny Mesa) extent of the District 11 study area. As in most years, January through March were the wettest months of the year. However, unlike the previous two wet seasons, around two inches of rain fell during the month of October. One of the four wettest events of the season occurred in October. The other three wettest events occurred in mid-January and mid-February. Only trace amounts of rain fell between mid-November and early January.

1.2.2 Precipitation During Monitored Events

Precipitation during each storm event was characterized by total rainfall, duration of rainfall, maximum intensity, days since last rainfall, and the magnitude of the event immediately preceding the monitored storm event (antecedent rainfall). Precipitation characteristics for the six events monitored during the 2000/2001 wet weather season are summarized in Table 1-2. Event totals for each station are presented in Figure 1-3. Cumulative rainfall and rainfall intensity for each monitored event at each BMP site are summarized graphically in Figures 1-4 through 1-104.

Variability of total event precipitation among monitored events and between BMPs is shown in Figure 1-3. Precipitation during two events monitored was in the range of 0.1-inches to 0.5-inches between BMPs. Five events had precipitation in the range of 0.2-inches to 0.7-inches. The remainder of the events monitored had precipitation that ranged from 0.5-inches to greater than 2.0-inches. Event 4, beginning on 10 January 2001, had the most rainfall and the most variability among stations. Cumulative rainfall during Event 4 ranged from 1.1-inches at the Palomar swale to 2.84-inches at the SR56/I5 extended detention basin (EDB). Events 8 and 9, which occurred between 23 and 28 February 2001, also showed considerable variability. However, the high variation in total rain among BMPs was a result of combining Events 8 and 9 at the Manchester EDB and the La Costa SF because these BMPs did not completely drain during the brief dry period

between rainfall events. A lot less rainfall occurred at the Carlsbad MS strip/IT and Palomar swale during Event 3 because monitoring was called off after a period of six hours with no recorded rainfall and the effluent sampling had ceased. Rainfall totals were similarly low for Events 1, 2 and 5, with precipitation totals among stations ranging from a few hundredths to 0.5-inches.

Rainfall intensities (calculated as twelve times the maximum rainfall recorded in any five-minute period) can help in interpreting water quality results. The higher the rainfall intensity, the higher the runoff and suspension of particulate pollutants. Rainfall intensities, for the most part, were the greatest during the third and fourth events (Table 1-3). Rainfall intensities reached as high as 2.52 inches per hour during Event 3 at the I-5/SR-78 Park and Ride (P&R) sand filter (SF) and 2.76 inches per hour during Event 4 at the Manchester EDB. The average maximum rainfall intensity between all BMPs for the 1999/2000 season was 0.63 inches per hour.

Antecedent conditions also play an important role in interpreting water quality results. Less runoff and transport of suspended pollutants is expected after drier antecedent periods between storm event. For the most part, all storm events and BMPs monitored during the 1999/2000 wet season were preceded by more than 72 hours of less than 0.1-inches of rain over a 6-hour period (Table 1-3). There were five exceptions to this. One of the exceptions was an antecedent period of 70 hours at the Escondido MS SF prior to Event 2. Also for the same event, 0.12-inches of rain fell 50 hours prior at the I-5/SR-78 P&R SF and 0.3-inches fell 65 hours prior at the Manchester EDB. The two stations monitored during Event 5 (I-5/SR-78 P&R SF and Kearny Mesa MS StF) received around an inch of rain 48 hours prior to the beginning of the event. Besides Event 5, Events 2 and 3 had the wettest antecedent conditions prior to monitoring. The 40 days plus of dry weather before Event 6 represented the driest period prior to a monitored event.

1.2.3 Stormwater Runoff During Monitored Events

Monitoring was designed to isolate rainfall events and the runoff created by those events. For information on monitoring equipment and methods please refer to the Volume II OMM Plan. Table 1-4 provides a summary of the runoff measured at each station in conjunction with each storm event. Figures 1-4 through 1-54 graphically summarize the influent and effluent flow during each monitored event at each BMP in response to rainfall. These figures also show how the aliquoting of each composite sample was conducted. Note that in a few cases, influent and effluent volumes did not match up well, and the percent storm captures were less than ideal. However, in most cases the flow proportioning of each sample aliquot was more than adequate. Most differences in influent and effluent volumes and reduced storm captures are readily explainable and are related to rainfall and antecedent storm characteristics or a direct failure of some portion of a BMP. Very few problems occurred that are related to the monitoring equipment itself. Problems encountered with the monitoring equipment and/or the BMP will be discussed in more detail later.

In general, the drainage areas at each of the BMP sites are relatively small and impervious. This resulted in quick response times of inlet flow in relation to the advent of rain and fluctuations in rainfall intensity. As designed, the EDB and WB effluent discharges occurred at a steady regulated rate. In contrast, effluent flow from the Kearny Mesa MS StF responded directly to rainfall intensity and inlet flow. Discharge flow from the sand filters responded directly to water levels within the pre-sedimentation chambers and indirectly to inflow intensity. The biofiltration swales and strips responded in a delayed manner to inlet flow, and in some cases there was a lack of response due to the infiltration properties of the swale.

The extent to which discharge flow was regulated drove the total time runoff was detained in a facility. Detention times, calculated as the period between the start of inlet flow and the end of discharge flow, were highest for the Manchester EDB (40.1 to 81.7 hours over 3 events) followed by the La Costa P&R SF (18.1 to 73.9 hours over 5 events). Note that during Event 3 the detention times were somewhat higher than reported at these two sites because monitoring was called off near the start of a separate storm event that began about 38 hours after the Event 3 rain had stopped.

Detention times calculated in the previous manner may be somewhat misleading. Perhaps a better measure of how long a facility retains runoff may be estimated by backing out the total time of inlet flow from the calculated detention time. Recalculating detention time in this manner shows that the Manchester EDB held runoff for 24.6 to 70.3 hours after the cessation of inflow, and the La Costa P&R SF held runoff for 1.2 to 62.9 hours after the cessation of inflow.

The difference between the intensity of inlet and outlet flows is a further measure of the extent runoff is detained in a facility. Maximum outlet flows were as little as 1% of the maximum inlet flows at the Manchester EDB. On the other end of the scale, maximum outlet flows from the Kearny Mesa MS StF were in some cases slightly more than the maximum inlet flows. Occasional higher peak flow out of the Kearny Mesa MS StF appears to be due to the basic design of the site. Water accumulates in the BMP until reaching a level where the siphon is actuated resulting in a sudden discharge.

In most cases, the total volume of treated runoff discharged from a BMP facility was only slightly different than the volume of runoff into the facility during any particular monitored event. Most of these differences can be attributed to the inability to accurately measure the very tail end of the discharge flow, infiltration, direct rainfall and runoff into the BMP, flow into the BMP from other than the inlet conveyance, and water that is unable to flow out of pre-sedimentation chambers and/or rip-rap.

In a few cases, treated runoff discharged from a BMP facility was different from the runoff into the facility. This was particularly true at the Palomar swale during Event 3 and the La Costa WB during Event 1. At the Palomar swale, a large quantity of runoff was observed bypassing the influent conveyance as direct sheet flow entered the swale along its complete length. At the La Costa WB, the gate valve separating the wet basin from the adjacent trapezoidal channel was leaking, causing runoff in the trapezoidal channel to enter the BMP. As was described earlier, there was a difference between

influent and effluent volumes at the Manchester EDB during Event 3 because monitoring was terminated early. Furthermore, during Events 1, 2 and 5 at the Palomar swale and Carlsbad MS strip/IT and all events at the Melrose swale, significant (or sufficient) flow never reached the discharge conveyance because of infiltration.

The percent storm capture for most events at most sites was excellent (>90%). At a few locations during Event 1 the percent storm capture was less than 90% but still greater than 70%. This was a result of the termination of influent sampling before late showers occurred at the BMPs while the effluents were still sampling. The decision to terminate influent sampling early was made in order to prevent samples from being submitted to the laboratory out of holding times, which would have happened if the late showers never occurred. The worst storm capture (31.1%) occurred at the La Costa WB effluent during Event 1. Sampling was terminated when the leaky gate valve described above was discovered. Because sampling was terminated early during Event 3 at the discharges to the Manchester EDB and the La Costa P&R SF and the addition of runoff to the BMPs from a separate storm after the termination of sampling, the exact storm captures for these effluents could not be determined. However, based on influent volumes (Table 1-4), it appears that nearly 100% of the La Costa P&R SF discharge was sampled but less than 50% of the Manchester EDB discharge was sampled.

The only equipment malfunction related to reduced storm capture occurred at the Carlsbad MS strip/IT during Event 4. The system data logger locked up at the very beginning of the event. As a result, an estimated 168 cubic feet or 7.5% of the initial flow was not sampled. This estimation was based on the rain that fell prior to the start of sampling. The only other problem related to reduced storm capture was that the effluent composite sample bottle from Event 4 at the I-5/SR-78 P&R SF broke, resulting in a total loss of that sample.

1.2.4 Hydraulic Residence Time Evaluation

No hydraulic residence time evaluations were performed at the two biofiltration sites during the 2000/2001 monitoring season. Due to the limited quantity of water quality data, emphasis was placed on monitoring flow quantity and quality at these sites.

1.3 Analytical Results

The following sections provide an assessment of the overall quality of the data set, a summary of water quality data for each monitored event and baseline soil sampling results.

1.3.1 Assessment of Quality Assurance/Quality Control Results

Based upon a preliminary review of QA/QC results, data quality was found to meet the program objectives. A complete analysis of the QA/QC data can be found in the Appendix A and all QA/QC data are included in data packs provided as a separate Appendix. Data are still considered preliminary since the full validation process has not been completed.

1.3.2 Water Quality Results

Stormwater and groundwater analyses were conducted by a certified laboratory under the California Environmental Laboratory Accreditation Program (ELAP). The analyses were performed in accordance with methods and procedures outlined in the OMM Plan - Quality Assurance Project Plan and as specified by applicable EPA methods. The laboratory analyses performed on stormwater and groundwater samples are listed below (Table 1-1). Analytical results are summarized in Tables 1-5a and 1-5b.

Table 1-1 Analytical Methods Summary

Analyte	Sample Type	Analytical Method
Conventionals		
pH	Composite	EPA 150.1
Specific Conductance	Composite	EPA 120.1
Hardness	Composite	EPA 130.2
Total Suspended Solids (TSS)	Composite	EPA 160.2
Total Dissolved Solids (TDS)	Composite	EPA 160.1
Total Organic Carbon (TOC)	Composite	EPA 415.1
Dissolved Organic Carbon (DOC)	Composite	EPA 415.1
Chemical Oxygen Demand (COD)	Composite	EPA 410.1
Nutrients		
Ammonia-N	Composite	EPA350.2
Nitrate-N	Composite	EPA 300
TKN	Composite	EPA 351.1
Total Phosphorus	Composite	EPA 365.3
Dissolved Orthophosphate	Composite	EPA 365.3
Total/Dissolved Metal		
Arsenic	Composite	EPA 206.3
Cadmium	Composite	EPA 200.8
Copper	Composite	EPA 200.8
Chromium	Composite	EPA 200.8
Lead	Composite	EPA 200.8
Nickel	Composite	EPA 200.8
Zinc	Composite	EPA 200.8
Organics		
TPH-diesel	Grab	EPA 8015M
TPH-oil	Grab	EPA 8015M
TPH-gasoline	Grab	EPA 8015M
TRPH	Grab	EPA 1664
Diazinon	Composite	EPA 8141a
Chlorpyrifos	Composite	EPA 8141a
Bacteria		
Fecal Coliform	Grab	SM 9221E

1.3.3 Baseline Soil Sampling Results

The annual inspection for sediment accumulation was performed on September 12, 2000. Core samples of the La Costa IB invert were collected and submitted to a laboratory for analysis. Samples were collected to establish baseline soil conditions. This year arsenic, cadmium, chromium, and nickel were added to the list of metal in addition to the copper, lead and zinc that had been analyzed in the previous years samples. Four sampling

points were chosen from a research randomizer and sampled within the basin invert. Each of the four cores was collected using a powered vibracore with 4-inch diameter aluminum tubes. The vibracore and tubes were driven 1 meter (3.28 ft) below the ground surface and then retrieved. Each core was then subdivided into three sections as follows:

- Section 1 was from the ground surface to 0.3 m (0.98 ft) below the ground surface.
- Section 2 was from 0.3 m (0.98 ft) to 0.5 m (1.64 ft) below the ground surface.
- Section 3 was from 0.6 m (1.97 ft) to 0.8 m (2.62 ft) below the ground surface.

Each like section from each of the four cores was then composited together inside stainless steel bowls. Each composite sample was then sent to the Laboratory for total metals, TRPH and grain size distribution analyses using methods specified in the OMM Plan.

Analytical results are summarized in Table 1-5c.

Soil samples from the IB floor will be collected again at the end of the 2000/2001 wet seasons. Results from future sampling rounds will be compared with results from the baseline samples to assess the impacts of pollutants to the soil.

1.3.4 Vadose Zone Sampling

One pressure-vacuum lysimeter is installed in the infiltration trench at the Carlsbad Maintenance Station bio-strip/infiltration trench. Attempts were made to collect samples of pore water from the vadose zone beneath the trench on at least two occasions during the 2000/2001storm season. The attempts were made at different times following rain events. On each occasion a vacuum was applied to the lysimeter and maintained for 24 hours. An attempt was then made to collect the sample. Only a few drops of liquid were obtained on both occasions. This is consistent with results obtained in previous years attempts to sample vadose zone water with the lysimeter.

Based on review of the sampling procedures, site lithology and performance of the lysimeters, the most likely causes preventing the lysimeters from collecting samples are that the silica flour encasing the lysimeter may have dried out and/or that water is not available to be collected.

1.4 Preliminary BMP Performance Evaluations

A preliminary evaluation of BMP performance was conducted to provide initial estimates of BMP efficiency (Table 1-6 and Figures 1-56a – 1-56d) Due to the limited number of storm events, BMP efficiencies are presented individually for each site and event. During the 2000/2001 wet season, only 3 to 6 events were sampled at each location. Calculation of lognormal statistics based upon the current data set is therefore premature.

BMP efficiencies presented in Table 1-6 were calculated based upon Event Mean Concentrations (EMCs) measured at the influent and effluent monitoring sites for each BMP. BMP efficiencies were calculated based upon EMCs and load estimates. For

purposes of these preliminary calculations, the value of the reporting limit was used in cases where an analyte was reported as undetected. The following equation was used:

$$\text{Efficiency (\%)} = [(\text{EMC in} - \text{EMC out})/\text{EMC in}] \times 100$$

For calculation of load reductions, the calculated loads for the influent and effluent site are substituted for the EMCs. Load estimates were calculated by multiplying EMC values by the total volume of BMP influent or effluent per storm event. Positive values indicate decreases in either mean concentration or load.

The methodology for computing influent and effluent constituent loadings was based on methods detailed in the *Caltrans BMP Retrofit Pilot Program Scoping Study*. Event Mean concentrations (EMC) were determined and tabulated for each storm. A log normal distribution of the EMCs was assumed when computing the mean and variance. Seasonal expected values and upper and lower 90% confidence limits were calculated for EMCs. Constituent loadings for the season were determined by multiplying the expected value of the EMCs by the computed runoff volume that was based on the seasonal rainfall, watershed area, and runoff coefficient. Minimum, maximum and average efficiencies based on EMCs are reported.

Note that on occasion EMC values for dissolved metals at the EDBs may increase while load values decrease. This results from less water leaving the EDB than what entered. This mainly occurred during Event 1 because a significant portion of the runoff that entered the EDBs infiltrated into the soils of the BMP.

Efficiencies the Carlsbad MS strip/IT are not provided in this report because this site has special conditions that must be accounted for in the final analysis. Efficiencies for the Palomar swale are included in this report but it should be noted that they are biased by the fact that the site also receives runoff throughout the length of the swale that is not included in water quantity and quality measurements at the inlet.

Table 1-2 District 11 BMP Monitoring Sites

Site ID.	BMP Location	Coordinates Datum NAD83		BMP Type
		Latitude	Longitude	
111101	I-5/SR-56	32.92741 N	117.24089 W	Extended Detention Basin
111102	I-15/SR-78	33.12571 N	117.10598 W	Extended Detention Basin
111103	I-5/La Costa Ave (W)	33.05112 N	117.18012 W	Infiltration Basin
111104	I-5/La Costa Ave (SE)	33.0832 N	117.2968 W	Wet Basin
111105	I-5/Manchester Ave	33.0114 N	117.2643 W	Extended Detention Basin
112201	Kearny Mesa MS	32.8233 N	117.16192 W	Media Filter StormFilter™
112202	Escondido MS	33.12941 N	117.11805 W	Media Filter Sand Delaware
112203	I-5/La Costa Ave Park & Ride	33.08585 N	117.2972 W	Media Filter Sand Austin
112204	I-5/SR-78 Park & Ride	33.17732 N	117.35199 W	Media Filter Sand Austin
112205	SR-78/Melrose Dr	33.19402 N	117.25972 W	Biofiltration Swale
112206	I-5/Palomar Airport Rd	33.12822 N	117.32603 W	Biofiltration Swale
112207a	Carlsbad MS	33.12074 N	117.31768 W	Biofiltration Strip
112207b	Carlsbad MS	33.12074 N	117.31768 W	Infiltration Trench

Table 1-3 Rainfall and Runoff Statistics for Each Monitored Event

Site/Event	Start Rain		End Rain						
	Date	Time	Date	Time	Duration Rain (hours:minutes)	Total Rain (inches)	Max Intensity (Inches/hour)	Antecedent Rain (days)	Antecedent Rain (inches)
Event 1									
SR56/I5	10/26/00	21:45	10/27/00	9:55	12:10:00	0.38	0.36	5.4	0.11
ESCONDIDO MS	10/26/00	23:05	10/27/00	11:50	12:45:00	0.07	0.12	First rain	NA
MANCHESTER	10/26/00	22:30	10/28/00	5:00	30:30:00	0.59	0.24	5.2	0.10
SR78/I5 P&R	10/26/00	22:15	10/27/00	8:30	10:15:00	0.38	0.36	33.8	0.11
LACOSTA P&R	10/26/00	21:40	10/27/00	20:00	22:20:00	0.58	0.36	5.2	0.13
KEARNYMESA MS	10/26/00	22:55	10/27/00	10:40	11:45:00	0.41	0.48	First rain over 0.1	NA
LACOSTA WB	10/26/00	21:40	10/27/00	20:05	22:25:00	0.60	1.20	5.0	0.14
CARLSBAD MS	10/26/00	21:30	10/27/00	11:20	13:50:00	0.22	0.12	20.5	0.14
MELROSE	10/26/00	21:00	10/27/00	15:00	18:00:00	0.27	0.14	First rain over 0.1	NA
LACOSTA IB	10/26/00	21:40	10/27/00	20:00	22:20:00	0.59	NA	First rain over 0.1	NA
Event 2									
SR78/I15	10/29/00	20:05	10/30/00	0:35	4:30:00	0.69	1.20	First rain over 0.1	NA
MANCHESTER	10/29/00	19:45	10/29/00	23:20	3:35:00	0.39	0.48	1.6	0.59
ESCONDIDO MS	10/29/00	19:55	10/30/00	22:15	26:20:00	0.70	1.32	First rain over 0.1	NA
SR78/I5 P&R	10/29/00	18:55	10/31/00	1:00	30:05:00	1.15	1.68	2.4	0.38
CARLSBAD MS	10/29/00	19:05	10/29/00	23:05	4:00:00	0.81	0.84	2.3	0.22
MELROSE	10/29/00	20:00	10/30/00	0:10	4:10:00	0.79	0.64	2.2	0.27
LACOSTA IB	10/29/00	19:15	10/31/00	1:00	29:45:00	1.49	1.56	2.0	0.59
Event 3									
SR78/I15	1/8/01	15:35	1/9/01	4:10	12:35:00	0.29	0.60	58.3	0.39
MANCHESTER	1/8/01	12:10	1/9/01	6:40	18:30:00	0.32	0.48	70.5	0.39
ESCONDIDO MS	1/8/01	14:55	1/9/01	4:06	13:11:00	0.29	0.36	58.3	0.31
SR78/I5 P&R	1/8/01	12:15	1/9/01	3:35	15:20:00	0.20	NA	57.6	0.22
LACOSTA P&R	1/8/01	12:10	1/9/01	3:30	15:20:00	0.22	0.24	58.3	0.24
KEARNYMESA MS	1/8/01	12:05	1/9/01	4:40	16:35:00	0.28	0.60	58.2	0.13
LACOSTA WB	1/8/01	13:25	1/9/01	3:55	14:30:00	0.21	0.12	58.1	0.28
CARLSBAD MS	1/8/01	12:10	1/9/01	7:15	19:05:00	0.20	0.24	58.2	0.14
LACOSTA IB	1/8/01	12:05	1/9/01	4:10	16:05:00	0.23	0.12	58.3	0.27
Event 4									
SR78/I15	1/10/01	21:30	1/12/01	13:05	39:35:00	1.80	1.08	1.1	0.29
SR56/I5	1/10/01	22:15	1/12/01	15:00	40:45:00	2.84	3.48	1.5	0.47
MANCHESTER	1/10/01	18:45	1/13/01	14:15	67:30:00	2.18	2.52	1.5	0.32
SR78/I5 P&R	1/10/01	17:35	1/12/01	11:05	41:30:00	1.99	1.08	1.6	0.20
LACOSTA P&R	1/10/01	18:00	1/12/01	13:35	43:35:00	1.64	0.72	1.6	0.22
KEARNYMESA MS	1/10/01	22:15	1/11/01	12:50	14:35:00	1.29	0.60	1.7	0.28
LACOSTA WB	1/10/01	17:50	1/12/01	13:40	43:50:00	1.69	0.24	1.6	0.21
PALOMAR SW	1/10/01	17:40	1/12/01	14:00	44:20:00	1.10	0.28	1.6	0.18
CARLSBAD MS	1/10/01	17:45	1/12/01	13:30	43:45:00	1.79	0.96	1.4	0.20
MELROSE	1/10/01	17:40	1/12/01	11:10	41:30:00	1.78	0.84	1.6	0.16
LACOSTA IB	1/10/01	17:55	1/12/01	13:25	43:30:00	1.70	0.84	1.6	0.23
Event 5									
SR78/I15	1/26/01	10:20	1/27/01	16:35	30:15:00	0.83	0.96	13.9	1.80
SR56/I5	1/26/01	10:45	1/27/01	1:25	14:40:00	0.78	1.08	13.8	2.84
MANCHESTER	1/26/01	10:20	1/27/01	2:40	16:20:00	0.95	0.60	1.1	0.19
ESCONDIDO MS	1/26/01	10:15	1/27/01	2:10	15:55:00	0.75	0.48	12.8	1.78
SR78/I5 P&R	1/26/01	9:55	1/27/01	0:55	15:00:00	0.55	1.08	1.8	0.10
LACOSTA P&R	1/26/01	10:00	1/27/01	1:00	15:00:00	0.58	0.60	13.9	1.64
KEARNYMESA MS	1/26/01	10:30	1/27/01	1:15	14:45:00	0.73	0.84	14.9	1.29
LACOSTA WB	1/26/01	10:00	1/28/01	2:50	40:50:00	0.60	0.60	13.8	1.69
PALOMAR	1/26/01	9:45	1/27/01	0:45	15:00:00	0.59	0.84	2.0	0.12
CARLSBAD MS	1/26/01	9:55	1/27/01	1:05	15:10:00	0.56	0.48	1.9	0.12
MELROSE	1/26/01	9:50	1/27/01	0:50	15:00:00	0.93	1.68	1.6	0.13
LACOSTA IB	1/26/01	10:05	1/27/01	1:10	15:05:00	0.61	0.48	13.9	1.70

Table 1-3 Rainfall and Runoff Statistics for Each Monitored Event (Continued)

Site/Event	Start Rain		End Rain						
	Date	Time	Date	Time	Duration Rain (hours:minutes)	Total Rain (inches)	Max Intensity (Inches/hour)	Antecedent Rain (days)	Antecedent Rain (inches)
Event 6									
SR78/I15	2/10/01	12:15	2/10/01	23:35	11:20:00	0.20	0.48	2.7	0.20
ESCONDIDO MS	2/10/01	12:10	2/10/01	23:15	11:05:00	0.22	0.48	2.6	0.13
SR78/I5 P&R	2/10/01	11:10	2/10/01	12:25	1:15:00	0.24	0.60	12.4	0.22
LACOSTA IB	2/10/01	11:40	2/10/01	14:35	2:55:00	0.04	0.12	14.4	0.64
Event 7									
SR78/I15	2/12/01	11:40	2/14/01	2:50	39:10:00	1.10	0.36	1.5	0.20
MANCHESTER	2/12/01	16:15	2/14/01	5:00	36:45:00	0.94	1.08	1.8	0.15
ESCONDIDO MS	2/12/01	12:25	2/14/01	2:20	37:55:00	1.19	0.72	1.5	0.13
SR78/I5 P&R	2/12/01	11:10	2/13/01	23:10	36:00:00	1.97	2.04	2.0	0.24
LACOSTA P&R	2/12/01	12:25	2/13/01	23:30	35:05:00	1.48	1.80	16.5	0.58
KEARNYMESA MS	2/13/01	1:55	2/14/01	0:15	22:20:00	1.20	0.72	17.0	0.73
LACOSTA WB	2/12/01	13:45	2/14/01	3:20	37:35:00	1.54	1.80	15.5	0.60
PALOMAR	2/12/01	12:20	2/14/01	2:15	37:55:00	1.83	1.20	16.5	0.59
CARLSBAD MS	2/12/01	12:30	2/14/01	1:35	37:05:00	1.58	0.96	16.5	0.58
MELROSE	2/12/01	11:30	2/13/01	23:50	36:20:00	1.71	0.84	2.0	0.17
Event 8									
SR78/I15	2/23/01	5:15	2/24/01	9:15	28:00:00	0.59	0.48	3.1	0.28
SR56/I5	2/23/01	6:20	2/23/01	16:17	9:57:00	0.52	0.84	3.1	0.15
MANCHESTER	2/23/01	8:20	2/28/01	12:20	124:00:00	2.26	0.60	3.2	0.20
SR78/I5 P&R	2/23/01	4:45	2/23/01	10:20	5:35:00	0.35	0.36	3.1	0.36
LACOSTA P&R	2/23/01	7:50	2/28/01	9:20	121:30:00	1.99	0.72	3.0	0.31
KEARNYMESA MS	2/23/01	5:00	2/23/01	15:20	10:20:00	0.40	0.48	9.2	1.20
PALOMAR	2/23/01	7:50	2/23/01	10:25	2:35:00	0.38	0.48	3.3	0.24
CARLSBAD MS	2/23/01	7:50	2/23/01	10:27	2:37:00	0.45	0.84	3.2	0.28
MELROSE	2/23/01	5:50	2/23/01	10:43	4:53:00	0.58	0.72	3.2	0.35
Event 9									
ESCONDIDO MS	2/25/01	3:55	2/28/01	16:20	84:25:00	2.00	0.48	1.4	0.66
LACOSTA WB	2/24/01	22:50	2/28/01	12:45	85:55:00	1.80	0.36	1.2	0.31
Event 10									
SR78/I15	3/6/01	2:30	3/6/01	20:45	18:15:00	0.53	0.60	4.5	2.01
SR56/I5	3/6/01	0:50	3/7/01	4:40	27:50:00	0.52	0.24	5.4	1.58
MANCHESTER	3/6/01	1:20	3/6/01	11:45	10:25:00	0.43	0.36	5.5	1.95
ESCONDIDO MS	3/6/01	2:20	3/6/01	20:45	18:25:00	0.58	0.48	5.4	2.00
SR78/I5 P&R	3/6/01	1:20	3/7/01	1:20	24:00:00	0.53	0.24	5.5	2.13
LACOSTA P&R	3/6/01	1:20	3/6/01	14:30	13:10:00	0.42	0.36	5.7	1.67
KEARNYMESA MS	3/6/01	1:15	3/6/01	19:05	17:50:00	0.59	0.36	5.4	1.79
LACOSTA WB	3/6/01	1:20	3/6/01	14:30	13:10:00	0.42	0.36	5.5	1.80
PALOMAR	3/6/01	1:20	3/6/01	20:50	19:30:00	0.58	0.36	5.7	1.89
CARLSBAD MS	3/6/01	1:20	3/6/01	20:35	19:15:00	0.49	0.24	5.7	1.90
Event 11									
SR78/I15	4/7/01	7:25	4/7/01	16:35	9:10:00	0.74	0.72	25.7	0.88
SR56/I5	4/7/01	7:30	4/7/01	14:00	6:30:00	0.45	0.48	25.9	0.18
MANCHESTER	4/7/01	7:50	4/7/01	13:45	5:55:00	0.35	0.36	25.9	0.18
ESCONDIDO MS	4/7/01	7:10	4/8/01	3:15	20:05:00	0.68	0.60	25.8	0.97
SR78/I5 P&R	4/6/01	22:30	4/7/01	14:25	15:55:00	0.49	0.60	25.6	0.13
LACOSTA P&R	4/7/01	7:25	4/10/01	2:35	67:10:00	0.57	0.72	25.9	0.19
KEARNYMESA MS	4/7/01	7:10	4/7/01	14:30	7:20:00	0.62	1.56	26.0	0.33
LACOSTA WB	4/7/01	7:25	4/7/01	15:00	7:35:00	0.43	0.60	25.9	0.20
PALOMAR	4/7/01	7:00	4/7/01	14:35	7:35:00	0.43	0.48	25.9	0.48
CARLSBAD MS	4/7/01	7:30	4/7/01	13:10	5:40:00	0.42	0.60	25.9	0.77
MELROSE	4/7/01	6:30	4/7/01	14:40	8:10:00	0.75	1.08	25.9	0.84
LACOSTA IB	4/7/01	7:25	4/7/01	13:15	5:50:00	0.34	0.36	25.9	0.19

Table 1-3 Rainfall and Runoff Statistics for Each Monitored Event (Continued)

Site/Event	Start Rain		End Rain						
	Date	Time	Date	Time	Duration Rain (hours:minutes)	Total Rain (inches)	Max Intensity (Inches/hour)	Antecedent Rain (days)	Antecedent Rain (inches)
Event 12									
SR78/I15	4/20/01	22:50	4/21/01	10:15	11:25:00	0.83	0.96	10.8	0.22
SR56/I5	4/20/01	22:15	4/21/01	9:15	11:00:00	0.22	0.60	10.4	0.34
MANCHESTER	4/20/01	22:00	4/21/01	18:55	20:55:00	0.25	0.24	10.7	0.48
ESCONDIDO MS	4/20/01	22:35	4/21/01	11:25	12:50:00	0.60	0.60	8.8	0.10
SR78/I5 P&R	4/20/01	22:00	4/21/01	11:15	13:15:00	0.31	0.48	10.5	0.19
LACOSTA P&R	4/20/01	22:00	4/21/01	11:10	13:10:00	0.28	0.48	10.8	0.13
KEARNYMESA MS	4/20/01	22:15	4/21/01	9:25	11:10:00	0.28	0.48	10.7	0.29
LACOSTA WB	4/20/01	21:55	4/21/01	11:10	13:15:00	0.23	0.36	10.8	0.18
PALOMAR	4/20/01	21:50	4/21/01	11:05	13:15:00	0.33	0.60	10.8	0.14
CARLSBAD MS	4/20/01	21:55	4/21/01	11:10	13:15:00	0.19	0.36	10.4	0.10
MELROSE	4/20/01	22:00	4/21/01	11:55	4/21/01	0.39	0.36	10.9	0.29
LACOSTA IB	4/20/01	21:55	4/21/01	11:10	4/21/01	0.24	0.36	10.8	0.14

NA = not available or not applicable

Table 1-4 Flow Data for Each Monitored Event

Site/Event	Start Flow Date	Start Flow Time	End Flow Date	End Flow Time	Duration Flow (hrs: mins)	Total Flow (cubic feet)	Vol. To Samp (kcf)	No. of Sample Aliquots Collected	Peak Flow (cfs)	% Capture	Peak Capture	Detention Time (hours)
Event 1												
SR56/I5-IN	10/26/00	23:32	10/27/00	12:05	12:33:00	2386	0.06	39	0.22	99.7	Y	20.63
SR56/I5-EFF	10/27/00	0:05	10/27/00	20:10	20:05:00	3000	0.05	60	0.07	100	Y	
MANCHESTER-IN	10/26/00	22:30	10/27/00	9:20	10:50:00	1872	0.06	31	0.40	77	Y	45.92
MANCHESTER-EFF	10/26/00	22:45	10/28/00	20:25	45:40:00	1035	0.05	20	0.01	100	Y	
ESCONDIDO MS-IN	10/26/00	18:55	10/27/00	12:25	17:30:00	223	0.02	11	0.02	100	Y	
ESCONDIDO MS-EFF	No Flow											
SR78/I5 P&R-IN	10/26/00	23:01	10/28/00	2:00	7:09:00	2352	0.025	90	0.57	97.4	Y	49.90
SR78/I5 P&R-EFF	10/27/00	6:10	10/29/00	0:55	42:45:00	1951	0.03	34	0.02	100	Y	
LACOSTA P&R-IN	10/26/00	21:49	10/27/00	22:00	24:11:00	3025	0.07	43	0.34	43	Y	53.60
LACOSTA P&R-EFF	10/26/00	23:09	10/29/00	3:25	52:16:00	1590	0.02	79	0.02	100	Y	
KEARNYMESA MS-IN	10/26/00	23:06	10/27/00	14:58	15:52:00	2709	0.03	90	0.34	100	Y	---
KEARNYMESA MS-EFF	10/26/00	23:17	10/27/00	14:55	15:38:00	2965	0.03	98	0.47	100	Y	
LACOSTA WB-IN	10/26/00	21:47	10/27/00	21:00	23:13:00	3169	0.03	0	2.44	0	Y	---
LACOSTA WB-EFF	10/26/00	22:30	10/29/00	8:20	57:50:00	2515	0.03	83	0.04	100	Y	
CARLSBAD MS-IT	10/26/00	21:51	10/27/00	11:20	13:29:00	810	0.025	32	0.13	100	Y	---
MELROSE-IN	10/26/00	20:30	10/27/00	9:20	12:50:00	468	0.03	18.00	0.27	100	Y	---
MELROSE-EFF	No Flow											
Event 2												
SR78/I15-IN	10/29/00	20:19	10/30/00	1:25	5:06:00	4606	0.04/0.08	84	1.99	89.9	Y	22.27
SR78/I15-EFF	10/29/00	21:55	10/30/00	18:35	20:40:00	7019	0.03	220	0.18	94.1	Y	
SR56/I5-IN	10/29/00	20:00	10/30/00	2:40	6:40:00	2989	0.06	49	1.15	100	Y	24.17
SR56/I5-EFF	10/30/00	1:07	10/30/00	20:10	19:03:00	>2,152	0.05	43	0.08	~70	Y	
MANCHESTER-IN	10/29/00	19:48	10/29/00	23:45	3:57:00	2319	0.06	38	0.72	100	Y	22.27
MANCHESTER-EFF	10/29/00	21:55	10/30/00	18:04	20:09:00	1808	0.05	34	0.02	92.2	Y	
ESCONDIDO MS-IN	10/29/00	19:56	10/30/00	5:05	9:09:00	2865	0.02	143	0.87	94.4	Y	36.32
ESCONDIDO MS-EFF	10/29/00	21:59	10/31/00	8:15	34:16:00	1868	0.02/0.04	83	0.12	100	Y	
SR78/I5 P&R-IN	10/29/00	19:01	10/31/00	4:00	32:59:00	2272	0.025	78	0.90	86	Y	82.07
SR78/I5 P&R-EFF	10/29/00	21:31	11/2/00	5:05	79:34:00	3135	0.025	124	0.04	100	Y	
LACOSTA P&R-IN	10/29/00	19:43	10/31/00	3:00	31:17:00	6710	0.03/0.06	175	1.50	81.3	Y	77.20
LACOSTA P&R-EFF	10/29/00	21:11	11/2/00	0:55	75:44:00	10250	0.02/0.04/0.12	199	0.43	96.3	Y	
CARLSBAD MS-IT	10/29/00	19:12	10/30/00	0:51	5:39:00	3809	0.025/0.05	116	1.16	99.2	Y	---
CARLSBAD MS-BS	10/29/00	21:10	10/29/00	23:45	2:35:00	213	0.01	21	0.08	100	Y	
MELROSE-IN	10/29/00	19:50	10/30/00	0:25	4:35:00	2019	0.03	80	0.51	99.6	Y	---
MELROSE-EFF	No Flow											

Table 1-4 Flow Data for Each Monitored Event (Continued)

Site/Event	Start Flow Date	Start Flow Time	End Flow Date	End Flow Time	Duration Flow (hrs: mins)	Total Flow (cubic feet)	Vol. To Samp (kcf)	No. of Sample Aliquots Collected	Peak Flow (cfs)	% Capture	Peak Capture	Detention Time (hours)
Event 3												
SR78/I15-IN	1/8/01	15:48	1/9/01	11:25	19:37:00	1754	0.06	29	0.98	100	Y	20.70
SR78/I15-EFF	1/9/01	3:20	1/9/01	12:30	9:10:00	1683	0.05	32	0.10	100	Y	
MANCHESTER-IN	1/8/01	12:16	1/9/01	5:10	16:54:00	2070	0.06	34	0.98	100	Y	39.57
MANCHESTER-EFF	1/8/01	15:35	1/10/01	3:50	36:15:00	955	0.05	19	0.01	100	Y	
ESCONDIDO MS-IN	1/8/01	14:56	1/9/01	13:25	22:29:00	1663	0.035	47	0.30	100	Y	38.65
ESCONDIDO MS-EFF	1/8/01	19:15	1/10/01	5:35	34:20:00	105	0.02	4	0.004	100	Y	
SR78/I5 P&R-IN	1/8/01	12:20	1/9/01	3:40	15:20:00	375	0.04	9	0.21	100	Y	31.42
SR78/I5 P&R-EFF	1/8/01	15:15	1/9/01	19:45	28:30:00	331	0.03	10	0.01	100	Y	
LACOSTA P&R-IN	1/8/01	12:15	1/9/01	11:00	22:45:00	976	0.05	18	0.22	100	Y	51.47
LACOSTA P&R-EFF	1/8/01	16:50	1/10/01	15:43	46:53:00	984	0.04	20	0.09	100	Y	
KEARNYMESA MS-IN	1/8/01	12:09	1/9/01	6:30	18:21:00	1791	0.12	29	0.81	100	Y	---
KEARNYMESA MS-EFF	1/8/01	12:23	1/9/01	6:40	18:17:00	1581	0.12	27	0.54	100	Y	
LACOSTA WB-IN	1/8/01	12:19	1/9/01	5:30	17:11:00	689	0.06	11	0.28	100	Y	---
LACOSTA WB-EFF	1/8/01	13:20	1/9/01	10:35	21:15:00	675	0.06	11	0.19	100	Y	
CARLSBAD MS-IT	1/8/01	12:19	1/9/01	4:55	16:36:00	775	0.04	19	0.22	100	Y	---
CARLSBAD MS-ST	No Flow											
Event 4												
SR78/I15-IN	1/10/01	21:45	1/13/01	0:45	51:00:00	22794	0.12/0.24	133	1.76	93.4	Y	59.33
SR78/I15-EFF	1/10/01	22:42	1/13/01	9:05	58:23:00	28146	0.12/0.24	156	0.22	99.9	Y	
SR56/I5-IN	1/10/01	22:30	1/12/01	19:05	44:35:00	24992	0.12/0.24	143	4.46	99.9	Y	71.00
SR56/I5-EFF	1/10/01	23:18	1/13/01	21:30	70:12:00	41906	0.12/0.36	168	3.95	99.3	Y	
MANCHESTER-IN	1/10/01	21:45	1/12/01	14:35	40:50:00	17579	0.12/0.24	110	2.77	97.9	Y	131.25
MANCHESTER-EFF	1/10/01	23:20	1/16/01	9:00	129:40:00	9900	0.10	97	0.05	99.2	Y	
SR78/I5 P&R-IN	1/10/01	17:38	1/12/01	11:50	42:12:00	4565	0.08	57	0.52	100	Y	131.00
SR78/I5 P&R-EFF	1/10/01	19:55	1/16/01	4:38	128:43:00	4627	0.08	57	0.03	100	Y	
LACOSTA P&R-IN	1/10/01	18:20	1/13/01	9:30	63:10:00	8045	0.12	66	0.54	100	Y	134.67
LACOSTA P&R-EFF	1/10/01	16:04	1/16/01	9:00	136:56:00	10662	0.12	87	0.10	98.8	Y	
KEARNYMESA MS-IN	1/10/01	22:25	1/11/01	16:25	18:00:00	14127	0.12/0.24	95	1.20	100	Y	---
KEARNYMESA MS-EFF	1/10/01	23:04	1/11/01	22:15	23:11:00	15517	0.12/0.24	100	1.12	95.8	Y	
LACOSTA WB-IN	1/10/01	18:06	1/12/01	17:25	47:19:00	11060	0.12	90	1.31	98.7	Y	---
LACOSTA WB-EFF	1/10/01	14:25	1/14/01	0:00	81:35:00	9086	0.12	75	0.12	99.9	Y	
PALOMAR SW-IN	Meter Malfunction											---
PALOMAR SW-EFF	1/10/01	18:10	1/12/01	16:45	46:35:00	15409	0.07/0.14	148	1.38	99.6	Y	
CARLSBAD MS-IT	1/10/01	17:53	1/12/01	14:40	16:36:00	8769	0.09/0.18	86	1.21	100	Y	---
CARLSBAD MS-ST	1/11/01	3:04	1/12/01	18:10	39:06:00	927	0.007/0.14	105	0.14	100	Y	
MELROSE-IN	1/10/01	18:25	1/12/01	11:55	41:30:00	4587	0.1	45	0.58	100	Y	---
MELROSE-EFF	1/11/01	2:45	1/12/01	13:00	34:15:00	274	0.02	13	0.07	100	Y	

Table 1-4 Flow Data for Each Monitored Event (Continued)

Site/Event	Start Flow Date	Start Flow Time	End Flow Date	End Flow Time	Duration Flow (hrs: mins)	Total Flow (cubic feet)	Vol. To Samp (kcf)	No. of Sample Aliquots Collected	Peak Flow (cfs)	% Capture	Peak Capture	Detention Time (hours)
Event 5												
SR78/I15-IN	1/26/01	10:20	1/27/01	20:15	33:55:00	8396	0.12	69	0.88	100	Y	35.67
SR78/I15-EFF	1/26/01	11:17	1/27/01	22:00	34:43:00	9674	0.1	93	0.13	96.4	Y	
SR56/I5-IN	1/26/01	11:00	1/27/01	2:05	15:05:00	9317	0.12	76	1.20	99.7	Y	45.25
SR56/I5-EFF	1/26/01	11:22	1/28/01	8:15	44:53:00	9172	0.12	76	0.13	100	Y	
MANCHESTER-IN	1/26/01	10:27	1/27/01	3:00	16:33:00	7273	0.12	60	0.94	100	Y	94.77
MANCHESTER-EFF	1/26/01	10:50	1/30/01	9:13	94:23:00	4601	0.1	46	0.02	100	Y	
ESCONDIDO MS-IN	1/26/01	10:20	1/27/01	11:25	25:05:00	2053	0.08	25	0.50	100	Y	25.58
ESCONDIDO MS-EFF	1/26/01	11:32	1/27/01	11:55	24:23:00	1935	0.08	24	0.07	100	Y	
SR78/I5 P&R-IN	1/26/01	10:00	1/27/01	1:05	15:05:00	1047	0.08	12	0.44	100	Y	64.50
SR78/I5 P&R-EFF	1/26/01	11:15	1/29/01	2:30	63:15:00	1396	0.08	17	0.01	100	Y	
LACOSTA P&R-IN	1/26/01	10:08	1/27/01	11:10	25:02:00	2680	0.1	26	0.39	100	Y	82.53
LACOSTA P&R-EFF	1/26/01	11:47	1/29/01	20:40	80:53:00	3447	0.08	43	0.03	100	Y	
KEARNYMESA MS-IN	1/26/01	11:10	1/27/01	4:15	17:05:00	6523	0.12	54	1.31	100	Y	---
KEARNYMESA MS-EFF	1/26/01	11:23	1/27/01	4:30	17:07:00	8062	0.12	68	1.22	100	Y	
LACOSTA WB-IN	1/26/01	10:13	1/27/01	4:30	18:17:00	4082	0.12	34	1.52	100	Y	---
LACOSTA WB-EFF	1/26/01	10:30	1/28/01	8:52	46:22:00	5067	0.12	42	0.08	100	Y	
PALOMAR SW-IN	1/26/01	10:40	1/27/01	1:45	15:05:00	5245	0.13	43	1.21	100	Y	---
PALOMAR SW-EFF	1/26/01	10:17	1/27/01	8:45	22:28:00	3881	0.13	32	0.92	100	Y	
CARLSBAD MS-IT	1/26/01	9:58	1/27/01	8:30	22:32:00	3107	0.09	34	0.60	100	Y	---
CARLSBAD MS-ST	1/26/01	11:00	1/27/01	1:50	14:50:00	111	0.007	15	0.05	100	Y	
MELROSE-IN	1/26/01	10:10	1/27/01	1:20	15:10:00	1451	0.1	14	0.27	100	Y	---
MELROSE-EFF	1/26/01	15:20	1/27/01	2:25	11:05:00	690	0.01	68	0.32	100	Y	
Event 6												
SR78/I15-IN	2/10/01	12:35	2/11/01	1:25	12:50:00	1630	0.06	27	0.95	100	Y	17.08
SR78/I15-EFF	2/10/01	15:08	2/11/01	5:40	14:32:00	1543	0.06	25	0.12	!00	Y	
ESCONDIDO MS-IN	2/10/01	12:15	2/11/01	4:49	16:34:00	680	0.04	17	0.24	100	Y	22.02
ESCONDIDO MS-EFF	2/10/01	14:57	2/11/01	10:16	19:19:00	427	0.04	10	0.08	100	Y	
SR78/I5 P&R-IN	2/10/01	11:15	2/10/01	13:10	1:55:00	484	0.035	13	0.49	100	Y	32.75
SR78/I5 P&R-EFF	2/10/01	12:40	2/11/01	20:00	31:20:00	504	0.035	14	0.02	100	Y	
Event 7												
SR78/I15-IN	2/12/01	12:40	2/14/01	3:10	38:30:00	~11795	0.12	70	1.07	~60	Y	51.33
SR78/I15-EFF	2/12/01	13:28	2/14/01	16:00	50:32:00	16006	0.12	132	0.20	99.5	Y	
MANCHESTER-IN	2/12/01	16:20	2/14/01	1:55	33:35:00	7795	0.1	64	1.20	100	Y	103.83
MANCHESTER-EFF	2/12/01	17:20	2/17/01	0:10	102:50:00	4627	0.1	46	0.02	100	Y	
ESCONDIDO MS-IN	2/12/01	12:27	2/14/01	8:40	44:13:00	3441	0.08	43	0.25	100	Y	48.15
ESCONDIDO MS-EFF	2/12/01	13:27	2/14/01	12:36	47:09:00	3361	0.08	42	0.08	100	Y	
SR78/I5 P&R-IN	2/12/01	12:25	2/14/01	0:05	35:40:00	3695	0.08	33	0.52	75.9	Y	51.58
SR78/I5 P&R-EFF	2/12/01	15:40	2/14/01	16:00	48:20:00	4592	0.08	57	0.61	100	Y	
LACOSTA P&R-IN	2/12/01	12:28	2/14/01	10:25	45:57:00	7431	0.09	80	0.91	97.1	Y	169.53
LACOSTA P&R-EFF	2/12/01	17:55	2/19/01	14:00	164:05:00	9194	0.09	98	0.05	96.5	Y	
KEARNYMESA MS-IN	2/13/01	2:05	2/14/01	2:25	24:20:00	11374	0.18	52	1.77	100	Y	---
KEARNYMESA MS-EFF	2/13/01	2:17	2/14/01	14:00	35:43:00	13392	0.18	75	1.46	100	Y	
LACOSTA WB-IN	2/12/01	14:08	2/14/01	2:10	36:02:00	8539	0.12	71	1.12	100	Y	---
LACOSTA WB-EFF	2/13/01	2:50	2/15/01	12:05	57:15:00	~6350	0.12	47	0.11	~88	Y	
PALOMAR SW-IN	2/12/01	16:49	2/14/01	0:20	31:31:00	17741	0.18	98	1.77	~87.5	Y	---
PALOMAR SW-EFF	2/13/01	1:55	2/14/01	8:25	30:30:00	16564	0.15	116	1.10	98.3	Y	

Table 1-4 Flow Data for Each Monitored Event (Continued)

Site/Event	Start Flow Date	Start Flow Time	End Flow Date	End Flow Time	Duration Flow (hrs: mins)	Total Flow (cubic feet)	Vol. To Samp (kcf)	No. of Sample Aliquots Collected	Peak Flow (cfs)	% Capture	Peak Capture	Detention Time (hours)
Event 7 (continued)												
CARLSBAD MS-IT	2/12/01	13:47	2/14/01	14:00	48:13:00	8715	0.09	93	1.39	96.6	Y	---
CARLSBAD MS-ST	2/13/01	2:26	2/14/01	9:40	31:14:00	674	0.01	67	0.11	100	Y	
MELROSE-IN	2/12/01	13:35	2/13/01	23:35	34:00:00	3145	0.08	39	0.45	100	Y	---
MELROSE-EFF	2/13/01	2:20	2/14/01	7:40	29:20:00	1757	0.025	70	0.22	100	Y	
Event 8												
SR78/I15-IN	2/23/01	5:20	2/23/01	22:25	17:05:00	~4631	0.06	55	1.07	~60	Y	28.50
SR78/I15-EFF	2/23/01	6:37	2/24/01	9:50	27:13:00	6600	0.06	92	0.14	96.4	Y	
SR56/I5-IN	2/23/01	6:20	2/23/01	18:45	12:25:00	5521	0.06	78	1.42	85.6	Y	31.33
SR56/I5-EFF	2/23/01	6:45	2/24/01	13:40	30:55:00	4219	0.06	70	0.06	100	Y	
MANCHESTER-IN	2/23/01	8:48	2/28/01	7:20	118:32:00	20838	0.05/0.1	229	0.79	91	Y	212.62
MANCHESTER-EFF	2/23/01	9:10	3/4/01	5:25	212:15:00	12707	0.04/0.16	137	0.04	99.8	Y	
SR78/I5 P&R-IN	2/23/01	5:27	2/23/01	11:30	6:03:00	738	0.04	18	0.21	100	Y	17.63
SR78/I5 P&R-EFF	2/23/01	7:30	2/23/01	23:05	15:35:00	836	0.04	20	0.02	100	Y	
LACOSTA P&R-IN	2/23/01	7:50	3/1/01	9:25	145:35:00	10729	0.045/0.135	155	0.54	98.1	Y	186.50
LACOSTA P&R-EFF	2/23/01	10:09	3/3/01	2:20	184:11:00	12455	0.045/0.135	144	0.05	100	Y	
KEARNYMESA MS-IN	2/23/01	9:05	2/23/01	17:45	8:40:00	2950	0.06	49	0.72	100	Y	---
KEARNYMESA MS-EFF	2/23/01	9:35	2/23/01	18:00	8:25:00	3679	0.06	61	0.73	100	Y	
PALOMAR SW-IN	2/23/01	8:47	2/23/01	11:35	2:48:00	2962	0.06	49	0.77	100	Y	---
PALOMAR SW-EFF	2/23/01	8:00	2/23/01	21:20	13:20:00	2249	0.06	44	0.40	100	Y	
CARLSBAD MS-IT	2/23/01	7:51	2/23/01	15:50	7:59:00	2484	0.05	55	1.11	100	Y	---
CARLSBAD MS-ST	2/23/01	8:43	2/23/01	17:35	8:52:00	187	0.007	26	0.05	100	Y	
MELROSE-IN	2/23/01	8:30	2/23/01	11:05	2:35:00	977	0.04	24	0.36	100	Y	---
MELROSE-EFF	2/23/01	9:21	2/23/01	20:55	11:34:00	406	0.023	21	0.15	100	Y	
Event 9												
ESCONDIDO MS-IN	2/25/01	4:00	3/1/01	9:00	101:00:00	10166	0.08	125	0.30	90	Y	112.67
ESCONDIDO MS-EFF	2/25/01	4:30	3/1/01	20:40	112:10:00	5473	0.08	68	0.04	100	Y	
LACOSTA WB-IN	2/25/01	0:15	2/28/01	10:40	82:25:00	8108	0.1	79	1.47	97.6	Y	105.42
LACOSTA WB-EFF	2/25/01	3:50	3/1/01	9:40	101:50:00	11008	0.1	109	0.10	~92	Y	
Event 10												
SR78/I15-IN	3/6/01	2:35	3/7/01	4:25	25:50:00	5529	0.14	39	1.09	100	Y	31.25
SR78/I15-EFF	3/6/01	2:37	3/7/01	9:50	31:13:00	5768	0.14	41	0.15	100	Y	
SR56/I5-IN	3/6/01	1:20	3/7/01	6:20	29:00:00	6383	0.135	53	1.14	100	Y	25.33
SR56/I5-EFF	3/6/01	1:46	3/7/01	2:40	24:54:00	5291	0.12	44	0.08	100	Y	
MANCHESTER-IN	3/6/01	1:24	3/6/01	4:45	3:21:00	2711	0.1	27	0.55	100	Y	60.60
MANCHESTER-EFF	3/6/01	1:40	3/8/01	14:00	60:20:00	3130	0.1	31	0.02	100	Y	
ESCONDIDO MS-IN	3/6/01	2:25	3/6/01	21:30	19:05:00	2293	0.08	25	0.36	100	Y	32.58
ESCONDIDO MS-EFF	3/6/01	3:08	3/7/01	11:00	31:52:00	1232	0.08	13	0.03	100	Y	
SR78/I5 P&R-IN	3/6/01	1:28	3/7/01	0:10	22:42:00	1126	0.08	14	0.15	100	Y	67.87
SR78/I5 P&R-EFF	3/6/01	2:35	3/8/01	21:20	66:45:00	1501	0.08	18	0.02	100	Y	
LACOSTA P&R-IN	3/6/01	1:25	3/7/01	8:20	30:55:00	1891	0.135	14	0.31	100	Y	36.25
LACOSTA P&R-EFF	3/6/01	3:13	3/7/01	13:40	34:27:00	2049	0.135	15	0.02	100	Y	
KEARNYMESA MS-IN	3/6/01	1:20	3/6/01	20:50	19:30:00	6246	0.12	68	0.98	100	Y	---
KEARNYMESA MS-EFF	3/6/01	1:34	3/6/01	19:00	17:26:00	6216	0.13	51	0.84	100	Y	
LACOSTA WB-IN	3/6/01	1:31	3/6/01	21:30	19:59:00	1171	0.12	9	0.42	100	Y	---
LACOSTA WB-EFF	3/6/01	2:55	3/7/01	10:05	31:10:00	1315	0.1	13	0.03	100	Y	

Table 1-4 Flow Data for Each Monitored Event (Continued)

Site/Event	Start Flow Date	Start Flow Time	End Flow Date	End Flow Time	Duration Flow (hrs: mins)	Total Flow (cubic feet)	Vol. To Samp (kcf)	No. of Sample Aliquots Collected	Peak Flow (cfs)	% Capture	Peak Capture	Detention Time (hours)
Event 10 (continued)												
PALOMAR SW-IN	3/6/01	1:44	3/6/01	21:55	20:11:00	5129	0.12	42	0.79	100	Y	---
PALOMAR SW-EFF	3/6/01	1:40	3/7/01	8:10	30:30:00	3751	0.12	31	0.51	100	Y	
CARLSBAD MS-IT	3/6/01	1:27	3/7/01	5:10	27:43:00	2417	0.1	24	0.31	100	Y	---
CARLSBAD MS-ST	3/6/01	2:05	3/6/01	22:40	20:35:00	198	0.007	28	0.01	100	Y	
Event 11												
SR78/I15-IN	4/7/01	7:30	4/8/01	9:50	26:20:00	~5687	0.06	67	1.39	~60	N	26.42
SR78/I15-EFF	4/7/01	9:10	4/8/01	9:55	24:45:00	7606	0.06	126	0.15	100	Y	
SR56/I5-IN	4/7/01	7:45	4/8/01	6:55	23:10:00	3371	0.05	67	1.03	100	Y	19.42
SR56/I5-EFF	4/7/01	9:49	4/8/01	3:10	17:21:00	3059	0.05	61	0.07	100	Y	
MANCHESTER-IN	4/7/01	7:45	4/7/01	14:20	6:35:00	1972	0.04	49	0.54	100	Y	34.92
MANCHESTER-EFF	4/7/01	8:55	4/8/01	18:40	33:45:00	1203	0.04	30	0.02	100	Y	
ESCONDIDO MS-IN	4/7/01	7:20	4/8/01	5:05	21:45:00	2557	0.04	63	0.45	<100	Y	22.50
ESCONDIDO MS-EFF	4/7/01	10:00	4/8/01	5:50	19:50:00	1691	0.04	42	0.05	100	Y	
SR78/I5 P&R-IN	4/6/01	22:30	4/7/01	17:15	18:45:00	1245	0.035	35	0.34	100	Y	44.92
SR78/I5 P&R-EFF	4/7/01	23:26	4/8/01	19:25	19:59:00	1261	0.035	36	0.02	100	Y	
LACOSTA P&R-IN	4/7/01	7:25	4/10/01	8:40	73:15:00	2158	0.06	33	0.45	100	Y	107.67
LACOSTA P&R-EFF	4/7/01	9:25	4/11/01	19:05	105:40:00	2077	0.05	41	0.02	100	Y	
KEARNYMESA MS-IN	4/7/01	7:22	4/7/01	17:10	9:48:00	5940	0.05	79	2.10	69	Y	---
KEARNYMESA MS-EFF	4/7/01	7:50	4/7/01	19:50	12:00:00	5885	0.05	97	2.21	98	Y	
LACOSTA WB-IN	4/7/01	7:44	4/7/01	15:40	7:56:00	2754	0.06	51	1.74	100	Y	---
LACOSTA WB-EFF	4/7/01	8:25	4/8/01	21:10	36:45:00	2532	0.06	50	0.06	100	Y	
PALOMAR SW-IN	4/7/01	8:35	4/7/01	12:10	3:35:00	2828	0.05	56	1.14	100	Y	---
PALOMAR SW-EFF	4/7/01	8:34	4/7/01	13:15	4:41:00	1138	0.06	22	0.49	100	Y	
CARLSBAD MS-IT	4/7/01	7:40	4/7/01	17:10	9:30:00	2279	0.05	45	0.71	100	Y	---
CARLSBAD MS-ST	4/7/01	8:45	4/7/01	12:30	3:45:00	63	0.007	9	0.02	100	Y	
MELROSE-IN	4/7/01	7:55	4/7/01	15:10	7:15:00	1143	0.03	38	0.27	100	Y	---
MELROSE-EFF	4/7/01	8:31	4/8/01	0:15	15:44:00	158	0.025	7	0.09	100	Y	
Event 12												
SR78/I15-IN	4/20/01	22:52	4/22/01	9:35	34:43:00	~6265	0.06	88	1.15	~82	Y	33.63
SR78/I15-EFF	4/20/01	23:53	4/22/01	8:30	32:37:00	7308	0.06	121	0.15	99.6	Y	
SR56/I5-IN	4/20/01	22:26	4/21/01	13:55	15:29:00	1431	0.05	28	1.40	100	Y	13.15
SR56/I5-EFF	4/20/01	23:28	4/21/01	11:35	12:07:00	448	0.05	8	0.04	100	Y	
MANCHESTER-IN	4/20/01	22:01	4/21/01	12:20	14:19:00	2385	0.04	59	0.45	100	Y	44.48
MANCHESTER-EFF	4/20/01	22:52	4/22/01	18:30	43:38:00	1788	0.04	44	0.02	100	Y	
ESCONDIDO MS-IN	4/20/01	22:48	4/21/01	8:25	9:37:00	2066	0.04	52	0.29	100	Y	62.62
ESCONDIDO MS-EFF	4/21/01	3:24	4/23/01	13:25	58:01:00	1119	0.04	27	0.02	100	Y	
SR78/I5 P&R-IN	4/20/01	22:09	4/21/01	11:55	13:46:00	757	0.035	21	0.29	100	Y	30.27
SR78/I5 P&R-EFF	4/20/01	23:28	4/22/01	4:25	28:57:00	733	0.035	20	0.02	100	Y	
LACOSTA P&R-IN	4/20/01	22:13	4/21/01	14:40	16:27:00	775	0.06	11	0.23	100	Y	38.53
LACOSTA P&R-EFF	4/21/01	4:20	4/22/01	12:45	32:25:00	584	0.05	11	0.01	100	Y	
KEARNYMESA MS-IN	4/20/01	22:17	4/21/01	10:55	12:38:00	1836	0.05	36	0.34	100	Y	---
KEARNYMESA MS-EFF	4/20/01	22:30	4/21/01	12:15	13:45:00	2011	0.05	40	0.30	100	Y	

Table 1-4 Flow Data for Each Monitored Event (Continued)

Site/Event	Start Flow Date	Start Flow Time	End Flow Date	End Flow Time	Duration Flow (hrs: mins)	Total Flow (cubic feet)	Vol. To Samp (kcf)	No. of Sample Aliquots Collected	Peak Flow (cfs)	% Capture	Peak Capture	Detention Time (hours)
Event 12 (continued)												
LACOSTA WB-IN	4/20/01	22:09	4/21/01	12:10	14:01:00	1034	0.05	20	0.47	100	Y	---
LACOSTA WB-EFF	4/21/01	0:03	4/22/01	11:00	34:57:00	1506	0.05	36	0.03	100	Y	
PALOMAR SW-IN	4/21/01	3:30	4/21/01	12:10	8:40:00	1763	0.05	35	0.85	100	Y	---
PALOMAR SW-EFF	4/21/01	3:20	4/21/01	16:15	12:55:00	656	0.05	13	0.21	100	Y	
CARLSBAD MS-IT	4/20/01	21:57	4/21/01	13:20	15:23:00	872	0.05	17	0.29	100	Y	---
CARLSBAD MS-ST	Insuff. flow					13		1				
MELROSE-IN	4/20/01	22:15	4/21/01	9:30	11:15:00	624	0.03	20	0.14	100	Y	---
MELROSE-EFF	No flow											

NA = not available

Table 1-5a BMP Retrofit Pilot Study, Stormwater Lab Data - District 11

October 26, 2000 through January 8, 2001

PRELIMINARY DATA

Sample Date	BMP Location	Site ID	BMP Type	Sampling Location	% Storm Capture	pH	Specific Conductance (umhos/cm)	Hardness (mg/L)	TSS (mg/L)	TDS (mg/L)	COD (mg/L)	TOC (mg/L)	DOC (mg/L)	Total (µg/L)							Dissolved (µg/L)						
														As	Cd	Cr	Cu	Pb	Ni	Zn	As	Cd	Cr	Cu	Pb	Ni	Zn
Oct 26, 2000	SR56/I-5-IN	111101	Extended Detention Basin	Influent	100	7.9	210	76	82	180	-	12	12	3.7	0.58	4.1	28	19	5.0	110	2.0	0.2U	1.5	11	4.5	2.8	21
Oct 26, 2000	SR56/I-5-EFF	111101	Extended Detention Basin	Effluent	100	7.4	240	93	42	180	-	15	15	3.1	0.2U	3.2	22	11	4.1	55	2.2	0.2U	1.5	13	5.4	3.2	30
Oct 26, 2000	Manchester-IN	111105	Extended Detention Basin	Influent	77	7.8	140	47	300	140	-	23	21	4.2	2.3	14	96	180	17	550	1.3	0.55	7.9	25	3.8	7.3	120
Oct 26, 2000	Manchester-EFF	111105	Extended Detention Basin	Effluent	100	7.3	150	54	84	140	-	20	22	3.4	1.2	10	49	69	11	240	1.3	0.37	6.7	26	6.4	7.1	110
Oct 26, 2000	LaCosta Wet-EFF	111104	Wet Basin	Effluent	100	8.1	2500	1200	22	1800	-	15	13	1.4	0.2U	3.3	5.7	14	5.8	41	1.1	0.2U	2.8	3.5	7.2	5.1	36
Oct 26, 2000	Kearny Mesa MS-IN	112201	Media Filter (Per/Zeolite)	Influent	100	7.0	140	43	390	130	200	32	30	49	0.92	5.3	94	48	11	680	48	0.69	2.3	49	6.9	8.1	360
Oct 26, 2000	Kearny Mesa MS-EFF	112201	Media Filter (Per/Zeolite)	Effluent	100	7.1	150	58	120	160	-	30	27	54	1.3	4.4	70	35	9.7	490	46	0.28	2.1	33	7.0	6.4	270
Oct 26, 2000	Escondido MS-IN	112202	Sand Filter	Influent	100	7.1	230	-	-	-	370	83	82	3.3	2.6	7.3	48	29	26	1100	-	-	-	-	-	-	-
Oct 26, 2000	LaCosta P&R-IN	112203	Sand Filter	Influent	43	6.2	80	20	62	130	-	31	28	1.9	0.43	1.4	16	20	6.8	190	0.5U	0.2U	1U	8.4	6.3	3.6	85
Oct 26, 2000	LaCosta P&R-EFF	112203	Sand Filter	Effluent	100	7.1	100	54	4.0	310	-	20	20	1.1	0.2U	1.1	8.1	2.6	3.7	10	0.83	0.2U	1U	6.9	3.6	3.4	8.1
Oct 26, 2000	SR78/I-5-IN	112204	Sand Filter	Influent	97	6.9	100	26	170	100	-	46	44	2.0	0.8	3.1	32	18	13	460	1.5	0.52	1U	16	1.5	11	210
Oct 26, 2000	SR78/I-5-EFF	112204	Sand Filter	Effluent	98	7.0	140	39	14	190	-	35	35	2.0	0.2U	1.4	17	3.4	9.5	51	1.7	0.2U	1.1	13	4.6	8.1	44
Oct 26, 2000	Melrose-IN	112205	Biofiltration Swale	Influent	100	6.6	190	45	70	200	-	56	54	1.2	1.3	4.9	66	12	26	800	0.7	0.54	3.5	53	2.4	22	670
Oct 26, 2000	Carlsbad MS-IN	112207	Biostrip/Infiltration Trench	Influent	100	7.3	150	41	200	140	240	42	39	53	0.61	6.4	91	54	15	310	47	0.2U	2.2	48	8.5	9.7	130
Oct 29, 2000	SR78/I-15-IN	111102	Extended Detention Basin	Influent	90	8.1	120	47	500	84	-	16	18	2.5	2.1	7.5	75	110	13	710	1.0	0.2U	1.4	11	3.3	4.0	28
Oct 29, 2000	SR78/I-15-EFF	111102	Extended Detention Basin	Effluent	94	7.4	140	49	62	110	-	16	15	1.3	0.52	2.2	19	24	4.0	110	1.0	0.2U	1.2	12	1U	2.6	36
Oct 29, 2000	Manchester-IN	111105	Extended Detention Basin	Influent	100	7.1	98	52	170	96	-	15	18	1.9	1.6	11	71	75	11	390	0.88	0.21	6.8	16	3.9	5.1	100
Oct 29, 2000	Manchester-EFF	111105	Extended Detention Basin	Effluent	92	6.9	8.2	35	28	88	-	15	16	2.2	0.63	7.0	26	21	6.0	150	1.7	0.5	4.2	19	1.7	5.1	100
Oct 29, 2000	Escondido MS-IN	112202	Sand Filter	Influent	94	6.6	110	67	140	100	42	29	29	1.8	1.3	3.1	18	16	7.0	400	0.78	0.2U	1.3	8.5	4.6	5.3	230
Oct 29, 2000	Escondido MS-EFF	112202	Sand Filter	Effluent	100	6.8	110	34	22	92	-	24	24	1.2	1.1	2.0	9.6	3.0	3.6	93	0.93	0.27	1U	4.6	1U	3.0	44
Oct 29, 2000	SR78/I-5-IN	112204	Sand Filter	Influent	86	6.8	35	41	340	30	-	14	13	1.6	1.5	2.8	120	18	12	620	0.88	0.2U	1U	4.6	3.5	2.4	57
Oct 29, 2000	SR78/I-5-EFF	112204	Sand Filter	Effluent	100	6.8	61	23	1U	38	-	8.7	8.9	1.0	0.2U	1U	5.1	1U	2.1	21	0.68	0.2U	1U	4.8	1U	1U	15
Oct 29, 2000	Melrose-IN	112205	Biofiltration Swale	Influent	100	6.5	55	22	44	74	-	17	16	1.5	0.78	2.1	27	10	8.1	350	0.5U	0.2U	1U	15	3.4	5.2	190
Oct 29, 2000	Carlsbad MS-IN	112207	Biostrip/Infiltration Trench	Influent	99	6.6	59	45	170	70	73	13	12	48	0.47	3.1	48	33	5.4	170	44	0.2U	1.1	22	3.7	2.9	68
Oct 29, 2000	Carlsbad MS-EFF	112207	Biostrip/Infiltration Trench	Effluent	100	6.9	50	45	52	48	-	9.5	9.0	3.0	0.2U	1.0	6.5	9.9	2.0	72	2.3	0.2U	1U	3.3	3.9	2U	32
Jan 8, 2001	SR56/I-5-IN	111101	Extended Detention Basin	Influent	NA1	NA1	NA1	NA1	NA1	NA1	NA1	NA1	NA1	NA1	NA1	NA1	NA1	NA1	NA1	NA1	NA1	NA1	NA1	NA1	NA1	NA1	NA1
Jan 8, 2001	SR56/I-5-EFF	111101	Extended Detention Basin	Effluent	NA1	NA1	NA1	NA1	NA1	NA1	NA1	NA1	NA1	NA1	NA1	NA1	NA1	NA1	NA1	NA1	NA1	NA1	NA1	NA1	NA1	NA1	NA1
Jan 8, 2001	SR78/I-15-IN	111102	Extended Detention Basin	Influent	100	8.1	190	62	340	170	-	36	29	4.1	2.7	11	120	110	22	1000	1.7	0.2U	2.7	21	1.1	5.6	49
Jan 8, 2001	SR78/I-15-EFF	111102	Extended Detention Basin	Effluent	100	7.7J	190	84	76	NA2	-	34	34	2.4	0.53	3.2	33	23	7.0	170	1.9	0.2U	1.8	20	1U	4.7	65
Jan 8, 2001	Manchester-IN	111105	Extended Detention Basin	Influent	100	7.4	180	65	270	160	-	31	30	3.3	1.5	10	88	87	15	540	1.5	0.43	4.4	28	1.9	8.1	140
Jan 8, 2001	Manchester-EFF	111105	Extended Detention Basin	Effluent	100	7.5	240	67	58	NA2	-	27	29	2.7	0.88	4.0	37	39	7.1	190	1.8	0.28	1.4	16	1.2	5.5	82
Jan 8, 2001	LaCosta Wet-IN	111104	Wet Basin	Influent	100	7.4	230	80	300	200	-	46	41	3.8	1.8	10	120	190	21	520	1.2	0.26	2.8	38	3.0	11	120
Jan 8, 2001	LaCosta Wet-EFF	111104	Wet Basin	Effluent	100	7.9	2600	930	10	1800	-	24	20	0.75	0.2U	2.1	5.1	2.8	6.1	19	0.5U	0.2U	1.0	3.5	1U	5.4	16
Jan 8, 2001	Kearny Mesa MS-IN	112201	Media Filter (Per/Zeolite)	Influent	100	7.6	150	50	420	140		36	32	44	2.7	11	170	120	19	1100	32	0.64	1.3	48	2.0	7.2	230
Jan 8, 2001	Kearny Mesa MS-EFF	112201	Media Filter (Per/Zeolite)	Effluent	100	7.5	170	62	280	140	-	35	34	32	1.9	9.6	150	110	18	920	25	0.51	1.4	69	2.3	8.8	250
Jan 8, 2001	Escondido MS-IN	112202	Sand Filter	Influent	100	7.0	170	64	160	170		65	55	2.9	2.2	5.7	45	25	16	740	2.4	0.72	2.4	24	6.4	10	430
Jan 8, 2001	LaCosta P&R-IN	112203	Sand Filter	Influent	100	6.5	190	54	80	180	-	72	59	2.5	0.5	2.5	29	22	10	240	2.2	0.2U	1.2	18	4.0	6.3	120
Jan 8, 2001	LaCosta P&R-EFF	112203	Sand Filter	Effluent	100	7.5	290	100	10	280	-	62	61	0.5	0.2U	1.6	19	2.1	8.2	23	0.5U	0.2U	1.1	15	1.3	6.9	17
Jan 8, 2001	SR78/I-5-IN	112204	Sand Filter	Influent	100	6.7	240	60	220	190	-	65	54	2.4	0.98	3.6	60	23	22	690	2.0	0.23	1U	25	2.0	12	230
Jan 8, 2001	SR78/I-5-EFF	112204	Sand Filter	Effluent	100	7.5J	330	92	20	NA2	-	58	65	2.9	0.2U	1.6	35	2.1	14	140	2.4	0.2U	1.0	25	1U	12	82
Jan 8, 2001	Carlsbad MS-IN	112207	Biostrip/Infiltration Trench	Influent	100	7.0	330	100	400	320		88	75	49	2.1	9.5	170	130	34	730	33	1.2	1.9	100	4.6	22	390

Table 1-5a BMP Retrofit Pilot Study, Stormwater Lab Data - District 11 – (continued)

October 26, 2000 through January 8, 2001 (continued)

PRELIMINARY DATA

Sample Date	BMP Location	Site ID	BMP Type	Sampling Location	% Storm Capture	Nitrate-Nitrogen (mg/L)	TKN (mg/L)	Ammonia (mg/L)	Total P (mg/L)	TRPH (mg/L)	Organophosphate Pest. Diazinon (ug/L)	Organophosphate Pest. Chlorpyrifos (ug/L)	Dissolved Ortho - Phosphate (mg/L)	Fecal Coliform (MPN/100 ml)	TPH Diesel (µg/L)	TPH Gasoline (µg/L)	TPH Oil (µg/L)
Oct 26, 2000	SR56/I-5-IN	111101	Extended Detention Basin	Influent	100	1.2	1.5	-	0.30	-	-	-	0.09	900	220J	50U	990J
Oct 26, 2000	SR56/I-5-EFF	111101	Extended Detention Basin	Effluent	100	1.2	1.5	-	0.33	-	-	-	0.20	11,000	210J	50U	680J
Oct 26, 2000	Manchester-IN	111105	Extended Detention Basin	Influent	77	2.0	3.7	-	0.51	-	-	-	0.21	9,000	570J	50U	3100J
Oct 26, 2000	Manchester-EFF	111105	Extended Detention Basin	Effluent	100	1.5	2.4	-	0.59	-	-	-	0.25	9,000	350J	50U	1500J
Oct 26, 2000	LaCosta Wet-EFF	111104	Wet Basin	Effluent	100	0.12	2.4	-	1.9	-	-	-	1.5	50	160J	50U	200UJ
Oct 26, 2000	Kearny Mesa MS-IN	112201	Media Filter (Per/Zeolite)	Influent	100	1.8	3.9	1.6	0.55	5U	1.4	0.05U	0.22	9,000	1100J	50U	2600J
Oct 26, 2000	Kearny Mesa MS-EFF	112201	Media Filter (Per/Zeolite)	Effluent	100	2.5	3.3	-	0.54	-	-	-	0.23	3,000	1000J	50U	680J
Oct 26, 2000	Escondido MS-IN	112202	Sand Filter	Influent	100	1.3	-	-	-	5U	-	-	0.035	50,000	760J	50U	560J
Oct 26, 2000	LaCosta P&R-IN	112203	Sand Filter	Influent	43	1.2	4.6	-	0.49	-	-	-	0.34	30	320J	50U	990J
Oct 26, 2000	LaCosta P&R-EFF	112203	Sand Filter	Effluent	100	1.0	1.7	-	0.19	-	-	-	0.15	80	100UJ	50U	250J
Oct 26, 2000	SR78/I-5-IN	112204	Sand Filter	Influent	97	1.2	5.6	-	0.86	-	-	-	0.55	5,000	270J	50U	930J
Oct 26, 2000	SR78/I-5-EFF	112204	Sand Filter	Effluent	98	1.2	2.4	-	0.45	-	-	-	0.37	5,000	110J	50U	370J
Oct 26, 2000	Melrose-IN	112205	Biofiltration Swale	Influent	100	3.6	8.5	-	0.31	-	-	-	0.18	700	510J	50U	3700J
Oct 26, 2000	Carlsbad MS-IN	112207	Biostrip/Infiltration Trench	Influent	100	1.4	3.8	0.85	0.76	5U	0.01U	0.05U	0.25	9,000	580J	50U	960J
Oct 29, 2000	SR78/I-15-IN	111102	Extended Detention Basin	Influent	90	1.4	3.3	-	1.5	-	-	-	0.17	NA1	NA1	NA1	NA1
Oct 29, 2000	SR78/I-15-EFF	111102	Extended Detention Basin	Effluent	94	1.2	1.5	-	0.24	-	-	-	0.20	NA1	NA1	NA1	NA1
Oct 29, 2000	Manchester-IN	111105	Extended Detention Basin	Influent	100	0.99	2.3	-	1.0	-	-	-	0.16	NA1	NA1	NA1	NA1
Oct 29, 2000	Manchester-EFF	111105	Extended Detention Basin	Effluent	92	0.63	2.0	-	0.36	-	-	-	0.18	NA1	NA1	NA1	NA1
Oct 29, 2000	Escondido MS-IN	112202	Sand Filter	Influent	94	0.10	2.4	0.55	0.65	5U	0.01U	0.05U	0.16	NA1	NA1	NA1	NA1
Oct 29, 2000	Escondido MS-EFF	112202	Sand Filter	Effluent	100	1.8	1.0	-	0.15	-	-	-	0.085	NA1	NA1	NA1	NA1
Oct 29, 2000	SR78/I-5-IN	112204	Sand Filter	Influent	86	0.17	2.7	-	0.73	-	-	-	0.22	NA1	NA1	NA1	NA1
Oct 29, 2000	SR78/I-5-EFF	112204	Sand Filter	Effluent	100	0.67	0.68	-	0.26	-	-	-	1.3R	NA1	NA1	NA1	NA1
Oct 29, 2000	Melrose-IN	112205	Biofiltration Swale	Influent	100	0.57	2.0	-	0.28	-	-	-	0.12	NA1	NA1	NA1	NA1
Oct 29, 2000	Carlsbad MS-IN	112207	Biostrip/Infiltration Trench	Influent	99	0.71	1.4	0.46	0.44	5U	0.01U	0.05U	0.27	NA1	NA1	NA1	NA1
Oct 29, 2000	Carlsbad MS-EFF	112207	Biostrip/Infiltration Trench	Effluent	100	0.2	0.77	-	0.36	-	-	-	0.30	NA1	NA1	NA1	NA1
Jan 8, 2001	SR56/I-5-IN	111101	Extended Detention Basin	Influent	NA1	NA1	NA1	NA1	NA1	-	-	-	NA1	1700	340J	50U	1200J
Jan 8, 2001	SR56/I-5-EFF	111101	Extended Detention Basin	Effluent	NA1	NA1	NA1	NA1	NA1	-	-	-	NA1	9000	440J	50U	740J
Jan 8, 2001	SR78/I-15-IN	111102	Extended Detention Basin	Influent	100	3.8	6.4	-	1.3	-	-	-	0.26	NA1	NA1	NA1	NA1
Jan 8, 2001	SR78/I-15-EFF	111102	Extended Detention Basin	Effluent	100	2.9J	3.6	-	0.39	-	-	-	0.29	NA1	NA1	NA1	NA1
Jan 8, 2001	Manchester-IN	111105	Extended Detention Basin	Influent	100	2.8	4.3	-	0.76	-	-	-	0.30	NA1	NA1	NA1	NA1
Jan 8, 2001	Manchester-EFF	111105	Extended Detention Basin	Effluent	100	2.1	3.6	-	0.72	-	-	-	0.51	NA1	NA1	NA1	NA1
Jan 8, 2001	LaCosta Wet-IN	111104	Wet Basin	Influent	100	0.011	5.0	3.9	0.78	-	-	-	0.21	NA1	NA1	NA1	NA1
Jan 8, 2001	LaCosta Wet-EFF	111104	Wet Basin	Effluent	100	0.23	1.6	1.5	0.36	-	-	-	0.15	NA1	NA1	NA1	NA1
Jan 8, 2001	Kearny Mesa MS-IN	112201	Media Filter (Per/Zeolite)	Influent	100	2.2	5.2	1.8	1.0	5U	0.77	0.05U	0.30	70	2100J	200U	2000J
Jan 8, 2001	Kearny Mesa MS-EFF	112201	Media Filter (Per/Zeolite)	Effluent	100	2.3	4.5	-	0.82	-	-	-	0.23	2U	740J	200U	620J
Jan 8, 2001	Escondido MS-IN	112202	Sand Filter	Influent	100	2.4	5.8	2.5	0.54	5U	0.18	0.05U	0.22	NA1	NA1	NA1	NA1
Jan 8, 2001	LaCosta P&R-IN	112203	Sand Filter	Influent	100	3.1	9.5	3.5	1.0	-	-	-	0.66	8000	570J	250U	930J
Jan 8, 2001	LaCosta P&R-EFF	112203	Sand Filter	Effluent	100	1.8	5.3	1.2	0.25	-	-	-	0.13	NA1	NA1	NA1	NA1
Jan 8, 2001	SR78/I-5-IN	112204	Sand Filter	Influent	100	2.7J	10	3.7	1.3	-	-	-	0.66	NA1	NA1	NA1	NA1
Jan 8, 2001	SR78/I-5-EFF	112204	Sand Filter	Effluent	100	4.1	6.9	1.8	0.64	-	-	-	0.59	NA1	NA1	NA1	NA1
Jan 8, 2001	Carlsbad MS-IN	112207	Biostrip/Infiltration Trench	Influent	100	4.2	8.3	2.8	0.90	5U	-	-	0.15	17,000	780J	200U	990J

Table 1-5a BMP Retrofit Pilot Study, Stormwater Lab Data - District 11 – (continued)

January 10, 2001 through January 26, 2001

PRELIMINARY DATA

Sample Date	BMP Location	Site ID	BMP Type	Sampling Location	% Storm Capture	pH	Specific Conductance (umhos/cm)	Hardness (mg/L)	TSS (mg/L)	TDS (mg/L)	COD (mg/L)	TOC (mg/L)	DOC (mg/L)	Total (µg/L) As	Cd	Cr	Cu	Pb	Ni	Zn	Dissolved (µg/L) As	Cd	Cr	Cu	Pb	Ni	Zn
Jan10, 2001	SR56/I-5-IN	111101	Extended Detention Basin	Influent	100	7.6	110	47	110	74	-	6.2	5.8	2.1	0.59	5.2	43	53	4.3	220	0.88	0.2U	3.1	5.5	1.7	2U	13
Jan10, 2001	SR56/I-5-EFF	111101	Extended Detention Basin	Effluent	99	7.2	150	100	220	92	-	6.5	6.5	3.3	0.73	3.7	28	52	5.2	160	1.3	0.2U	1.9	5.3	1.3	2U	9.7
Jan10, 2001	SR78/I-15-IN	111102	Extended Detention Basin	Influent	93	8.1	83	36	200	68	-	10	10	2.5	0.81	3.3	37	44	5.0	260	1.1	0.2U	1.5	9.1	1U	2U	21
Jan10, 2001	SR78/I-15-EFF	111102	Extended Detention Basin	Effluent	100	7.6	150	99	38	110	-	12	12	2.1	0.34	3.3	19	15	4.2	94	2.2	0.2U	1.2	9.7	1U	2U	33
Jan10, 2001	Manchester-IN	111105	Extended Detention Basin	Influent	98	6.9	69	33	190	56	-	11	9.5	2.5	2.8	8.7	95	130	10	550	1.1	0.36	3.1	11	1.4	2.3	73
Jan10, 2001	Manchester-EFF	111105	Extended Detention Basin	Effluent	99	7.0	81	33	94	66	-	11	11	0.5U	0.73	3.7	28	50	3.4	160	0.85	0.35	2.0	13	9.0	2.7	83
Jan10, 2001	LaCosta Wet-IN	111104	Wet Basin	Influent	99	8.1	100	38	240	86	-	11	11	1.0	1.3	3.7	66	250	7.7	280	0.88	0.2U	1.4	14	2.3	2.9	23
Jan10, 2001	LaCosta Wet-EFF	111104	Wet Basin	Effluent	100	8.0	2100	860	10	1600	-	17	13	1.3	0.2U	1.1	7.1	9.2	5.0	28	0.5U	0.2U	1U	4.6	1U	4.4	18
Jan10, 2001	Kearny Mesa MS-IN	112201	Media Filter (Per/Zeolite)	Influent	100	6.9J	74	45	78	58	95	18	14	50	0.87	3.6	53	40	4.2	400	39	0.2U	1U	24	1.5	2.6	110
Jan10, 2001	Kearny Mesa MS-EFF	112201	Media Filter (Per/Zeolite)	Effluent	96	7.1J	76	58	44	58	-	15	13	54	0.47	1.7	42	15	3.9	210	49	0.2U	1.1	26	1.9	2.7	120
Jan10, 2001	Escondido MS-IN	112202	Sand Filter	Influent	NA2	NA2	NA2	NA2	NA2	NA2	NA2	NA2	NA2	NA2	NA2	NA2	NA2	NA2	NA2	NA2	NA2	NA2	NA2	NA2	NA2	NA2	NA2
Jan10, 2001	Escondido MS-EFF	112202	Sand Filter	Effluent	NA2	NA2	NA2	NA2	NA2	NA2	NA2	NA2	NA2	NA2	NA2	NA2	NA2	NA2	NA2	NA2	NA2	NA2	NA2	NA2	NA2	NA2	NA2
Jan10, 2001	LaCosta P&R-IN	112203	Sand Filter	Influent	100	6.6	44	24	120	38	-	14	13	0.65	0.41	2.5	10	28.0	5.0	140	0.55	O.2U	2.4	3.6	1.2	4.0	18
Jan10, 2001	LaCosta P&R-EFF	112203	Sand Filter	Effluent	99	7.0	68	32	6.0	60		14	14	0.98	0.2U	1U	3.7	1.8	2U	9.7	1.3	0.2U	1U	3.2	1U	2U	8.6
Jan10, 2001	SR78/I-5-IN	112204	Sand Filter	Influent	100	6.6	32	21	120	28	-	11	9.3	1.2	0.55	1.3	18	14	3.8	270	0.5U	0.2U	1U	3.6	1U	2U	35
Jan10, 2001	SR78/I-5-EFF	112204	Sand Filter	Effluent	85	6.9	62	32	2.0	46	-	10	10	2.5	0.56	1U	12	2.5	5.3	66	1.5	0.54	1U	11	1.3	5.2	59
Jan10, 2001	Melrose-IN	112205	Biofiltration Swale	Influent	100	6.9	44	21		38	-	15	14	3.4	0.62	2.4	27	12	4.8	260	0.83	0.2U	1.3	11	1.0	2.7	100
Jan10, 2001	Melrose-EFF	112205	Biofiltration Swale	Effluent	100	7.4	130	28	52	120	-	27	28	1.8	0.34	2.8	14	7.2	2.5	76	2.1	0.2U	1U	7.4	1.6	2U	31
Jan10, 2001	Palomar-IN	112206	Biofiltration Swale	Influent	NA	7.5	110	56	100	80	-	NA2	NA2	NA2	NA2	NA2	NA2	NA2	NA2	NA2	NA2	NA2	NA2	NA2	NA2	NA2	NA2
Jan10, 2001	Palomar-EFF	112206	Biofiltration Swale	Effluent	100	7.2	92	23	46	70	-	11	10	2.1	0.34	3.3	19	15	4.2	94	0.55	0.2U	4.6	8.4	4.1	2.5	26
Jan10, 2001	Carlsbad MS-IN	112207	Biostrip/Infiltration Trench	Influent	100	6.8	59	23	210	46	120	15	12	66	0.78	2.9	72	50	6.9	380	53	0.36	1.9	35	1.7	2.9	120
Jan10, 2001	Carlsbad MS-EFF	112207	Biostrip/Infiltration Trench	Effluent	100	7.3	95	42	40	74	-	14	12	12	0.2U	1.5	14	9.9	3.3	75	9.7	0.2U	1U	8.4	1.4	2U	36
Jan 26, 2001	SR56/I-5-IN	111101	Extended Detention Basin	Influent	100	7.8	140	39	76	82	-	9.2	6.8	0.5U	0.32	7.0	31	47	5.2	190	1.2	0.2U	4.2	7.2	4.0	2U	14
Jan 26, 2001	SR56/I-5-EFF	111101	Extended Detention Basin	Effluent	100	7.6	170	38	42	100	-	8.7	7.5	1.8	0.2U	4.3	12	22	3.0	59	1.2	0.2U	3.3	5.7	1U	2U	25
Jan 26, 2001	SR78/I-15-IN	111102	Extended Detention Basin	Influent	100	7.9	96	25	68	110	-	12	11	2.7	2.7	11	78	130	13	730	1.1	0.2U	1.6	7.7	1U	4.0	20
Jan 26, 2001	SR78/I-15-EFF	111102	Extended Detention Basin	Effluent	96	7.6	170	51	260	76	-	14	12	1.8	0.6	3.5	82	22	3.9	120	1.2	0.2U	2.4	8.4	1U	2.2	36
Jan 26, 2001	Manchester-IN	111105	Extended Detention Basin	Influent	100	7.3	82	22	170	66	-	12	9.7	3.0	1.9	12	82	87	13	570	0.73	0.2U	9.0	13	1.1	2.9	63
Jan 26, 2001	Manchester-EFF	111105	Extended Detention Basin	Effluent	100	6.9	100	32	48	66	-	11	9.4	2.5	0.77	8.4	26	31	5.0	150	1.7	0.2U	4.8	13	2.0	4.0	73
Jan 26, 2001	LaCosta Wet-IN	111104	Wet Basin	Influent	100	7.9	110	27	240	88	-	11	10	3.0	1.7	7.6	72	330	9.3	460	1.1	0.2U	2.0	38	2.8	2U	22
Jan 26, 2001	LaCosta Wet-EFF	111104	Wet Basin	Effluent	100	8.0	1800	550	12	1200	-	13	12	0.68	0.2U	1U	4.2	4.7	5.5	18	0.5U	0.2U	1U	3.6	1U	2.2	14
Jan 26, 2001	Kearny Mesa MS-IN	112201	Media Filter (Per/Zeolite)	Influent	100	7.2	75	17	180	44	39	13	12	48	1.0	5.8	90	54	8.0	740	46	0.22	4.5	27	2.1	2.7	140
Jan 26, 2001	Kearny Mesa MS-EFF	112201	Media Filter (Per/Zeolite)	Effluent	100	7.0	77	23	80	44	-	15	13	43	0.71	5.6	46	19	3.0	230	38	0.41	3.7	29	3.1	2U	130
Jan 26, 2001	Escondido MS-IN	112202	Sand Filter	Influent	100	6.9	85	22	140	62	52	23	23	1.7	1.5	4.0	25	20	6.2	390	0.75	0.61	1U	10	1.2	3.4	210
Jan 26, 2001	Escondido MS-EFF	112202	Sand Filter	Effluent	100	7.0	63	13	36	56	-	12	12	1.0	0.2U	2.5	6.4	3.8	2.6	37	0.63	0.2U	1U	2.0	1U	2U	15
Jan 26, 2001	LaCosta P&R-IN	112203	Sand Filter	Influent	100	6.4	54	12	100	36	-	17	12	0.98	0.36	2.3	12	36	3.6	150	0.5U	0.2U	1U	1.6	1.0	2U	21
Jan 26, 2001	LaCosta P&R-EFF	112203	Sand Filter	Effluent	100	7.0	81	34	6.0	50	-	12	12	0.75	0.2U	1U	3.2	1U	2U	11	0.5U	0.2U	1U	2.3	1U	2U	6
Jan 26, 2001	SR78/I-5-IN	112204	Sand Filter	Influent	100	6.8	35	5.0	180	26	-	12	8.9	2.5	0.59	2.2	23	19	4.9	330	2.5	0.2U	1U	4.7	1U	4.3	59
Jan 26, 2001	SR78/I-5-EFF	112204	Sand Filter	Effluent	100	7.1	60	10	4.0	34	-	8.9	8.3	1.0	0.2U	1U	5.3	1U	2U	27	0.88	0.2U	1U	3.5	1U	2U	21
Jan 26, 2001	Melrose-IN	112205	Biofiltration Swale	Influent	100	6.7	55	12	98	40	-	15	13	1.2	0.7	2.4	34	18	5.1	280	0.53	0.53	1.3	11	1.4	4.3	130
Jan 26, 2001	Melrose-EFF	112205	Biofiltration Swale	Effluent	100	6.5	87	16	34	88	-	24	21	1.1	0.2U	2.5	13	5.9	2.5	55	0.85	0.2U	2.1	4.3	1.8	2U	29
Jan 26, 2001	Palomar-IN	112206	Biofiltration Swale	Influent	100	7.4	88	25	96	62	-	12	10	2.5	0.72	5.5	32	61	6.9	190	2.4	0.2U	3.3	11	13	2U	48
Jan 26, 2001	Palomar-EFF	112206	Biofiltration Swale	Effluent	100	7.2	86	18	46	82	-	13	12	1.6	0.33	4.0	16	31	4.6	73	0.9	0.2U	2.9	9.6	3.6	2U	32
Jan 26, 2001	Carlsbad MS-IN	112207	Biostrip/Infiltration Trench	Influent	100	6.8	63	12	180	42	51	15	15	38	1.1	3.0	56	52	6.6	270	29	0.2U	1U	19	1U	3.2	94
Jan 26, 2001	Carlsbad MS-EFF	112207	Biostrip/Infiltration Trench	Effluent	100	7.1	58	6.9	52	34	-	11	10	2.1	0.2U	1.1	7.3	7.4	2U	64	2.0	0.2U	1U	1.9	1U	2U	38

Table 1-5a BMP Retrofit Pilot Study, Stormwater Lab Data - District 11 – (continued)

January 10, 2001 through January 26, 2001 (continued)

PRELIMINARY DATA

Sample Date	BMP Location	Site ID	BMP Type	Sampling Location	% Storm Capture	Nitrate-Nitrogen (mg/L)	TKN (mg/L)	Ammonia (mg/L)	Total P (mg/L)	TRPH (mg/L)	Organophosphate Pest. Diazinon (ug/L)	Organophosphate Pest. Chlorpyrifos (ug/L)	Dissolved Ortho - Phosphate (mg/L)	Fecal Coliform (MPN/100 ml)	TPH Diesel (µg/L)	TPH Gasoline (µg/L)	TPH Oil (µg/L)
Jan10, 2001	SR56/I-5-IN	111101	Extended Detention Basin	Influent	100	0.18	0.89	-	0.26	-	-	-	0.054	300	170	50U	1100
Jan10, 2001	SR56/I-5-EFF	111101	Extended Detention Basin	Effluent	99	0.17	0.88	-	0.26	-	-	-	0.10	3,300	100U	50U	560
Jan10, 2001	SR78/I-15-IN	111102	Extended Detention Basin	Influent	93	0.87	1.5	-	0.31	-	-	-	0.091	170	240	50U	1000
Jan10, 2001	SR78/I-15-EFF	111102	Extended Detention Basin	Effluent	100	0.85	1.1	-	0.20	-	-	-	0.11	900	340	50U	1400
Jan10, 2001	Manchester-IN	111105	Extended Detention Basin	Influent	98	0.48	1.5	-	0.44	-	-	-	0.96	500	460	50U	1300
Jan10, 2001	Manchester-EFF	111105	Extended Detention Basin	Effluent	99	0.53	1.6	-	0.23	-	-	-	0.094	5000	810	50U	7900
Jan10, 2001	LaCosta Wet-IN	111104	Wet Basin	Influent	99	1.4	1.7	0.45	0.32	-	-	-	0.08	2600	390	50U	1100
Jan10, 2001	LaCosta Wet-EFF	111104	Wet Basin	Effluent	100	0.24	1.4	0.1U	0.29	-	-	-	0.16	30	100U	50U	200U
Jan10, 2001	Kearny Mesa MS-IN	112201	Media Filter (Per/Zeolite)	Influent	100	0.65J	2.7	0.99	0.31	5U	0.26	0.05U	0.17	NA1	NA1	NA1	NA1
Jan10, 2001	Kearny Mesa MS-EFF	112201	Media Filter (Per/Zeolite)	Effluent	96	0.88J	1.9	-	0.20	-	-	-	0.16	NA1	NA1	NA1	NA1
Jan10, 2001	Escondido MS-IN	112202	Sand Filter	Influent	NA2	NA2	NA2	NA2	NA2	NA2	NA2	NA2	NA2	900	420	50U	430
Jan10, 2001	Escondido MS-EFF	112202	Sand Filter	Effluent	NA2	NA2	NA2	NA2	NA2	NA2	NA2	NA2	NA2	5000	360	50U	310
Jan10, 2001	LaCosta P&R-IN	112203	Sand Filter	Influent	100	0.35	2.8	0.64	0.40	-	-	-	0.19	80000	410	50U	800
Jan10, 2001	LaCosta P&R-EFF	112203	Sand Filter	Effluent	99	0.67	1.7	0.31	0.18		-	-	0.14	50	100U	50U	200U
Jan10, 2001	SR78/I-5-IN	112204	Sand Filter	Influent	100	0.20	2.2	0.55	0.33	-	-	-	0.15	240	730	50U	1200
Jan10, 2001	SR78/I-5-EFF	112204	Sand Filter	Effluent	85	0.63	1.4	0.48	0.17	-	-	-	0.15	130	100U	50U	250
Jan10, 2001	Melrose-IN	112205	Biofiltration Swale	Influent	100	0.48	1.3	-	0.20	-	-	-	0.04	50000	1400	100U	930
Jan10, 2001	Melrose-EFF	112205	Biofiltration Swale	Effluent	100	0.77	1.9	-	0.79	-	-	-	0.56	16000	100U	50U	200U
Jan10, 2001	Palomar-IN	112206	Biofiltration Swale	Influent	NA	-	1.5	-	0.31	-	-	-	-	900	690	50U	1400
Jan10, 2001	Palomar-EFF	112206	Biofiltration Swale	Effluent	100	-	1.2	-	0.30	-	-	-	-	240	500	50U	1900
Jan10, 2001	Carlsbad MS-IN	112207	Biostrip/Infiltration Trench	Influent	100	0.46	1.8	0.98	0.43	5U	0.01U	0.05U	0.095	16000	100	50U	680
Jan10, 2001	Carlsbad MS-EFF	112207	Biostrip/Infiltration Trench	Effluent	100	0.75	1.4	-	0.72	-	-	-	0.33	3000	100U	50U	310
Jan 26, 2001	SR56/I-5-IN	111101	Extended Detention Basin	Influent	100	0.55	1.4	-	0.34	-	-	-	0.052	NA1	NA1	NA1	NA1
Jan 26, 2001	SR56/I-5-EFF	111101	Extended Detention Basin	Effluent	100	0.47	1.4	-	0.078	-	-	-	0.054	NA1	NA1	NA1	NA1
Jan 26, 2001	SR78/I-15-IN	111102	Extended Detention Basin	Influent	100	0.91	2.7	-	1.0	-	-	-	0.074	500	280J	50U	930J
Jan 26, 2001	SR78/I-15-EFF	111102	Extended Detention Basin	Effluent	96	0.84	2.1	-	0.20	-	-	-	0.10	500	340J	50U	1200J
Jan 26, 2001	Manchester-IN	111105	Extended Detention Basin	Influent	100	0.9	2.2	-	0.38	-	-	-	0.098	NA1	NA1	NA1	NA1
Jan 26, 2001	Manchester-EFF	111105	Extended Detention Basin	Effluent	100	0.76	1.5	-	0.16	-	-	-	0.12	NA1	NA1	NA1	NA1
Jan 26, 2001	LaCosta Wet-IN	111104	Wet Basin	Influent	100	1.4	1.8	0.70	0.51	-	-	-	0.083	5000	380J	50U	990J
Jan 26, 2001	LaCosta Wet-EFF	111104	Wet Basin	Effluent	100	0.01U	2.3	0.29	0.28	-	-	-	0.079	240	100UJ	50U	250J
Jan 26, 2001	Kearny Mesa MS-IN	112201	Media Filter (Per/Zeolite)	Influent	100	0.67	2.9	0.97	0.37	5U	0.23	0.05U	0.11	NA1	NA1	NA1	NA1
Jan 26, 2001	Kearny Mesa MS-EFF	112201	Media Filter (Per/Zeolite)	Effluent	100	0.78	2.7	-	0.22	-	-	-	0.099	NA1	NA1	NA1	NA1
Jan 26, 2001	Escondido MS-IN	112202	Sand Filter	Influent	100	0.33	3.0	1.1	0.53	5U	0.01U	0.05U	0.24	1700	640J	50U	1900J
Jan 26, 2001	Escondido MS-EFF	112202	Sand Filter	Effluent	100	0.42	1.0	0.21	0.28	-	-	-	0.17	5000	100U	50U	200U
Jan 26, 2001	LaCosta P&R-IN	112203	Sand Filter	Influent	100	0.64	3.9	0.72	0.26	-	-	-	0.099	NA1	NA1	NA1	NA1
Jan 26, 2001	LaCosta P&R-EFF	112203	Sand Filter	Effluent	100	1.1	1.5	0.18	0.11	-	-	-	0.076	NA1	NA1	NA1	NA1
Jan 26, 2001	SR78/I-5-IN	112204	Sand Filter	Influent	100	0.52	2.6	1.5	0.42	-	-	-	0.11	NA1	NA1	NA1	NA1
Jan 26, 2001	SR78/I-5-EFF	112204	Sand Filter	Effluent	100	1.2	0.99	0.30	0.14	-	-	-	0.12	NA1	NA1	NA1	NA1
Jan 26, 2001	Melrose-IN	112205	Biofiltration Swale	Influent	100	0.73	2.9	-	0.12	-	-	-	0.036	5000	440J	50U	1400J
Jan 26, 2001	Melrose-EFF	112205	Biofiltration Swale	Effluent	100	0.68	2.0	-	0.53	-	-	-	0.35	NA1	NA1	NA1	NA1
Jan 26, 2001	Palomar-IN	112206	Biofiltration Swale	Influent	100	1.1	2.2	-	0.20	-	-	-	0.073	1600	390J	50U	1200J
Jan 26, 2001	Palomar-EFF	112206	Biofiltration Swale	Effluent	100	0.97	1.8	-	0.24	-	-	-	0.14	3000	170J	50U	680J
Jan 26, 2001	Carlsbad MS-IN	112207	Biostrip/Infiltration Trench	Influent	100	0.63	2.8	0.92	0.32	5U	0.01U	0.05U	0.065	30	810J	50U	870J
Jan 26, 2001	Carlsbad MS-EFF	112207	Biostrip/Infiltration Trench	Effluent	100	0.48	1.7	-	0.31	-	-	-	0.22	NA1	NA1	NA1	NA1

Table 1-5a BMP Retrofit Pilot Study, Stormwater Lab Data - District 11 – (continued)

February 10, 2001 through February 23, 2001

PRELIMINARY DATA

Sample Date	BMP Location	Site ID	BMP Type	Sampling Location	% Storm Capture	pH	Specific Conductance (umhos/cm)	Hardness (mg/L)	TSS (mg/L)	TDS (mg/L)	COD (mg/L)	TOC (mg/L)	DOC (mg/L)	Total (µg/L)							Dissolved (µg/L)						
														As	Cd	Cr	Cu	Pb	Ni	Zn	As	Cd	Cr	Cu	Pb	Ni	Zn
Feb 10, 2001	SR78/I-15-IN	111102	Extended Detention Basin	Influent	100	8.1	140	59	240	120	-	20	20	1.5	1	3.9	43	36	5.5	380	0.65	0.2U	1.6	10	1U	2U	21
Feb 10, 2001	SR78/I-15-EFF	111102	Extended Detention Basin	Effluent	100	7.9	160	65	66	130	-	19	19	1.0	0.28	2.3	18	13	2.4	83.0	0.65	0.2U	1U	9.3	1U	2U	21
Feb 10, 2001	Escondido MS-IN	112202	Sand Filter	Influent	100	6.8	79	45	150	70	160	23	23	1.6	0.73	1.5	14	13	2.7	240	0.63	0.2U	1U	7.9	1U	2U	160
Feb 10, 2001	Escondido MS-EFF	112202	Sand Filter	Effluent	100	7.0	98	49	28	100	-	19	19	0.90	0.26	1U	6.2	2.4	2U	21	0.53	0.2U	1U	4.0	1U	2U	8.9
Feb 10, 2001	SR78/I-5-IN	112204	Sand Filter	Influent	100	6.7	61	31	220	60	-	27	25	1.0	0.2U	1U	32	22	2U	480	0.53	0.2U	1U	7.3	1.0	2U	78
Feb 10, 2001	SR78/I-5-EFF	112204	Sand Filter	Effluent	100	7.0	96	53	6.0	84	-	21	20	0.73	0.2U	1U	8.9	1.1	2U	33	0.80	0.2U	1U	5.9	1U	2U	27
Feb 12, 2001	SR78/I-15-IN	111102	Extended Detention Basin	Influent	~60	8.1	93	53	130	62	-	8.4	8.4	2.7	0.89	4.9	41	75	7.3	620	0.5U	0.2U	1U	6.2	1U	2U	20
Feb 12, 2001	SR78/I-15-EFF	111102	Extended Detention Basin	Effluent	100	7.7	140	59	32	94	-	8.0	8.0	1.8	0.45	2.2	15	10	2U	72	0.80	0.2U	1U	8.1	5.2	2U	41
Feb 12, 2001	Manchester-IN	111105	Extended Detention Basin	Influent	100	7.5	99	53	94	38	-	12	9.8	3.0	1.5	6.7	62	65	8.2	440	0.58	0.2U	1.3	8.9	1U	2U	62
Feb 12, 2001	Manchester-EFF	111105	Extended Detention Basin	Effluent	100	7.1	83	310	38	74	-	7.8	7.8	2.2	0.35	1U	11	14	2U	75	0.5U	0.2U	1U	4.8	1U	2U	44
Feb 12, 2001	LaCosta Wet-IN	111104	Wet Basin	Influent	100	8.1	92	50	170	60	-	7.2	6.8	1.5	0.59	3.7	43	150	5.1	200	0.5U	0.2U	1U	6.5	3.4	2U	23
Feb 12, 2001	LaCosta Wet-EFF	111104	Wet Basin	Effluent	~88	8.0	1900	690	28	1300	-	11	10	0.5U	0.2U	1U	13	6.6	2.5	37	0.55	0.2U	1U	11	1.6	2.4	32
Feb 12, 2001	Kearny Mesa MS-IN	112201	Media Filter (Per/Zeolite)	Influent	100	7.3	83	40	170	60	120	13	13	90	0.95	12	110	97	5.3	640	39	0.2U	2.6	29	2.0	2U	120
Feb 12, 2001	Kearny Mesa MS-EFF	112201	Media Filter (Per/Zeolite)	Effluent	100	7.1	80	42	120	52	-	12	12	61	0.64	4.0	53	27	2.3	280	41	0.24	2.2	24	1.5	2U	110
Feb 12, 2001	Escondido MS-IN	112202	Sand Filter	Influent	100	6.8	45	30	54	22	45	12	12	1.5	0.2U	1.2	5.5	1U	2U	190	0.6	0.2U	1U	3	1U	2U	150
Feb 12, 2001	Escondido MS-EFF	112202	Sand Filter	Effluent	100	7.0	49	36	12	38	-	10	7.9	1.0	0.2U	1U	3.2	1.6	U2	14	0.5U	0.2U	1U	1.4	1U	2U	8.0
Feb 12, 2001	LaCosta P&R-IN	112203	Sand Filter	Influent	97	6.7	54	360	270	32	-	18	18	1.2	0.74	1.4	13	39	4.7	230	0.5U	0.2U	1U	2.3	1.1	2U	19
Feb 12, 2001	LaCosta P&R-EFF	112203	Sand Filter	Effluent	97	7.0	65	430	10	48	-	7.8	7.8	0.5U	0.2U	1U	1.8	1.2	2U	4.4	0.5U	0.2U	1U	1.4	1U	2U	2.6
Feb 12, 2001	SR78/I-5-IN	112204	Sand Filter	Influent	76	6.8	39	32	94	18	-	9.5	8.2	0.83	0.2U	1U	14	9.0	2U	140	0.5U	0.2U	1U	2.0	1U	2U	27
Feb 12, 2001	SR78/I-5-EFF	112204	Sand Filter	Effluent	100	7.0	44	40	18	18	-	7.5	5.2	0.78	0.2U	1U	4.9	1.2	2U	31	0.5U	0.2U	1U	5.0	1U	2U	10
Feb 12, 2001	Melrose-IN	112205	Biofiltration Swale	Influent	100	6.7	51	26	24	48	-	10	10	0.65	0.76	1.7	45	8.7	3.2	220	0.5U	0.40	1U	10	1.5	2.4	110
Feb 12, 2001	Melrose-EFF	112205	Biofiltration Swale	Effluent	100	6.8	76	40	110	140	-	11	11	0.93	0.2U	1.5	6.1	1.9	2U	26	0.68	0.2U	1U	4.5	1U	2U	22
Feb 12, 2001	Palomar-IN	112206	Biofiltration Swale	Influent	~88	7.5	72	32	200	42	-	6.5	6.5	1.7	0.96	6.4	43	97	6.3	260	0.5U	0.2U	6.0	7.3	1.8	2U	33
Feb 12, 2001	Palomar-EFF	112206	Biofiltration Swale	Effluent	98	7.2	76	71	52	62	-	7.5	7.3	1.2	0.54	7.1	18	48	2.9	94	0.5U	0.2U	5.0	5.9	2.7	2U	31
Feb 12, 2001	Carlsbad MS-IN	112207	Biostrip/Infiltration Trench	Influent	97	7.0	58	38	310	38	140	12	12	51	1.5	3.1	73	83	7.9	390	29	0.51	1U	18	1U	2U	62
Feb 12, 2001	Carlsbad MS-EFF	112207	Biostrip/Infiltration Trench	Effluent	100	7.2	76	32	36	56	-	14	6.8	5.1	0.2U	1U	8.9	7.4	2U	62	4.0	0.2U	1U	4.7	1U	2U	36
Feb 23, 2001	SR56/I-5-IN	111101	Extended Detention Basin	Influent	86	8.3	120	42	110	88	-	10	10	3.0	0.61	5.3	33	57	2.6	180	1.2	0.3	2.6	8.0	11	2U	29
Feb 23, 2001	SR56/I-5-EFF	111101	Extended Detention Basin	Effluent	100	7.7	170	48	26	120	-	10	10	1.8	0.53	3.1	15	25	2U	58	1.0	0.2U	1.9	6.5	1U	2U	22
Feb 23, 2001	SR78/I-15-IN	111102	Extended Detention Basin	Influent	~60	8.3	110	48	370	94	-	10	10	5.3	2.9	8.8	120	170	39	1100	2.4	0.2U	1.8	7.1	1U	2U	13
Feb 23, 2001	SR78/I-15-EFF	111102	Extended Detention Basin	Effluent	96	8.0	130	46	70	92	-	11	11	1.8	0.83	2.9	22	23	3.5	120	1.6	0.2U	1.2	7.7	1U	2U	21
Feb 23, 2001	Manchester-IN	111105	Extended Detention Basin	Influent	91	7.1	80	46	120	72	-	17	11	1.9	0.83	5.4	39	51	6.5	280	0.85	0.35	3.3	14	8.7	3.7	100
Feb 23, 2001	Manchester-EFF	111105	Extended Detention Basin	Effluent	100	6.7	80	50	76	76	-	16	8.9	3.4	0.83	4.1	28	35	5.0	190	0.60	0.62	1.9	12	6.5	3.1	140
Feb 23, 2001	Kearny Mesa MS-IN	112201	Media Filter (Per/Zeolite)	Influent	100	7.3	73	28	160	64	160	21	8.4	70	2.4	7.2	77	99	7.5	1000	47	0.28	1.5	30	1.1	2U	120
Feb 23, 2001	Kearny Mesa MS-EFF	112201	Media Filter (Per/Zeolite)	Effluent	100	7.2	82	34	80	68	-	26	11	52	0.67	2.8	49	23	2U	260	47	0.2U	1.2	22	1U	2U	120
Feb 23, 2001	LaCosta P&R-IN	112203	Sand Filter	Influent	98	6.4	35	36	66	34	-	15	11	0.5U	0.2U	1.1	7.9	22	2.7	120	0.5U	0.2U	1U	3.2	1.3	2U	28
Feb 23, 2001	LaCosta P&R-EFF	112203	Sand Filter	Effluent	100	6.6	46	210	1U	50	-	17	8.8	1.1	0.27	4.7	11	2.0	3.0	79	0.70	0.2U	1U	2.7	1U	2U	7.6
Feb 23, 2001	SR78/I-5-IN	112204	Sand Filter	Influent	100	6.8	57	34	42	32	-	18	9.2	0.83	0.75	5.0	29	10	9.3	470	0.55	0.2U	1U	3.1	1U	2U	52
Feb 23, 2001	SR78/I-5-EFF	112204	Sand Filter	Effluent	100	7.0	74	28	1U	54	-	17	10	0.58	0.2U	1U	4.3	1U	2U	29	2.4	0.2U	1U	3.4	1U	2U	23
Feb 23, 2001	Melrose-IN	112205	Biofiltration Swale	Influent	100	6.9	49	44	52	28	-	10	10	0.60	0.60	2.1	23	12	2.6	210	0.5U	0.25	1U	8.6	1.4	2U	120
Feb 23, 2001	Melrose-EFF	112205	Biofiltration Swale	Effluent	100	6.9	76	40	12	62	-	21	21	0.50	0.2U	1.8	8.2	2.9	2U	31	0.53	0.2U	1U	3.6	1U	2U	20
Feb 23, 2001	Palomar-IN	112206	Biofiltration Swale	Influent	100	8.1	100	48	100	82	-	13	13	1.9	0.53	5.8	37	73	4.0	210	0.63	0.2U	3.4	13	1U	2U	36
Feb 23, 2001	Palomar-EFF	112206	Biofiltration Swale	Effluent	100	7.4	100	42	44	110	-	17	12	1.3	0.57	4.8	25	42	2.4	110	0.58	0.2U	3.0	13	1.3	2U	35
Feb 23, 2001	Carlsbad MS-IN	112207	Biostrip/Infiltration Trench	Influent	100	7.1	65	42	390	60	140	19	12	48	1.8	5.3	60	97	11	350	33	0.2U	1U	13	5.2	2U	74
Feb 23, 2001	Carlsbad MS-EFF	112207	Biostrip/Infiltration Trench	Effluent	100	7.3	87	30	46	78	-	19	12	8.0	0.2U	1.1	11	10	2U	74	6.4	0.2U	1U	3.9	1U	2U	34

Table 1-5a BMP Retrofit Pilot Study, Stormwater Lab Data - District 11 – (continued)

February 10, 2001 through February 23, 2001 (continued)

PRELIMINARY DATA

Sample Date	BMP Location	Site ID BMP Type	Sampling Location	% Storm Capture	Nitrate-Nitrogen (mg/L)	TKN (mg/L)	Ammonia (mg/L)	Total P (mg/L)	TRPH (mg/L)	Organophosphate Pest. Diazinon (ug/L)	Organophosphate Pest. Chlorpyrifos (ug/L)	Dissolved Ortho - Phosphate (mg/L)	Fecal Coliform (MPN/100 ml)	TPH Diesel (µg/L)	TPH Gasoline (µg/L)	TPH Oil (µg/L)
Feb 10, 2001	SR78/I-15-IN	111102 Extended Detention Basin	Influent	100	0.62	1.2	-	0.67	-	-	-	0.045	NA1	NA1	NA1	NA1
Feb 10, 2001	SR78/I-15-EFF	111102 Extended Detention Basin	Effluent	100	0.38	0.88	-	0.10	-	-	-	0.069	NA1	NA1	NA1	NA1
Feb 10, 2001	Escondido MS-IN	112202 Sand Filter	Influent	100	0.45	1.5	-	0.77	-	-	-	0.066	NA1	NA1	NA1	NA1
Feb 10, 2001	Escondido MS-EFF	112202 Sand Filter	Effluent	100	2.3	0.45	-	0.13	-	-	-	0.035	NA1	NA1	NA1	NA1
Feb 10, 2001	SR78/I-5-IN	112204 Sand Filter	Influent	100	0.65	0.98	0.47	0.21	-	-	-	0.067	NA1	NA1	NA1	NA1
Feb 10, 2001	SR78/I-5-EFF	112204 Sand Filter	Effluent	100	NA2	2.2	0.32	0.85	-	-	-	NA2	NA1	NA1	NA1	NA1
Feb 12, 2001	SR78/I-15-IN	111102 Extended Detention Basin	Influent	~60	0.35	2.1	1.3	0.38	5U	0.026	0.05U	0.11	NA1	NA1	NA1	NA1
Feb 12, 2001	SR78/I-15-EFF	111102 Extended Detention Basin	Effluent	100	0.46	1.8	-	0.23	-	-	-	0.086	NA1	NA1	NA1	NA1
Feb 12, 2001	Manchester-IN	111105 Extended Detention Basin	Influent	100	0.13	0.88	0.34	0.17	5U	0.01U	0.05U	0.049	110	230J	50U	1500J
Feb 12, 2001	Manchester-EFF	111105 Extended Detention Basin	Effluent	100	0.17	2.4	0.13	0.12	-	-	-	0.044	15	110J	50U	430J
Feb 12, 2001	LaCosta Wet-IN	111104 Wet Basin	Influent	100	0.27	2.6	0.58	0.39	-	-	-	0.095	NA1	NA1	NA1	NA1
Feb 12, 2001	LaCosta Wet-EFF	111104 Wet Basin	Effluent	~88	0.42	0.71	0.12	0.22	-	-	-	0.074	NA1	NA1	NA1	NA1
Feb 12, 2001	Kearny Mesa MS-IN	112201 Media Filter (Per/Zeolite)	Influent	100	0.15	1.3	0.62	0.19	-	-	-	0.082	NA1	NA1	NA1	NA1
Feb 12, 2001	Kearny Mesa MS-EFF	112201 Media Filter (Per/Zeolite)	Effluent	100	0.28	0.50	0.19	0.11	-	-	-	0.072	NA1	NA1	NA1	NA1
Feb 12, 2001	Escondido MS-IN	112202 Sand Filter	Influent	100	0.49	1.7	-	0.099	-	-	-	0.014	3000	1100J	50U	5600J
Feb 12, 2001	Escondido MS-EFF	112202 Sand Filter	Effluent	100	0.28	1.1	-	0.32	-	-	-	0.25	50	380J	50U	370J
Feb 12, 2001	LaCosta P&R-IN	112203 Sand Filter	Influent	97	0.32	1.3	-	0.40	-	-	-	0.11	110	110J	50U	930J
Feb 12, 2001	LaCosta P&R-EFF	112203 Sand Filter	Effluent	97	0.34	0.89	-	0.25	-	-	-	0.16	70	100UJ	50U	680J
Feb 12, 2001	SR78/I-5-IN	112204 Sand Filter	Influent	76	0.25	1.6	0.70	0.65	5U	0.016	0.05U	0.071	3000	870J	50U	1300J
Feb 12, 2001	SR78/I-5-EFF	112204 Sand Filter	Effluent	100	0.26	0.81	-	0.28	-	-	-	0.16	50	140J	50U	310J
Feb 12, 2001	Melrose-IN	112205 Biofiltration Swale	Influent	100	0.28	0.95	-	0.23	-	-	-	0.047	NA1	NA1	NA1	NA1
Feb 12, 2001	Melrose-EFF	112205 Biofiltration Swale	Effluent	100	0.22	0.69	-	0.13	-	-	-	0.040	NA1	NA1	NA1	NA1
Feb 12, 2001	Palomar-IN	112206 Biofiltration Swale	Influent	~88	0.81	2.0	-	1.3	-	-	-	0.064	NA1	NA1	NA1	NA1
Feb 12, 2001	Palomar-EFF	112206 Biofiltration Swale	Effluent	98	0.50	1.1	-	0.22	-	-	-	0.071	NA1	NA1	NA1	NA1
Feb 12, 2001	Carlsbad MS-IN	112207 Biostrip/Infiltration Trench	Influent	97	0.51	1.5	-	0.20	-	-	-	0.068	NA1	NA1	NA1	NA1
Feb 12, 2001	Carlsbad MS-EFF	112207 Biostrip/Infiltration Trench	Effluent	100	0.26	1.3	-	0.17	-	-	-	0.035	NA1	NA1	NA1	NA1
Feb 23, 2001	SR56/I-5-IN	111101 Extended Detention Basin	Influent	86	0.32	1.6	0.88	0.45	5U	0.01U	0.05U	0.11	NA1	NA1	NA1	NA1
Feb 23, 2001	SR56/I-5-EFF	111101 Extended Detention Basin	Effluent	100	0.62	1.4	-	0.23	-	-	-	0.081	NA1	NA1	NA1	NA1
Feb 23, 2001	SR78/I-15-IN	111102 Extended Detention Basin	Influent	~60	0.22	2.6	0.38	0.29	-	-	-	0.074	NA1	NA1	NA1	NA1
Feb 23, 2001	SR78/I-15-EFF	111102 Extended Detention Basin	Effluent	96	0.34	0.56	0.1U	0.059	-	-	-	0.083	NA1	NA1	NA1	NA1
Feb 23, 2001	Manchester-IN	111105 Extended Detention Basin	Influent	91	0.20	1.3	0.44	0.27	-	-	-	0.060	NA1	NA1	NA1	NA1
Feb 23, 2001	Manchester-EFF	111105 Extended Detention Basin	Effluent	100	0.63	0.58	0.1U	0.14	-	-	-	0.072	NA1	NA1	NA1	NA1
Feb 23, 2001	Kearny Mesa MS-IN	112201 Media Filter (Per/Zeolite)	Influent	100	0.44	1.8	-	0.16	-	-	-	0.025	NA1	NA1	NA1	NA1
Feb 23, 2001	Kearny Mesa MS-EFF	112201 Media Filter (Per/Zeolite)	Effluent	100	0.42	1.1	-	0.41	-	-	-	0.29	NA1	NA1	NA1	NA1
Feb 23, 2001	LaCosta P&R-IN	112203 Sand Filter	Influent	98	0.49	1.4	-	0.34	-	-	-	0.11	NA1	NA1	NA1	NA1
Feb 23, 2001	LaCosta P&R-EFF	112203 Sand Filter	Effluent	100	0.50	1.2	-	0.39	-	-	-	0.17	NA1	NA1	NA1	NA1
Feb 23, 2001	SR78/I-5-IN	112204 Sand Filter	Influent	100	0.22	1.6	0.54	0.53	5U	0.01U	0.05U	0.076	NA1	NA1	NA1	NA1
Feb 23, 2001	SR78/I-5-EFF	112204 Sand Filter	Effluent	100	0.16	0.77	-	0.26	-	-	-	0.15	NA1	NA1	NA1	NA1
Feb 23, 2001	Melrose-IN	112205 Biofiltration Swale	Influent	100	0.62	1.2	-	0.67	-	-	-	0.045	NA1	NA1	NA1	NA1
Feb 23, 2001	Melrose-EFF	112205 Biofiltration Swale	Effluent	100	0.38	0.88	-	0.10	-	-	-	0.069	NA1	NA1	NA1	NA1
Feb 23, 2001	Palomar-IN	112206 Biofiltration Swale	Influent	100	0.45	1.5	-	0.77	-	-	-	0.066	NA1	NA1	NA1	NA1
Feb 23, 2001	Palomar-EFF	112206 Biofiltration Swale	Effluent	100	2.3	0.45	-	0.13	-	-	-	0.035	NA1	NA1	NA1	NA1
Feb 23, 2001	Carlsbad MS-IN	112207 Biostrip/Infiltration Trench	Influent	100	0.65	0.98	0.47	0.21	-	-	-	0.067	NA1	NA1	NA1	NA1
Feb 23, 2001	Carlsbad MS-EFF	112207 Biostrip/Infiltration Trench	Effluent	100	NA2	2.2	0.32	0.85	-	-	-	NA2	NA1	NA1	NA1	NA1

Table 1-5a BMP Retrofit Pilot Study, Stormwater Lab Data - District 11 – (continued)

February 25, 2001 through April 7, 2001

PRELIMINARY DATA

Sample Date	BMP Location	Site ID	BMP Type	Sampling Location	% Storm Capture	pH	Specific Conductance (umhos/cm)	Hardness (mg/L)	TSS (mg/L)	TDS (mg/L)	COD (mg/L)	TOC (mg/L)	DOC (mg/L)	Total (µg/L)							Dissolved (µg/L)						
														As	Cd	Cr	Cu	Pb	Ni	Zn	As	Cd	Cr	Cu	Pb	Ni	Zn
Feb 25, 2001	LaCosta Wet-IN	111104	Wet Basin	Influent	98	7.4	90	48	68	62	-	15	22	1.2	1.0	9.7	77	290	8.1	270	0.53	0.2U	1.5	8.4	1.8	2.0	34
Feb 25, 2001	LaCosta Wet-EFF	111104	Wet Basin	Effluent	100	7.6	1100	390	2.0	680	-	13	7.6	0.5U	0.35	1U	7.0	8.6	4.3	37	0.68	0.2U	1U	5.7	4.2	3.7	30
Feb 25, 2001	Escondido MS-IN	112202	Sand Filter	Influent	90	6.7	43	38	34	34	32	14	14	0.5U	0.53	1.4	5.9	4.8	2U	310	0.53	0.44	1U	2.9	1.1	2U	260
Feb 25, 2001	Escondido MS-EFF	112202	Sand Filter	Effluent	100	6.6	34	28	1U		-	13	12	0.5U	0.2U	1U	2.7	1U	2U	13	0.5U	0.2U	1U	1.9	1U	2U	8.8
Mar 6, 2001	SR56/I-5-IN	111101	Extended Detention Basin	Influent	100	7.7	76	29	94	52	-	5.6	3.1	2.0	0.54	3.0	51	66	4.6	260	0.83	0.2U	1U	3.9	1U	2U	7.5
Mar 6, 2001	SR56/I-5-EFF	111101	Extended Detention Basin	Effluent	100	7.5	180	50	16	120	-	7.0	4.4	1.2	0.2U	1.3	7.1	7.2	2U	29	0.63	0.2U	1U	3.9	1U	2U	10
Mar 6, 2001	SR78/I-15-IN	111102	Extended Detention Basin	Influent	100	7.9	100	41	200	80	-	9.2	4.8	2.0	1.4	5.5	44	270	7.8	510	0.53	0.2U	1.1	6.4	1U	2U	22
Mar 6, 2001	SR78/I-15-EFF	111102	Extended Detention Basin	Effluent	100	7.4	110	44	26	82	-	13	4.4	1.5	0.2U	1.4	11	8.1	2.4	68	1.1	0.2U	1U	7.1	1.7	2U	32
Mar 6, 2001	Manchester-IN	111105	Extended Detention Basin	Influent	100	7.1	58	26	76	44	-	11	9.8	1.6	0.57	2.5	27	35	4.6	220	0.58	0.47	1U	7.9	1U	2U	45
Mar 6, 2001	Manchester-EFF	111105	Extended Detention Basin	Effluent	100	6.9	77	52	18	54	-	11	7.6	0.95	0.33	1.6	21	13	4.2	100	0.70	0.2U	1U	12	4.8	3.2	73
Mar 6, 2001	LaCosta Wet-IN	111104	Wet Basin	Influent	100	7.5	80	41	110	64	-	530	483	1.6	0.63	12	35	450	5.3	190	0.78	0.2U	6.0	7.5	2.1	2U	30
Mar 6, 2001	LaCosta Wet-EFF	111104	Wet Basin	Effluent	100	7.7	760	380	1U	530	-	11	10	0.63	0.2U	1U	3.4	2.4	3.1	21	0.5U	0.2U	1U	2.2	1U	2.9	13
Mar 6, 2001	Kearny Mesa MS-IN	112201	Media Filter (Per/Zeolite)	Influent	100	7.0	66	21	130	50	76	11	5.7	88	1.1	3.2	65	35	3.4	360	41	0.2U	1.3	27	1U	2U	110
Mar 6, 2001	Kearny Mesa MS-EFF	112201	Media Filter (Per/Zeolite)	Effluent	100	7.0	66	21	66	54	-	10	7.3	61	0.44	2.3	49	16	2.8	230	44	0.2U	1.1	22	1U	2U	92
Mar 6, 2001	Escondido MS-IN	112202	Sand Filter	Influent	100	6.8	36	14	110	46	66	12	5.5	1.4	1.4	3.2	14	11	4.0	470	0.5U	0.21	1U	3.7	1U	2U	230
Mar 6, 2001	Escondido MS-EFF	112202	Sand Filter	Effluent	100	6.9	40	20	4.0	50	-	8.0	5.3	0.58	0.2U	1U	3.1	1U	2U	16	0.5U	0.2U	1U	2.0	1U	2U	9.5
Mar 6, 2001	LaCosta P&R-IN	112203	Sand Filter	Influent	100	6.7	43	24	30	36	-	18	12	0.93	0.31	1U	5.9	12	2.3	67	1.0	0.2U	1U	3.0	1U	2U	16
Mar 6, 2001	LaCosta P&R-EFF	112203	Sand Filter	Effluent	100	7.0	73	38	1U	56	-	15	8.3	1.7	0.2U	1U	3.3	1U	2U	11	0.58	0.2U	1U	2.6	1U	2U	7.3
Mar 6, 2001	SR78/I-5-IN	112204	Sand Filter	Influent	100	6.8	34	22	90	24	-	19	14	0.90	0.40	1.3	13	7.6	2.7	270	0.63	0.2U	1U	11	2.6	2U	80
Mar 6, 2001	SR78/I-5-EFF	112204	Sand Filter	Effluent	100	6.9	65	38	4.0	48	-	13	7.5	1.6	0.2U	1U	5.9	1U	2.2	42	0.5U	0.2U	1U	4.6	1U	2U	26
Mar 6, 2001	Palomar-IN	112206	Biofiltration Swale	Influent	100	7.2	72	29	42	58	-	7.8	5.4	1.0	0.70	1.8	16	21	2.9	100	0.50	0.2U	1U	7.3	1U	2U	33
Mar 6, 2001	Palomar-EFF	112206	Biofiltration Swale	Effluent	100	7.1	72	29	24	72	-	11	5.6	0.95	0.26	1.7	9.6	10	2.1	54	0.5U	0.30	1.4	7.3	2.5	2U	34
Mar 6, 2001	Carlsbad MS-IN	112207	Biostrip/Infiltration Trench	Influent	100	6.8	59	21	54	28	79	15	7.1	52	0.55	2.8	42	19	4.3	170	44	0.2U	1U	25	1U	2.2	83
Mar 6, 2001	Carlsbad MS-EFF	112207	Biostrip/Infiltration Trench	Effluent	100	7.2	88	29	16	74	-	11	6.1	15	0.2U	1U	11	3.2	2U	37	15	0.2U	1U	8.3	1U	2U	20
Apr 7, 2001	SR56/I-5-IN	111101	Extended Detention Basin	Influent	100	7.8	190	54	92	140	-	15	13	3.2	1.1	7.0	46	38	4.8	390	1.2	0.25	3.1	12	1U	2U	22
Apr 7, 2001	SR56/I-5-EFF	111101	Extended Detention Basin	Effluent	100	7.3	180	54	22	180	-	16	15	2.7	0.2U	3.5	22	8.1	2U	55	1.2	0.2U	2.3	12	1U	3.2	25
Apr 7, 2001	SR78/I-15-IN	111102	Extended Detention Basin	Influent	~60	7.6	120	43	250	130	-	16	16	2.5	1.3	6.6	64	50	11	830	1.2	0.2U	2.0	12	1U	2.6	50
Apr 7, 2001	SR78/I-15-EFF	111102	Extended Detention Basin	Effluent	100	7.6	120	49	32	110	-	14	14	1.5	0.32	2.9	26	14	4.3	150	0.80	0.21	1.7	14	2.4	2U	69
Apr 7, 2001	Manchester-IN	111105	Extended Detention Basin	Influent	100	7.3	140	39	280	150	-	36	27	3.7	3.0	12	120	130	16	1200	0.90	0.2U	7.0	35	1.7	5.2	170
Apr 7, 2001	Manchester-EFF	111105	Extended Detention Basin	Effluent	100	7.0	150	49	100	150	-	30	28	3.0	1.6	7.6	65	38	9.3	390	1.1	0.48	4.1	33	1U	6.0	190
Apr 7, 2001	LaCosta Wet-IN	111104	Wet Basin	Influent	100	7.5	160	55	270	140	-	25	24	2.7	1.9	9.5	200	320	18	850	0.88	0..25	2.6	23	2.7	3.9	62
Apr 7, 2001	LaCosta Wet-EFF	111104	Wet Basin	Effluent	100	7.8	2700	1000	18	1900	-	27	27	0.5U	0.2U	1U	6.6	2.4	11	37	0.5U	0.2U	1U	5.0	1U	9.9	41
Apr 7, 2001	Kearny Mesa MS-IN	112201	Media Filter (Per/Zeolite)	Influent	100	6.6	93	33	130	96	80	22	20	91	2.4	7.4	210	64	28	1500	67	0.24	1.8	60	1.6	4.8	290
Apr 7, 2001	Kearny Mesa MS-EFF	112201	Media Filter (Per/Zeolite)	Effluent	98	6.8	96	25	210	80	-	26	21	78	1.5	4.4	110	52	8.1	730	65	0.93	1.7	48	1.9	2.6	270
Apr 7, 2001	Escondido MS-IN	112202	Sand Filter	Influent	<100	6.3	52	24	90	54	68	19	19	0.90	1.3	1.5	38	12	3.7	530	0.5U	0.63	1U	7.6	1.5	2U	340
Apr 7, 2001	Escondido MS-EFF	112202	Sand Filter	Effluent	100	6.7	63	28	12	100	-	17	16	0.60	0.2U	1U	8.2	1.7	2U	35	0.5U	0.2U	1U	5.6	1U	2U	26
Apr 7, 2001	LaCosta P&R-IN	112203	Sand Filter	Influent	100	6.0	147	51	82	130	-	49	48	1.4	0.2U	1.6	21	27	5.2	270	1.2	0.2U	1U	9.2	3.1	2.0	100
Apr 7, 2001	LaCosta P&R-EFF	112203	Sand Filter	Effluent	100	7.0	200	87	1U	180	-	77	74	2.2	0.2U	1U	9.1	1U	2.7	24	1.9	0.2U	1U	9.5	1U	2.0	18
Apr 7, 2001	SR78/I-5-IN	112204	Sand Filter	Influent	100	7.1	350	77	170	230	-	32	32	1.6	1.2	4.6	52	12	12	960	1.0	0.2U	1U	12	1.5	4.4	200
Apr 7, 2001	SR78/I-5-EFF	112204	Sand Filter	Effluent	100	7.2	360	93	10	250	-	26	26	1.2	0.48	1U	13	1.0	7.4	97	1.1	0.2U	1U	12	1U	5.8	83
Apr 7, 2001	Melrose-IN	112205	Biofiltration Swale	Influent	100	6.3	79	20	60	68	-	27	21	1.3	0.57	2.1	31	9.6	5.6	330	0.65	0.29	1.1	18	1U	4.5	320
Apr 7, 2001	Melrose-EFF	112205	Biofiltration Swale	Effluent	100	7.0	110	31	40	94	-	17	17	0.98	0.67	2.2	13	4.0	2U	64	1.2	0.2U	1.2	6.7	1U	2U	22
Apr 7, 2001	Palomar-IN	112206	Biofiltration Swale	Influent	100	7.2	130	35	120	110	-	27	23	1.5	1.2	9.2	63	58	9.6	430	0.50	0.2U	6.6	28	1.9	4.5	130
Apr 7, 2001	Palomar-EFF	112206	Biofiltration Swale	Effluent	100	6.9	140	32	32	120	-	22	22	1.1	0.73	7.6	32	23	5.2	130	0.60	0.2U	5.8	20	2.1	2.5	72
Apr 7, 2001	Carlsbad MS-IN	112207	Biostrip/Infiltration Trench	Influent	100	6.5	210	43	170	180	180	46	43	53	1.8	3.5	110	29	14	680	43	0.87	2.0	81	1.7	9.7	490
Apr 7, 2001	Carlsbad MS-EFF	112207	Biostrip/Infiltration Trench	Effluent	100	6.6	120	29	NA1	NA1	-	35	34	13	0.2U	1.3	15	4.6	2.9	150	14	0.2U	1U	14	1.2	2.2	120

Table 1-5a BMP Retrofit Pilot Study, Stormwater Lab Data - District 11– (continued)

February 25, 2001 through April 7, 2001 (continued)

PRELIMINARY DATA

Sample Date	BMP Location	Site ID	BMP Type	Sampling Location	% Storm Capture	Nitrate-Nitrogen (mg/L)	TKN (mg/L)	Ammonia (mg/L)	Total P (mg/L)	TRPH (mg/L)	Organophosphate Pest. Diazinon (ug/L)	Organophosphate Pest. Chlorpyrifos (ug/L)	Dissolved Ortho - Phosphate (mg/L)	Fecal Coliform (MPN/100 ml)	TPH Diesel (µg/L)	TPH Gasoline (µg/L)	TPH Oil (µg/L)
Feb 25, 2001	LaCosta Wet-IN	111104	Wet Basin	Influent	98	0.22	0.87	-	0.35	-	-	-	0.046	NA1	NA1	NA1	NA1
Feb 25, 2001	LaCosta Wet-EFF	111104	Wet Basin	Effluent	100	0.18	0.57	-	0.044	-	-	-	0.047	NA1	NA1	NA1	NA1
Feb 25, 2001	Escondido MS-IN	112202	Sand Filter	Influent	90	1.20	1.4	-	0.94	-	-	-	0.12	NA1	NA1	NA1	NA1
Feb 25, 2001	Escondido MS-EFF	112202	Sand Filter	Effluent	100	0.56	1.1	-	0.15	-	-	-	0.11	NA1	NA1	NA1	NA1
Mar 6, 2001	SR56/I-5-IN	111101	Extended Detention Basin	Influent	100	0.48	1.4	-	0.18	-	-	-	0.074	NA1	NA1	NA1	NA1
Mar 6, 2001	SR56/I-5-EFF	111101	Extended Detention Basin	Effluent	100	0.25	0.58	-	0.091	-	-	-	0.036	NA1	NA1	NA1	NA1
Mar 6, 2001	SR78/I-15-IN	111102	Extended Detention Basin	Influent	100	0.64	1.1	0.51	0.36	-	-	-	0.075	NA1	NA1	NA1	NA1
Mar 6, 2001	SR78/I-15-EFF	111102	Extended Detention Basin	Effluent	100	0.082	1.1	0.10	0.50	-	-	-	0.37	NA1	NA1	NA1	NA1
Mar 6, 2001	Manchester-IN	111105	Extended Detention Basin	Influent	100	0.29	1.8	1.1	0.23	5U	0.25	0.05U	0.12	NA1	NA1	NA1	NA1
Mar 6, 2001	Manchester-EFF	111105	Extended Detention Basin	Effluent	100	0.51	1.4	-	0.16	-	-	-	0.11	NA1	NA1	NA1	NA1
Mar 6, 2001	LaCosta Wet-IN	111104	Wet Basin	Influent	100	0.22	1.2	0.43	0.17	5U	0.01U	0.05U	0.036	NA1	NA1	NA1	NA1
Mar 6, 2001	LaCosta Wet-EFF	111104	Wet Basin	Effluent	100	0.57	0.37	0.10	0.059	-	-	-	0.045	NA1	NA1	NA1	NA1
Mar 6, 2001	Kearny Mesa MS-IN	112201	Media Filter (Per/Zeolite)	Influent	100	0.20	2.1	0.51	0.16	-	-	-	0.058	NA1	NA1	NA1	NA1
Mar 6, 2001	Kearny Mesa MS-EFF	112201	Media Filter (Per/Zeolite)	Effluent	100	0.76	0.88	1.2	0.067	-	-	-	0.075	NA1	NA1	NA1	NA1
Mar 6, 2001	Escondido MS-IN	112202	Sand Filter	Influent	100	0.21	1.7	0.65	1.5	-	-	-	0.095	NA1	NA1	NA1	NA1
Mar 6, 2001	Escondido MS-EFF	112202	Sand Filter	Effluent	100	0.63	0.57	1.3	0.11	-	-	-	0.074	NA1	NA1	NA1	NA1
Mar 6, 2001	LaCosta P&R-IN	112203	Sand Filter	Influent	100	0.39	1.3	-	0.15	-	-	-	0.078	NA1	NA1	NA1	NA1
Mar 6, 2001	LaCosta P&R-EFF	112203	Sand Filter	Effluent	100	0.41	1.0	-	0.19	-	-	-	0.14	NA1	NA1	NA1	NA1
Mar 6, 2001	SR78/I-5-IN	112204	Sand Filter	Influent	100	0.28	1.6	0.86	0.17	5U	0.01U	0.05U	0.071	NA1	NA1	NA1	NA1
Mar 6, 2001	SR78/I-5-EFF	112204	Sand Filter	Effluent	100	0.22	0.97	-	0.21	-	-	-	0.17	NA1	NA1	NA1	NA1
Mar 6, 2001	Palomar-IN	112206	Biofiltration Swale	Influent	100	0.74	2.2	-	0.19	-	-	-	0.08	NA1	NA1	NA1	NA1
Mar 6, 2001	Palomar-EFF	112206	Biofiltration Swale	Effluent	100	0.73	1.2	-	0.14	-	-	-	0.12	NA1	NA1	NA1	NA1
Mar 6, 2001	Carlsbad MS-IN	112207	Biostrip/Infiltration Trench	Influent	100	1.7	2.9	-	0.65	-	-	-	0.087	NA1	NA1	NA1	NA1
Mar 6, 2001	Carlsbad MS-EFF	112207	Biostrip/Infiltration Trench	Effluent	100	1.2	2.6	-	0.13	-	-	-	0.12	NA1	NA1	NA1	NA1
Apr 7, 2001	SR56/I-5-IN	111101	Extended Detention Basin	Influent	100	1.5	2.6	-	0.60	-	-	-	0.20	NA1	NA1	NA1	NA1
Apr 7, 2001	SR56/I-5-EFF	111101	Extended Detention Basin	Effluent	100	0.97	4.4	-	0.27	-	-	-	0.026	NA1	NA1	NA1	NA1
Apr 7, 2001	SR78/I-15-IN	111102	Extended Detention Basin	Influent	~60	2.7	3.2	1.1	0.37	-	-	-	0.19	NA1	NA1	NA1	NA1
Apr 7, 2001	SR78/I-15-EFF	111102	Extended Detention Basin	Effluent	100	1.5	2.3	0.19	0.21	-	-	-	0.074	NA1	NA1	NA1	NA1
Apr 7, 2001	Manchester-IN	111105	Extended Detention Basin	Influent	100	1.6	3.2	1.2	0.19	5U	0.084	0.05U	0.097	NA1	NA1	NA1	NA1
Apr 7, 2001	Manchester-EFF	111105	Extended Detention Basin	Effluent	100	1.0	2.6	-	0.16	-	-	-	0.099	NA1	NA1	NA1	NA1
Apr 7, 2001	LaCosta Wet-IN	111104	Wet Basin	Influent	100	0.51	2.1	0.49	0.15	5U	0.036	0.05U	0.016	NA1	NA1	NA1	NA1
Apr 7, 2001	LaCosta Wet-EFF	111104	Wet Basin	Effluent	100	1.3	2.7	0.18	0.079	-	-	-	0.083	NA1	NA1	NA1	NA1
Apr 7, 2001	Kearny Mesa MS-IN	112201	Media Filter (Per/Zeolite)	Influent	100	2.0	4.7	1.2	0.37	-	-	-	0.26	NA1	NA1	NA1	NA1
Apr 7, 2001	Kearny Mesa MS-EFF	112201	Media Filter (Per/Zeolite)	Effluent	98	2.3	2.6	0.32	0.20	-	-	-	0.19	NA1	NA1	NA1	NA1
Apr 7, 2001	Escondido MS-IN	112202	Sand Filter	Influent	<100	1.5	7.5	3.2	1.7	-	-	-	0.58	NA1	NA1	NA1	NA1
Apr 7, 2001	Escondido MS-EFF	112202	Sand Filter	Effluent	100	2.5	3.9	1.7	0.53	-	-	-	0.34	NA1	NA1	NA1	NA1
Apr 7, 2001	LaCosta P&R-IN	112203	Sand Filter	Influent	100	1.5	2.8	-	0.089	-	-	-	0.052	NA1	NA1	NA1	NA1
Apr 7, 2001	LaCosta P&R-EFF	112203	Sand Filter	Effluent	100	0.94	2.0	-	0.40	-	-	-	0.35	NA1	NA1	NA1	NA1
Apr 7, 2001	SR78/I-5-IN	112204	Sand Filter	Influent	100	1.4	2.9	-	0.21	-	-	-	0.15	NA1	NA1	NA1	NA1
Apr 7, 2001	SR78/I-5-EFF	112204	Sand Filter	Effluent	100	1.5	3.6	-	0.34	-	-	-	0.28	NA1	NA1	NA1	NA1
Apr 7, 2001	Melrose-IN	112205	Biofiltration Swale	Influent	100	2.4	2.3	1.3	0.34	5U	0.023	0.05U	0.14	NA1	NA1	NA1	NA1
Apr 7, 2001	Melrose-EFF	112205	Biofiltration Swale	Effluent	100	1.0	3.9	-	0.26	-	-	-	0.26	NA1	NA1	NA1	NA1
Apr 7, 2001	Palomar-IN	112206	Biofiltration Swale	Influent	100	0.22	0.87	-	0.35	-	-	-	0.046	NA1	NA1	NA1	NA1
Apr 7, 2001	Palomar-EFF	112206	Biofiltration Swale	Effluent	100	0.18	0.57	-	0.044	-	-	-	0.047	NA1	NA1	NA1	NA1
Apr 7, 2001	Carlsbad MS-IN	112207	Biostrip/Infiltration Trench	Influent	100	1.20	1.4	-	0.94	-	-	-	0.12	NA1	NA1	NA1	NA1
Apr 7, 2001	Carlsbad MS-EFF	112207	Biostrip/Infiltration Trench	Effluent	100	0.56	1.1	-	0.15	-	-	-	0.11	NA1	NA1	NA1	NA1

Table 1-5a BMP Retrofit Pilot Study, Stormwater Lab Data - District 11 – (continued)

April 21, 2001

PRELIMINARY DATA

Sample Date	BMP Location	Site ID	BMP Type	Sampling Location	% Storm Capture	pH	Specific Conductance (umhos/cm)	Hardness (mg/L)	TSS (mg/L)	TDS (mg/L)	COD (mg/L)	TOC (mg/L)	DOC (mg/L)	Total (µg/L)							Dissolved (µg/L)						
														As	Cd	Cr	Cu	Pb	Ni	Zn	As	Cd	Cr	Cu	Pb	Ni	Zn
April 21, 2001	SR56/I-5-IN	111101	Extended Detention Basin	Influent	100	7.7	180	31	86	130	-	23	21	2.6	0.21	3.5	36	17	4.7	330	1.2	0.2U	1.4	14	1U	2.0	23
April 21, 2001	SR56/I-5-EFF	111101	Extended Detention Basin	Effluent	100	7.7	340	62	12	230	-	26	25	2.0	0.34	1.9	22	5.3	3.2	41	1.6	0.2U	1.4	16	1U	2.3	19
April 21, 2001	SR78/I-15-IN	111102	Extended Detention Basin	Influent	~82	8.0	130	26	120	84	-	13	11	1.8	0.64	3.3	26	28	4.9	230	1.2	0.2U	2.2	13	9.0	4.8	51
April 21, 2001	SR78/I-15-EFF	111102	Extended Detention Basin	Effluent	100	7.5	120	19	30	82	-	12	12	1.3	0.74	1.7	15	11	2.2	89	1.3	0.2U	1.2	11	1.7	2U	47
April 21, 2001	Manchester-IN	111105	Extended Detention Basin	Influent	100	7.3	140	48	170	120	-	25	25	2.6	1.5	8.9	82	67	14	550	1.1	0.48	2.6	24	1.7	4.9	130
April 21, 2001	Manchester-EFF	111105	Extended Detention Basin	Effluent	100	7.0	170	54	62	120	-	25	25	2.3	0.73	3.4	42	30	7.1	250	1.2	0.61	1.4	21	2.1	4.5	140
April 21, 2001	LaCosta Wet-IN	111104	Wet Basin	Influent	100	7.6	240	52	190	190	-	33	30	2.0	0.87	4.0	62	100	12	340	0.83	0.48	1.1	20	1.7	5.2	74
April 21, 2001	LaCosta Wet-EFF	111104	Wet Basin	Effluent	100	7.8	2600	990	12	1900	-	14	13	0.5U	0.23	1U	3.8	1U	7.2	31	0.90	0.2U	1U	2.8	1U	6.9	30
April 21, 2001	Kearny Mesa MS-IN	112201	Media Filter (Per/Zeolite)	Influent	100	7.1	110	22	100	92	140	34	26	48	0.85	2.7	100	24	6.6	600	45	0.72	1.2	72	2.9	4.3	400
April 21, 2001	Kearny Mesa MS-EFF	112201	Media Filter (Per/Zeolite)	Effluent	100	7.0	120	22	74	100	-	30	23	52	0.68	2.3	81	18	6.2	470	40	0.36	1.1	56	1U	3.9	320
April 21, 2001	Escondido MS-IN	112202	Sand Filter	Influent	100	6.6	64	1U	84	32	85	22	18	2.6	1.0	2.3	13	13	3.5	490	0.63	0.68	1.1	9.1	1.7	5.1	350
April 21, 2001	Escondido MS-EFF	112202	Sand Filter	Effluent	100	6.9	81	11	6.0	54	-	11	11	0.5U	0.2U	1U	13	1U	2U	31	0.5U	0.2U	1U	4.6	1U	2U	17
April 21, 2001	LaCosta P&R-IN	112203	Sand Filter	Influent	100	6.5	210	22	54	130	-	76	51	7.0	0.2U	1.4	21	17	6.7	230	1.0	0.27	1U	18	7.7	6.6	170
April 21, 2001	LaCosta P&R-EFF	112203	Sand Filter	Effluent	100	7.2	200	32	6.0	180	-	47	42	7.6	0.2U	1U	9.8	1U	3.7	25	1.3	0.2U	1U	8.8	1U	3.5	22
April 21, 2001	SR78/I-5-IN	112204	Sand Filter	Influent	100	7.5	420	71	130	280	-	32	25	5.9	0.69	1.2	21	9.9	6.0	350	0.90	0.28	1U	12	1.2	3.5	170
April 21, 2001	SR78/I-5-EFF	112204	Sand Filter	Effluent	100	7.3	440	85	8.0	290	-	24	23	7.7	0.2U	1U	14	1U	6.4	110	1.3	0.2U	1U	10	1U	5.0	88
April 21, 2001	Melrose-IN	112205	Biofiltration Swale	Influent	100	6.8	120	37	50	100	-	37	36	0.70	1.0	1.3	41	5.6	12	550	0.5U	0.52	1U	32	1.6	9.8	480
April 21, 2001	Palomar-IN	112206	Biofiltration Swale	Influent	100	7.5	150	48	160	100	-	22	19	8.4	0.88	9.4	52	60	9.2	360	0.63	0.2U	5.5	15	1.3	2.9	72
April 21, 2001	Palomar-EFF	112206	Biofiltration Swale	Effluent	100	7.2	170	19	42	160	-	22	22	7.4	0.63	6.0	23	20	4.0	94	0.73	0.24	4.1	13	3.2	2.0	51
April 21, 2001	Carlsbad MS-IN	112207	Biostrip/Infiltration Trench	Influent	100	6.6	170	46	190	170	270	59	50	43	1.4	3.8	99	42	18	530	29	0.86	1.0	62	2.8	10	380

NA1 not sampled

NA2 results cancelled &/or samples exceeded hold time

* Sample contains hydrocarbons that does not match diesel and oil pattern. However, quantitation is based on diesel oil standard

Table 1-5a BMP Retrofit Pilot Study, Stormwater Lab Data - District 11 – (continued)

April 21, 2001 (continued)

PRELIMINARY DATA

Sample Date	BMP Location	Site ID	BMP Type	Sampling Location	% Storm Capture	Nitrate-Nitrogen (mg/L)	TKN (mg/L)	Ammonia (mg/L)	Total P (mg/L)	TRPH (mg/L)	Organophosphate Pest. Diazinon (ug/L)	Organophosphate Pest. Chlorpyrifos (ug/L)	Dissolved Ortho - Phosphate (mg/L)	Fecal Coliform (MPN/100 ml)	TPH Diesel (µg/L)	TPH Gasoline (µg/L)	TPH Oil (µg/L)
Apr 21, 2001	SR56/I-5-IN	111101	Extended Detention Basin	Influent	100	1.0	2.9	-	0.19	-	-	-	0.11	NA1	NA1	NA1	NA1
Apr 21, 2001	SR56/I-5-EFF	111101	Extended Detention Basin	Effluent	100	0.97	1.8	-	0.10	-	-	-	0.14	NA1	NA1	NA1	NA1
Apr 21, 2001	SR78/I-15-IN	111102	Extended Detention Basin	Influent	~82	1.0	2.9	-	0.11	-	-	-	0.094	NA1	NA1	NA1	NA1
Apr 21, 2001	SR78/I-15-EFF	111102	Extended Detention Basin	Effluent	100	0.59	1.8	-	0.10	-	-	-	0.092	NA1	NA1	NA1	NA1
Apr 21, 2001	Manchester-IN	111105	Extended Detention Basin	Influent	100	1.2	3.2	-	0.19	-	-	-	0.15	NA1	NA1	NA1	NA1
Apr 21, 2001	Manchester-EFF	111105	Extended Detention Basin	Effluent	100	0.66	2.8	-	0.16	-	-	-	0.041	NA1	NA1	NA1	NA1
Apr 21, 2001	LaCosta Wet-IN	111104	Wet Basin	Influent	100	1.9	4.4	1.2	0.16	-	-	-	0.15	NA1	NA1	NA1	NA1
Apr 21, 2001	LaCosta Wet-EFF	111104	Wet Basin	Effluent	100	0.50	4.1	0.15	0.23	-	-	-	0.011	NA1	NA1	NA1	NA1
Apr 21, 2001	Kearny Mesa MS-IN	112201	Media Filter (Per/Zeolite)	Influent	100	0.91	2.9	1.1	0.17	5U	0.07	0.05U	0.11	NA1	NA1	NA1	NA1
Apr 21, 2001	Kearny Mesa MS-EFF	112201	Media Filter (Per/Zeolite)	Effluent	100	1.2	2.5	-	0.15	-	-	-	0.13	NA1	NA1	NA1	NA1
Apr 21, 2001	Escondido MS-IN	112202	Sand Filter	Influent	100	0.58	2.2	0.55	0.061	5U	0.01U	0.05U	0.028	NA1	NA1	NA1	NA1
Apr 21, 2001	Escondido MS-EFF	112202	Sand Filter	Effluent	100	0.72	1.2	0.12	0.041	-	-	-	0.032	NA1	NA1	NA1	NA1
Apr 21, 2001	LaCosta P&R-IN	112203	Sand Filter	Influent	100	0.64	5.3	1.4	0.36	-	-	-	0.25	NA1	NA1	NA1	NA1
Apr 21, 2001	LaCosta P&R-EFF	112203	Sand Filter	Effluent	100	1.1	3.0	0.30	0.19	-	-	-	0.14	NA1	NA1	NA1	NA1
Apr 21, 2001	SR78/I-5-IN	112204	Sand Filter	Influent	100	0.66	9.1	4.9	1.0	-	-	-	0.95	NA1	NA1	NA1	NA1
Apr 21, 2001	SR78/I-5-EFF	112204	Sand Filter	Effluent	100	2.2	5.7	2.1	0.86	-	-	-	0.77	NA1	NA1	NA1	NA1
Apr 21, 2001	Melrose-IN	112205	Biofiltration Swale	Influent	100	1.3	5.1	-	0.11	-	-	-	0.061	NA1	NA1	NA1	NA1
Apr 21, 2001	Palomar-IN	112206	Biofiltration Swale	Influent	100	0.69	3.0	-	0.20	-	-	-	0.15	NA1	NA1	NA1	NA1
Apr 21, 2001	Palomar-EFF	112206	Biofiltration Swale	Effluent	100	1.1	3.1	-	0.38	-	-	-	0.31	NA1	NA1	NA1	NA1
Apr 21, 2001	Carlsbad MS-IN	112207	Biostrip/Infiltration Trench	Influent	100	1.2	4.0	1.1	0.11	NA1	NA1	NA1	0.08	NA1	NA1	NA1	NA1

NA1 not sampled

NA2 results cancelled &/or samples exceeded hold time

* Sample contains hydrocarbons that do not match diesel and oil pattern. However, quantitation is based on diesel oil standard

Table 1-5b BMP Retrofit Pilot Study, Groundwater Lab Data - District 11

PRELIMINARY DATA

Sample Date	Location	Site ID	BMP Type	pH	Specific Conductance (umhos/cm)	Hardness (mg/L)	TSS (mg/L)	TDS (mg/L)	DOC (mg/L)	TOC (mg/L)	Total (ug/L)							Dissolved (ug/L)						
											As	Cd	Cr	Cu	Pb	Ni	Zn	As	Cd	Cr	Cu	Pb	Ni	Zn
Groundwater Matrix																								
9/19/00	Carlsbad MS GW Well (Baseline)	112207	Biofiltration strip/ infiltration trench	6.7	15000	3100	26	8900	2.9	3.1	1.3	0.2U	4.5	4.6	1.7	4.2	3.2	1.1	0.2U	4.4	3.9	1.3	3.1	3.0
1/17/01	Carlsbad MS GW Well (Baseline)	112207	Biofiltration strip/ infiltration trench	6.7	9400	2600	18	8700	7.8	7.8	2.4	0.84	2.8	1.9	1U	4.4	1.9	2.2	0.2U	1.8	1.3	1U	3.8	1U
4/19/01	Carlsbad MS GW Well (Baseline)	112207	Biofiltration strip/ infiltration trench	6.9	8100	2100	1000	6400	2.8	4.5														
9/20/00	La Costa Infiltration (Baseline)	111103	Infiltration Basin	7.4	130000	13000	28	69000	9.3	7.9	3.7	0.2U	8.8	1U	1U	3.0	11	3.8	0.2U	6.0	1U	1U	2.1	6.4
1/16/01	La Costa Infiltration (Baseline)	111103	Infiltration Basin	7.4	82000	14000	500	70000	27	28	5.0	0.2U	20	1.3	1U	2U	9.6	5.5	0.2U	8.0	1U	1U	1U	3.3
4/19/01	La Costa Infiltration (Baseline)	111103	Infiltration Basin	7.6	82000	15000	190	69000	6.4	8.6	1.8	0.2U	21	1.6	1U	2U	8.0	3.4	0.2U	18	1	1U	2U	6.5

PRELIMINARY DATA

Sample Date	Location	Site ID	BMP Type	Nitrate-Nitrogen (mg/L)	TKN (mg/L)	Total P (mg/L)	Dissolved Ortho Phosphate (mg/L)	Fecal Coliform (MPN/100 ml)	TPH - Diesel (ug/L)	TPH - Gasoline (ug/L)	TPH Oil (mg/L)
Groundwater Matrix											
9/19/00	Carlsbad MS GW Well (Baseline)	112207	Biofiltration strip/ infiltration trench	110	0.44	0.21	0.12	2U	100U	50U	200U
1/17/01	Carlsbad MS GW Well (Baseline)	112207	Biofiltration strip/ infiltration trench	78J	0.66	0.12	0.16	2U	100U	50U	200U
4/19/01	Carlsbad MS GW Well (Baseline)	112207	Biofiltration strip/ infiltration trench	57	0.40	0.14	0.16	2U	100U	50U	200U
9/20/00	La Costa Infiltration (Baseline)	111103	Infiltration Basin	0.10U	8.0	0.98	0.91	2U	100U	50U	200U
1/16/01	La Costa Infiltration (Baseline)	111103	Infiltration Basin	<0.5	7.1	0.91	0.54	2U	100U	50U	200U
4/19/01	La Costa Infiltration (Baseline)	111103	Infiltration Basin	24	16	1.1	1.1	2U	100U	50U	200U

Table 1-5c BMP Retrofit Pilot Study, Sediment Lab Data - District 11

PRELIMINARY DATA

Submitted:				Wet Wt. Values								Dry Wt. Values									Grain Size Distribution		
				Total (mg/Kg)								Total (mg/Kg)											
Sample Date	Location	Site ID	BMP Type	As	Cd	Cr	Cu	Pb	Ni	Zn	TRPH (mg/kg)	As	Cd	Cr	Cu	Pb	Ni	Zn	TRPH (mg/kg)	% Solids	%Sand	%Silt	% Clay
Sediment Matrix																							
9/12/00	LaCostaIB, Top Section	111103	Infiltration Basin	5.7	0.1U	9.9	3.7	7.7	2.1	25	50U	6.1	0.11U	11	4.0	8.2	2.2	26	53U	94	91.7	5.4	2.8
9/12/00	LaCostaIB, Mid Section	111103	Infiltration Basin	2.5	0.1U	9.9	3.2	5.4	3.0	18	50U	2.8	0.11U	11	3.5	5.9	3.3	19	55U	91	87.2	7.1	5.7
9/12/00	LaCostaIB, Bottom Section	111103	Infiltration Basin	0.66	0.1U	12	3.2	3.0	3.9	10	50U	0.74	0.11U	14	3.6	3.4	4.4	12	56U	89	82.4	9.3	8.3

Table 1-5d BMP Retrofit Pilot Study, Monthly Wet Basin Baseline Lab Data - District 11

PRELIMINARY DATA

											Total (ug/L)							Dissolved (ug/L)						
Sample Date	Location	Site ID	BMP Type	pH	Specific Conductance (umhos/cm)	Hardness (mg/L)	TDS (mg/L)	TSS (mg/L)	DOC (mg/L)	TOC (mg/L)	As	Cd	Cr	Cu	Pb	Ni	Zn	As	Cd	Cr	Cu	Pb	Ni	Zn
Baseline																								
7/5/00	La Costa WET inflow (Baseline)	111104	Wet Basin	7.5	2900	940	-	20	-	-	-	-	-	63	22	-	120	-	-	-	35	1.2	-	91
7/5/00	La Costa WET outflow (Baseline)	111104	Wet Basin	7.6	3300	1000	-	11	-	-	-	-	-	20	1U	-	50	-	-	-	10	1U	-	38
8/4/00	La Costa WET inflow (Baseline)	111104	Wet Basin	7.6	2800	1000	-	7.0	-	-	-	-	-	31	3.9	-	74	-	-	-	21	1.3	-	63
8/4/00	La Costa WET outflow (Baseline)	111104	Wet Basin	7.7	3000	1100	-	15	-	-	-	-	-	7.0	1.1	-	29	-	-	-	5.0	1U	-	24
9/7/00	La Costa WET inflow (Baseline)	111104	Wet Basin	7.5	3000	1200	2200	1U	8.6	4.5	0.75	0.2U	1U	9.3	1.4	2.9	39	0.73	0.20U	1U	9.1	1.0	2.9	33
9/7/00	La Costa WET outflow (Baseline)	111104	Wet Basin	8.7	3000	1100	2200	28	11	12	2.3	0.31	1U	12	1.1	3.9	54	2.1	0.29	1U	9.5	1U	4.0	47
10/5/00	La Costa WET inflow (Baseline)	111104	Wet Basin	7.4	2500	890	1700	1U	11	12	1.7	0.97	3.8	15	1.0	9.6	78	1.6	0.93	2.6	15	1.1	9.3	71
10/5/00	La Costa WET outflow (Baseline)	111104	Wet Basin	7.9	2700	1100	1900	10	11	13	1.6	0.45	4.0	5.5	1U	10	37	1.5	0.2U	1.9	5.2	1U	10	30
11/8/00	La Costa WET inflow (Baseline)	111104	Wet Basin	7.5	2900	1100	2100	18	6.7	7.3	5U	0.33	3.3	17	4.3	6.7	55	5U	0.2U	2.8	12	1.2	6.5	52
11/8/00	La Costa WET outflow (Baseline)	111104	Wet Basin	7.7	1800	710	1200	4.0	11	12	5U	0.2U	2.2	4.9	3.0	5.6	34	5U	0.2U	2.0	4.1	2.1	5.2	27
12/7/00	La Costa WET inflow (Baseline)	111104	Wet Basin	7.5	3000	1100	2300	8.0	4.8	5.8	2.2	0.2U	1.5	10	2.2	6.9	36	1.1	0.2U	1.2	5.1	1U	6.7	19
12/7/00	La Costa WET outflow (Baseline)	111104	Wet Basin	8.0	2200	840	1700	12	10	13	2.2	0.2U	1.4	5.3	1U	7.0	31	2.2	0.2U	1U	4.5	1U	5.7	24
1/4/01	La Costa WET inflow (Baseline)	111104	Wet Basin	7.6	2900	1200	2100	10	4.5	5.0	0.8	0.2U	1.6	9.5	2.4	5.9	35	0.78	0.2U	1.0	6.2	1.0	5.5	28
1/4/01	La Costa WET outflow (Baseline)	111104	Wet Basin	7.8	2900	990	1700	4.0	12	12	0.78	0.2U	1.7	3.3	1.2	5.6	19	0.7	0.2U	1.1	3.1	1U	4.9	68R
2/7/01	La Costa WET inflow (Baseline)	111104	Wet Basin	7.5	3200	1000	2200	8.0	5.0	5.0	0.73	0.61	1U	13	1U	6.3	44	0.65	0.2U	1U	9.1	1U	5.1	43
2/7/01	La Costa WET outflow (Baseline)	111104	Wet Basin	8.2	1800	500	1100	42	15	17	0.5U	0.2U	1U	250	1.9	5.9	23	0.5U	0.2U	1U	3.1	1U	3.0	16
3/15/01	La Costa WET inflow (Baseline)	111104	Wet Basin	7.5	3100	1200	2200	8.0	6.4	9.2	0.90	0.2U	1U	11	2.1	16	38	0.90	0.2U	1U	8.4	1U	15	33
3/15/01	La Costa WET outflow (Baseline)	111104	Wet Basin	7.4	1500	540	970	8.0	5.3	6.7	2.6	0.21	1U	4.5	1.1	8.0	18	0.5U	0.2U	1U	2.8	1U	7.6	17
4/4/01	La Costa WET inflow (Baseline)	111104	Wet Basin	7.8	2900	1300	2000	18	8.6	11	1.2	0.2U	1U	6.3	1.5	14.0	39	0.83	0.2U	1U	4.6	1U	13	36
4/4/01	La Costa WET outflow (Baseline)	111104	Wet Basin	7.5	2900	1300	2000	8.0	8.2	10	2.0	0.32	1U	12	1U	12.0	29	1.4	0.2U	1U	16	1U	18	40
5/9/01	La Costa WET inflow (Baseline)	111104	Wet Basin																					
5/9/01	La Costa WET outflow (Baseline)	111104	Wet Basin																					

*Quantified as diesel but chromatographic pattern does not match that of diesel

Table 1-5d BMP Retrofit Pilot Study, Monthly Wet Basin Baseline Lab Data - District 11 – (continued)

PRELIMINARY DATA

Sample Date	Location	Site ID	BMP Type	Nitrate-N (mg/L)	TKN (mg/L)	Ammonia-N (mg/L)	Total P (mg/L)	Diss P (mg/L)	Fecal Coliform (MPN/100 ml)	TPH - Diesel (ug/L)	TPH - Oil (ug/L)	TPH - Gasoline (ug/L)
Baseline												
7/5/00	La Costa WET inflow (Baseline)	111104	Wet Basin	22	2.0	-	6.6	-	2200	100U	200U	50U
7/5/00	La Costa WET outflow (Baseline)	111104	Wet Basin	1.1	6.3	-	7.0	-	240	220	200U	50U
8/4/00	La Costa WET inflow (Baseline)	111104	Wet Basin	17	1.9	-	2.8	-	30	100U	200U	50U
8/4/00	La Costa WET outflow (Baseline)	111104	Wet Basin	0.68	2.7	-	1.8	-	30	120	200U	50U
9/7/00	La Costa WET inflow (Baseline)	111104	Wet Basin	11	1.2	-	1.0	0.89	30	100U	200U	50U
9/7/00	La Costa WET outflow (Baseline)	111104	Wet Basin	3.1	2.6	-	1.5	0.93	30	100U	200U	50U
10/5/00	La Costa WET inflow (Baseline)	111104	Wet Basin	17	2.1	-	3.0	3.0	300	100U	200U	50U
10/5/00	La Costa WET outflow (Baseline)	111104	Wet Basin	3.3	2.1	-	2.4	2.1	27	100U	200U	50U
11/8/00	La Costa WET inflow (Baseline)	111104	Wet Basin	13	1.2	0.14	1.4	1.1	500	300	200U	50U
11/8/00	La Costa WET outflow (Baseline)	111104	Wet Basin	1.5	1.4	0.20	1.2	1.2	30	100U	200U	50U
12/7/00	La Costa WET inflow (Baseline)	111104	Wet Basin	7.4	0.56	0.1U	0.80	0.5	50	100U	200U	50U
12/7/00	La Costa WET outflow (Baseline)	111104	Wet Basin	<0.01	1.5	0.1U	0.75	0.43	13	100U	200U	50U
1/4/01	La Costa WET inflow (Baseline)	111104	Wet Basin	12	0.88	0.21	0.52	0.4	110	100U	200U	50U
1/4/01	La Costa WET outflow (Baseline)	111104	Wet Basin	0.071	1.3	0.10	0.30	0.2	2	100U	200U	50U
2/7/01	La Costa WET inflow (Baseline)	111104	Wet Basin	15	0.81	0.40	0.38	0.33	2	1000	200U	50U
2/7/01	La Costa WET outflow (Baseline)	111104	Wet Basin	<0.01	3.1	0.17	0.43	0.012	4	100U	200U	50U
3/15/01	La Costa WET inflow (Baseline)	111104	Wet Basin	11	1.9	0.80	0.54	0.42	50	100U	50U	200U
3/15/01	La Costa WET outflow (Baseline)	111104	Wet Basin	2.1	2.0	0.11	1.6	0.29	11	100U	50U	200U
4/4/01	La Costa WET inflow (Baseline)	111104	Wet Basin	3.2	2.7	0.1U	0.29	0.064	500	150	50U	250
4/4/01	La Costa WET outflow (Baseline)	111104	Wet Basin	9.9	1.6	0.17	0.83	0.31	50	130	50U	200U
5/9/01	La Costa WET inflow (Baseline)	111104	Wet Basin									
5/9/01	La Costa WET outflow (Baseline)	111104	Wet Basin									

*Quantified as diesel but chromatographic pattern does not match that of diesel

Table 1-6 BMP Pollutant Removal Efficiencies

Media Filters (Perlite/Zeolite) EMCs and Loads

	Kearny Mesa MS October 26, 2000				Kearny Mesa MS October 29, 2000				Kearny Mesa MS January 8, 2001				Kearny Mesa MS January 10, 2001				Kearny Mesa MS January 26, 2001				Kearny Mesa MS February 10, 2001				Kearny Mesa MS February 12, 2001			
	EMC		Efficiency (%)	% Diff. In Load	EMC		Efficiency (%)	% Diff. In Load	EMC		Efficiency (%)	% Diff. In Load	EMC		Efficiency (%)	% Diff. In Load	EMC		Efficiency (%)	% Diff. In Load	EMC		Efficiency (%)	% Diff. In Load	EMC		Efficiency (%)	% Diff. In Load
	Influent	Effluent			Influent	Effluent			Influent	Effluent			Influent	Effluent			Influent	Effluent			Influent	Effluent			Influent	Effluent		
TSS (mg/L)	390	120	69	66					420	280	33	41	78	44	44	38	180	80	56	45					170	120	29	17
TDS (mg/L)	130	160	-23	-35					140	140	0	12	58	58	0	-10	44	44	0	-24					60	52	13	-2
TOC (mg/L)	32	30	6	-3					36	35	3	14	18	15	17	8	13	15	-15	-43					13	12	8	-9
DOC (mg/L)	30	27	10	1					32	34	-6	6	14	13	7	-2	12	13	-8	-34					13	12	8	-9
As Tot. (ug/L)	49	54	-10	-21					44	32	27	36	50	54	-8	-19	48	43	10	-11					90	61	32	20
Cd	0.92	1.3	-41	-55					2.7	1.9	30	38	0.87	0.47	46	41	1.0	0.71	29	12					0.95	0.64	33	21
Cr	5.3	4.4	17	9					11	9.6	13	23	3.6	1.7	53	48	5.8	5.6	3	-19					12	4.0	67	61
Cu	94	70	26	18					170	150	12	22	53	42	21	13	90	46	49	37					110	53	52	43
Pb	48	35	27	20					120	110	8	19	40	15	63	59	54	19	65	57					97	27	72	67
Ni	11	9.7	12	3					19	18	5	16	4.2	3.9	7	-2	8.0	3.0	63	54					5.3	2.3	57	49
Zn	680	490	28	21					1100	920	16	26	400	210	48	42	740	230	69	62					640	280	56	48
As Diss. (ug/L)	48	46	4	-5					32	25	22	31	39	49	-26	-38	46	38	17	-2					39	41	-5	-24
Cd	0.69	0.28	59	56					0.64	0.51	20	30	0.2U	0.2U	0	0	0.22	0.41	-86	-130					0.2U	0.24	<-20	<-41
Cr	2.3	2.1	9	0					1.3	1.4	-8	5	1U	1.1	<-10	<-21	4.5	3.7	18	-2					2.6	2.2	15	0
Cu	49	33	33	26					48	69	-44	-27	24	26	-8	-19	27	29	-7	-33					29	24	17	3
Pb	6.9	7.0	-1	-11					2.0	2.3	-15	-2	1.5	1.9	-27	-39	2.1	3.1	-48	-82					2.0	1.5	25	12
Ni	8.1	6.4	21	14					7.2	8.8	-22	-8	2.6	2.7	-4	-14	2.7	2U	>26	>8					2U	2U	0	0
Zn	360	270	25	18					230	250	-9	4	110	120	-9	-20	140	130	7	-15					120	110	8	-8
Nitrate-N (mg/L)	1.8	2.5	-39	-52					2.2	2.3	-5	8	0.65	0.88	-35	-49	0.67	0.78	-16	-44					0.35	0.46	-31	-55
TKN (mg/L)	3.9	3.3	15	7					5.2	4.5	13	24	2.7	1.9	30	23	2.9	2.7	7	-15					2.1	1.8	14	-1
Total P (mg/L)	0.55	0.54	2	-7					1.0	0.82	18	28	0.31	0.20	35	29	0.37	0.22	41	27					0.38	0.23	39	29
Diss. OrthoP (mg/L)	0.22	0.23	-5	-14					0.3	0.23	23	32	0.17	0.16	6	-3	0.11	0.099	10	-11					0.11	0.086	22	8
Volume (Liters)	76709	83958							50714	44768			400024	439383			184707	228286							322069	379211		

Table 1-6 BMP Pollutant Removal Efficiencies (continued)

Media Filters (Perlite/Zeolite) EMCs and Loads

	Kearny Mesa MS February 23, 2001				Kearny Mesa MS February 25, 2001				Kearny Mesa MS March 6, 2001				Kearny Mesa MS April 7, 2001				Kearny Mesa MS April 21, 2001				Kearny Mesa MS *2000 - 2001 Wet Season Statistics*			
	EMCs		Efficiency (%)	% Diff. In Load	EMCs		Efficiency (%)	% Diff. In Load	EMCs		Efficiency (%)	% Diff. In Load	EMCs		Efficiency (%)	% Diff. In Load	EMCs		Efficiency (%)	% Diff. In Load	Parameters	Minimum Load Removal (%)	Maximum Load Removal (%)	Average Season Removal (%)
	Influent	Effluent			Influent	Effluent			Influent	Effluent			Influent	Effluent			Influent	Effluent						
TSS (mg/L)	160	80	50	38					130	66	49	49	130	210	-62	-60	100	74	26	19	TSS (mg/L)	-60	66	29
TDS (mg/L)	64	68	-6	-33					50	54	-8	-7	96	80	17	17	92	100	-9	-19	TDS (mg/L)	-35	17	-20
TOC (mg/L)	21	26	-24	-54					11	10	9	10	22	26	-18	-17	34	30	12	3	TOC (mg/L)	-54	14	-16
DOC (mg/L)	8.4	11	-31	-63					5.7	7.3	-28	-27	20	21	-5	-4	26	23	12	3	DOC (mg/L)	-63	6	-15
As Tot. (ug/L)	70	52	26	7					88	61	31	31	91	78	14	15	48	52	-8	-19	T-As	-21	36	2
Cd	2.4	0.67	72	65					1.1	0.44	60	60	2.4	1.5	38	38	0.85	0.68	20	12	Cd	-55	65	27
Cr	7.2	2.8	61	52					3.2	2.3	28	28	7.4	4.4	41	41	2.7	2.3	15	7	Cr	-19	61	27
Cu	77	49	36	21					65	49	25	25	210	110	48	48	100	81	19	11	Cu	11	48	22
Pb	99	23	77	71					35	16	54	55	64	52	19	20	24	18	25	18	Pb	18	71	39
Ni	7.5	2U	>73	>67					3.4	2.8	18	18	28	8.1	71	71	6.6	6.2	6	-3	Ni	-3	71	30
Zn	1000	260	74	68					360	230	36	36	1500	730	51	52	600	470	22	14	Zn	14	68	37
As Diss. (ug/L)	47	47	0	-25					41	44	-7	-7	67	65	3	4	45	40	11	3	D-As	-38	31	-14
Cd	0.28	0.2U	>29	>11					0.2U	0.2U	0	0	0.24	0.93	-288	-284	0.72	0.36	50	45	Cd	-284	56	-13
Cr	1.5	1.2	20	0					1.3	1.1	15	16	1.8	1.7	6	6	1.2	1.1	8	0	Cr	-2	16	-4
Cu	30	22	27	9					27	22	19	19	60	48	20	21	72	56	22	15	Cu	-33	26	-4
Pb	1.1	1U	>9	>-13					1U	1U	0	0	1.6	1.9	-19	-18	2.9	1U	66	62	Pb	-82	62	-14
Ni	2U	2U	0	0					2U	2U	0	0	4.8	2.6	46	46	4.3	3.9	9	1	Ni	-14	46	-4
Zn	120	120	0	-25					110	92	16	17	290	270	7	8	400	320	20	12	Zn	-25	18	-4
Nitrate-N (mg/L)	0.32	0.62	-94	-142					0.29	0.51	-76	-75	1.6	1.0	38	38	0.91	1.2	-32	-44	N-N	-142	38	-31
TKN (mg/L)	1.6	1.4	13	-9					1.8	1.4	22	23	3.2	2.6	19	20	2.9	2.5	14	6	TKN (mg/L)	-15	24	2
Total P (mg/L)	0.45	0.23	49	36					0.23	0.16	30	31	0.19	0.16	16	17	0.17	0.15	12	3	T-P	-7	36	15
Diss. OrthoP (mg/L)	0.11	0.081	26	8					0.12	0.11	8	9	0.097	0.099	-2	-1	0.11	0.13	-18	-29	D-O-PO3	-29	32	-6
Volume (Liters)	83533	104175							176863	176014			168199	166641			51989	56944						

Seasonal Load Removal Calculations based upon the 1999 Scoping Document.

Table 1-6 BMP Pollutant Removal Efficiencies (continued)

Media Filters (Sand Type I) EMCs and Loads

	La Costa Park and Ride October 26, 2000				La Costa Park and Ride October 29, 2000				La Costa Park and Ride January 8, 2001				La Costa Park and Ride January 10, 2001				La Costa Park and Ride January 26, 2001				La Costa Park and Ride February 10, 2001				La Costa Park and Ride February 12, 2001			
	EMC		Efficiency (%)	% Diff. In Load	EMC		Efficiency (%)	% Diff. In Load	EMC		Efficiency (%)	% Diff. In Load	EMC		Efficiency (%)	% Diff. In Load	EMC		Efficiency (%)	% Diff. In Load	EMC		Efficiency (%)	% Diff. In Load	EMC		Efficiency (%)	% Diff. In Load
	Influent	Effluent			Influent	Effluent			Influent	Effluent			Influent	Effluent			Influent	Effluent			Influent	Effluent			Influent	Effluent		
TSS (mg/L)	62	4.0	94	97					80	10	88	87	120	6.0	95	93	100	6.0	94	92					270	10	96	95
TDS (mg/L)	130	310	-138	-25					180	280	-56	-57	38	60	-58	-109	36	50	-39	-79					32	48	-50	-86
TOC (mg/L)	31	20	35	66					72	62	14	13	14	14	0	-33	17	12	29	9					18	7.8	57	46
DOC (mg/L)	28	20	29	62					59	61	-3	-4	13	14	-8	-43	12	12	0	-29					18	7.8	57	46
As Tot. (ug/L)	1.9	1.1	42	70					2.5	0.5	80	80	0.65	0.98	-51	-100	0.98	0.75	23	2					1.2	0.5U	>58	>48
Cd	0.43	0.2U	>53	>76					0.5	0.2U	>60	>60	0.41	0.2U	>51	>35	0.36	0.2U	>44	>29					0.74	0.2U	>73	>67
Cr	1.4	1.1	21	59					2.5	1.6	36	35	2.5	1U	>60	>47	2.3	1U	>57	>44					1.4	1U	>29	>12
Cu	16	8.1	49	73					29	19	34	34	10	3.7	63	51	12	3.2	73	66					13	1.8	86	83
Pb	20	2.6	87	93					22	2.1	90	90	28.0	1.8	94	91	36	1U	>97	>96					39	1.2	97	96
Ni	6.8	3.7	46	71					10	8.2	18	17	5.0	2U	>60	>47	3.6	2U	>44	>29					4.7	2U	>57	>47
Zn	190	10	95	97					240	23	90	90	140	9.7	93	91	150	11	93	91					230	4.4	98	98
As Diss. (ug/L)	1.5U	0.83	>45	>71					2.2	0.5U	>77	>77	0.55	1.3	-136	-213	0.5U	0.5U	0	0					0.5U	0.5U	0	0
Cd	0.2U	0.2U	0	0					0.2U	0.2U	0	0	0.2U	0.2U	0	0	0.2U	0.2U	0	0					0.2U	0.2U	0	0
Cr	1U	1U	0	0					1.2	1.1	8	8	2.4	1U	>58	>45	1U	1U	0	0					1U	1U	0	0
Cu	8.4	6.9	18	57					18	15	17	16	3.6	3.2	11	-18	1.6	2.3	-44	-85					2.3	1.4	39	25
Pb	6.3	3.6	43	70					4.0	1.3	68	67	1.2	1U	>17	>-10	1.0	1U	>0	>-29					1.1	1U	>9	>-12
Ni	3.6	3.4	6	50					6.3	6.9	-10	-10	4.0	2U	>50	>34	2U	2U	0	0					2U	2U	0	0
Zn	85	8.1	90	95					120	17	86	86	18	8.6	52	37	21	6	71	63					19	2.6	86	83
Nitrate-N (mg/L)	1.2	1.0	17	56					3.1	1.8	42	41	0.35	0.67	-91	-154	0.64	1.1	-72	-121					0.27	0.42	-56	-92
TKN (mg/L)	4.6	1.7	63	81					9.5	5.3	44	44	2.8	1.7	39	20	3.9	1.5	62	51					2.6	0.71	73	66
Ammonia-N (mg/L)	-	-							3.5	1.2	66	65	0.64	0.31	52	36	0.72	0.18	75	68					0.58	0.12	79	74
Total P (mg/L)	0.49	0.19	61	80					1.0	0.25	75	75	0.40	0.18	55	40	0.26	0.11	58	46					0.39	0.22	44	30
Diss. OrthoP (mg/L)	0.34	0.15	56	77					0.66	0.13	80	80	0.19	0.14	26	2	0.099	0.076	23	1					0.095	0.074	22	4
Volume (Liters)	85657	45023							27637	27863			227804	301908			75888	97606							210418	260340		

Table 1-6 BMP Pollutant Removal Efficiencies (continued)

Media Filters (Sand Type I) EMCs and Loads

	La Costa Park and Ride February 23, 2001				La Costa Park and Ride February 25, 2001				La Costa Park and Ride March 6, 2001				La Costa Park and Ride April 7, 2001				La Costa Park and Ride April 21, 2001				La Costa Park and Ride *2000 - 2001 Wet Season Statistics*			
	EMCs		Efficiency (%)	% Diff. In Load	EMCs		Efficiency (%)	% Diff. In Load	EMCs		Efficiency (%)	% Diff. In Load	EMCs		Efficiency (%)	% Diff. In Load	EMCs		Efficiency (%)	% Diff. In Load				
	Influent	Effluent			Influent	Effluent			Influent	Effluent			Influent	Effluent			Influent	Effluent			Parameters	Minimum Load Removal (%)	Maximum Load Removal (%)	Average Season Removal (%)
TSS (mg/L)	66	1U	>98	>98					30	1U	>97	>96	82	1U	>99	>99	54	6.0	89	92	TSS (mg/L)	-60	66	29
TDS (mg/L)	34	50	-47	-71					36	56	-56	-69	130	180	-38	-33	130	180	-38	-4	TDS (mg/L)	-35	17	-20
TOC (mg/L)	15	17	-13	-32					18	15	17	10	49	77	-57	-51	76	47	38	53	TOC (mg/L)	-54	14	-16
DOC (mg/L)	11	8.8	20	7					12	8.3	31	25	48	74	-54	-48	51	42	18	38	DOC (mg/L)	-63	6	-15
As Tot. (ug/L)	0.5U	1.1	<-120	<-155					0.93	1.7	-83	-98	1.4	2.2	-57	-51					T-As	-21	36	2
Cd	0.2U	0.27	<-37	<-57					0.31	0.2U	>35	>30	0.2U	0.2U	0	4	0.2U	0.2U	0	25	Cd	-55	65	27
Cr	1.1	4.7	-327	-396					1U	1U	0	0	1.6	1U	>38	>40	1.4	1U	>29	>46	Cr	-19	61	27
Cu	7.9	11	-39	-62					5.9	3.3	44	39	21	9.1	57	58	21	9.8	53	65	Cu	11	48	22
Pb	22	2.0	91	89					12	1U	>92	>91	27	1U	>96	>96	17	1U	>94	>96	Pb	18	71	39
Ni	2.7	3.0	-11	-29					2.3	2U	>13	>6	5.2	2.7	48	50	6.7	3.7	45	58	Ni	-3	71	30
Zn	120	79	34	24					67	11	84	82	270	24	91	91	230	25	89	92	Zn	14	68	37
As Diss. (ug/L)	0.5U	0.70	<-40	<-63					1.0	0.58	42	37	1.2	1.9	-58	-52					D-As	-38	31	-14
Cd	0.2U	0.2U	0	0					0.2U	0.2U	0	0	0.2U	0.2U	0	4	0.27	0.2U	>26	>44	Cd	-284	56	-13
Cr	1U	1U	0	0					1U	1U	0	0	1U	1U	0	4	1U	1U	0	25	Cr	-2	16	-4
Cu	3.2	2.7	16	2					3.0	2.6	13	6	9.2	9.5	-3	1	18	8.8	51	63	Cu	-33	26	-4
Pb	1.3	1U	>23	>11					1U	1U	0	0	3.1	1U	>68	>69	7.7	1U	>87	>90	Pb	-82	62	-14
Ni	2U	2U	0	0					2U	2U	0	0	2	2	0	4	6.6	3.5	47	60	Ni	-14	46	-4
Zn	28	7.6	73	68					16	7.3	54	51	100	18	82	83	170	22	87	90	Zn	-25	18	-4
Nitrate-N (mg/L)	0.22	0.34	-55	-79					0.20	0.76	-280	-312	2.0	2.3	-15	-11	0.64	1.1	-72	-30	N-N	-142	38	-31
TKN (mg/L)	2.6	0.56	78	75					2.1	0.88	58	55	4.7	2.6	45	47	5.3	3.0	43	57	TKN (mg/L)	-15	24	2
Ammonia-N (mg/L)	0.38	0.1U	>74	>69					0.51	1.2	-135	-155	1.2	0.32	73	74	1.4	0.3	79	84	NH3	-7	36	15
Total P (mg/L)	0.29	0.059	80	76					0.16	0.067	58	55	0.37	0.20	46	48	0.36	0.19	47	60	T-P	-29	32	-6
Diss. OrthoP (mg/L)	0.074	0.083	-12	-30					0.058	0.075	-29	-40	0.26	0.19	27	30	0.25	0.14	44	58	D-O-PO3	-60	66	29
Volume (Liters)	303805	352679							53546	58020			61106	58813			21945	16537						

Seasonal Load Removal Calculations based upon the 1999 Scoping Document

Table 1-6 BMP Pollutant Removal Efficiencies (continued)

Media Filters (Sand Type I) EMCs and Loads

	Sr-78/I-5 Park & Ride October 26, 2000				Sr-78/I-5 Park & Ride October 29, 2000				Sr-78/I-5 Park & Ride January 8, 2001				Sr-78/I-5 Park & Ride January 10, 2001				Sr-78/I-5 Park & Ride January 26, 2001				Sr-78/I-5 Park & Ride February 10, 2001				Sr-78/I-5 Park & Ride February 12, 2001			
	EMC		Efficiency (%)	% Diff. In Load	EMC		Efficiency (%)	% Diff. In Load	EMC		Efficiency (%)	% Diff. In Load	EMC		Efficiency (%)	% Diff. In Load	EMC		Efficiency (%)	% Diff. In Load	EMC		Efficiency (%)	% Diff. In Load	EMC		Efficiency (%)	% Diff. In Load
	Influent	Effluent			Influent	Effluent			Influent	Effluent			Influent	Effluent			Influent	Effluent			Influent	Effluent			Influent	Effluent		
TSS (mg/L)	170	14	92	93	340	1U	>100	>100	220	20	91	92	120	2.0	98	98	180	4.0	98	97	220	6.0	97	97	94	18	81	76
TDS (mg/L)	100	190	-90	-58	30	38	-27	-75	190	-	NA	NA	28	46	-64	-103	26	34	-31	-74	60	84	-40	-46	18	18	0	-24
TOC (mg/L)	46	35	24	37	14	8.7	38	14	65	58	11	21	11	10	9	-12	12	8.9	26	1	27	21	22	19	9.5	7.5	21	2
DOC (mg/L)	44	35	20	34	13	8.9	32	6	54	65	-20	-6	9.3	10	-8	-33	8.9	8.3	7	-24	25	20	20	17	8.2	5.2	37	21
As Tot. (ug/L)	2.0	2.0	0	17	1.6	1.0	38	14	2.4	2.9	-21	-7	1.2	2.5	-108	-157	2.5	1.0	60	47	1.0	0.73	27	24	0.83	0.78	6	-17
Cd	0.8	0.2U	>75	>79	1.5	0.2U	>87	>82	0.98	0.2U	>80	>82	0.55	0.56	-2	-26	0.59	0.2U	>66	>55	0.2U	0.2U	0	0	0.2U	0.2U	0	0
Cr	3.1	1.4	55	63	2.8	1U	>64	>51	3.6	1.6	56	61	1.3	1U	>23	>5	2.2	1U	>55	>39	1U	1U	0	0	1U	1U	0	0
Cu	32	17	47	56	120	5.1	96	94	60	35	42	49	18	12	33	18	23	5.3	77	69	32	8.9	72	71	14	4.9	65	57
Pb	18	3.4	81	84	18	1U	>94	>92	23	2.1	91	92	14	2.5	82	78	19	1U	>95	>93	22	1.1	95	95	9.0	1.2	87	83
Ni	13	9.5	27	39	12	2.1	83	76	22	14	36	44	3.8	5.3	-39	-72	4.9	2U	>59	>46	2U	2U	0	0	2U	2U	0	0
Zn	460	51	89	91	620	21	97	95	690	140	80	82	270	66	76	70	330	27	92	89	480	33	93	93	140	31	78	72
As Diss. (ug/L)	1.5	1.7	-13	6	0.88	0.68	23	-7	2.0	2.4	-20	-6	0.5U	1.5	<-200	<-271	2.5	0.88	65	53	0.53	0.8	-51	-57	0.5U	0.5U	0	0
Cd	0.52	0.2U	>62	>68	0.2U	0.2U	0	0	0.23	0.2U	>13	>23	0.2U	0.54	<-170	<-234	0.2U	0.2U	0	0	0.2U	0.2U	0	0	0.2U	0.2U	0	0
Cr	1U	1.1	>-10	>9	1U	1U	0	0	1U	1.0	>0	>12	1U	1U	0	0	1U	1U	0	0	1U	1U	0	0	1U	1U	0	0
Cu	16	13	19	33	4.6	4.8	-4	-44	25	25	0	12	3.6	11	-206	-278	4.7	3.5	26	1	7.3	5.9	19	16	2.0	5.0	-150	-211
Pb	1.5	4.6	-207	-154	3.5	1U	>71	>61	2.0	1U	>50	>56	1U	1.3	<-30	<-61	1U	1U	0	0	1.0	1U	>0	>-4	1U	1U	0	0
Ni	11	8.1	26	39	2.4	1U	>58	>43	12	12	0	12	2U	5.2	<-160	<-221	4.3	2U	>53	>38	2U	2U	0	0	2U	2U	0	0
Zn	210	44	79	83	57	15	74	64	230	82	64	69	35	59	-69	-108	59	21	64	53	78	27	65	64	27	10	63	54
Nitrate-N (mg/L)	1.2	1.2	0	17	0.17	0.67	-294	-444	2.7	4.1	-52	-34	0.20	0.63	-215	-289	0.52	1.2	-131	-208	0.87	1.9	-118	-127	0.15	0.28	-87	-132
TKN (mg/L)	5.6	2.4	57	64	2.7	0.68	75	65	10	6.9	31	39	2.2	1.4	36	21	2.6	0.99	62	49	4.8	2.3	52	50	1.3	0.50	62	52
Ammonia-N (mg/L)	-	-	NA	NA	-	-	NA	NA	3.7	1.8	51	57	0.55	0.48	13	-8	1.5	0.30	80	73	1.2	0.55	54	52	0.62	0.19	69	62
Total P (mg/L)	0.86	0.45	48	57	0.73	0.26	64	51	1.3	0.64	51	57	0.33	0.17	48	36	0.42	0.14	67	56	0.69	0.26	62	61	0.19	0.11	42	28
Diss. OrthoP (mg/L)	0.55	0.037	93	94	0.22	1.3R			0.66	0.59	11	21	0.15	0.15	0	-24	0.11	0.12	-9	-45	0.26	0.23	12	8	0.082	0.072	12	-9
Volume (Liters)	66600	55245			64335	88771			10619	9373			129264	159760			29647	39529			13705	14271			104629	130028		

Table 1-6 BMP Pollutant Removal Efficiencies (continued)

Media Filters (Sand Type I) EMCs and Loads

	Sr-78/I-5 Park & Ride February 23, 2001				Sr-78/I-5 Park & Ride February 25, 2001				Sr-78/I-5 Park & Ride March 6, 2001				Sr-78/I-5 Park & Ride April 7, 2001				Sr-78/I-5 Park & Ride April 21, 2001				Sr-78/I-5 Park & Ride *2000 - 2001 Wet Season Statistics*			
	EMCs		Efficiency (%)	% Diff. In Load	EMCs		Efficiency (%)	% Diff. In Load	EMCs		Efficiency (%)	% Diff. In Load	EMCs		Efficiency (%)	% Diff. In Load	EMCs		Efficiency (%)	% Diff. In Load	Parameters	Minimum Load Removal (%)	Maximum Load Removal (%)	Average Season Removal (%)
	Influent	Effluent			Influent	Effluent			Influent	Effluent			Influent	Effluent			Influent	Effluent						
TSS (mg/L)	42	1U	>98	>97					90	4.0	96	94	170	10	94	94	130	8.0	94	94	TSS (mg/L)	4	98	94
TDS (mg/L)	32	54	-69	-91					24	48	-100	-167	230	250	-9	-10	280	290	-4	0	TDS (mg/L)	-167	34	-49
TOC (mg/L)	18	17	6	-7					19	13	32	9	32	26	19	18	32	24	25	27	TOC (mg/L)	-12	37	11
DOC (mg/L)	9.2	10	-9	-23					14	7.5	46	29	32	26	19	18	25	23	8	11	DOC (mg/L)	-33	34	0
As Tot. (ug/L)	0.83	0.58	30	21					0.90	1.6	-78	-137	1.6	1.2	25	24	5.9	7.9	-34	-30	T-As	-157	47	-18
Cd	0.75	0.2U	>73	>70					0.40	0.2U	50U	33	1.2	0.48	60	59	0.69	0.2U	>71	>72	Cd	-26	59	62
Cr	5.0	1U	>80	>77					1.3	1U	>23	>-3	4.6	1U	>78	>78	1.2	1U	>17	>19	Cr	0	63	51
Cu	29	4.3	85	83					13	5.9	55	40	52	13	75	75	21	14	33	35	Cu	5	94	66
Pb	10	1U	>90	>89					7.6	1U	>87	>82	12	1	92	92	9.9	1U	>90	>90	Pb	78	95	89
Ni	9.3	2U	>78	>76					2.7	2.2	19	-9	12	7.4	38	38	6	6.4	-7	-3	Ni	-72	76	34
Zn	470	29	94	93					270	42	84	79	960	97	90	90	350	110	69	70	Zn	27	95	86
As Diss. (ug/L)	0.55	2.4	-336	-394					0.63	0.5U	>21	>-6	1.0	1.1	-10	-11	0.9	1.3	-44	-40	D-As	-394	53	-36
Cd	0.2U	0.2U	0	0					0.2U	0.2U	0	0	0.2U	0.2U	0	-1	0.28	0.2U	>29	>31	Cd	-1	0	-8
Cr	1U	1U	0	0					1U	1U	0	0	1U	1U	0	-1	1U	1U	0	3	Cr	-1	3	-13
Cu	3.1	3.4	-10	-24					11	4.6	58	44	12	12	0	-1	12	10	17	19	Cu	-278	44	-5
Pb	1U	1U	0	0					2.6	1U	>62	>49	1.5	1U	>33	>32	1.2	1U	>17	>19	Pb	-154	0	7
Ni	2U	2U	0	0					2U	2U	0	0	4.4	5.8	-32	-34	3.5	5	-43	-38	Ni	-43	39	-15
Zn	52	23	56	50					80	26	68	57	200	83	59	58	170	88	48	50	Zn	-108	83	55
Nitrate-N (mg/L)	0.20	0.63	-215	-257					0.21	0.63	-200	-300	1.5	2.5	-67	-69	0.66	2.2	-233	-223	N-N	-444	17	-110
TKN (mg/L)	1.3	0.58	55	49					1.7	0.57	66	55	7.5	3.9	48	47	9.1	5.7	37	39	TKN (mg/L)	1	65	40
Ammonia-N (mg/L)	0.44	0.1U	>77	>74					0.65	1.3	-100	-167	3.2	1.7	47	46	4.9	2.1	57	59	NH3	-167	73	36
Total P (mg/L)	0.27	0.14	48	41					1.5	0.11	93	90	1.7	0.53	69	68	1.0	0.86	14	17	T-P	0	90	56
Diss. OrthoP (mg/L)	0.06	0.072	-20	-36					0.095	0.074	22	-4	0.58	0.34	41	41	0.95	0.77	19	22	D-O-PO3	-45	94	5
Volume (Liters)	20897	23672							31884	42503			35254	35707			21435	20756						

Seasonal Load Removal Calculations based upon the 1999 Scoping Document.

Table 1-6 BMP Pollutant Removal Efficiencies (continued)

Extended Detention Basins EMCs and Loads

	I-5/SR-56 October 26, 2000				I-5/SR-56 October 29, 2000				I-5/SR-56 January 8, 2001				I-5/SR-56 January 10, 2001				I-5/SR-56 January 26, 2001				I-5/SR-56 February 10, 2001				I-5/SR-56 February 12, 2001			
	EMC		Efficiency (%)	% Diff. In Load	EMC		Efficiency (%)	% Diff. In Load	EMC		Efficiency (%)	% Diff. In Load	EMC		Efficiency (%)	% Diff. In Load	EMC		Efficiency (%)	% Diff. In Load	EMC		Efficiency (%)	% Diff. In Load	EMC		Efficiency (%)	% Diff. In Load
	Influent	Effluent			Influent	Effluent			Influent	Effluent			Influent	Effluent			Influent	Effluent			Influent	Effluent			Influent	Effluent		
TSS (mg/L)	82	42	49	36									110	220	-100	-235	76	42	45	46								
TDS (mg/L)	180	180	0	-26									74	92	-24	-108	82	100	-22	-20								
TOC (mg/L)	12	15	-25	-57									6.2	6.5	-5	-76	9.2	8.7	5	7								
DOC (mg/L)	12	15	-25	-57									5.8	6.5	-12	-88	6.8	7.5	-10	-9								
As Tot. (ug/L)	3.7	3.1	16	-5									2.1	3.3	-57	-163	0.5U	1.8	>-260	>-254								
Cd	0.58	0.2U	>66	>57									0.59	0.73	-24	-107	0.32	0.2U	>38	>38								
Cr	4.1	3.2	22	2									5.2	3.7	29	-19	7.0	4.3	39	40								
Cu	28	22	21	1									43	28	35	-9	31	12	61	62								
Pb	19	11	42	27									53	52	2	-65	47	22	53	54								
Ni	5.0	4.1	18	-3									4.3	5.2	-21	-103	5.2	3.0	42	43								
Zn	110	55	50	37									220	160	27	-22	190	59	69	69								
As Diss. (ug/L)	2.0	2.2	-10	-38									0.88	1.3	-48	-148	1.2	1.2	0	2								
Cd	0.2U	0.2U	0	0									0.2U	0.2U	0	0	0.2U	0.2U	0	0								
Cr	1.5	1.5	0	-26									3.1	1.9	39	-3	4.2	3.3	21	23								
Cu	11	13	-18	-49									5.5	5.3	4	-62	7.2	5.7	21	22								
Pb	4.5	5.4	-20	-51									1.7	1.3	24	-28	4.0	1U	>75	>75								
Ni	2.8	3.2	-14	-44									2U	2U	0	0	2U	2U	0	0								
Zn	21	30	-43	-80									13	9.7	25	-25	14	25	-79	-76								
Nitrate-N (mg/L)	1.2	1.2	0	-26									0.18	0.17	6	-58	0.55	0.47	15	16								
TKN (mg/L)	1.5	1.5	0	-26									0.89	0.88	1	-66	1.4	1.4	0	2								
Total P (mg/L)	0.30	0.33	-10	-38									0.26	0.26	0	-68	0.34	0.078	77	77								
Diss. OrthoP (mg/L)	0.09	0.20	-122	-179									0.054	0.10	-85	-211	0.052	0.054	-4	-2								
Volume (Liters)	67563	84949											707680	1186621			263823	259717										

Table 1-6 BMP Pollutant Removal Efficiencies (continued)

Extended Detention Basins EMCs and Loads

	I-5/SR-56 February 23, 2001				I-5/SR-56 February 25, 2001				I-5/SR-56 March 6, 2001				I-5/SR-56 April 7, 2001				I-5/SR-56 April 21, 2001			
	EMCs		Efficiency (%)	% Diff. In Load	EMCs		Efficiency (%)	% Diff. In Load	EMCs		Efficiency (%)	% Diff. In Load	EMCs		Efficiency (%)	% Diff. In Load	EMCs		Efficiency (%)	% Diff. In Load
	Influent	Effluent			Influent	Effluent			Influent	Effluent			Influent	Effluent			Influent	Effluent		
TSS (mg/L)	110	26	76	82					94	16	83	86	92	22	76	78	86	12	86	96
TDS (mg/L)	88	120	-36	-4					52	120	-131	-91	140	180	-29	-17	130	230	-77	45
TOC (mg/L)	10	10	0	24					5.6	7.0	-25	-4	15	16	-7	3	23	26	-13	65
DOC (mg/L)	10	10	0	24					3.1	4.4	-42	-18	13	15	-15	-5	21	25	-19	63
As Tot. (ug/L)	3.0	1.8	40	54					2.0	1.2	40	50	3.2	2.7	16	23	2.6	2	23	76
Cd	0.61	0.53	13	34					0.54	0.2U	>63	>69	1.1	0.2U	>82	>84	0.21	0.34	-62	49
Cr	5.3	3.1	42	55					3.0	1.3	57	64	7	3.5	50	55	3.5	1.9	46	83
Cu	33	15	55	65					51	7.1	86	88	46	22	52	57	36	22	39	81
Pb	57	25	56	66					66	7.2	89	91	38	8.1	79	81	17	5.3	69	90
Ni	2.6	2U	>23	>41					4.6	2U	>57	>64	4.8	2U	>58	>62	4.7	3.2	32	79
Zn	180	58	68	75					260	29	89	91	390	55	86	87	330	41	88	96
As Diss. (ug/L)	1.2	1.0	17	36					0.83	0.63	24	37	1.2	1.2	0	9	1.2	1.6	-33	58
Cd	0.3	0.2U	>33	>49					0.2U	0.2U	0	0	0.25	0.2U	>20	>27	0.2U	0.2U	0	69
Cr	2.6	1.9	27	44					1U	1U	0	0	3.1	2.3	26	33	1.4	1.4	0	69
Cu	8.0	6.5	19	38					3.9	3.9	0	17	12	12	0	9	14	16	-14	64
Pb	11	1U	>91	>93					1U	1U	0	0	1U	1U	0	9	1U	1U	0	69
Ni	2U	2U	0	0					2U	2U	0	0	2U	3.2	>-60	>-45	2	2.3	-15	64
Zn	29	22	24	42					7.5	10	-33	-11	22	25	-14	-3	23	19	17	74
Nitrate-N (mg/L)	0.28	0.22	21	40					0.22	0.18	18	32	0.74	0.73	1	10	1.0	0.97	3	70
TKN (mg/L)	0.95	0.69	27	44					0.87	0.57	34	46	2.2	1.2	45	51	2.9	1.8	38	81
Total P (mg/L)	0.23	0.13	43	57					0.35	0.044	87	90	0.19	0.14	26	33	0.19	0.10	47	84
Diss. OrthoP (mg/L)	0.047	0.04	15	35					0.046	0.047	-2	15	0.08	0.12	-50	-36	0.11	0.14	-27	60
Volume (Liters)	156334	119466							180743	149821			95454	86619			40521	12686		

I-5/SR-56 *2000 - 2001 Wet Season Statistics*			
Parameters	Minimum Load Removal (%)	Maximum Load Removal (%)	Average Season Removal (%)
TSS (mg/L)	-235	96	31
TDS (mg/L)	-108	45	-67
TOC (mg/L)	-76	65	-35
DOC (mg/L)	-88	63	-41
T-As	-163	76	-6
Cd	-107	49	27
Cr	-19	83	26
Cu	-9	88	40
Pb	-65	91	46
Ni	-103	79	15
Zn	-22	96	67
D-As	-148	58	-33
Cd	0	69	-11
Cr	-26	69	5
Cu	-62	64	-25
Pb	-51	69	45
Ni	-44	64	-39
Zn	-80	74	-33
N-N	-58	70	-17
TKN (mg/L)	-66	81	7
T-P	-68	90	26
D-O-PO3	-211	60	-84

Seasonal Load Removal Calculations based upon the 1999 Scoping Document.

Table 1-6 BMP Pollutant Removal Efficiencies (continued)

Extended Detention Basins EMCs and Loads

	I-15/SR-78 October 26, 2000				I-15/SR-78 October 29, 2000				I-15/SR-78 January 8, 2001				I-15/SR-78 January 10, 2001				I-15/SR-78 January 26, 2001				I-15/SR-78 February 10, 2001				I-15/SR-78 February 12, 2001			
	EMC		Efficiency (%)	% Diff. In Load	EMC		Efficiency (%)	% Diff. In Load	EMC		Efficiency (%)	% Diff. In Load	EMC		Efficiency (%)	% Diff. In Load	EMC		Efficiency (%)	% Diff. In Load	EMC		Efficiency (%)	% Diff. In Load	EMC		Efficiency (%)	% Diff. In Load
	Influent	Effluent			Influent	Effluent			Influent	Effluent			Influent	Effluent			Influent	Effluent			Influent	Effluent			Influent	Effluent		
TSS (mg/L)					500	62	88	81	340	76	78	79	200	38	81	77	68	260	-282	-341	240	66	73	74	130	32	75	67
TDS (mg/L)					84	110	-31	-100	170	-			68	110	-62	-100	110	76	31	20	120	130	-8	-3	62	94	-52	-106
TOC (mg/L)					16	16	0	-52	36	34	6	9	10	12	-20	-48	12	14	-17	-34	20	19	5	10	8.4	8.0	5	-29
DOC (mg/L)					18	15	17	-27	29	34	-17	-12	10	12	-20	-48	11	12	-9	-26	20	19	5	10	8.4	8.0	5	-29
As Tot. (ug/L)					2.5	1.3	48	21	4.1	2.4	41	44	2.5	2.1	16	-4	2.7	1.8	33	23	1.5	1.0	33	37	2.7	1.8	33	10
Cd					2.1	0.52	75	62	2.7	0.53	80	81	0.81	0.34	58	48	2.7	0.6	78	74	1	0.28	72	73	0.89	0.45	49	31
Cr					7.5	2.2	71	55	11	3.2	71	72	3.3	3.3	0	-23	11	3.5	68	63	3.9	2.3	41	44	4.9	2.2	55	39
Cu					75	19	75	61	120	33	73	74	37	19	49	37	78	82	-5	-21	43	18.0	58	60	41	15	63	50
Pb					110	24	78	67	110	23	79	80	44	15	66	58	130	22	83	81	36.0	13.0	64	66	75	10	87	82
Ni					13	4.0	69	53	22	7.0	68	69	5.0	4.2	16	-4	13	3.9	70	65	5.5	2.4	56	59	7.3	2U	>73	>48
Zn					710	110	85	76	1000	170	83	84	260	94	64	55	730	120	84	81	380	83	78	79	620	72	88	84
As Diss. (ug/L)					1.0	1.0	0	-52	1.7	1.9	-12	-7	1.1	2.2	-100	-147	1.1	1.2	-9	-26	0.65	0.65	0	5	0.5U	0.80	<-60	<-204
Cd					0.2U	0.2U	0	0	0.2U	0.2U	0	0	0.2U	0.2U	0	0	0.2U	0.2U	0	0	0.2U	0.2U	0	0	0.2U	0.2U	0	0
Cr					1.4	1.2	14	-31	2.7	1.8	33	36	1.5	1.2	20	1	1.6	2.4	-50	-73	1.6	1U	>38	>41	1U	1U	0	0
Cu					11	12	-9	-66	21	20	5	9	9.1	9.7	-7	-32	7.7	8.4	-9	-26	10	9.3	7	12	6.2	8.1	-31	-77
Pb					3.3	1U	>70	>54	1.1	1U	>9	>13	1U	1U	0	0	1U	1U	0	0	1U	1U	0	0	1U	5.2	<-420	<-888
Ni					4.0	2.6	35	1	5.6	4.7	16	19	2U	2U	0	0	4.0	2.2	45	37	2U	2U	0	0	2U	2U	0	0
Zn					28	36	-29	-96	49	65	-33	-27	21	33	-57	-94	20	36	-80	-107	21	21	0	5	20	41	-105	-178
Nitrate-N (mg/L)					1.4	1.2	14	-31	3.8	2.9	24	27	0.87	0.85	2	-21	0.91	0.84	8	-6	1.4	1.0	29	32	0.62	0.38	39	17
TKN (mg/L)					3.3	1.5	55	31	6.4	3.6	44	46	1.5	1.1	27	9	2.7	2.1	22	10	2.7	2.0	26	30	1.2	0.88	27	0
Total P (mg/L)					1.5	0.24	84	76	1.3	0.39	70	71	0.31	0.20	35	20	1.0	0.2	80	77	0.47	0.18	62	64	0.67	0.10	85	80
Diss. OrthoP (mg/L)					0.17	0.20	-18	-79	0.26	0.29	-12	-7	0.091	0.11	-21	-49	0.074	0.10	-35	-56	0.088	0.081	8	13	0.045	0.069	-53	-108
Volume (Liters)					130425	198752			49667	47656			645441	796989			237743	273931			46155	43692			333990	453230		

Table 1-6 BMP Pollutant Removal Efficiencies (continued)

Extended Detention Basins EMCs and Loads

	I-15/SR-78 February 23, 2001				I-15/SR-78 February 25, 2001				I-15/SR-78 March 6, 2001				I-15/SR-78 April 7, 2001				I-15/SR-78 April 21, 2001			
	EMCs		Efficiency (%)	% Diff. In Load	EMCs		Efficiency (%)	% Diff. In Load	EMCs		Efficiency (%)	% Diff. In Load	EMCs		Efficiency (%)	% Diff. In Load	EMCs		Efficiency (%)	% Diff. In Load
	Influent	Effluent			Influent	Effluent			Influent	Effluent			Influent	Effluent			Influent	Effluent		
TSS (mg/L)	370	70	81	73					200	26	87	86	250	32	87	83	120	30	75	71
TDS (mg/L)	94	92	2	-39					80	82	-3	-7	130	110	15	-13	84	82	2	-14
TOC (mg/L)	10	11	-10	-57					9.2	13	-41	-47	16	14	13	-17	13	12	8	-8
DOC (mg/L)	10	11	-10	-57					4.8	4.4	8	4	16	14	13	-17	11	12	-9	-27
As Tot. (ug/L)	5.3	1.8	66	52					2.0	1.5	25	22	2.5	1.5	40	20	1.8	1.3	28	16
Cd	2.9	0.83	71	59					1.4	0.2U	>86	>85	1.3	0.32	75	67	0.64	0.74	-16	-35
Cr	8.8	2.9	67	53					5.5	1.4	75	73	6.6	2.9	56	41	3.3	1.7	48	40
Cu	120	22	82	74					44	11	75	74	64	26	59	46	26	15	42	33
Pb	170	23	86	81					270	8.1	97	97	50	14	72	63	28	11	61	54
Ni	39	3.5	91	87					7.8	2.4	69	68	11	4.3	61	48	4.9	2.2	55	48
Zn	1100	120	89	84					510	68	87	86	830	150	82	76	230	89	61	55
As Diss. (ug/L)	2.4	1.6	33	5					0.53	1.1	-108	-117	1.2	0.80	33	11	1.2	1.3	-8	-26
Cd	0.2U	0.2U	0	0					0.2U	0.2U	0	0	0.2U	0.21	>-5	>-97	0.2U	0.2U	0	-38
Cr	1.8	1.2	33	5					1.1	1U	>9	>5	2	1.7	15	-14	2.2	1.2	45	36
Cu	7.1	7.7	-8	-55					6.4	7.1	-11	-16	12	14	-17	-56	13	11	15	1
Pb	1U	1U	0	0					1U	1.7	<-70	<-77	1U	2.4	<-140	<-349	9	1.7	81	78
Ni	2U	2U	0	0					2U	2U	0	0	2.6	2U	>23	>-44	4.8	2U	>58	>43
Zn	13	21	-62	-130					22	32	-45	-52	50	69	-38	-85	51	47	8	-7
Nitrate-N (mg/L)	0.81	0.50	38	12					1.20	0.56	53	51	1.7	1.2	29	6	1.0	0.59	41	31
TKN (mg/L)	2.0	1.1	45	22					1.4	1.1	21	18	2.9	2.6	10	-20	2.9	1.8	38	28
Total P (mg/L)	1.3	0.22	83	76					0.94	0.15	84	83	0.65	0.13	80	73	0.11	0.10	9	-6
Diss. OrthoP (mg/L)	0.064	0.071	-11	-58					0.12	0.11	8	4	0.087	0.12	-38	-84	0.094	0.092	2	-14
Volume (Liters)	131133	186887							156561	163328			161035	215373			177401	206935		

I-15/SR-78 *2000 - 2001 Wet Season Statistics*			
Parameters	Minimum Load Removal (%)	Maximum Load Removal (%)	Average Season Removal (%)
TSS (mg/L)	-341	86	66
TDS (mg/L)	-106	20	-33
TOC (mg/L)	-57	9	-27
DOC (mg/L)	-57	4	-28
T-As	-4	52	25
Cd	-35	81	64
Cr	-23	73	52
Cu	-21	74	51
Pb	54	97	81
Ni	-4	87	65
Zn	55	86	79
D-As	-147	11	-37
Cd	-38	0	-26
Cr	-73	36	-1
Cu	-77	9	-29
Pb	0	78	-11
Ni	0	37	6
Zn	-178	-7	-70
N-N	-31	51	8
TKN (mg/L)	-20	46	18
T-P	-6	83	74
D-O-PO3	-108	4	-41

Seasonal Load Removal Calculations based upon the 1999 Scoping Document.

Table 1-6 BMP Pollutant Removal Efficiencies (continued)

Extended Detention Basins EMCs and Loads

	Manchester October 26, 2000				Manchester October 29, 2000				Manchester January 8, 2001				Manchester January 10, 2001				Manchester January 26, 2001				Manchester February 10, 2001				Manchester February 12, 2001			
	EMC		Efficiency (%)	% Diff. In Load	EMC		Efficiency (%)	% Diff. In Load	EMC		Efficiency (%)	% Diff. In Load	EMC		Efficiency (%)	% Diff. In Load	EMC		Efficiency (%)	% Diff. In Load	EMC		Efficiency (%)	% Diff. In Load	EMC		Efficiency (%)	% Diff. In Load
	Influent	Effluent			Influent	Effluent			Influent	Effluent			Influent	Effluent			Influent	Effluent			Influent	Effluent			Influent	Effluent		
TSS (mg/L)	300	84	72	85	170	28	84	87	270	58	79	90	190	94	51	72	170	48	72	82					94	38	60	76
TDS (mg/L)	140	140	0	45	96	88	8	29	160	-	NA	NA	56	66	-18	34	66	66	0	37					38	74	-95	-16
TOC (mg/L)	23	20	13	52	15	15	0	22	31	27	13	60	11	11	0	44	12	11	8	42					12	7.8	35	61
DOC (mg/L)	21	22	-5	42	18	16	11	31	30	29	3	55	9.5	11	-16	35	9.7	9.4	3	39					9.8	7.8	20	53
As Tot. (ug/L)	4.2	3.4	19	55	1.9	2.2	-16	10	3.3	2.7	18	62	2.5	0.5U	>80	>89	3.0	2.5	17	47					3.0	2.2	27	56
Cd	2.3	1.2	48	71	1.6	0.63	61	69	1.5	0.88	41	73	2.8	0.73	74	85	1.9	0.77	59	74					1.5	0.35	77	86
Cr	14	10	29	61	11	7.0	36	50	10	4.0	60	82	8.7	3.7	57	76	12	8.4	30	56					6.7	1U	>85	>91
Cu	96	49	49	72	71	26.0	63	71	88	37	58	81	95	28	71	83	82	26	68	80					62	11	82	89
Pb	180	69	62	79	75	21	72	78	87	39	55	79	130	50	62	78	87	31	64	77					65	14	78	87
Ni	17	11	35	64	11	6.0	45	57	15	7.1	53	78	10	3.4	66	81	13	5.0	62	76					8.2	2U	>76	>86
Zn	550	240	56	76	390	150	62	70	540	190	65	84	550	160	71	84	570	150	74	83					440	75	83	90
As Diss. (ug/L)	1.3	1.3	0	45	0.88	1.7	-93	-51	1.5	1.8	-20	45	1.1	0.85	23	56	0.73	1.7	-133	-47					0.58	0.5U	>14	>49
Cd	0.55	0.37	33	63	0.21	0.5	-138	-86	0.43	0.28	35	70	0.36	0.35	3	45	0.2U	0.2U	0	0					0.2U	0.2U	0	0
Cr	7.9	6.7	15	53	6.8	4.2	38	52	4.4	1.4	68	85	3.1	2.0	35	64	9.0	4.8	47	66					1.3	1U	>23	>54
Cu	25	26	-4	43	16	19	-19	7	28	16	43	74	11	13	-18	33	13	13	0	37					8.9	4.8	46	68
Pb	3.8	6.4	-68	7	3.9	1.7	56	66	1.9	1.2	37	71	1.4	9.0	-543	-262	1.1	2.0	-82	-15					1U	1U	0	0
Ni	7.3	7.1	3	46	5.1	5.1	0	22	8.1	5.5	32	69	2.3	2.7	-17	34	2.9	4.0	-38	13					2U	2U	0	0
Zn	120	110	8	49	100	100	0	22	140	82	41	73	73	83	-14	36	63	73	-16	27					62	44	29	58
Nitrate-N (mg/L)	2.0	1.5	25	59	0.99	0.63	36	50	2.8	2.1	25	65	0.48	0.53	-10	38	0.9	0.76	16	47					0.45	2.3	-411	-203
TKN (mg/L)	3.7	2.4	35	64	2.3	2.0	13	32	4.3	3.6	16	61	1.5	1.6	-7	40	2.2	1.5	32	57					1.5	0.45	70	82
Total P (mg/L)	0.51	0.59	-16	36	1.0	0.36	64	72	0.76	0.72	5	56	0.44	0.23	48	71	0.38	0.16	58	73					0.77	0.13	83	90
Diss. OrthoP (mg/L)	0.21	0.25	-19	34	0.16	0.18	-13	12	0.30	0.51	-70	22	0.96	0.094	90	94	0.098	0.12	-22	23					0.066	0.035	47	69
Volume (Liters)	53008	29307			65665	51196			58615	27042			497771	280331			205944	130283							220725	131019		

Table 1-6 BMP Pollutant Removal Efficiencies (continued)

Extended Detention Basins EMCs and Loads

	Manchester February 23, 2001				Manchester February 25 2001			Manchester March 6, 2001				Manchester April 7, 2001				Manchester April 21, 2001				Manchester *2000 - 2001 Wet Season Statistics*			
	EMCs		Efficiency (%)	% Diff. In Load	EMCs		Efficiency (%)	% Diff. In Load	EMCs		Efficiency (%)	% Diff. In Load	EMCs		Efficiency (%)	% Diff. In Load	EMCs		Efficiency (%)	% Diff. In Load	Parameters	Minimum Load Removal (%)	Maximum Load Removal (%)	Average Season Removal (%)
	Influent	Effluent			Influent	Effluent			Influent	Effluent			Influent	Effluent			Influent	Effluent						
SS (mg/L)	120	76	37	61					76	18	76	73	280	100	64	78	170	62	64	73	TSS (mg/L)	61	90	79
TDS (mg/L)	72	76	-6	36					44	54	-23	-42	150	150	0	39	120	120	0	25	TDS (mg/L)	-42	45	34
TOC (mg/L)	17	16	6	43					11	11	0	-15	36	30	17	49	25	25	0	25	TOC (mg/L)	-15	61	43
DOC (mg/L)	11	8.9	19	51					9.8	7.6	22	10	27	28	-4	37	25	25	0	25	DOC (mg/L)	10	55	39
As Tot. (ug/L)	1.9	3.4	-79	-9					1.6	0.95	41	31	3.7	3.0	19	51	2.6	2.3	12	34	T-As	-9	62	45
Cd	0.83	0.83	0	39					0.57	0.33	42	33	3	1.6	47	67	1.5	0.73	51	64	Cd	33	86	72
Cr	5.4	4.1	24	54					2.5	1.6	36	26	12	7.6	37	61	8.9	3.4	62	71	Cr	26	82	64
Cu	39	28	28	56					27	21	22	10	120	65	46	67	82	42	49	62	Cu	10	89	73
Pb	51	35	31	58					35	13	63	57	130	38	71	82	67	30	55	66	Pb	57	87	76
Ni	6.5	5.0	23	53					4.6	4.2	9	-5	16	9.3	42	65	14	7.1	49	62	Ni	-5	81	67
Zn	280	190	32	59					220	100	55	48	1200	390	68	80	550	250	55	66	Zn	48	90	77
As Diss. (ug/L)	0.85	0.60	29	57					0.58	0.70	-21	-39	0.90	1.1	-22	25	1.1	1.2	-9	18	D-As	-51	57	24
Cd	0.35	0.62	-77	-8					0.47	0.2U	>57	>51	0.2U	0.48	>-140	>-46	0.48	0.61	-27	5	Cd	-86	70	31
Cr	3.3	1.9	42	65					1U	1U	0	0	7	4.1	41	64	2.6	1.4	46	60	Cr	0	85	63
Cu	14	12	14	48					7.9	12	-52	-75	35	33	6	42	24	21	13	34	Cu	-75	74	41
Pb	8.7	6.5	25	54					1U	4.8	>-380	>-454	1.7	1U	>41	>64	1.7	2.1	-24	7	Pb	-262	71	10
Ni	3.7	3.1	16	49					2U	3.2	>-60	>-85	5.2	6.0	-15	30	4.9	4.5	8	31	Ni	0	69	38
Zn	100	140	-40	15					45	73	-62	-87	170	190	-12	32	130	140	-8	19	Zn	-87	73	36
Nitrate-N (mg/L)	0.51	0.26	49	69					0.48	0.25	48	40	1.5	0.97	35	61	1.2	0.66	45	59	N-N	-203	69	43
TKN (mg/L)	1.5	1.3	13	47					1.4	0.58	59	52	2.6	4.4	-69	-3	3.2	2.8	13	34	TKN (mg/L)	-3	82	44
Total P (mg/L)	0.20	0.17	15	48					0.18	0.091	49	42	0.60	0.27	55	73	0.19	0.16	16	37	T-P	36	90	65
Diss. OrthoP (mg/L)	0.068	0.035	49	69					0.074	0.036	51	44	0.20	0.026	87	92	0.15	0.041	73	80	D-O-PO3	12	94	62
Volume (Liters)	590054	359815							76765	88630			55840	34064			67534	50629						

Seasonal Load Removal Calculations based upon the 1999 Scoping Document

Table 1-6 BMP Pollutant Removal Efficiencies (continued)

Media Filters (Sand Type II) EMCs and Loads

	Escondido MS October 26, 2000				Escondido MS October 29, 2000				Escondido MS January 8, 2001				Escondido MS January 10, 2001			
	EMC		Efficiency (%)	% Diff. In Load	EMC		Efficiency (%)	% Diff. In Load	EMC		Efficiency (%)	% Diff. In Load	EMC		Efficiency (%)	% Diff. In Load
	Influent	Effluent			Influent	Effluent			Influent	Effluent			Influent	Effluent		
TSS (mg/L)					140	22	84	90								
TDS (mg/L)					100	92	8	40								
TOC (mg/L)					29	24	17	46								
DOC (mg/L)					29	24	17	46								
As Tot. (ug/L)					1.8	1.2	33	57								
Cd					1.3	1.1	15	45								
Cr					3.1	2	35	58								
Cu					18	9.6	47	65								
Pb					16	3	81	88								
Ni					7	3.6	49	66								
Zn					400	93	77	85								
As Diss. (ug/L)					.78	.93	-19	22								
Cd					0.2U	.27	>-35	>12								
Cr					1.3	1U	>23	>50								
Cu					8.5	4.6	46	65								
Pb					4.6	1U	>78	>86								
Ni					5.3	3	43	63								
Zn					230	44	81	88								
Nitrate-N (mg/L)					0.1	1.8	-1700	-1074								
TKN (mg/L)					2.4	1	58	73								
Ammonia-N (mg/L)					0.55		100	100								
Total P (mg/L)					0.65	0.15	77	85								
Diss. OrthoP (mg/L)					0.16	0.085	47	65								
Volume (Liters)					81126	52895										

	Escondido MS January 26, 2001				Escondido MS February 10, 2001				Escondido MS February 12, 2001			
	EMC		Efficiency (%)	% Diff. In Load	EMC		Efficiency (%)	% Diff. In Load	EMC		Efficiency (%)	% Diff. In Load
	Influent	Effluent			Influent	Effluent			Influent	Effluent		
TSS (mg/L)	140	36	74	76	150	28	81	88	54	12	78	78
TDS (mg/L)	62	56	10	15	70	100	-43	10	22	38	-73	-69
TOC (mg/L)	23	12	48	51	23	19	17	48	12	10	17	19
DOC (mg/L)	23	12	48	51	23	19	17	48	12	7.9	34	36
As Tot. (ug/L)	1.7	1.0	41	45	1.6	0.90	44	65	1.5	1.0	33	35
Cd	1.5	0.2U	>87	>87	0.73	0.26	64	78	0.2U	0.2U	>100	>100
Cr	4.0	2.5	38	41	1.5	1U	>33	>58	1.2	1U	>99	>99
Cu	25	6.4	74	76	14	6.2	56	72	5.5	3.2	42	43
Pb	20	3.8	81	82	13	2.4	82	88	1U	1.6	-60	2
Ni	6.2	2.6	58	60	2.7	2U	>26	>53	2U	2U	0	0
Zn	390	37	91	91	240	21	91	95	190	14	93	93
As Diss. (ug/L)	0.75	0.63	16	21	0.63	0.53	16	47	0.60	0.5U	>17	>19
Cd	0.61	0.2U	>67	>69	0.2U	0.2U	0	0	0.2U	0.5U	0	0
Cr	1U	1U	0	0	1U	1U	0	0	1U	1U	0	0
Cu	10	2.0	80	81	7.9	4.0	49	68	2.9	1.4	52	53
Pb	1.2	1U	>17	>21	1U	1U	0	0	1U	1U	0	0
Ni	3.4	2U	>41	>45	2U	2U	0	0	2U	2U	0	0
Zn	210	15	93	93	160	8.9	94	97	150	8.0	95	95
Nitrate-N (mg/L)	0.33	0.42	-27	-20	0.32	1.4	-338	-175	0.13	0.17	-31	-28
TKN (mg/L)	3.0	1.0	67	69	2.6	1.1	58	73	0.88	2.4	-173	-166
Ammonia-N (mg/L)	1.1	0.21	81	82	0.72	0.15	79	87	0.34	0.13	62	63
Total P (mg/L)	0.53	0.28	47	50	0.31	0.18	42	64	0.17	0.12	29	31
Diss. OrthoP (mg/L)	0.24	0.17	29	33	0.058	0.081	-40	12	0.049	0.044	10	12
Volume (Liters)	58133	54792			19255	12091			97436	95171		

Table 1-6 BMP Pollutant Removal Efficiencies (continued)

Media Filters (Sand Type II) EMCs and Loads

	Escondido MS February 23, 2001				Escondido MS February 25 2001				Escondido MS March 6, 2001				Escondido MS April 7, 2001				Escondido MS April 21, 2001			
	EMCs		Efficiency (%)	% Diff. In Load	EMCs		Efficiency (%)	% Diff. In Load	EMCs		Efficiency (%)	% Diff. In Load	EMCs		Efficiency (%)	% Diff. In Load	EMCs		Efficiency (%)	% Diff. In Load
	Influent	Effluent			Influent	Effluent			Influent	Effluent			Influent	Effluent			Influent	Effluent		
TSS (mg/L)					34	1U	>97	>98	110	4.0	-96	98	90	12	87	91	84	6.0	93	96
TDS (mg/L)					34	42	-24	33	46	50	-9	42	54	100	-85	-22	32	54	-69	9
TOC (mg/L)					14	13	7	50	12	8.0	33	64	19	17	11	41	22	11	50	73
DOC (mg/L)					14	12	14	54	5.5	5.3	4	48	19	16	16	44	18	11	39	67
As Tot. (ug/L)					0.5U	0.5U	0	0	1.4	0.58	59	78	0.90	0.60	33	56	2.6	0.5	81	90
Cd					0.53	0.2U	>62	>80	1.4	0.2U	>86	>92	1.3	0.2U	>85	>90	1	0.2U	>80	>89
Cr					1.4	1U	>29	>62	3.2	1U	>69	>83	1.5	1U	>33	>56	2.3	1U	>57	>76
Cu					5.9	2.7	54	75	14	3.1	78	88	38	8.2	78	86	13	13	0	46
Pb					4.8	1U	>79	>89	11	1U	>91	>95	12	1.7	86	91	13	1U	>92	>96
Ni					2U	2U	0	0	4.0	2U	>50	>73	3.7	2U	>46	>64	3.5	2U	>43	>69
Zn					310	13	96	98	470	16	97	98	530	35	93	96	490	31	94	97
As Diss. (ug/L)					0.53	0.5U	>6	>49	0.5U	0.5U	0	0	0.5U	0.5U	0	34	0.68	0.2	71	84
Cd					0.44	0.2U	>55	>76	0.21	0.2U	>5	>49	0.63	0.2U	>68	>79	0.68	0.2U	>71	>84
Cr					1U	1U	0	0	1U	1U	0	0	1U	1U	0	34	1.1	1U	>9	>51
Cu					2.9	1.9	34	65	3.7	2.0	46	71	7.6	5.6	26	51	9.1	4.6	49	73
Pb					1.1	1U	>9	>51	1U	1U	0	0	1.5	1U	>33	>56	1.7	1U	>41	>68
Ni					2U	2U	0	0	2U	2U	0	0	2U	2U	0	34	5.1	2U	>61	>79
Zn					260	8.8	97	98	230	95	59	78	340	26	92	95	350	17	95	97
Nitrate-N (mg/L)					0.14	0.21	-50	19	0.22	0.57	-159	-39	0.51	1.3	-155	-69	0.58	0.72	-24	33
TKN (mg/L)					0.63	0.39	38	67	1.2	0.37	69	83	2.1	2.7	-29	15	2.2	1.2	45	70
Ammonia-N (mg/L)					0.19	0.10	47	72	0.43	0.1	77	88	0.49	0.18	63	76	0.55	0.12	78	88
Total P (mg/L)					0.11	0.045	59	78	0.17	0.059	65	81	0.15	0.079	47	65	0.061	0.041	33	64
Diss. OrthoP (mg/L)					0.049	0.041	16	55	0.036	0.045	-25	33	0.016	0.083	-419	-243	0.028	0.032	-14	38
Volume (Liters)					287863	154975			64929	34886			72405	47883			58501	31686		

Escondido MS *2000 - 2001 Wet Season Statistics*			
Parameters	Minimum Load Removal (%)	Maximum Load Removal (%)	Average Season Removal (%)
TSS (mg/L)	76	98	88
TDS (mg/L)	-69	42	23
TOC (mg/L)	19	73	55
DOC (mg/L)	36	67	55
T-As	0	90	69
Cd	45	78	98
Cr	41	58	93
Cu	43	88	80
Pb	2	91	96
Ni	0	66	64
Zn	85	98	99
D-As	0	84	43
Cd	0	0	63
Cr	0	34	41
Cu	51	81	70
Pb	0	0	62
Ni	0	63	56
Zn	78	98	93
N-N	-1074	33	-84
TKN (mg/L)	-166	83	58
NH3	63	100	84
T-P	31	85	73
D-O-PO3	-243	65	45

Seasonal Load Removal Calculations based upon the 1999 Scoping Document.

Table 1-6 BMP Pollutant Removal Efficiencies (continued)

Wet Basin EMCs and Loads

	La Costa Wet Basin October 26, 2000				La Costa Wet Basin October 29, 2000				La Costa Wet Basin January 8, 2001				La Costa Wet Basin January 10, 2001				La Costa Wet Basin January 26, 2001				La Costa Wet Basin February 10, 2001				La Costa Wet Basin February 12, 2001			
	EMC		Efficiency (%)	% Diff. In Load	EMC		Efficiency (%)	% Diff. In Load	EMC		Efficiency (%)	% Diff. In Load	EMC		Efficiency (%)	% Diff. In Load	EMC		Efficiency (%)	% Diff. In Load	EMC		Efficiency (%)	% Diff. In Load	EMC		Efficiency (%)	% Diff. In Load
	Influent	Effluent			Influent	Effluent			Influent	Effluent			Influent	Effluent			Influent	Effluent			Influent	Effluent			Influent	Effluent		
TSS (mg/L)									300	10	97	97	240	10	96	97	240	12	95	94					170	28	84	88
TDS (mg/L)									200	1800	-800	-782	86	1600	-1760	-1428	88	1200	-1264	-1593					60	1300	-2067	-1511
TOC (mg/L)									46	24	48	49	11	17	-55	-27	11	13	-18	-47					7.2	11	-53	-14
DOC (mg/L)									41	20	51	52	11	13	-18	3	10	12	-20	-49					6.8	10	-47	-9
As Tot. (ug/L)									3.8	0.75	80	81	1.0	1.3	-30	-7	3.0	0.68	77	72					1.5	0.5U	>67	>57
Cd									1.8	0.2U	>89	>89	1.3	0.2U	>85	>87	1.7	0.2U	>88	>85					0.59	0.2U	>66	>75
Cr									10	2.1	79	79	3.7	1.1	70	76	7.6	1U	>87	>84					3.7	1U	>73	>80
Cu									120	5.1	96	96	66	7.1	89	91	72	4.2	94	93					43	13	70	78
Pb									190	2.8	99	99	250	9.2	96	97	330	4.7	99	98					150	6.6	96	97
Ni									21	6.1	71	72	7.7	5.0	35	47	9.3	5.5	41	27					5.1	2.5	51	64
Zn									520	19	96	96	280	28	90	92	460	18	96	95					200	37	82	86
As Diss. (ug/L)									1.2	0.5U	>58	>59	0.88	0.5U	>43	>53	1.1	0.5U	>55	>44					0.5U	0.55	<-10	<18
Cd									0.26	0.2U	>23	>25	0.2U	0.2U	0	0	0.2U	0.2U	0	0					0.2U	0.2U	0	0
Cr									2.8	1.0	64	65	1.4	1U	>29	>41	2.0	1U	>50	>38					1U	1U	0	0
Cu									38	3.5	91	91	14	4.6	67	73	38	3.6	91	88					6.5	11	-69	-26
Pb									3.0	1U	>67	>67	2.3	1U	>57	>64	2.8	1U	>64	>56					3.4	1.6	53	65
Ni									11	5.4	51	52	2.9	4.4	-52	-25	2U	2.2	<-10	<-37					2U	2.4	<-20	<11
Zn									120	16	87	87	23	18	22	36	22	14	36	21					23	32	-39	-3
Nitrate-N (mg/L)									0.011	0.23	-1991	-1948	1.4	0.24	83	86	1.4	0.01U	>99	>99					0.65	-		
TKN (mg/L)									5.0	1.6	68	69	1.7	1.4	18	32	1.8	2.3	-28	-59					0.98	2.2	-124	-67
Ammonia-N (mg/L)									3.9	1.5	62	62	0.45	.1U	>78	>82	0.70	0.29	59	49					0.47	0.32	32	49
Total P (mg/L)									0.78	0.36	54	55	0.32	0.29	9	26	0.51	0.28	45	32					0.21	0.85	-305	-201
Diss. OrthoP (mg/L)									0.21	0.15	29	30	0.08	0.16	-100	-64	0.083	0.079	5	-18					0.067	-		
Volume (Liters)									19504	19105			313178	257281			115587	143478							241792	179808		

Table 1-6 BMP Pollutant Removal Efficiencies (continued)

Wet Basin EMCs and Loads

	La Costa Wet Basin February 23, 2001				La Costa Wet Basin February 25, 2001				La Costa Wet Basin March 6, 2001				La Costa Wet Basin April 7, 2001				La Costa Wet Basin April 21, 2001			
	EMCs		Efficiency (%)	% Diff. In Load	EMCs		Efficiency (%)	% Diff. In Load	EMCs		Efficiency (%)	% Diff. In Load	EMCs		Efficiency (%)	% Diff. In Load	EMCs		Efficiency (%)	% Diff. In Load
	Influent	Effluent			Influent	Effluent			Influent	Effluent			Influent	Effluent			Influent	Effluent		
TSS (mg/L)					68	2.0	97	96	110	1U	>99	>99	270	18	93	94	190	12	94	91
TDS (mg/L)					62	680	-997	-1389	64	530	-728	-830	140	1900	-1257	-1148	190	1900	-900	-1356
TOC (mg/L)					15	13	13	-18	530	11	98	98	25	27	-8	1	33	14	58	38
DOC (mg/L)					22	7.6	65	53	483	10	98	98	24	27	-13	-3	30	13	57	37
As Tot. (ug/L)					1.2	0.5U	>58	>43	1.6	0.63	61	56	2.7	0.5U	>81	>83	2	0.5	75	64
Cd					1.0	0.35	65	52	0.63	0.2U	>68	>64	1.9	0.2U	>89	>90	0.87	0.23	74	61
Cr					9.7	1U	>90	>86	12	1U	>92	>91	5.9	1U	>83	>84	4	1U	>75	>64
Cu					77	7.0	91	88	35	3.4	90	89	200	6.6	97	97	62	3.8	94	91
Pb					290	8.6	97	96	450	2.4	99	99	230	2.4	99	99	100	1U	>99	>99
Ni					8.1	4.3	47	28	5.3	3.1	42	34	18	11	39	44	12	7.2	40	13
Zn					270	37	86	81	190	21	89	88	850	37	96	96	340	31	91	87
As Diss. (ug/L)					0.53	0.68	-28	-74	0.78	0.5U	>36	>28	0.88	0.5U	>43	>48	0.83	0.9	-8	-58
Cd					0.2U	0.2U	0	0	0.2U	0.2U	0	0	0.25	0.2U	>20	>26	0.48	0.2U	>58	>39
Cr					1.5	1U	>33	>9	6.0	1U	>83	>81	2.6	1U	>62	>65	1.1	1U	>9	>-32
Cu					8.4	5.7	32	8	7.5	2.2	71	67	23	5	78	80	20	2.8	86	80
Pb					1.8	4.2	-133	-217	2.1	1U	>52	>47	2.7	1U	>63	>66	1.7	1U	>41	>14
Ni					2.0	3.7	-85	-151	2	2.9	-45	-63	3.9	9.9	-154	-133	5.2	6.9	-33	-93
Zn					34	30	12	-20	30	13	57	51	62	41	34	39	74	30	59	41
Nitrate-N (mg/L)					0.78	0.27	65	53	0.64	0.082	87	86	2.7	1.5	44	49	1.9	0.50	74	62
TKN (mg/L)					0.99	1.5	-52	-106	1.1	1.1	0	-12	3.2	2.3	28	34	4.4	4.1	7	-36
Ammonia-N (mg/L)					0.33	0.18	45	26	0.51	0.10	80	78	1.1	0.19	83	84	1.2	0.15	88	82
Total P (mg/L)					0.44	0.45	-2	-39	0.36	0.5	-39	-56	0.37	0.21	43	48	0.16	0.23	-44	-109
Diss. OrthoP (mg/L)					0.070	0.310	-343	-501	0.075	0.37	-393	-454	0.19	0.074	61	64	0.15	0.011	93	89
Volume (Liters)					229588	311705			33158	37236			77983	71697			29279	42644		

La Costa Wet Basin *2000 - 2001 Wet Season Statistics*			
Parameters	Minimum Load Removal (%)	Maximum Load Removal (%)	Average Season Removal (%)
TSS (mg/L)	88	97	93
TDS (mg/L)	-1593	-782	-1156
TOC (mg/L)	-47	98	76
DOC (mg/L)	-49	98	77
T-As	-7	81	68
Cd	52	61	82
Cr	76	79	84
Cu	78	97	93
Pb	96	99	98
Ni	13	72	48
Zn	81	96	93
D-As	-74	-58	31
Cd	0	0	19
Cr	0	65	56
Cu	-26	91	76
Pb	-217	65	41
Ni	-151	52	-25
Zn	-20	87	50
N-N	-1948	86	83
TKN (mg/L)	-106	69	15
NH3	26	84	68
T-P	-201	55	0
D-O-PO3	-501	89	-76

Seasonal Load Removal Calculations based upon the 1999 Scoping Document.

Table 1-6 BMP Pollutant Removal Efficiencies (continued)

Biofiltration Swales EMCs and Loads

	Palomar October 26, 2000				Palomar October 29, 2000				Palomar January 8, 2001				Palomar January 10, 2001				Palomar January 26, 2001				Palomar February 10, 2001				Palomar February 12, 2001			
	EMC		Efficiency (%)	% Diff. In Load	EMC		Efficiency (%)	% Diff. In Load	EMC		Efficiency (%)	% Diff. In Load	EMC		Efficiency (%)	% Diff. In Load	EMC		Efficiency (%)	% Diff. In Load	EMC		Efficiency (%)	% Diff. In Load	EMC		Efficiency (%)	% Diff. In Load
	Influent	Effluent			Influent	Effluent			Influent	Effluent			Influent	Effluent			Influent	Effluent			Influent	Effluent			Influent	Effluent		
TSS (mg/L)																	96	46	52	65					200	52	74	76
TDS (mg/L)																	62	82	-32	2					42	62	-48	-38
TOC (mg/L)																	12	13	-8	20					6.5	7.5	-15	-8
DOC (mg/L)																	10	12	-20	11					6.5	7.3	-12	-5
As Tot. (ug/L)																	2.5	1.6	36	53					1.7	1.2	29	34
Cd																	0.72	0.33	54	66					0.96	0.54	44	47
Cr																	5.5	4.0	27	46					6.4	7.1	-11	-4
Cu																	32	16	50	63					43	18	58	61
Pb																	61	31	49	62					97	48	51	54
Ni																	6.9	4.6	33	51					6.3	2.9	54	57
Zn																	190	73	62	72					260	94	64	66
As Diss. (ug/L)																	2.4	0.9	63	72					0.5U	0.5U	0	0
Cd																	0.2U	0.2U	0	0					0.2U	0.2U	0	0
Cr																	3.3	2.9	12	35					6.0	5.0	17	22
Cu																	11	9.6	13	35					7.3	5.9	19	25
Pb																	13	3.6	72	80					1.8	2.7	-50	-40
Ni																	2U	2U	0	0					2U	2U	0	0
Zn																	48	32	33	51					33	31	6	12
Nitrate-N (mg/L)																	1.1	0.97	12	35					0.32	0.34	-6	1
TKN (mg/L)																	2.2	1.8	18	39					1.3	0.89	32	36
Total P (mg/L)																	0.20	0.24	-20	11					0.40	0.25	38	42
Diss. OrthoP (mg/L)																	0.073	0.14	-92	-42					0.11	0.16	-45	-36
Volume (Liters)																	148519	109895							502359	469030		

Table 1-6 BMP Pollutant Removal Efficiencies (continued)

Biofiltration Swales EMCs and Loads

	Palomar February 23, 2001				Palomar February 25, 2001				Palomar March 6, 2001				Palomar April 7, 2001				Palomar April 21, 2001				Palomar *2000 - 2001 Wet Season Statistics*			
	EMCs		Efficiency (%)	% Diff. In Load	EMCs		Efficiency (%)	% Diff. In Load	EMCs		Efficiency (%)	% Diff. In Load	EMCs		Efficiency (%)	% Diff. In Load	EMCs		Efficiency (%)	% Diff. In Load	Parameters	Minimum Load Removal (%)	Maximum Load Removal (%)	Average Season Removal (%)
	Influent	Effluent			Influent	Effluent			Influent	Effluent			Influent	Effluent			Influent	Effluent						
TSS (mg/L)	100	44	56	67					42	24	43	58	120	32	73	89	160	42	74	90	TSS (mg/L)	43	90	60
TDS (mg/L)	82	110	-34	-2					58	72	-24	9	110	120	-9	56	100	160	-60	40	TDS (mg/L)	-38	56	-63
TOC (mg/L)	13	17	-31	1					7.8	11	-41	-3	27	22	19	67	22	22	0	63	TOC (mg/L)	-41	67	-27
DOC (mg/L)	13	12	8	30					5.4	5.6	-4	24	23	22	4	62	19	22	-16	57	DOC (mg/L)	-5	62	-29
As Tot. (ug/L)	1.9	1.3	32	48					1.0	0.95	5	31	1.5	1.1	27	70	8.4	7.4	12	67	T-As	5	70	5
Cd	0.53	0.57	-8	18					0.70	0.26	63	73	1.2	0.73	39	76	0.88	0.63	28	73	Cd	18	76	24
Cr	5.8	4.8	17	37					1.8	1.7	6	31	9.2	7.6	17	67	9.4	6	36	76	Cr	-4	76	1
Cu	37	25	32	49					16	9.6	40	56	63	32	49	80	52	23	56	84	Cu	40	84	38
Pb	73	42	42	56					21	10	52	65	58	23	60	84	60	20	67	88	Pb	52	88	42
Ni	4.0	2.4	40	54					2.9	2.1	28	47	9.6	5.2	46	78	9.2	4	57	84	Ni	28	84	34
Zn	210	110	48	60					100	54	46	61	430	130	70	88	360	94	74	90	Zn	46	90	57
As Diss. (ug/L)	0.63	0.58	8	30					0.50	0.5U	>0	>27	0.50	0.60	-20	52	0.63	0.73	-16	57	D-As	0	72	8
Cd	0.2U	0.2U	0	0					0.2U	0.3	>-50	>-10	0.2U	0.2U	0	60	0.2U	0.24	>-20	>55	Cd	0	60	-37
Cr	3.4	3.0	12	33					1U	1.4	>-40	>-2	6.6	5.8	12	65	5.5	4.1	25	72	Cr	22	72	0
Cu	13	13	0	24					7.3	7.3	0	27	28	20	29	71	15	13	13	68	Cu	0	71	-3
Pb	1U	1.3	>-30	>1					1U	2.5	>-150	>83	1.9	2.1	-11	56	1.3	3.2	-146	8	Pb	-40	80	-2
Ni	2U	2U	0	0					2U	2U	0	0	4.5	2.5	44	78	2.9	2	31	74	Ni	0	78	1
Zn	36	35	3	26					33	34	-3	25	130	72	45	78	72	51	29	74	Zn	-3	78	12
Nitrate-N (mg/L)	0.49	0.5	-2	23					0.39	0.41	-5	23	1.4	1.5	-7	57	0.69	1.1	-59	41	N-N	-5	57	-35
TKN (mg/L)	1.4	1.2	14	35					1.3	1.0	23	44	2.9	3.6	-24	50	3.0	3.1	-3	62	TKN (mg/L)	23	62	-19
Total P (mg/L)	0.34	0.39	-15	13					0.15	0.19	-27	7	0.21	0.34	-62	35	0.20	0.38	-90	29	T-P	-27	42	-46
Diss. OrthoP (mg/L)	0.11	0.17	-55	-17					0.078	0.14	-79	-31	0.15	0.28	-87	25	0.15	0.31	-107	23	D-O-PO3	-79	25	-119
Volume (Liters)	83873	63683							145234	106214			80078	32224			49922	18575						

Seasonal Load Removal Calculations based upon the 1999 Scoping Document.

Table 1-6 BMP Pollutant Removal Efficiencies (continued)

Biofiltration Swales EMCs and Loads

	Melrose October 26, 2000				Melrose October 29, 2000				Melrose January 8, 2001				Melrose January 10, 2001				Melrose January 26, 2001				Melrose February 10, 2001				Melrose February 12, 2001			
	EMC		Efficiency (%)	% Diff. In Load	EMC		Efficiency (%)	% Diff. In Load	EMC		Efficiency (%)	% Diff. In Load	EMC		Efficiency (%)	% Diff. In Load	EMC		Efficiency (%)	% Diff. In Load	EMC		Efficiency (%)	% Diff. In Load	EMC		Efficiency (%)	% Diff. In Load
	Influent	Effluent			Influent	Effluent			Influent	Effluent			Influent	Effluent			Influent	Effluent			Influent	Effluent			Influent	Effluent		
TSS (mg/L)	70		100	100	44		100	100					110	52	53	97	98	34	65	84					24	110	-358	-156
TDS (mg/L)	200		100	100	74		100	100					38	120	-216	81	40	88	-120	-5					48	140	-192	-63
TOC (mg/L)	56		100	100	17		100	100					15	27	-80	89	15	24	-60	24					10	11	-10	39
DOC (mg/L)	54		100	100	16		100	100					14	28	-100	88	13	21	-62	23					10	11	-10	39
As Tot. (ug/L)	1.2		100	100	1.5		100	100					3.4	1.8	47	97	1.2	1.1	8	56					0.65	0.93	-43	20
Cd	1.3		100	100	0.78		100	100					0.62	0.34	45	97	0.7	0.2U	>71	>86					0.76	0.2U	>74	>85
Cr	4.9		100	100	2.1		100	100					2.4	2.8	-17	93	2.4	2.5	-4	50					1.7	1.5	12	51
Cu	66		100	100	27		100	100					27	14	48	97	34	13	62	82					45	6.1	86	92
Pb	12		100	100	10		100	100					12	7.2	40	96	18	5.9	67	84					8.7	1.9	78	88
Ni	26		100	100	8.1		100	100					4.8	2.5	48	97	5.1	2.5	51	77					3.2	2U	>38	>65
Zn	800		100	100	350		100	100					260	76	71	98	280	55	80	91					280	26	91	95
As Diss. (ug/L)	0.7		100	100	0.5U		100	100					0.83	2.1	-153	85	0.53	0.85	-60	24					0.5U	0.68	<-36	<24
Cd	0.54		100	100	0.2U		100	100					0.2U	0.2U	0	0	0.53	0.2U	>62	>82					0.4	0.2U	>50	>72
Cr	3.5		100	100	1U		100	100					1.3	1U	>23	>95	1.3	2.1	-62	23					1U	1U	0	0
Cu	53		100	100	15		100	100					11	7.4	33	96	11	4.3	61	81					10	4.5	55	75
Pb	2.4		100	100	3.4		100	100					1.0	1.6	-60	90	1.4	1.8	-29	39					1.5	1U	>33	>63
Ni	22		100	100	5.2		100	100					2.7	2U	>26	>96	4.3	2U	>53	>78					2.4	2U	>17	>53
Zn	670		100	100	190		100	100					100	31	69	98	130	29	78	89					110	22	80	89
Nitrate-N (mg/L)	3.6		100	100	0.57		100	100					0.48	0.77	-60	90	0.73	0.68	7	56					0.49	0.28	43	68
TKN (mg/L)	8.5		100	100	2.0		100	100					1.3	1.9	-46	91	2.9	2.0	31	67					1.7	1.1	35	64
Total P (mg/L)	0.31		100	100	0.28		100	100					0.20	0.79	-295	76	0.12	0.53	-342	-110					0.099	0.32	-223	-81
Diss. OrthoP (mg/L)	0.18		100	100	0.12		100	100					0.04	0.56	-1300	16	0.036	0.35	-872	-362					0.014	0.25	-1686	-898
Volume (Liters)	67563	0			67563	0							129887	7759			41087	19538							89055	49752		

Table 1-6 BMP Pollutant Removal Efficiencies (continued)

Biofiltration Swales EMCs and Loads

	Melrose February 23, 2001				Melrose February 25, 2001				Melrose March 6, 2001				Melrose April 7, 2001				Melrose April 21, 2001			
	EMCs		Efficiency (%)	% Diff. In Load	EMCs		Efficiency (%)	% Diff. In Load	EMCs		Efficiency (%)	% Diff. In Load	EMCs		Efficiency (%)	% Diff. In Load	EMCs		Efficiency (%)	% Diff. In Load
	Influent	Effluent			Influent	Effluent			Influent	Effluent			Influent	Effluent			Influent	Effluent		
TSS (mg/L)	52	12	77	90									60	40	33	91	50		100	100
TDS (mg/L)	28	62	-121	8									68	94	-38	81	100		100	100
TOC (mg/L)	10	21	-110	13									27	17	37	91	37		100	100
DOC (mg/L)	10	21	-110	13									21	17	19	89	36		100	100
As Tot. (ug/L)	0.60	0.5	17	65									1.3	0.98	25	90	0.7		100	100
Cd	0.60	0.2U	>67	>86									0.57	0.67	-18	84	1		100	100
Cr	2.1	1.8	14	64									2.1	2.2	-5	86	1.3		100	100
Cu	23	8.2	64	85									31	13	58	94	41		100	100
Pb	12	2.9	76	90									9.6	4	58	94	5.6		100	100
Ni	2.6	2U	>23	>68									5.6	2U	>64	>95	12		100	100
Zn	210	31	85	94									330	64	81	97	550		100	100
As Diss. (ug/L)	0.5U	0.53	<-6	<56									0.65	1.2	-85	74	0.5		100	100
Cd	0.25	0.2U	>20	>67									0.29	0.2U	>31	>90	0.52		100	100
Cr	1U	1U	0	0									1.1	1.2	-9	85	1U		100	100
Cu	8.6	3.6	58	83									18	6.7	63	95	32		100	100
Pb	1.4	1U	>29	>70									1U	1U	0	86	1.6		100	100
Ni	2U	2U	0	0									4.5	2U	>56	>94	9.8		100	100
Zn	120	20	83	93									320	22	93	99	480		100	100
Nitrate-N (mg/L)	0.44	0.42	5	60									1.5	0.94	37	91	1.3		100	100
TKN (mg/L)	1.8	1.1	39	75									2.8	2.0	29	90	5.1		100	100
Total P (mg/L)	0.16	0.41	-156	-6									0.089	0.40	-349	38	0.11		100	100
Diss. OrthoP (mg/L)	0.025	0.29	-1060	-382									0.052	0.35	-573	7	0.061		100	100
Volume (Liters)	27665	11496											32365	4474			17669	0		

Melrose *2000 - 2001 Wet Season Statistics*			
Parameters	Minimum Load Removal (%)	Maximum Load Removal (%)	Average Season Removal (%)
TSS (mg/L)	-156	100	75
TDS (mg/L)	-63	100	59
TOC (mg/L)	13	100	74
DOC (mg/L)	13	100	72
T-As	20	100	75
Cd	84	100	88
Cr	50	100	72
Cu	82	100	91
Pb	84	100	88
Ni	77	100	92
Zn	91	100	96
D-As	24	100	44
Cd	0	100	84
Cr	0	100	72
Cu	75	100	92
Pb	39	100	77
Ni	0	100	91
Zn	89	100	97
N-N	56	100	83
TKN	64	100	85
T-P	-110	100	13
D-O-PO3	-898	100	-59

Seasonal Load Removal Calculations based upon the 1999 Scoping Document.

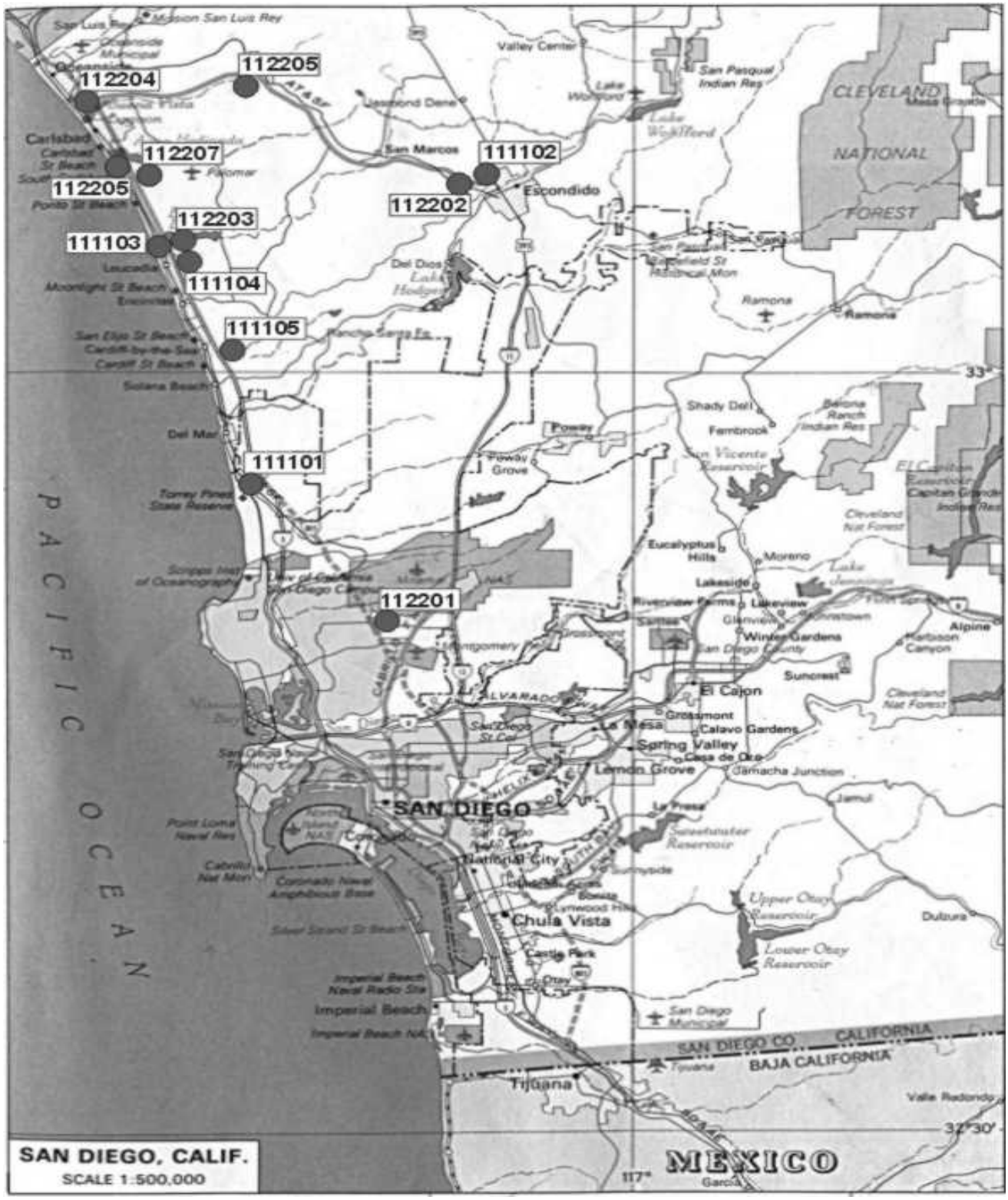


Figure 1-1 Map of Study Area: Caltrans District 11 San Diego

Figure 1-2a Daily Precipitation Totals and Yearly Cumulative Rainfall for North County San Diego (Escondido MS)

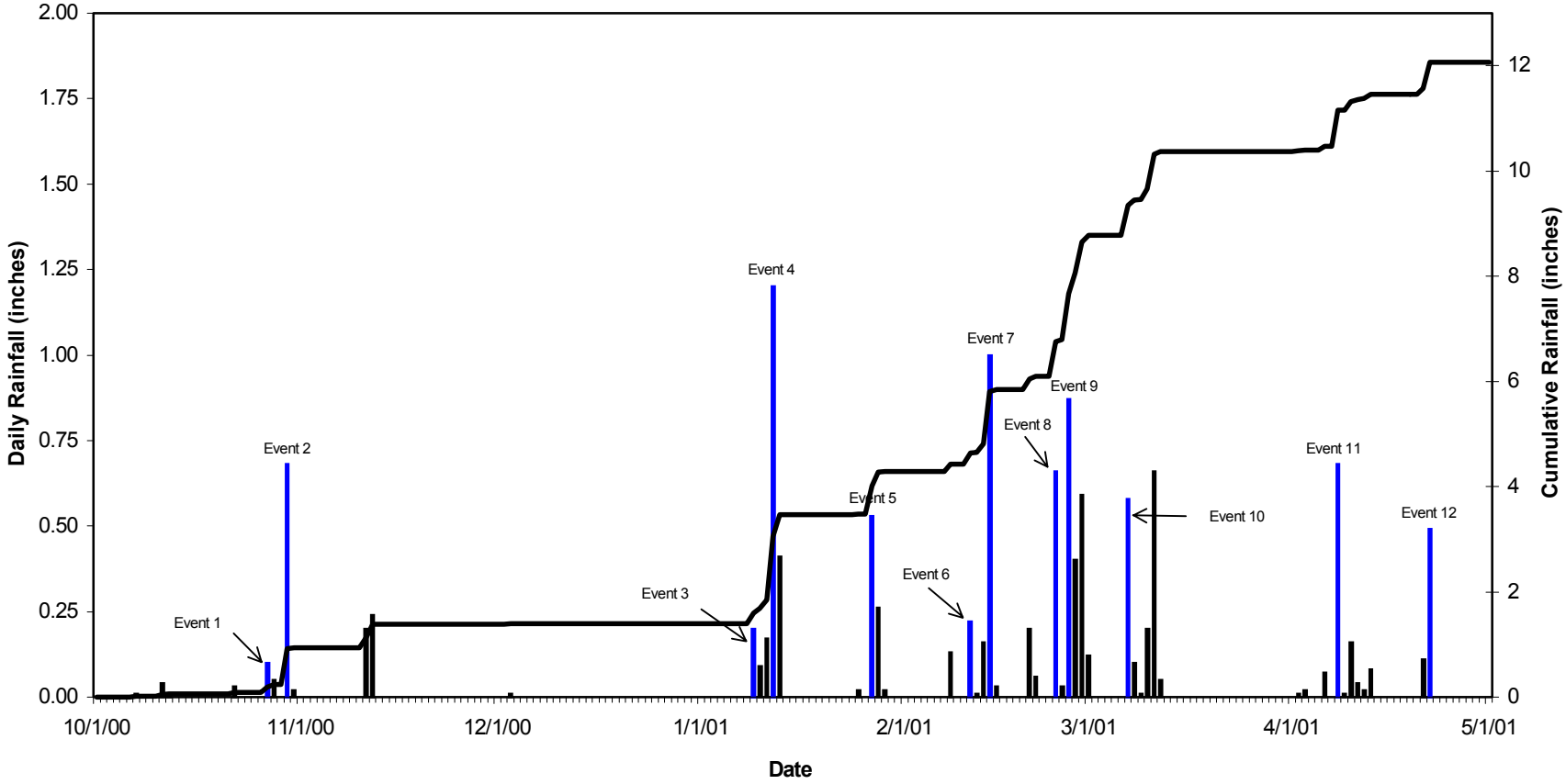


Figure 1-2b Daily Precipitation Totals and Yearly Cumulative Rainfall for Mid-County San Diego (La Costa P&R)

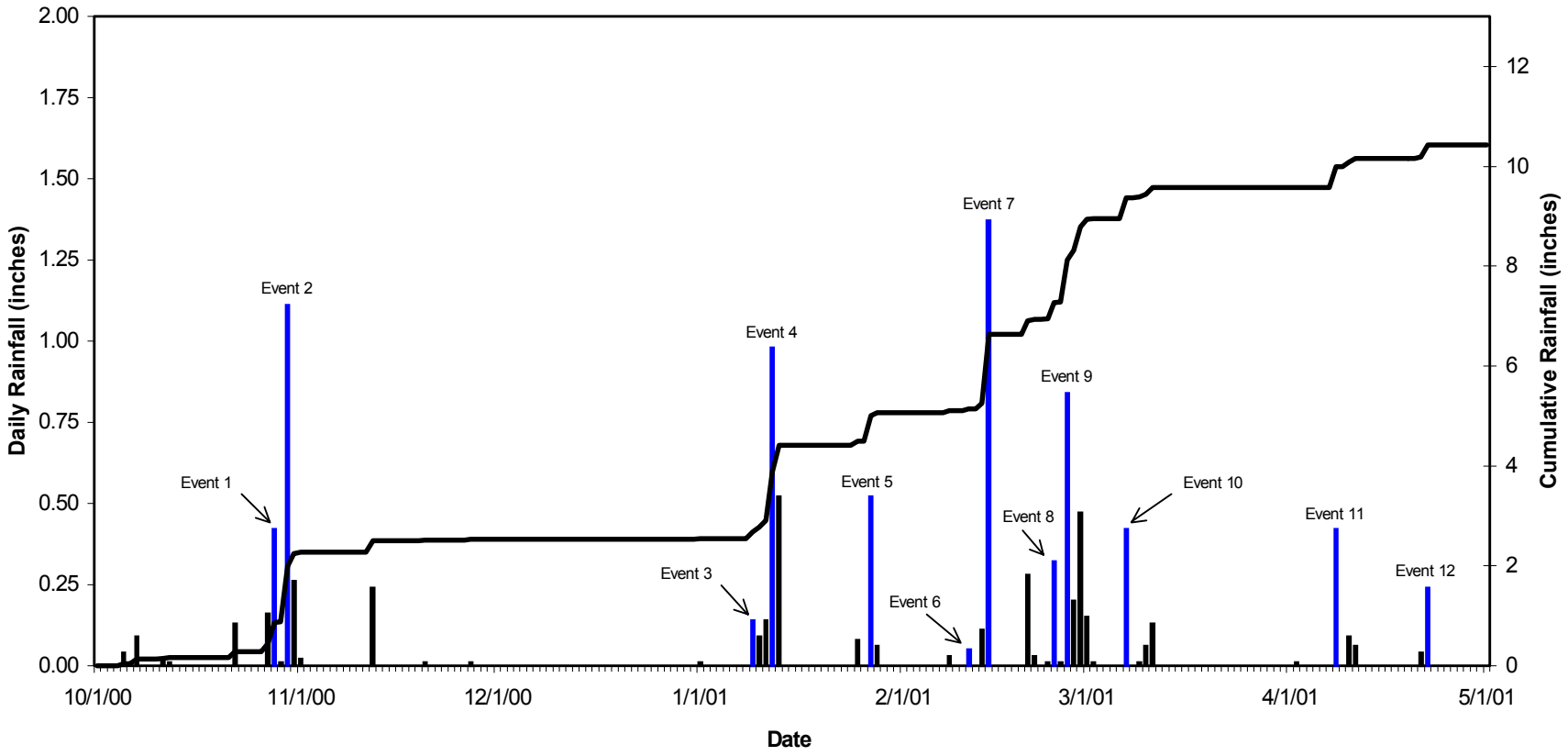


Figure 1-2c Daily Precipitation Totals and Yearly Cumulative Rainfall for South County San Diego (Kearny Mesa MS)

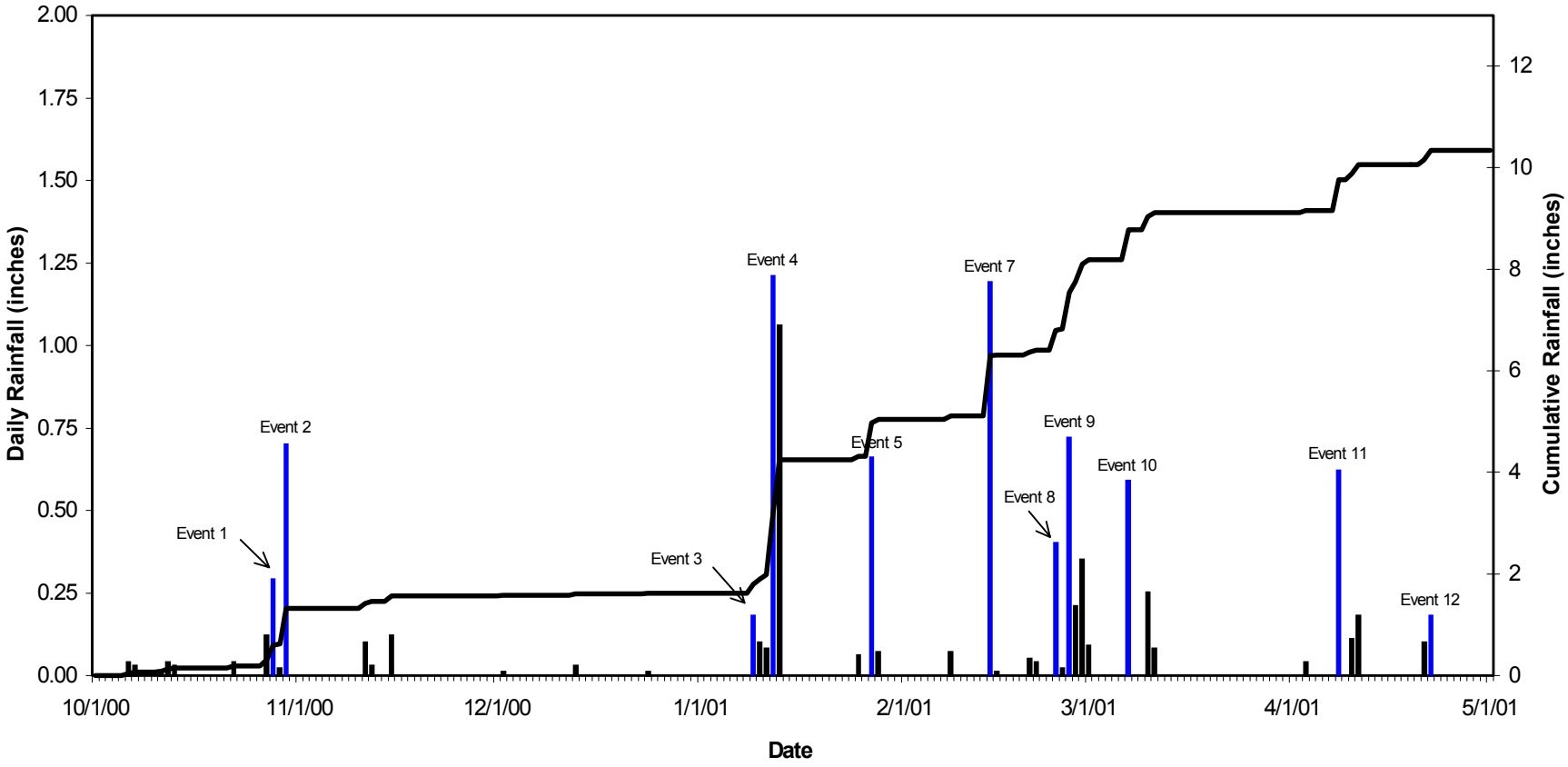
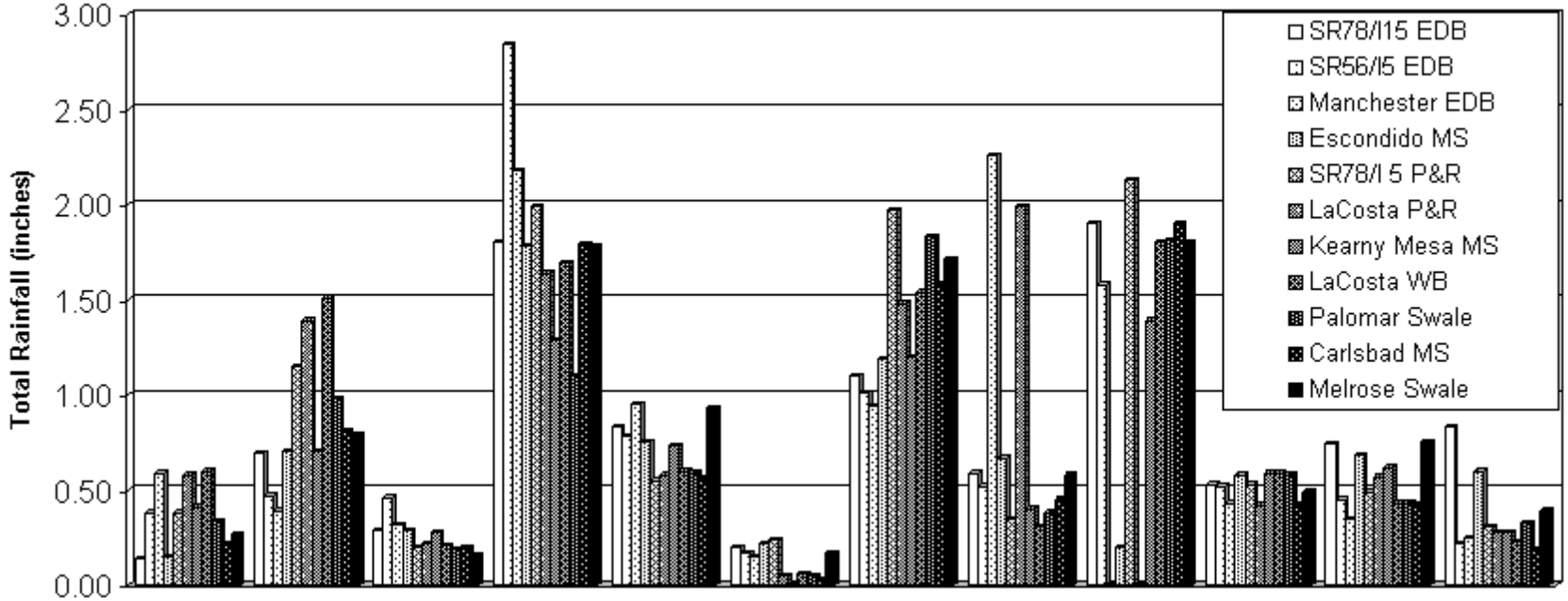


Figure 1-3 Event Rainfall Totals for the 2000/2001 Wet Season for all BMPs



Station Name	Event 1 10/26/00	Event 2 10/29/00	Event 3 1/8/01	Event 4 1/10/01	Event 5 1/26/01	Event 6 2/10/01	Event 7 2/12/01	Event 8 2/23/01	Event 9 2/25/01	Event 10 3/6/01	Event 11 4/7/01	Event 12 4/20/01
SR78/I15 EDB	0.14	**0.69**	**0.29**	**1.80**	**0.83**	**0.20**	**1.10**	**0.59**	1.90	**0.53**	**0.74**	**0.83**
SR56/I5 EDB	**0.38**	0.47	0.46	**2.84**	**0.78**	0.17	1.01	**0.52**	1.58	**0.52**	**0.45**	**0.22**
Manchester EDB	**0.59**	**0.39**	**0.32**	**2.18**	**0.95**	**0.15**	**0.94**	**2.26**	0.00*	**0.43**	**0.35**	**0.25**
Escondido MS	**0.15**	**0.70**	**0.29**	1.78	**0.75**	0.22	**1.19**	0.67	**0.20**	**0.58**	**0.68**	**0.60**
SR78/I 5 P&R	**0.38**	**1.15**	**0.20**	**1.99**	**0.55**	**0.24**	**1.97**	**0.35**	2.13	**0.53**	**0.49**	**0.31**
LaCosta P&R	**0.58**	1.39	**0.22**	**1.64**	**0.58**	0.05	**1.48**	**1.99**	0.00*	**0.42**	**0.57**	**0.28**
Kearny Mesa MS	**0.41**	0.70	**0.28**	**1.29**	**0.73**	0.00	**1.20**	**0.40**	1.39	**0.59**	**0.62**	**0.28**
LaCosta WB	**0.60**	**1.51**	**0.21**	**1.69**	**0.60**	0.06	**1.54**	0.31	**1.80**	**0.59**	**0.43**	**0.23**
Palomar Swale	0.34	0.98	0.19	**1.10**	**0.59**	0.05	**1.83**	**0.38**	1.81	**0.58**	**0.43**	**0.33**
Carlsbad MS	**0.22**	**0.81**	**0.20**	**1.79**	**0.56**	0.03	**1.58**	**0.45**	1.90	**0.42**	**0.42**	**0.19**
Melrose Swale	**0.27**	**0.79**	0.16	**1.78**	**0.93**	0.17	**1.71**	**0.58**	1.80	0.49	**0.75**	**0.39**

Bolded values indicate successfully monitored events.

* Event 9 total is zero because Event 8 continued through 2/25/2001.

Fig. 1-4. State Route 56 & I5 - Event 1 (26-27 October 2000)

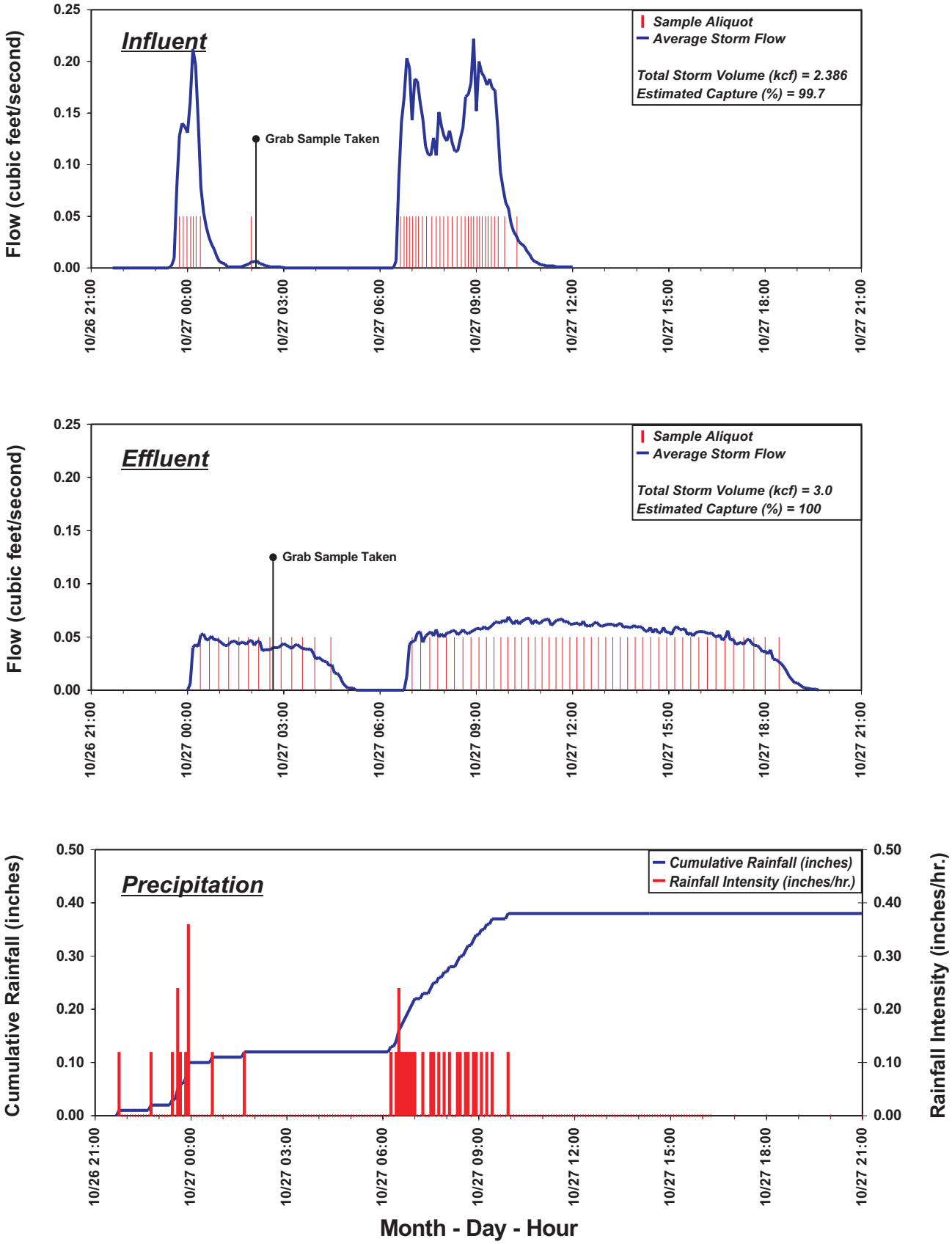


Fig. 1-5. Manchester Detention Basin - Event 1 (26-28 October 2000)

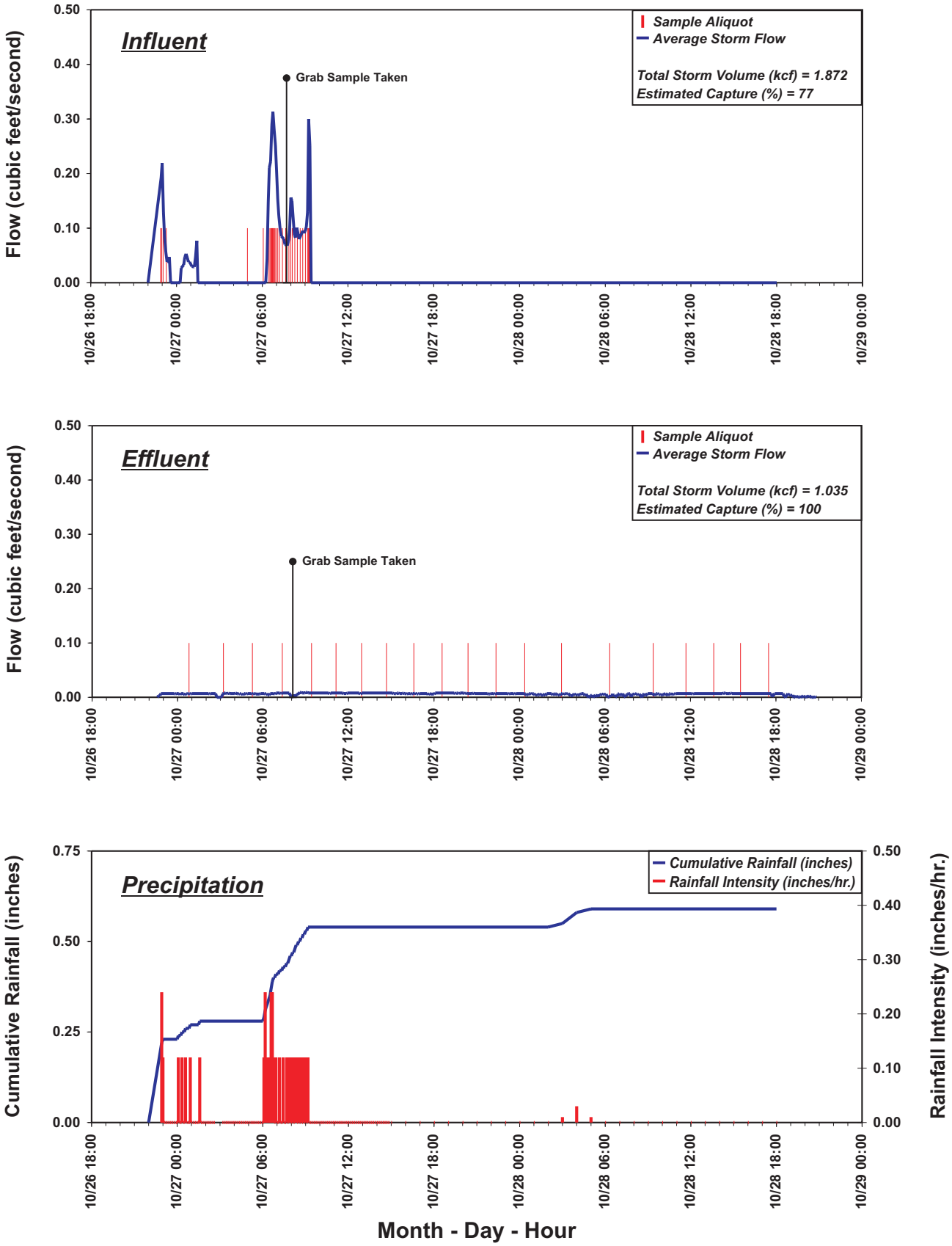


Fig. 1-6. Escondido Maintenance Station - Event 1 (26-27 October 2000)

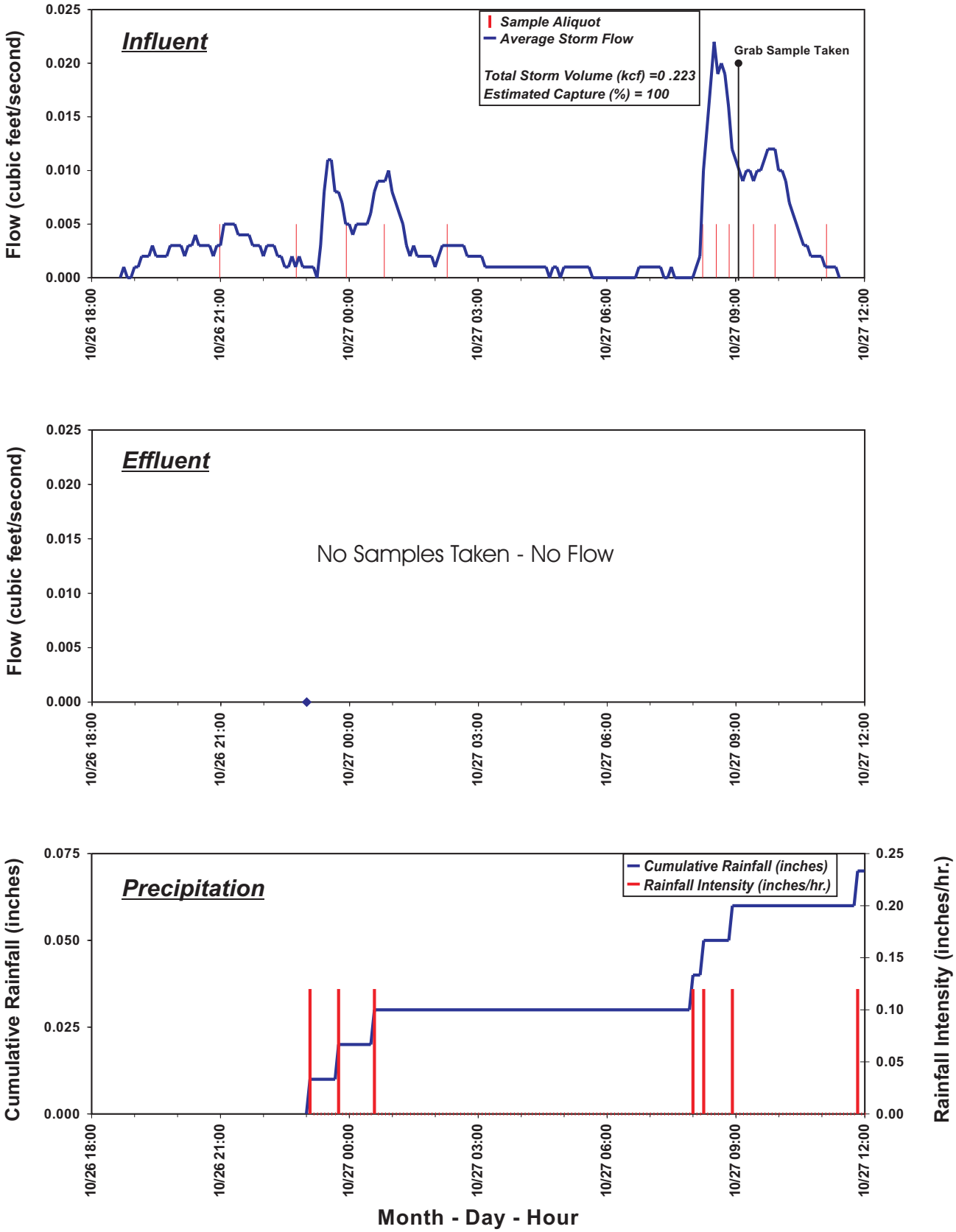


Fig. 1-7. State Route 78 & I5 Park & Ride - Event 1 (26-28 October 2000)

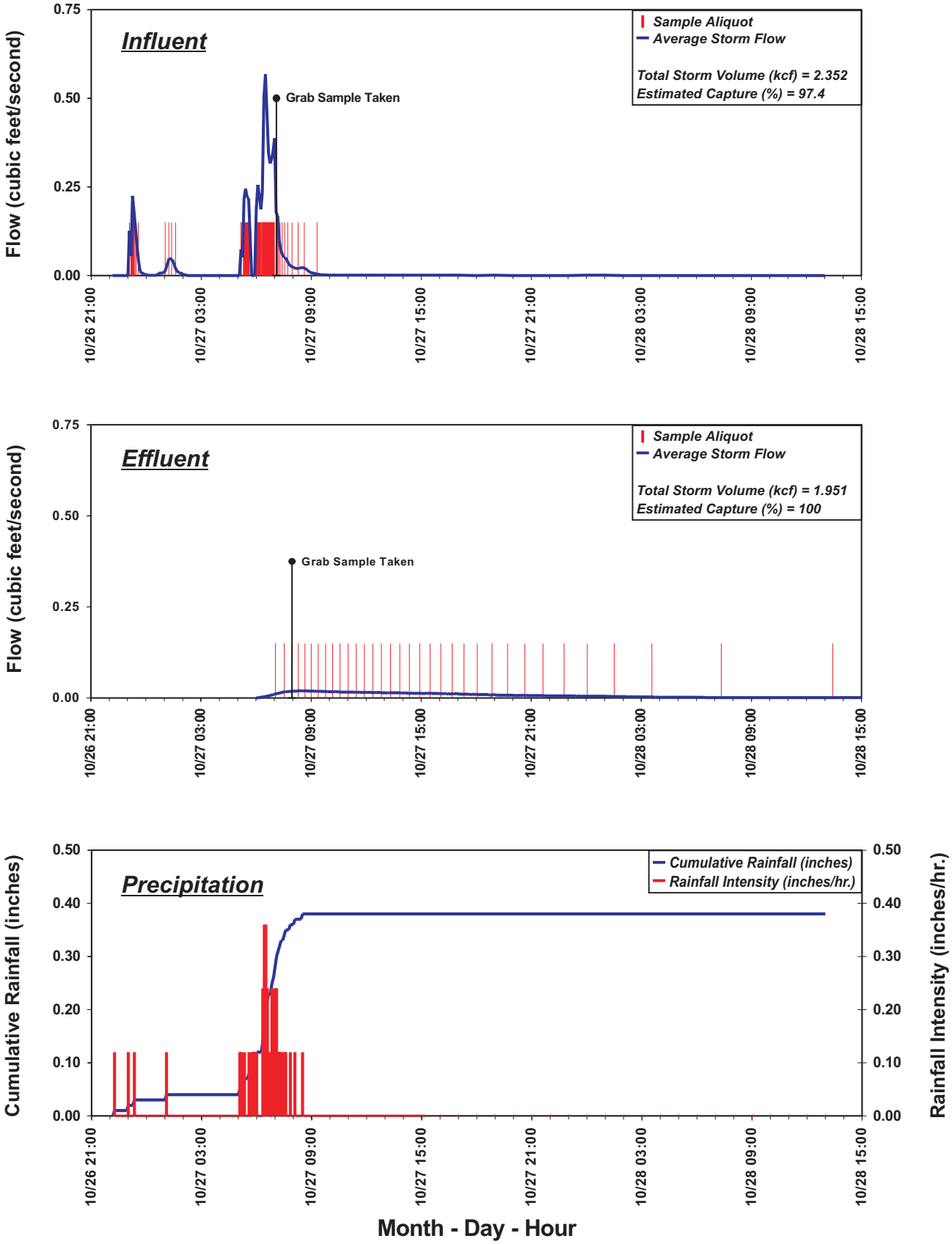


Fig. 1-8. La Costa Park & Ride - Event 1 (26-28 October 2000)

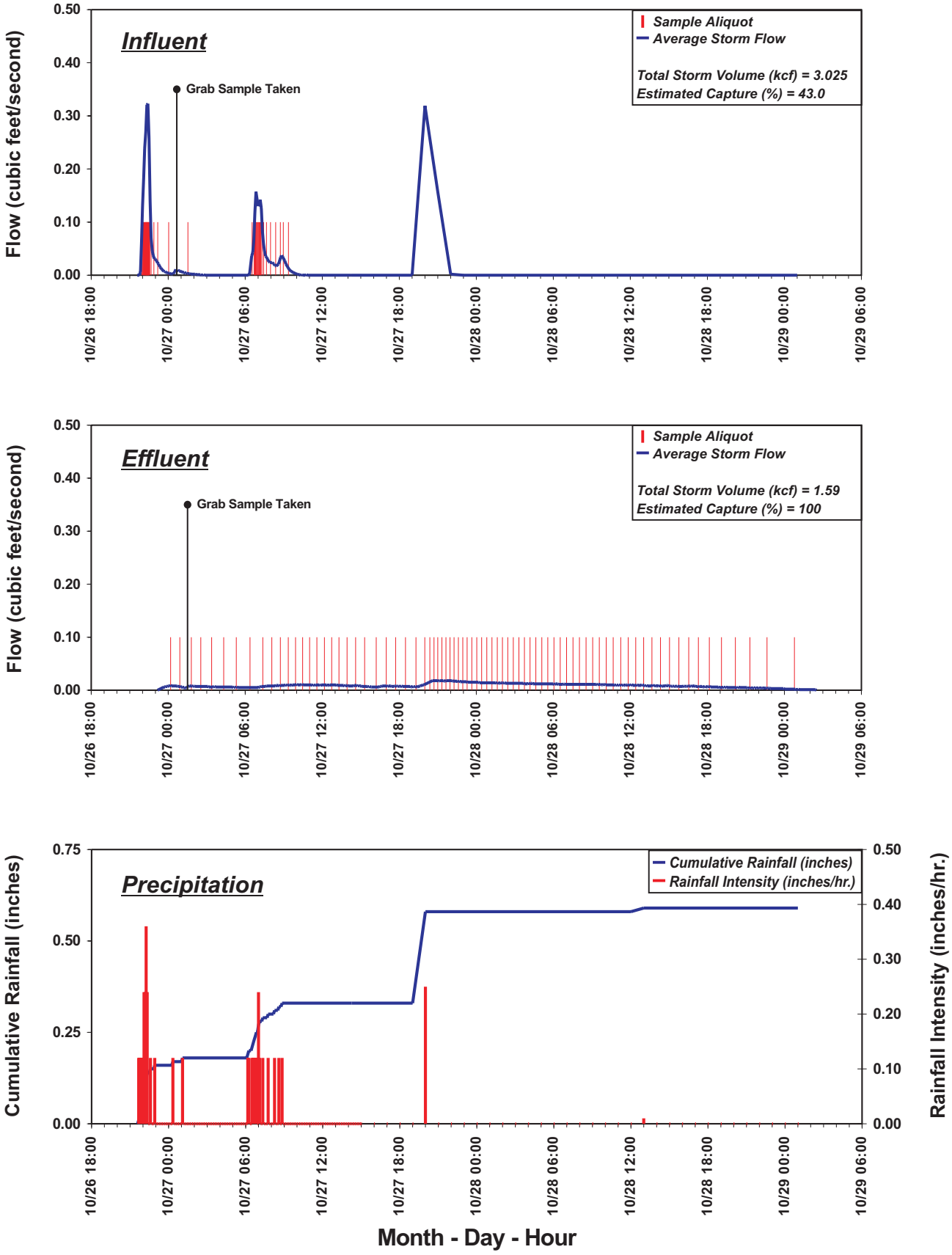


Fig. 1-9. Kearny Mesa Maintenance Station - Event 1 (26-27 October 2000)

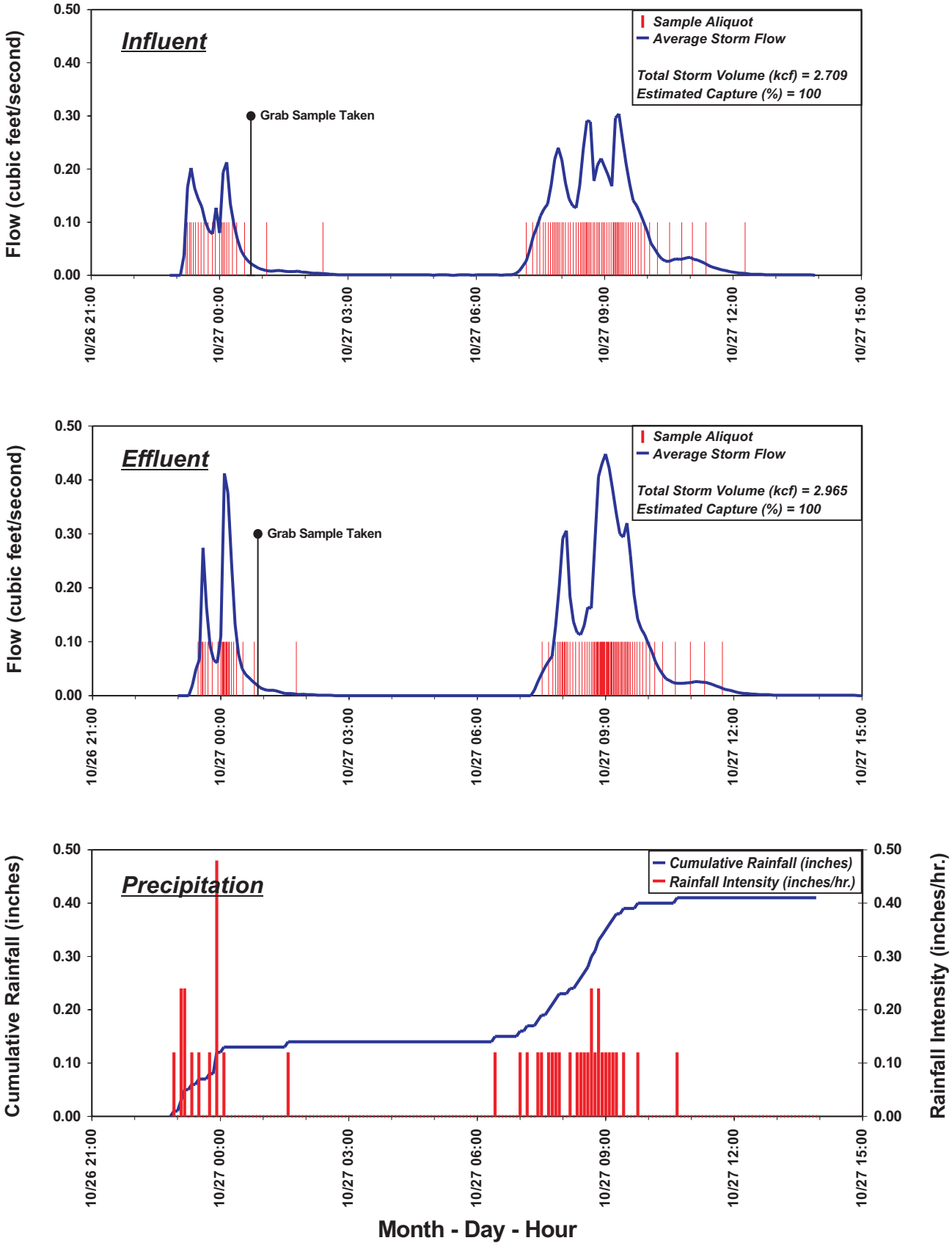


Fig. 1-10. La Costa Wet Basin - Event 1 (26-28 October 2000)

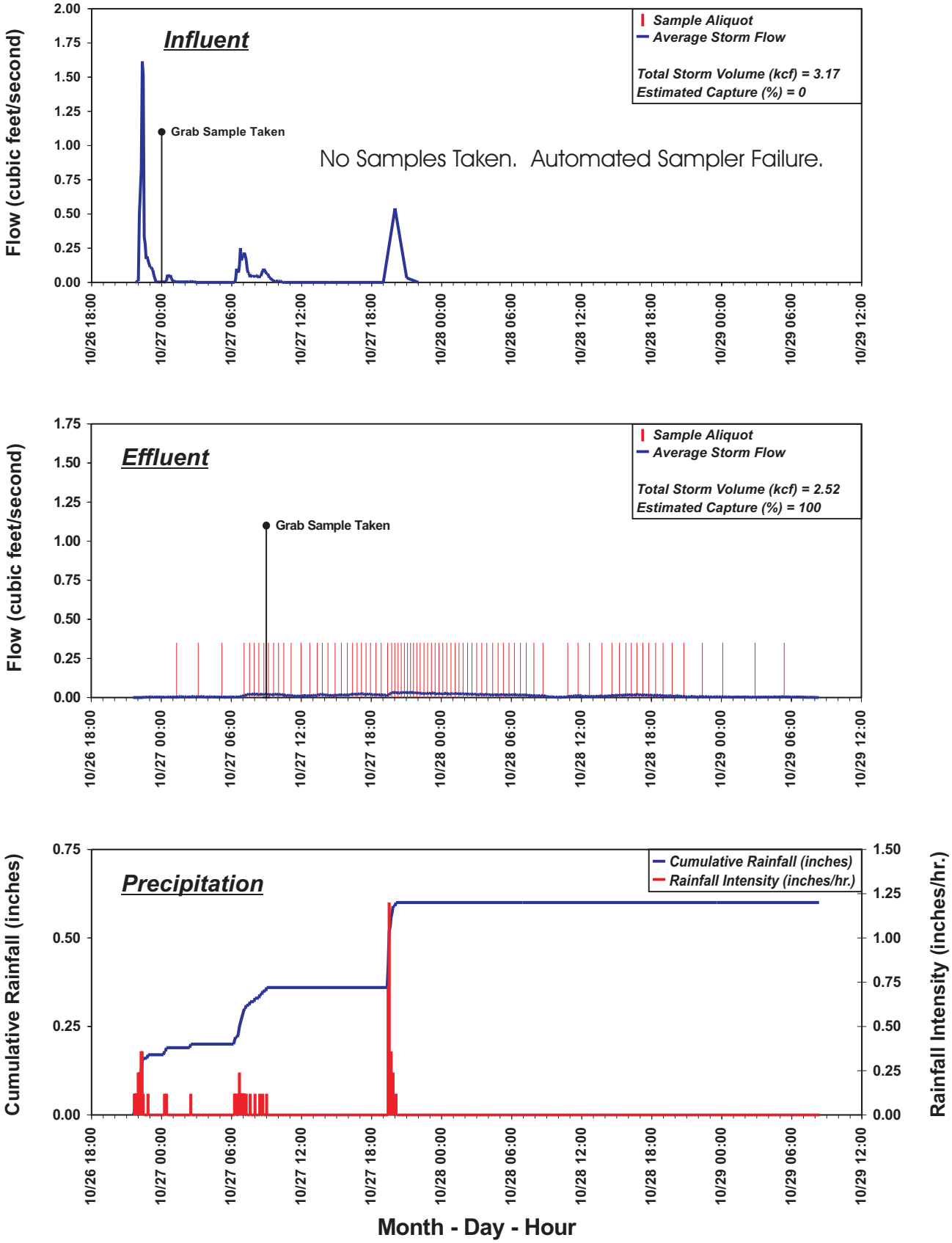


Fig. 1-11. Carlsbad Maintenance Station - Event 1 (26-27 October 2000)

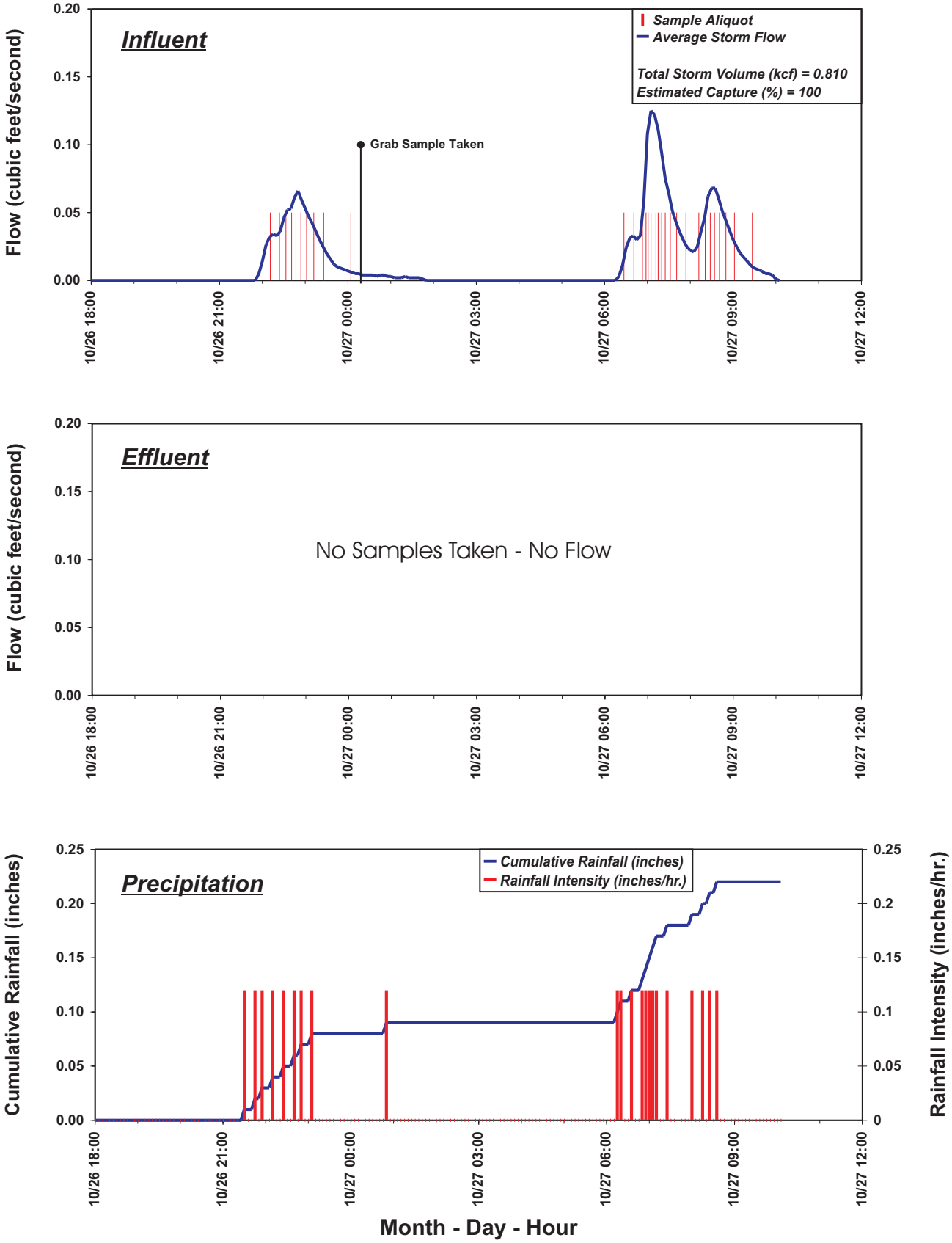


Fig. 1-12. Melrose - Event 1 (26-27 October 2000)

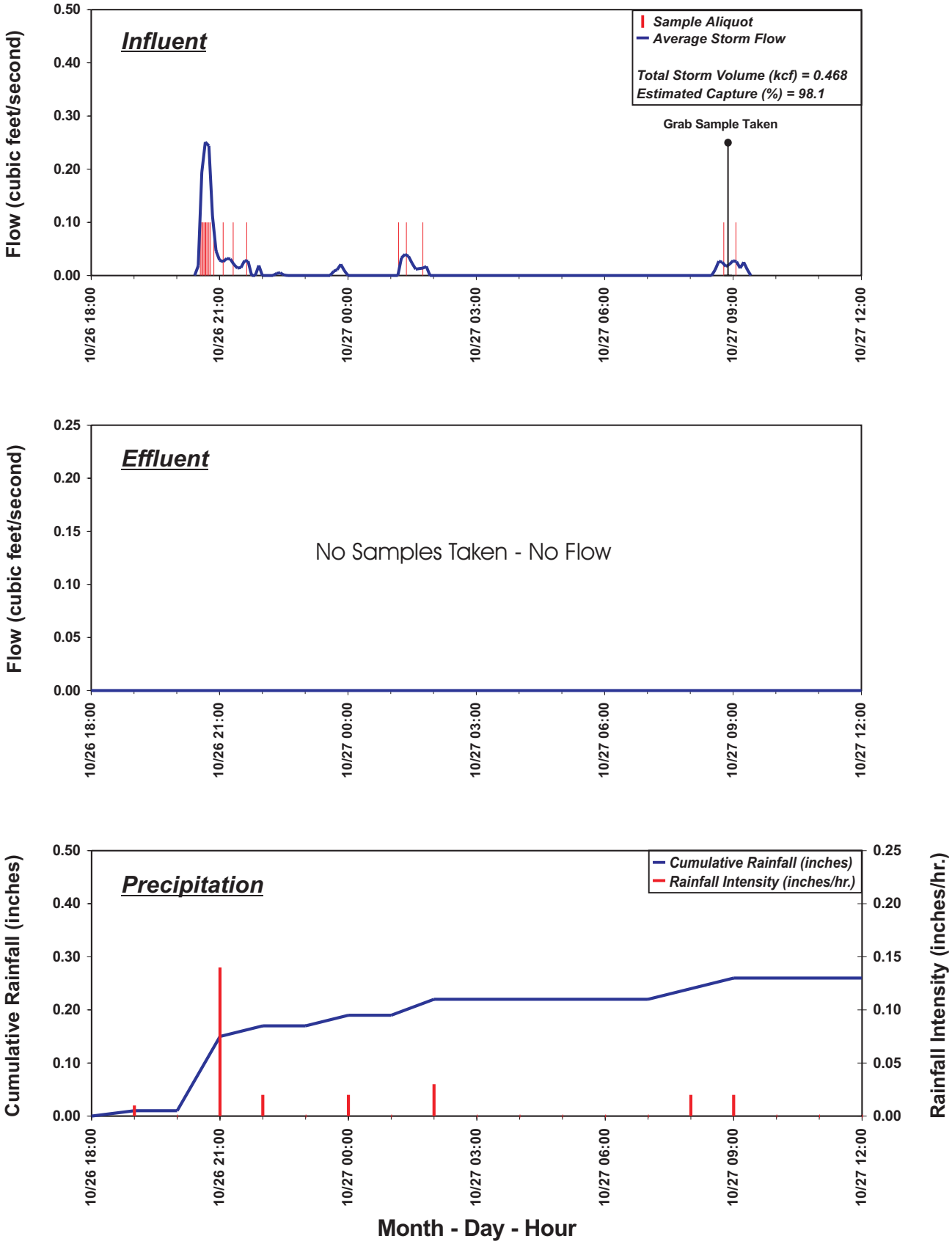


Fig. 1-13. State Route 78 & I15 - Event 2 (29-31 October 2000)

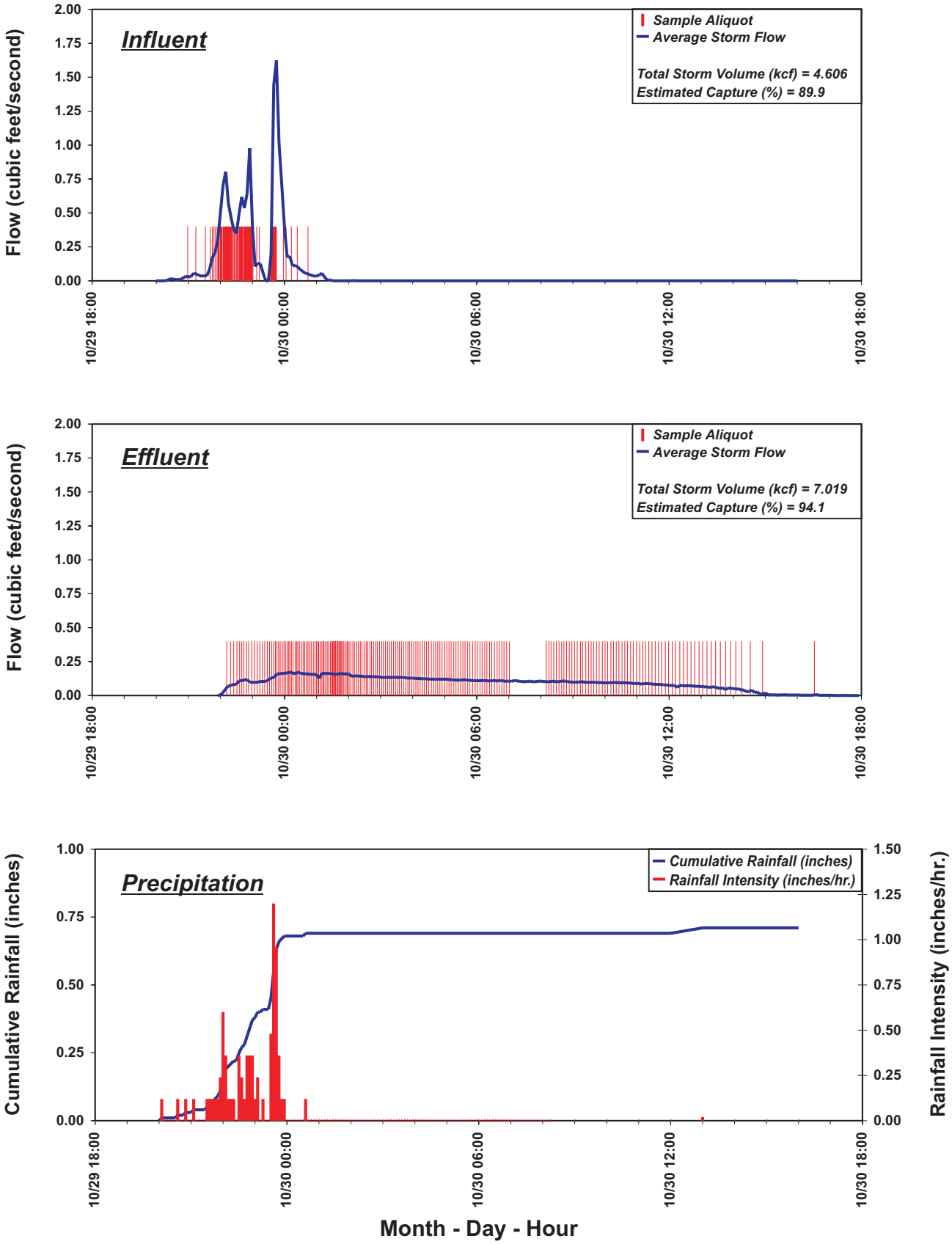


Fig. 1-14. Manchester Detention Basin - Event 2 (29-31 October 2000)

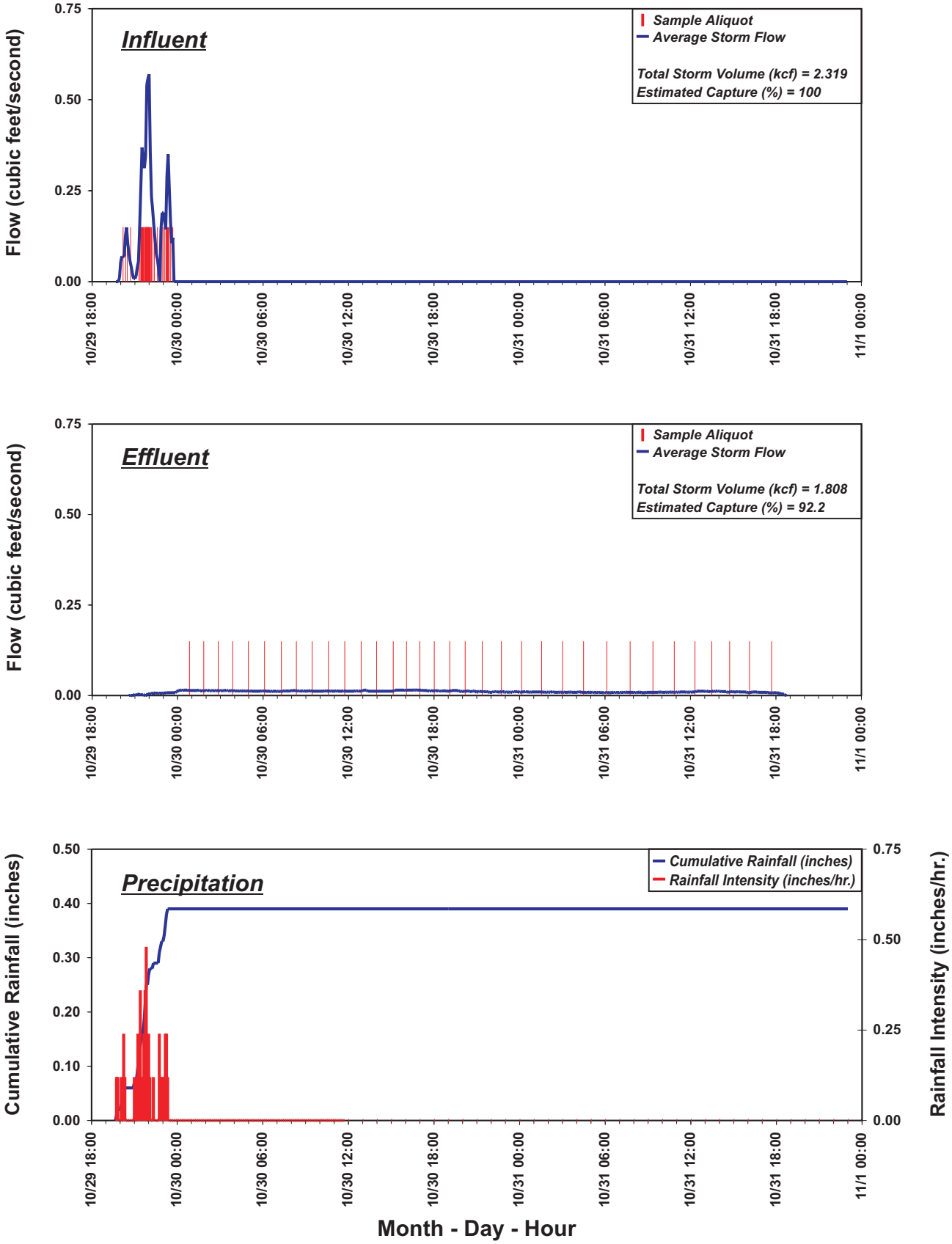


Fig. 1-15. Escondido Maintenance Station - Event 2 (29-30 October 2000)

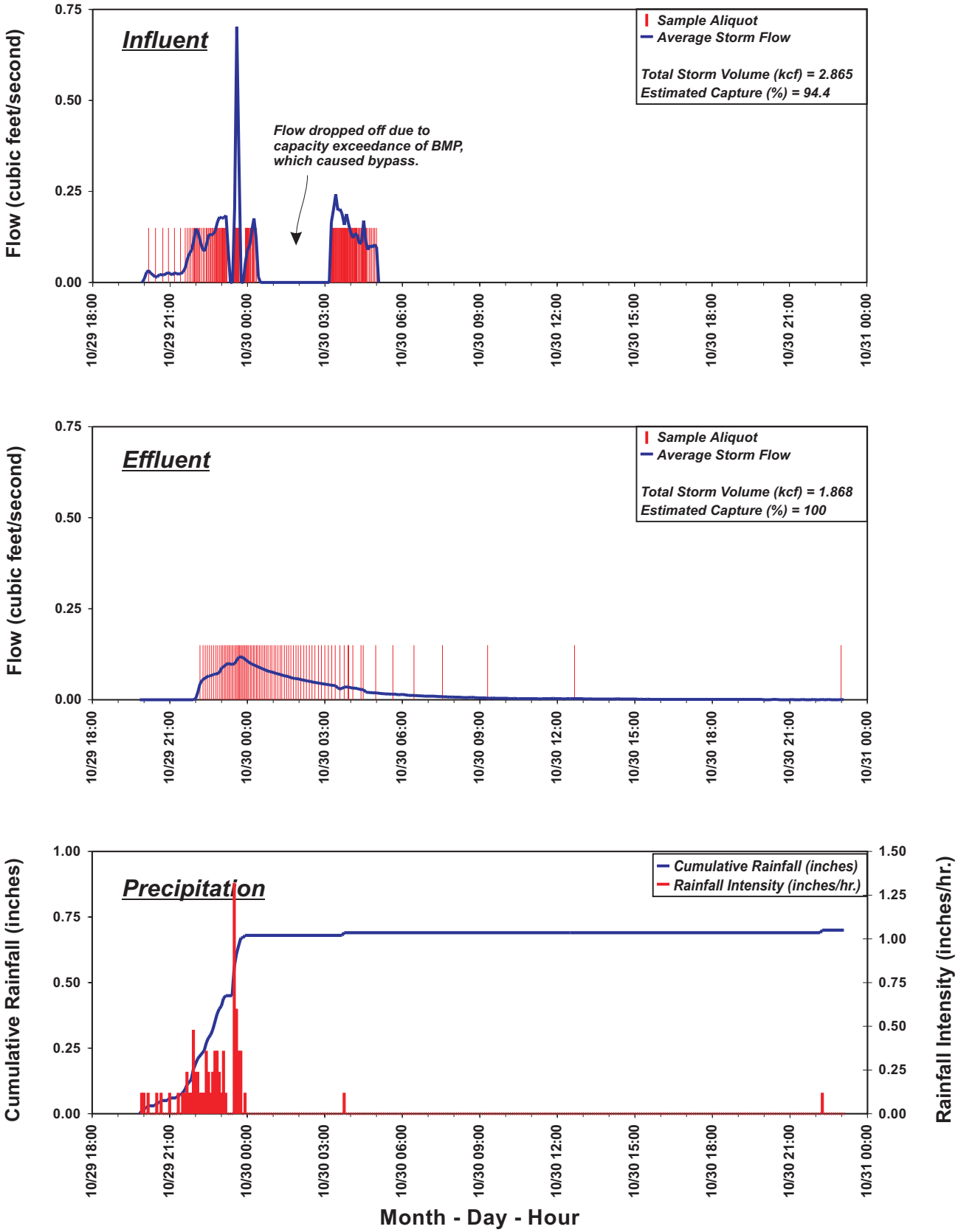


Fig. 1-16. State Route 78 & I5 Park & Ride - Event 2 (29-31 October 2000)

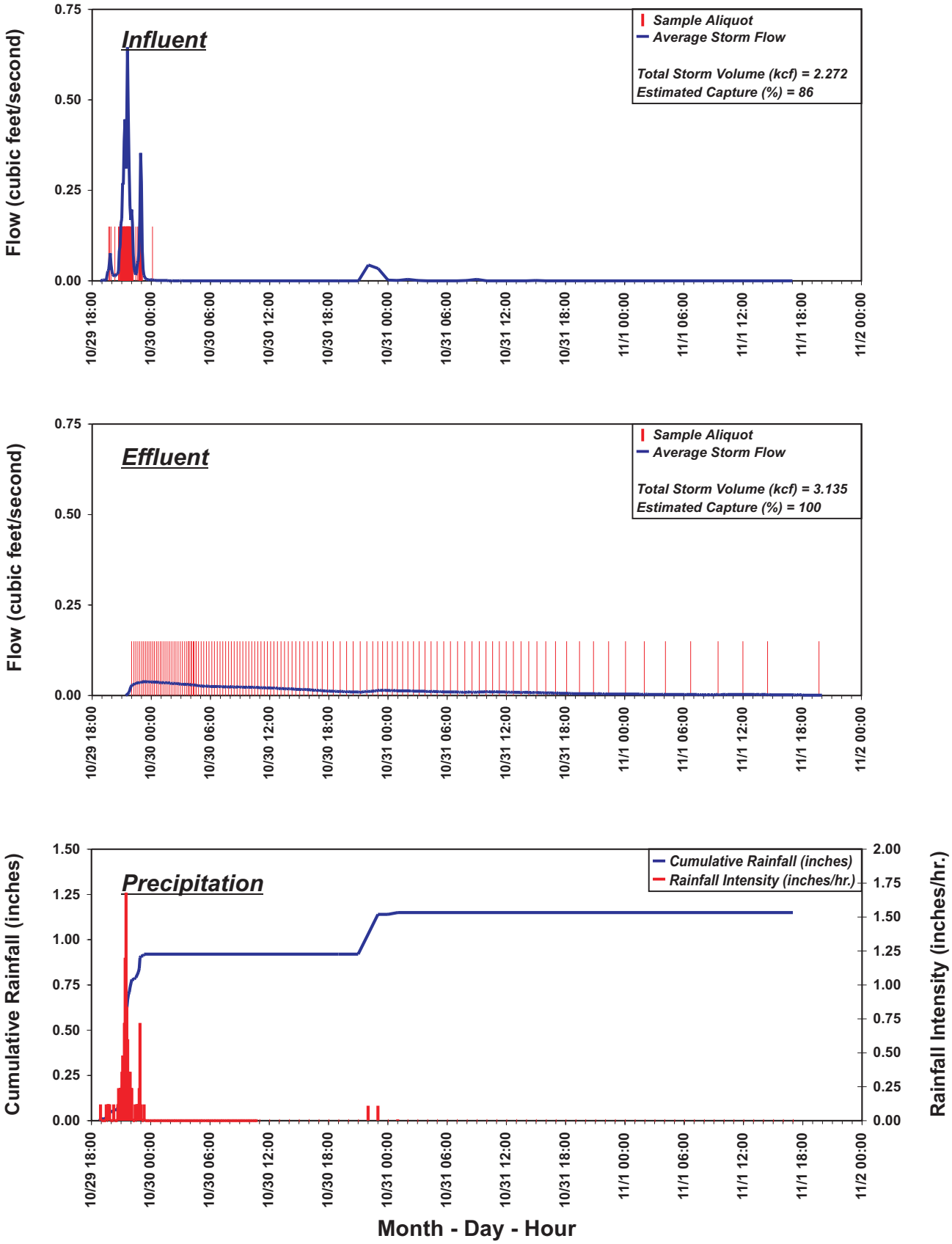


Fig. 1-17. La Costa Wet Basin - Event 2 (29-31 October 2000)

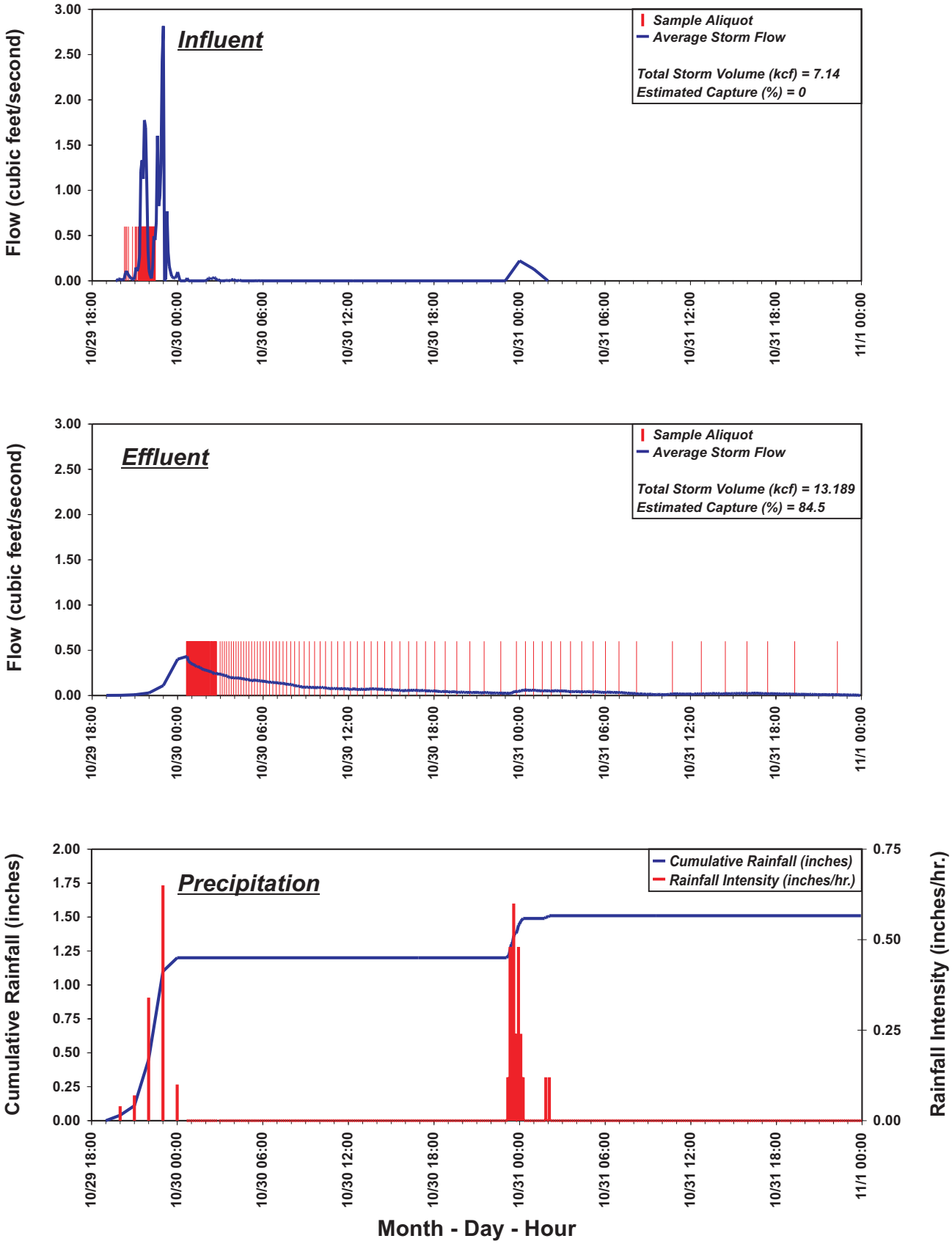


Fig. 1-18. Carlsbad Maintenance Station - Event 2 (29-30 October 2000)

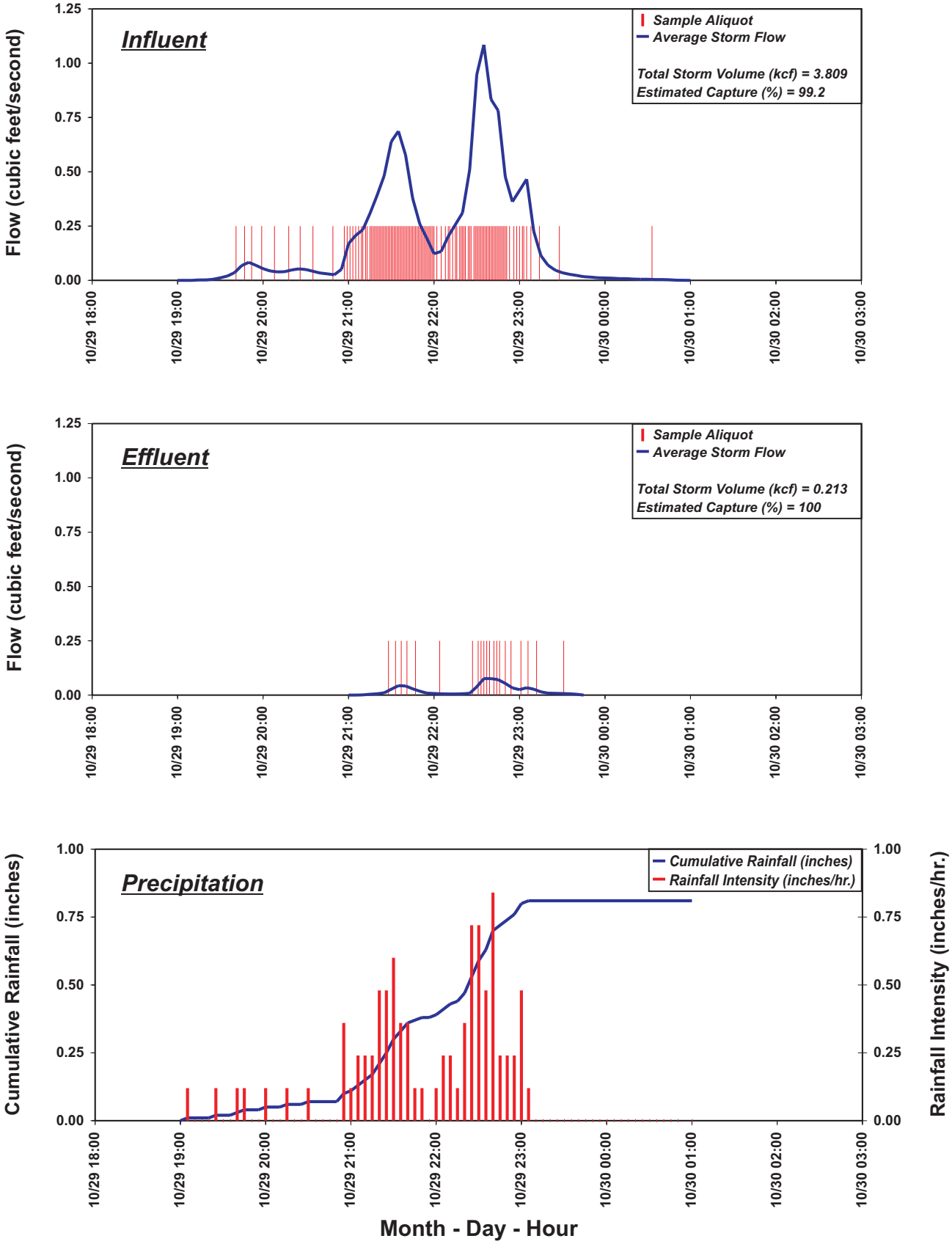


Fig. 1-19. Melrose - Event 2 (29-30 October 2000)

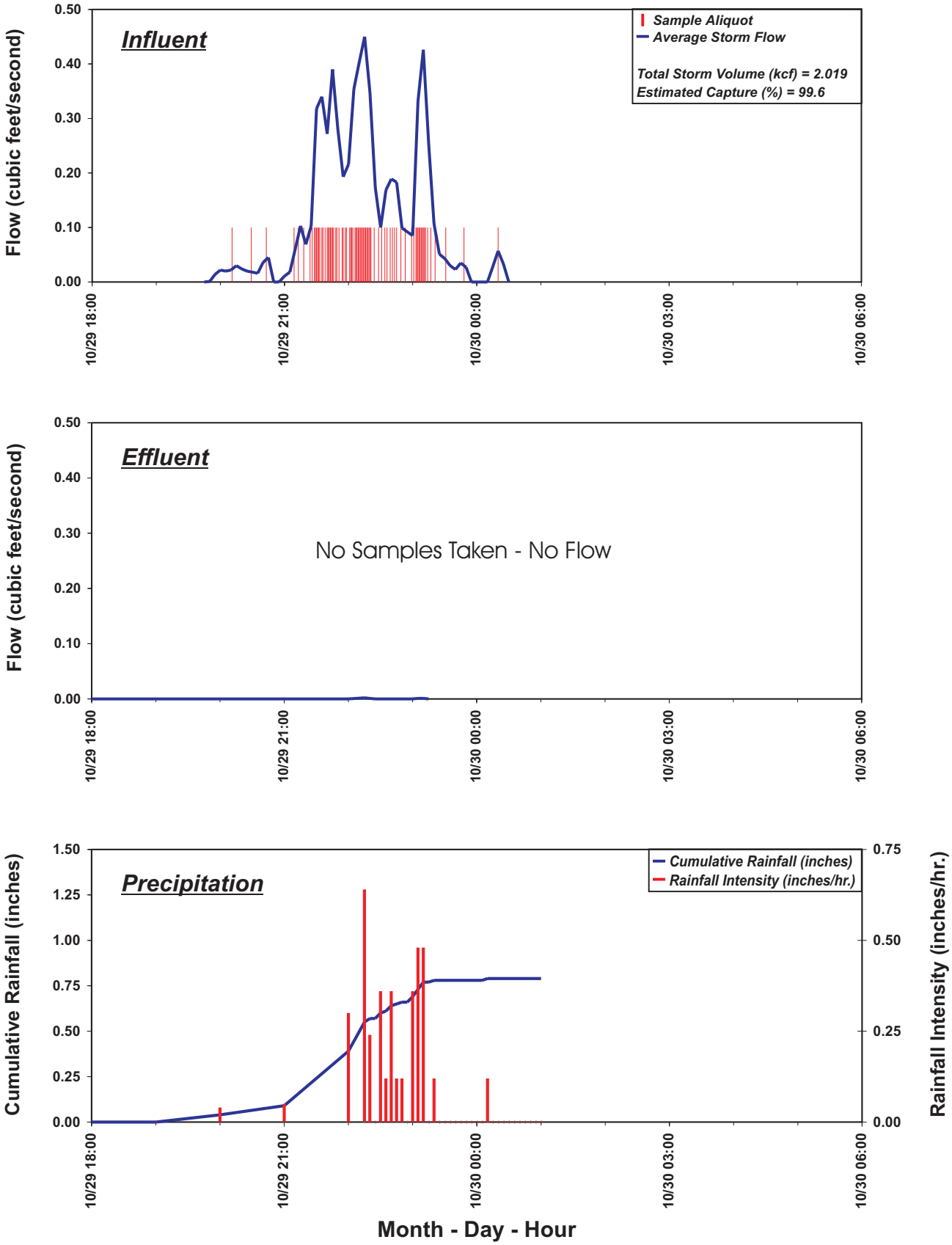


Fig. 1-20. State Route 78 & I15 - Event 3 (9-8 January 2001)

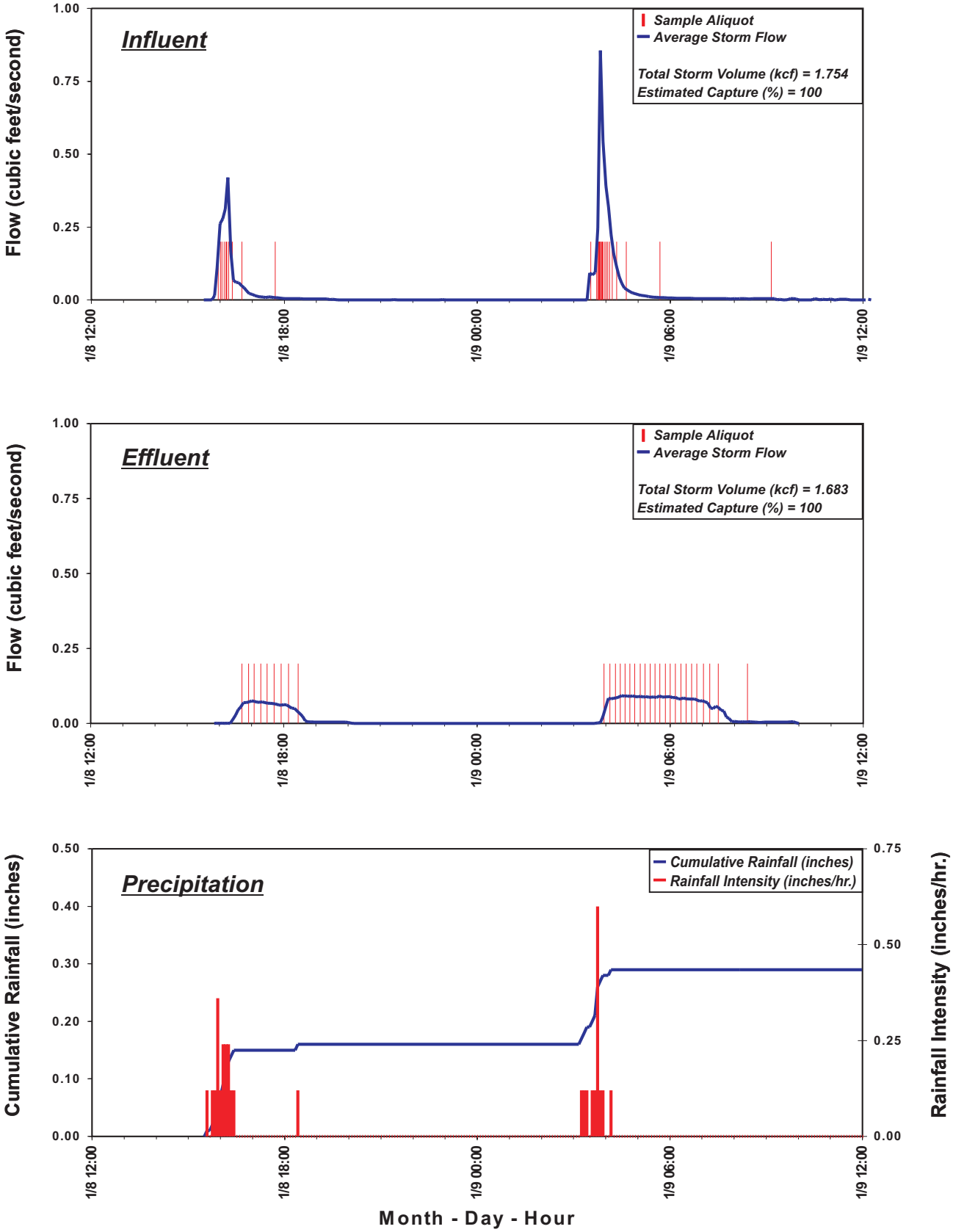


Fig. 1-21. Manchester Detention Basin - Event 3 (8-10 January 2001)

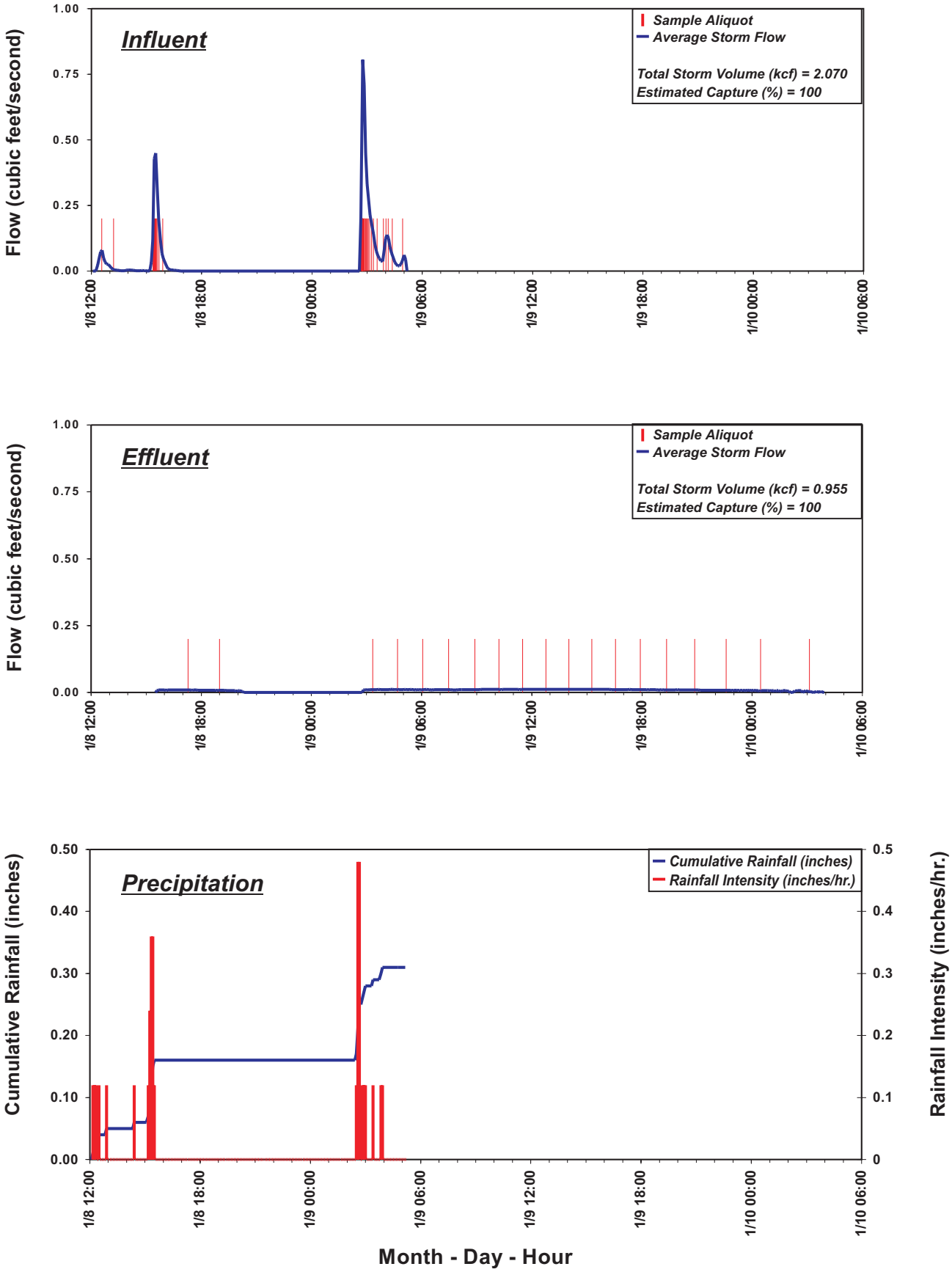


Fig. 1-22. Escondido Maintenance Station - Event 3 (8-10 January 2001)

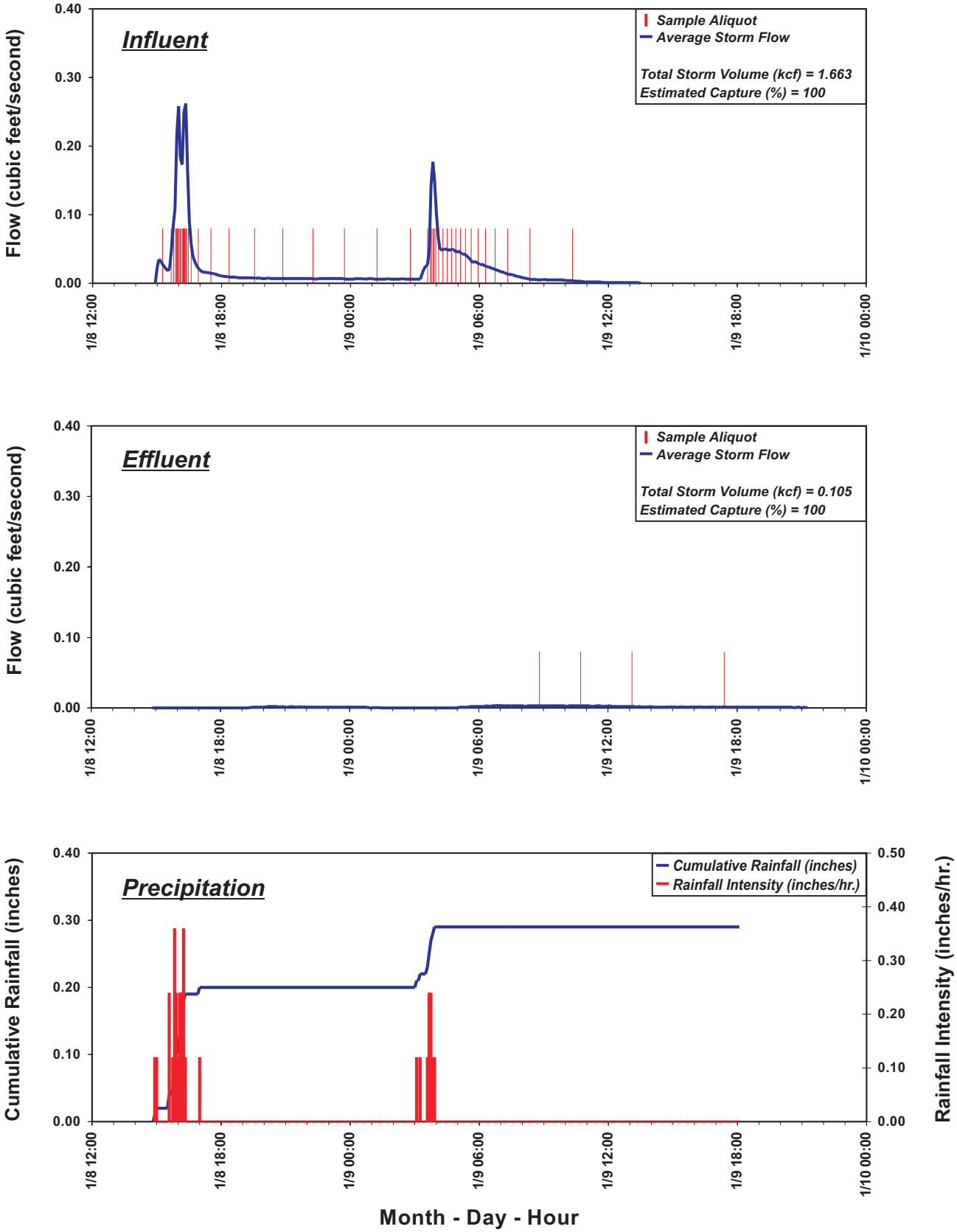


Fig. 1-23. State Route 78 & I5 Park & Ride - Event 3 (8-19 January 2001)

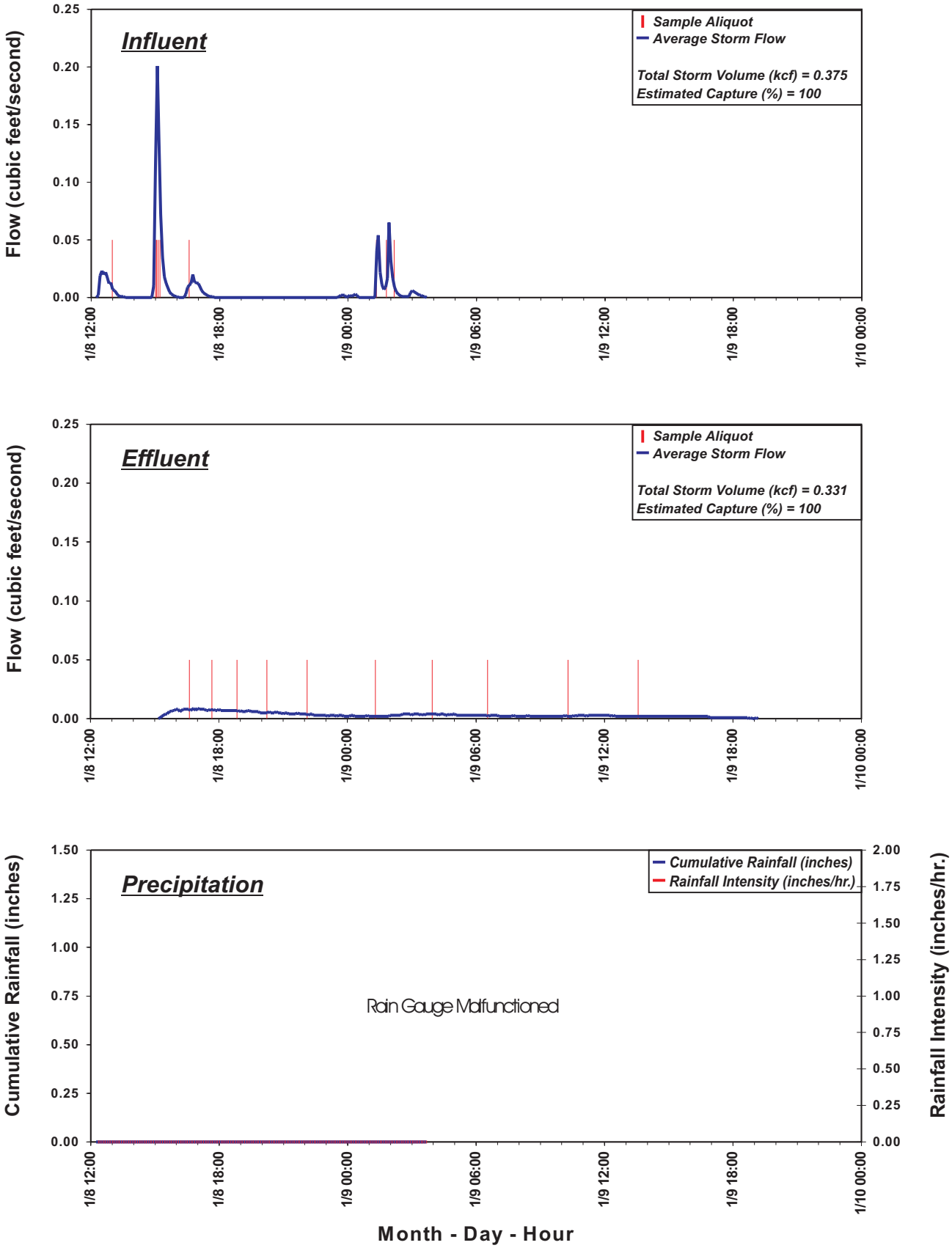


Fig. 1-24. La Costa Park & Ride - Event 3 (8-10 January 2001)

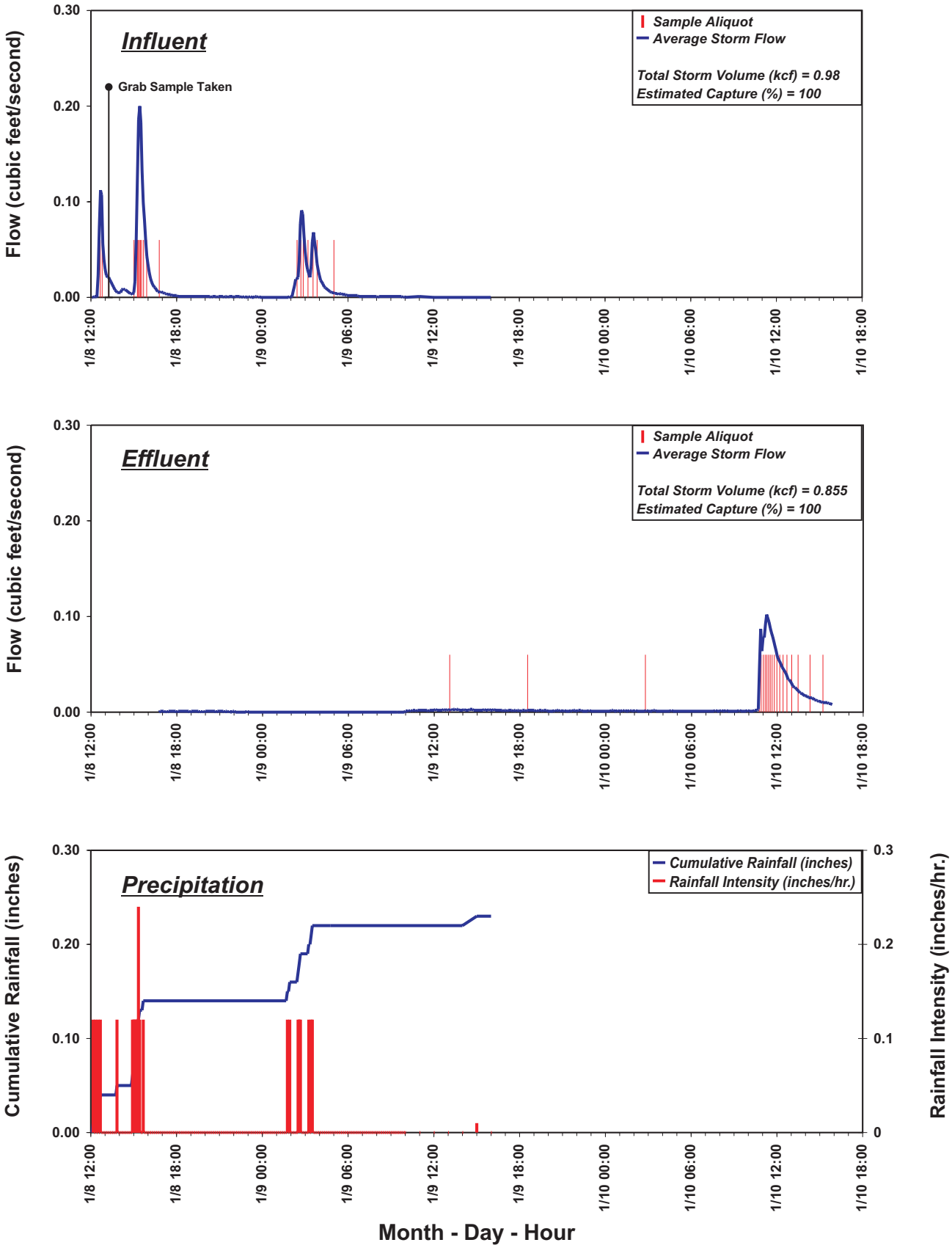


Fig. 1-25. Kearny Mesa Maintenance Station - Event 3 (8-9 January 2001)

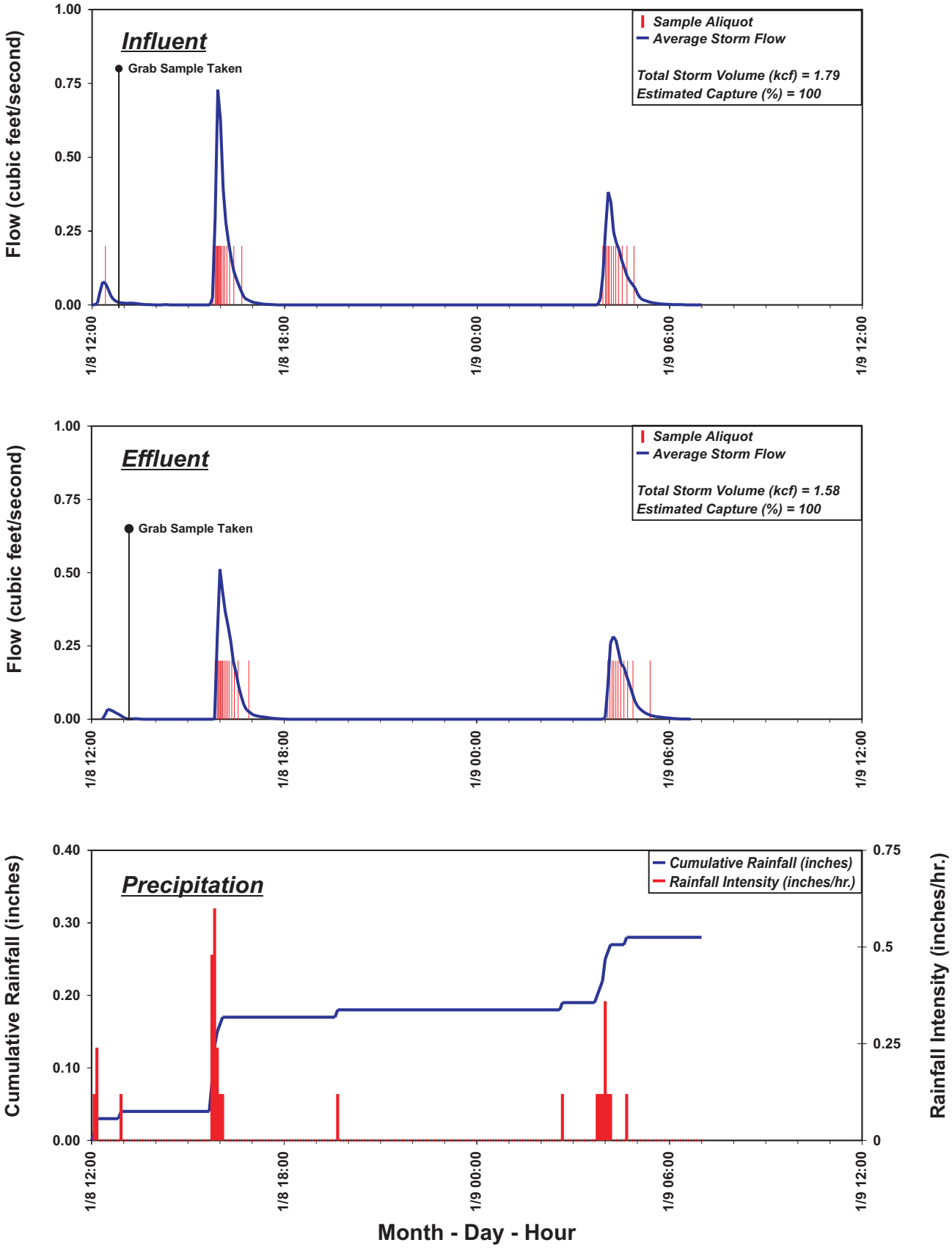


Fig. 1-26. La Costa Wet Basin - Event 3 (8-9 January 2001)

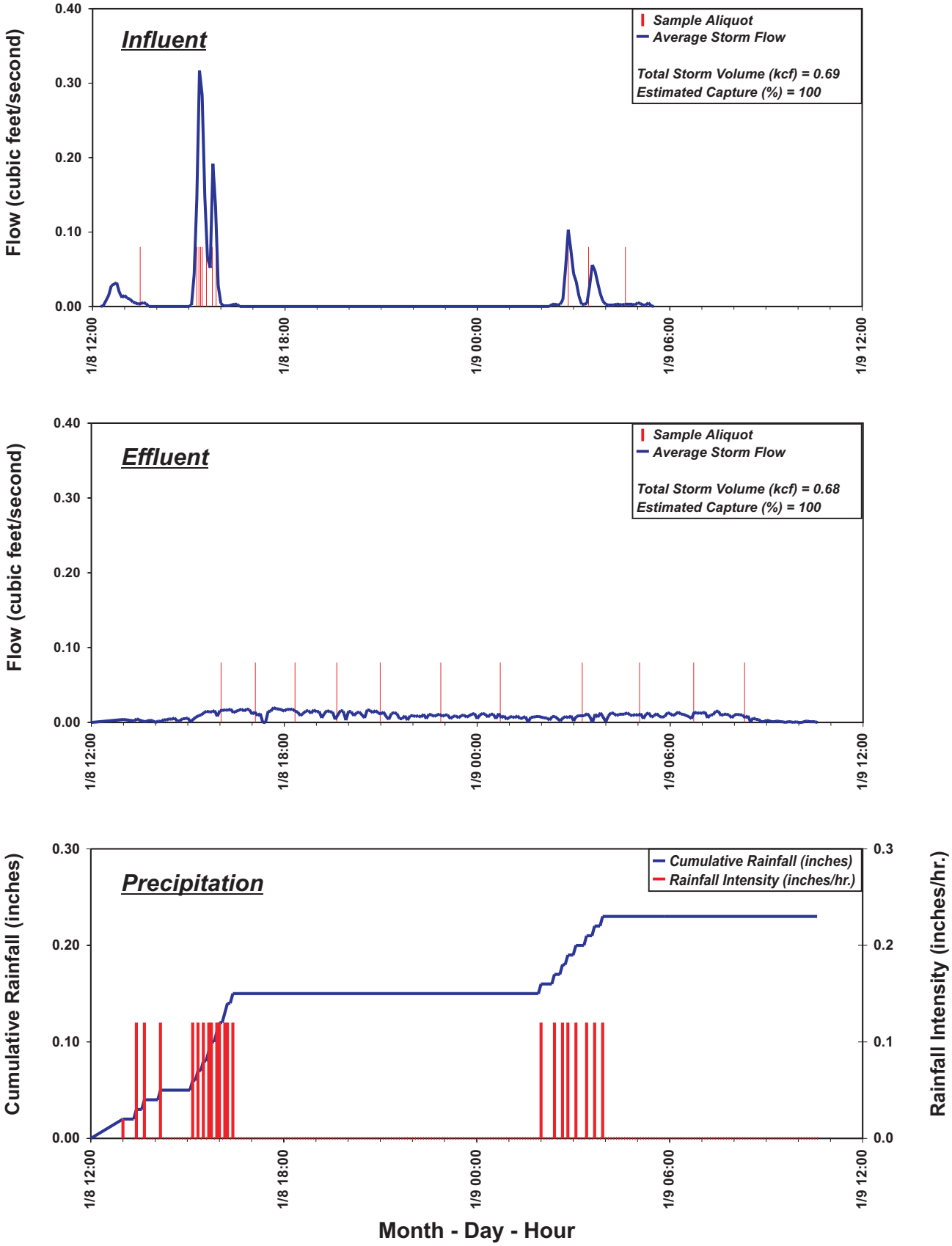


Fig. 1-27. Carlsbad Maintenance Station - Event 3 (8-9 January 2001)

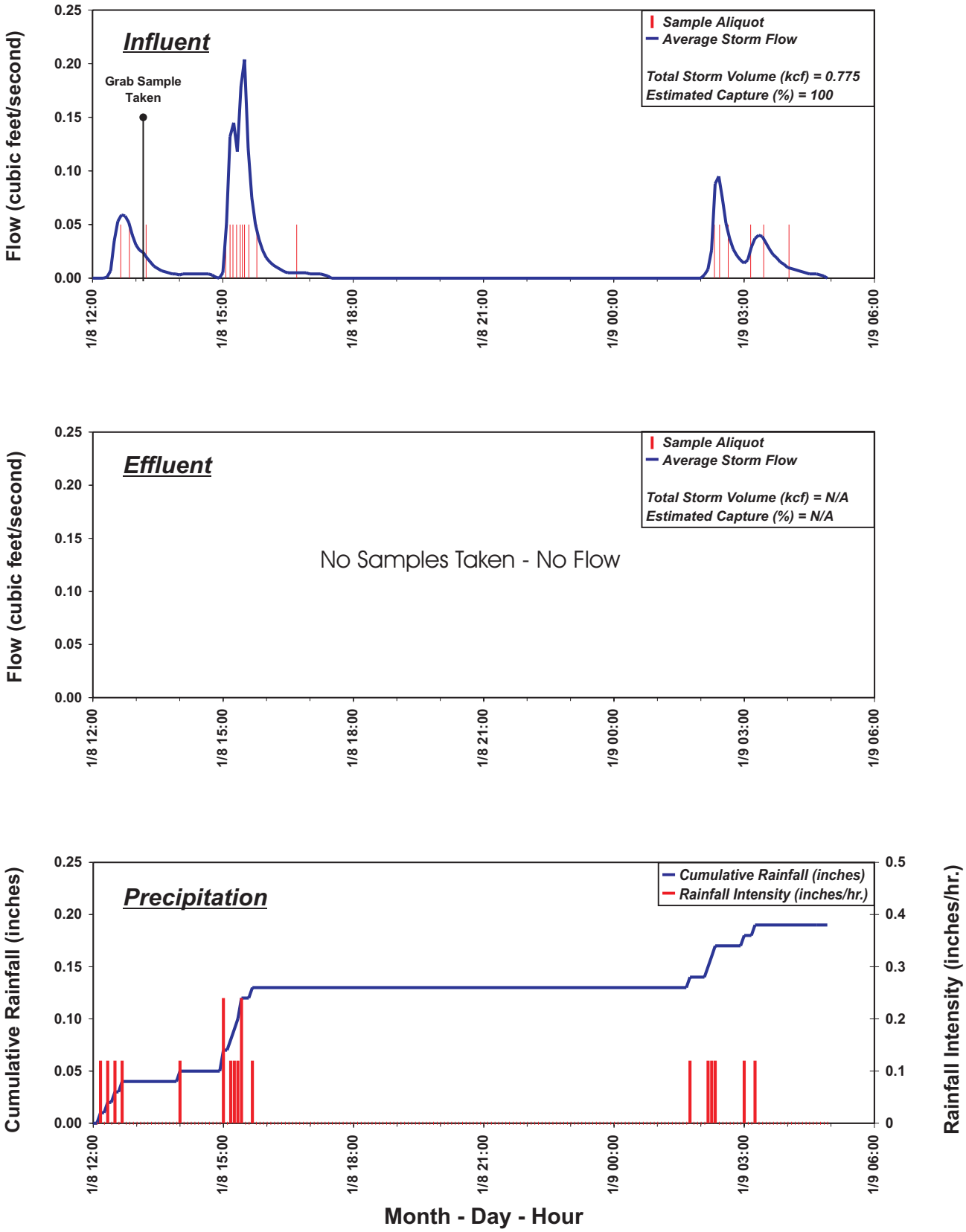


Fig. 1-28. State Route 78 & I15 - Event 4 (10-13 January 2001)

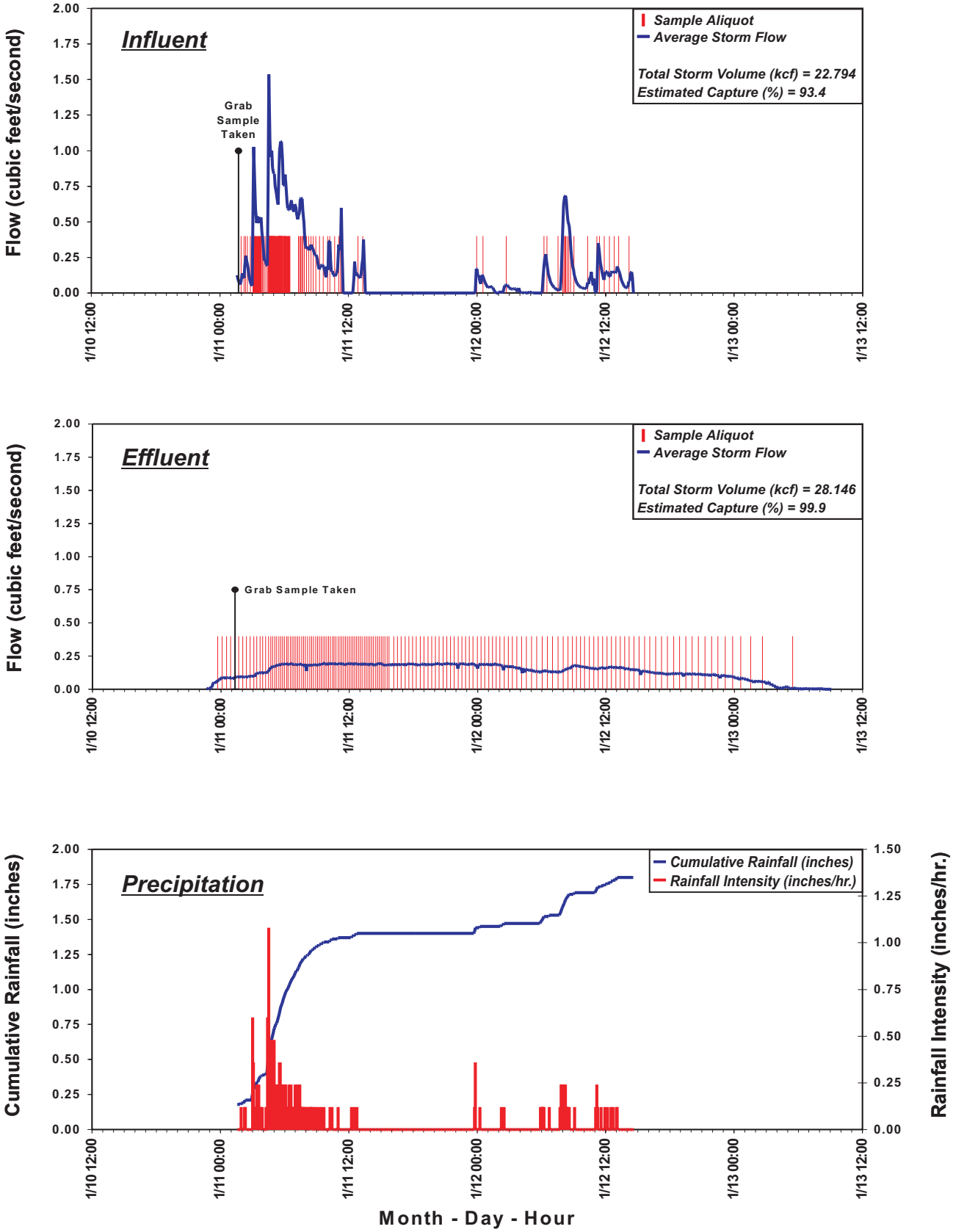


Fig. 1-29. State Route 56 & I5 -Event 4 (10-13 January 2001)

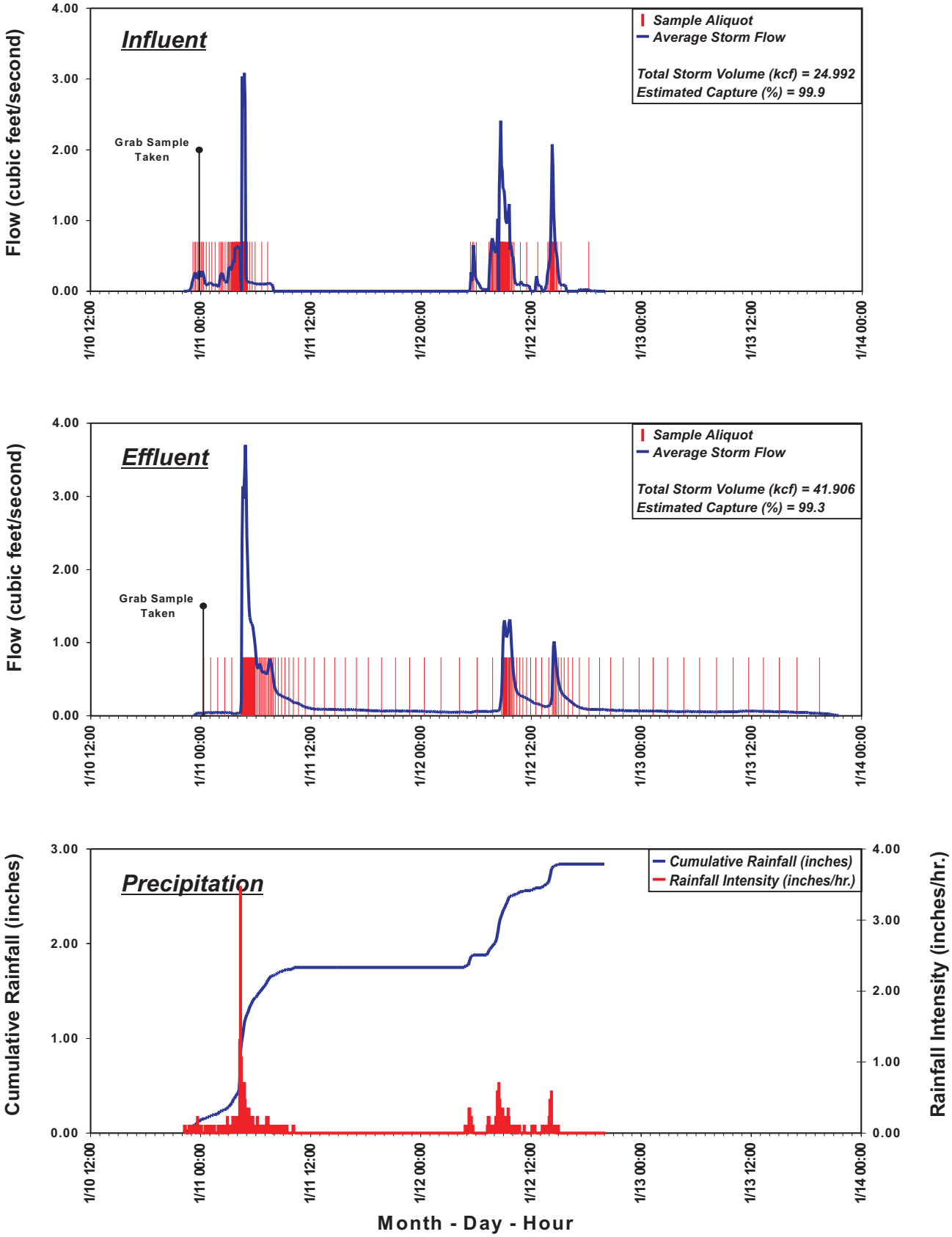


Fig. 1-30. Manchester Detention Basin - Event 4 (10-16 January 2001)

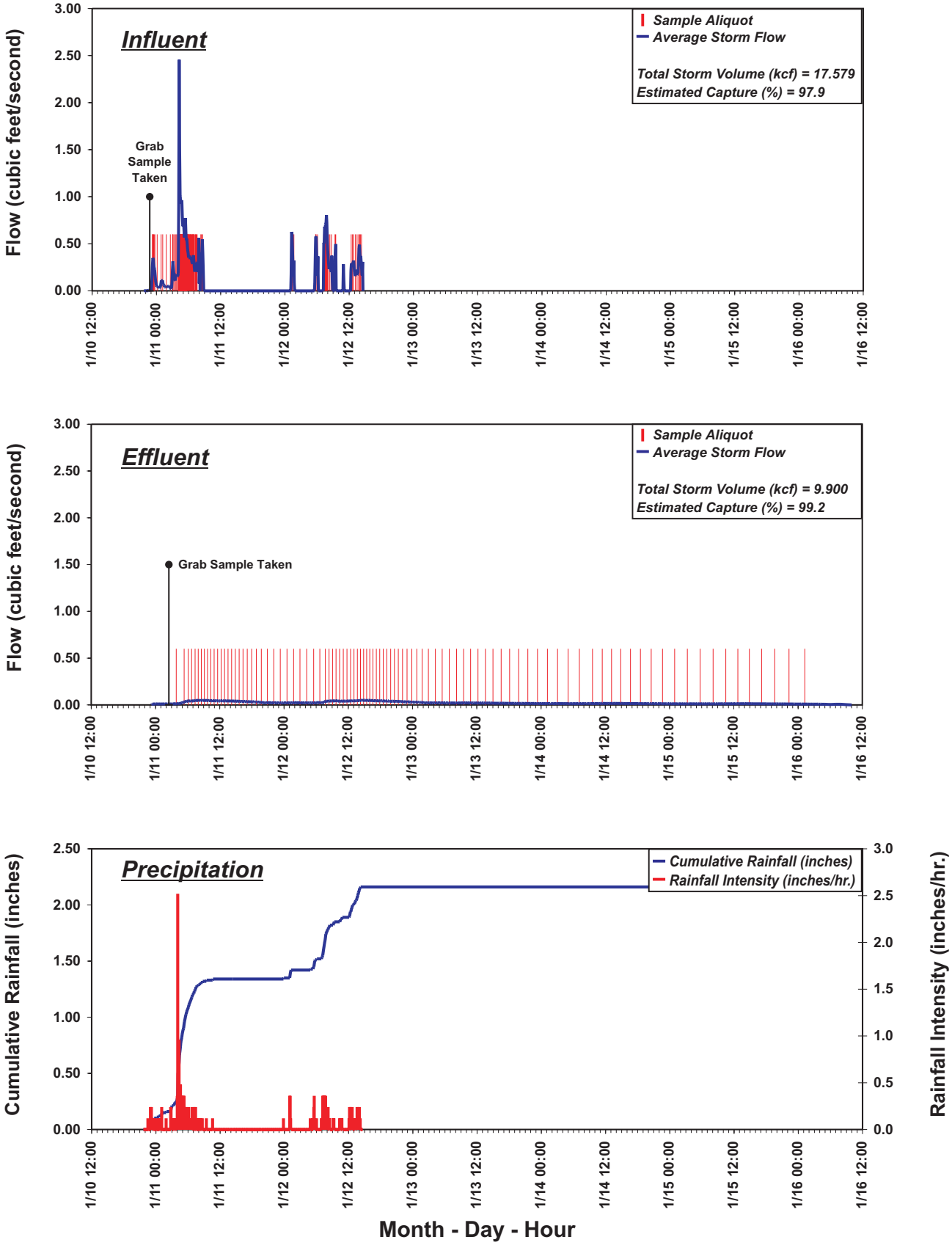


Fig. 1-31. State Route 78 & I5 Park & Ride - Event 4 (10-12 January 2001)

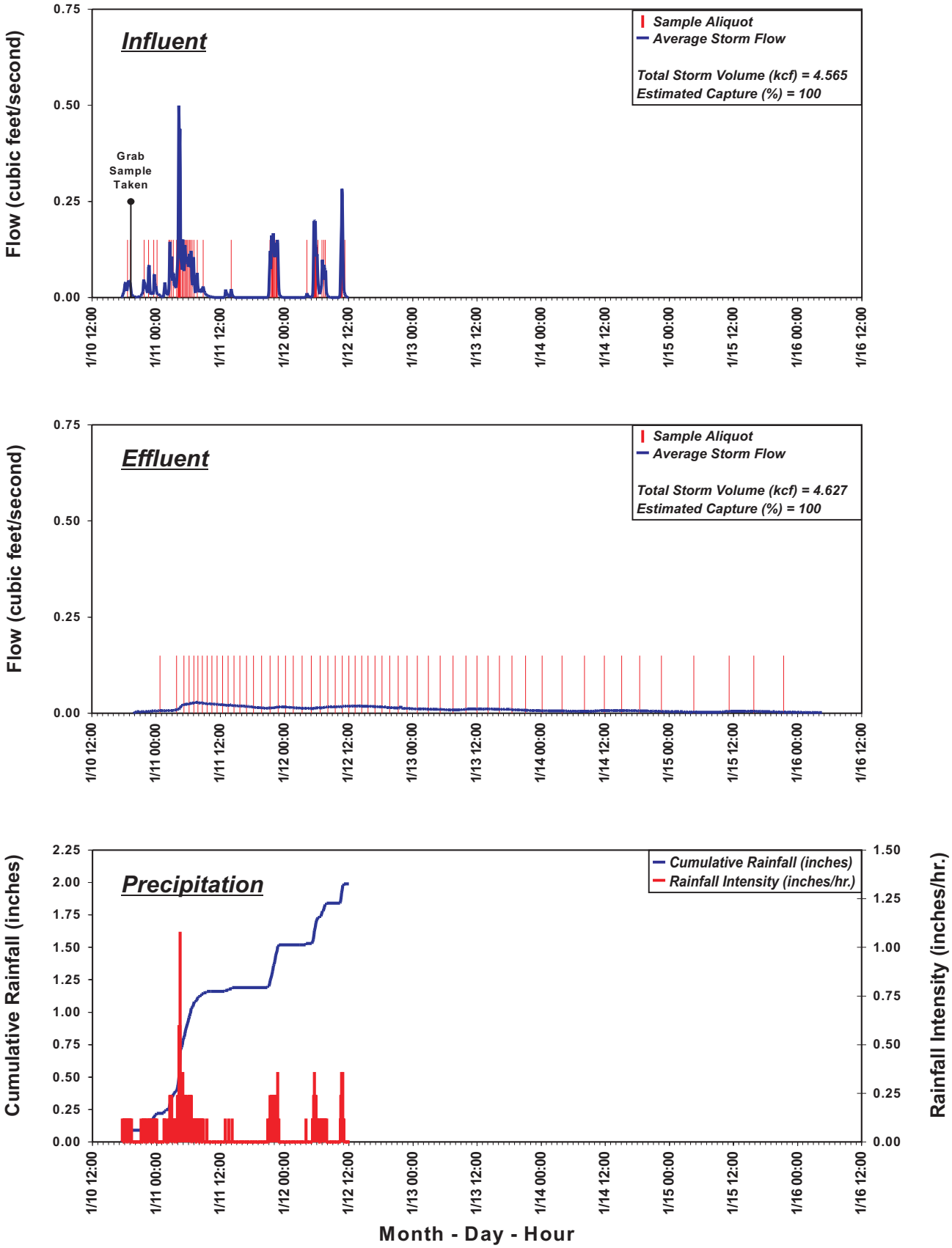


Fig. 1-32. La Costa Park & Ride - Event 4 (10-16 January 2001)

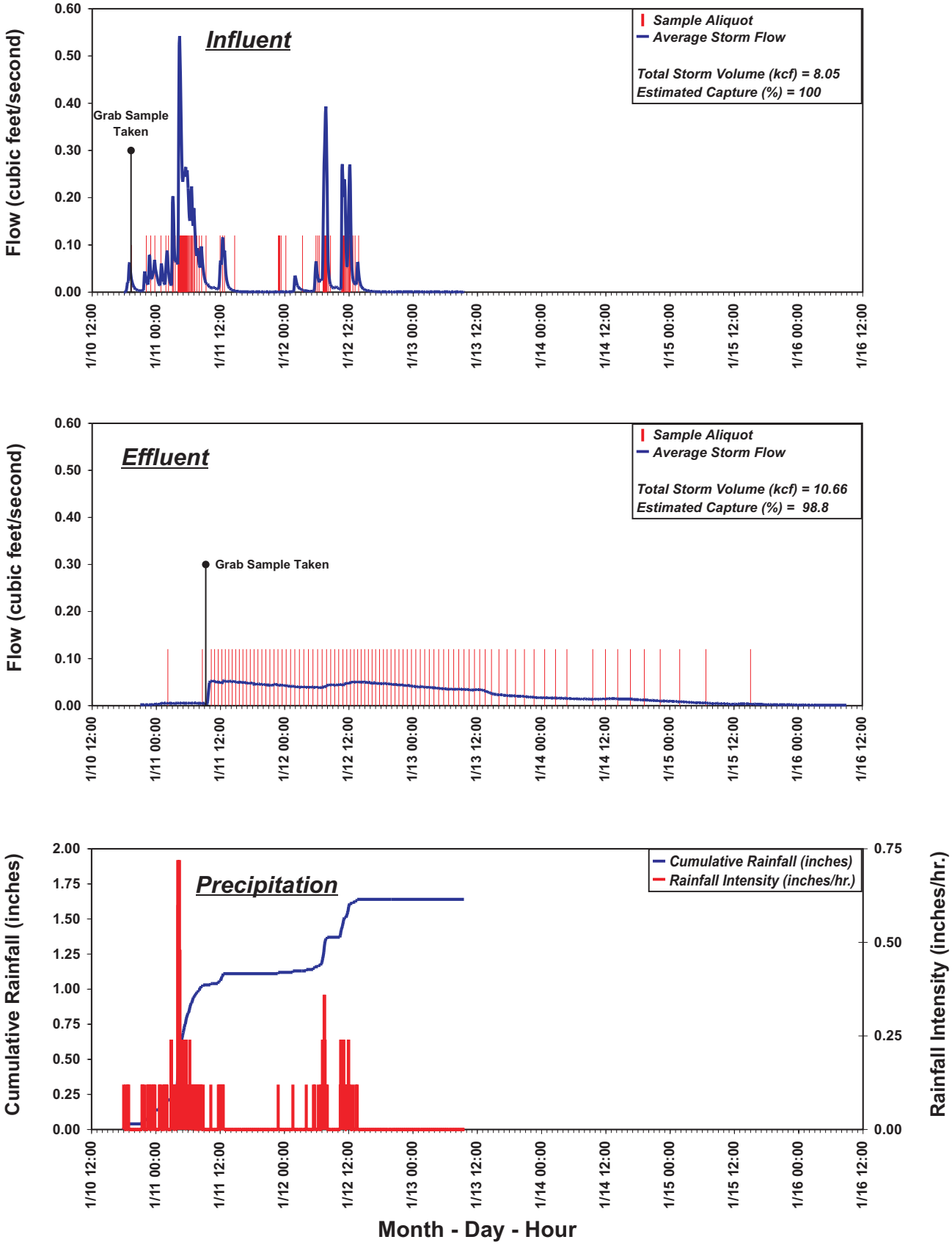


Fig. 1-33. Kearny Mesa Maintenance Station - Event 4 (10-11 January 2001)

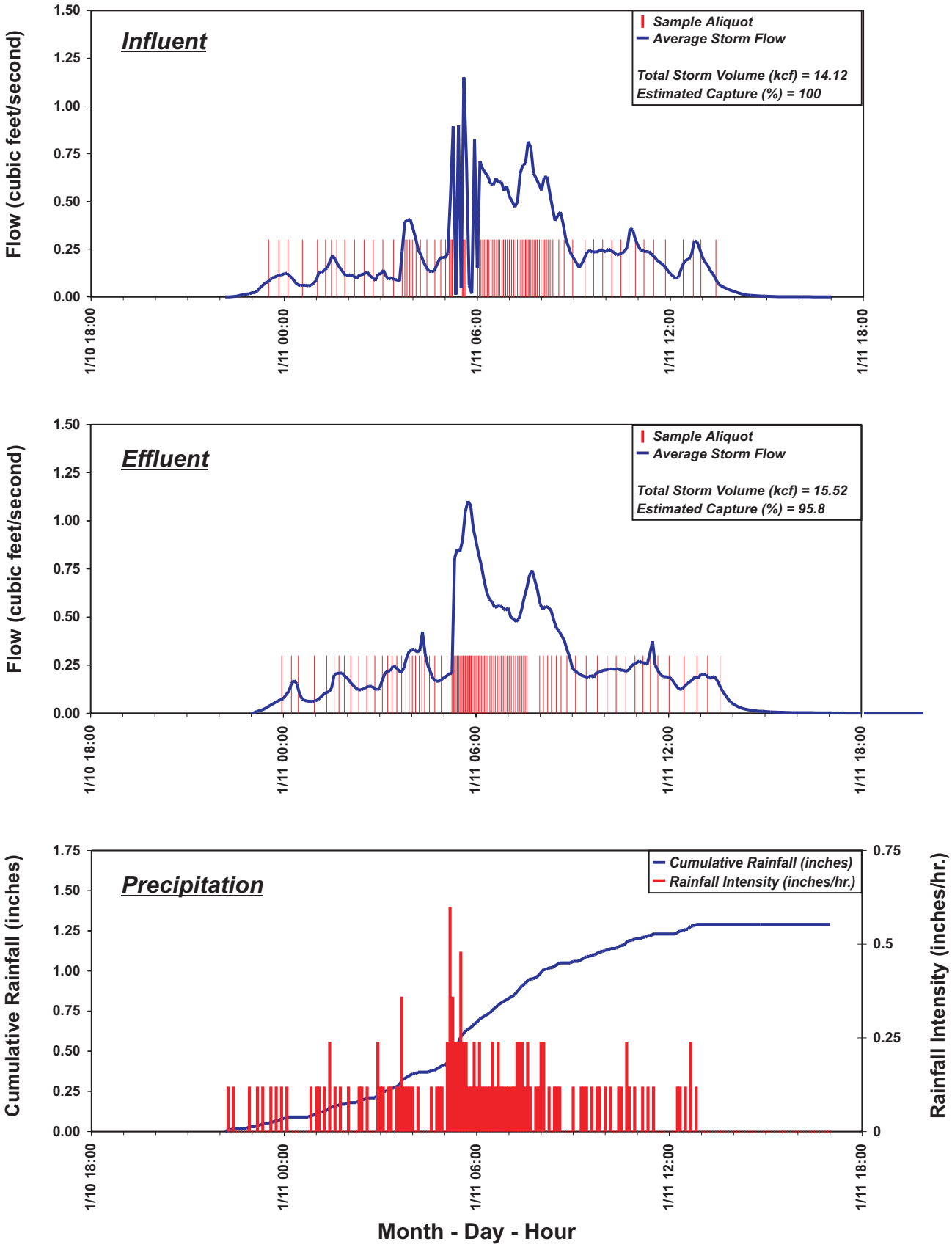


Fig. 1-34. La Costa Wet Basin - Event 4 (10-14 January 2001)

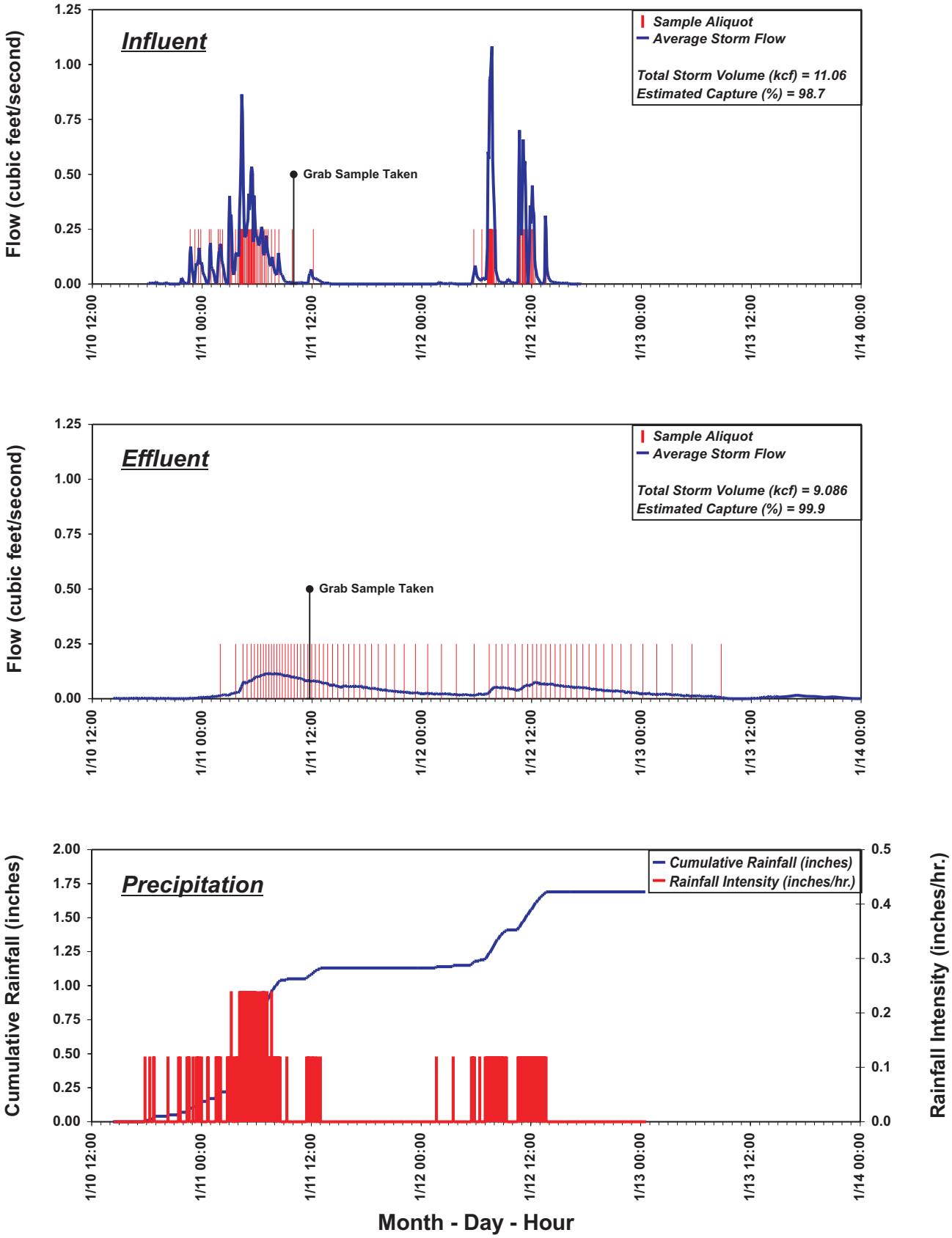


Fig. 1-35. Palomar Swale - Event 4 (10-12 January 2001)

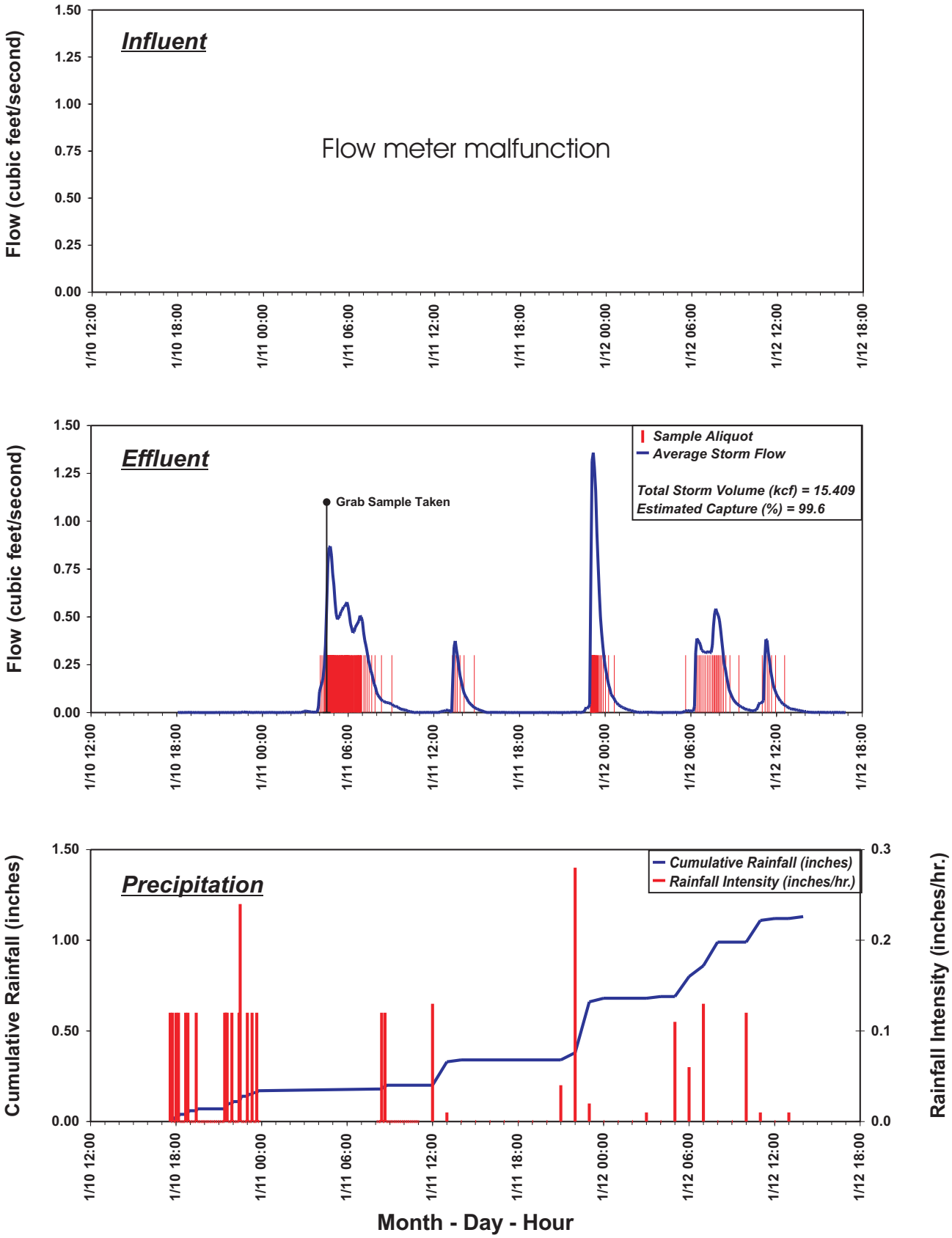


Fig. 1-36. Carlsbad Maintenance Station - Event 4 (10-12 January 2001)

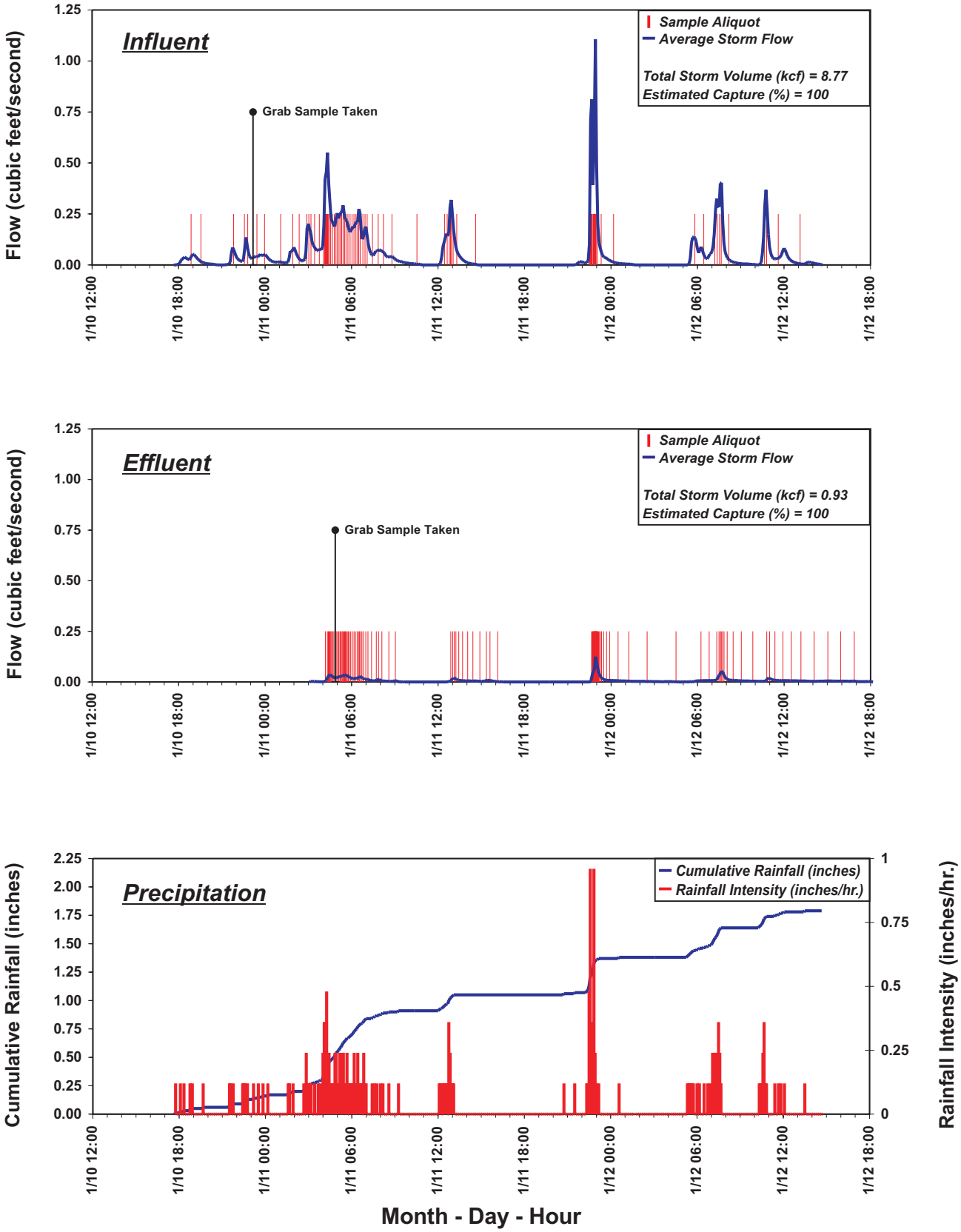


Fig. 1-37. Melrose - Event 4 (10-12 January 2001)

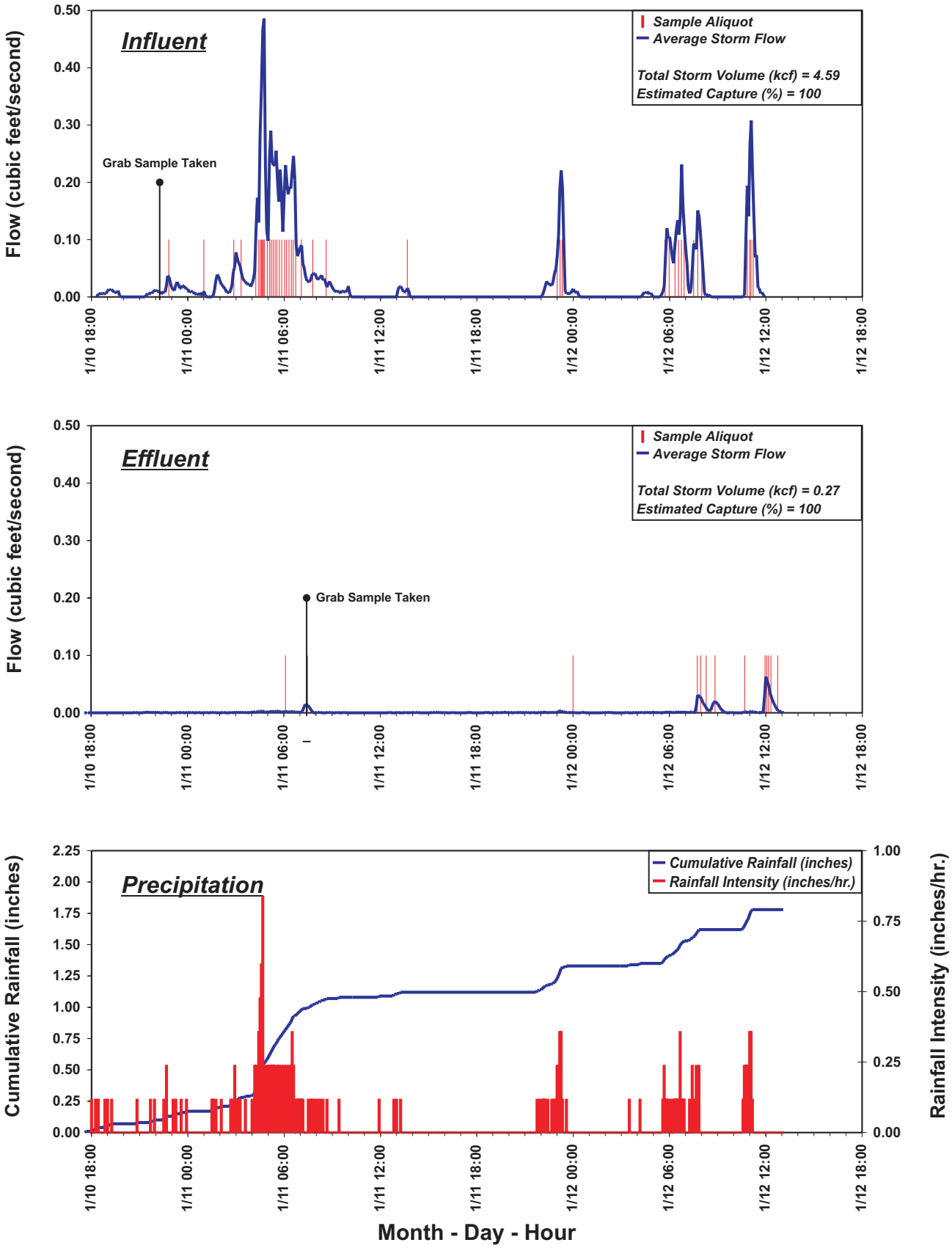


Fig. 1-38. State Route 78 & I15 - Event 5 (26-27 January 2001)

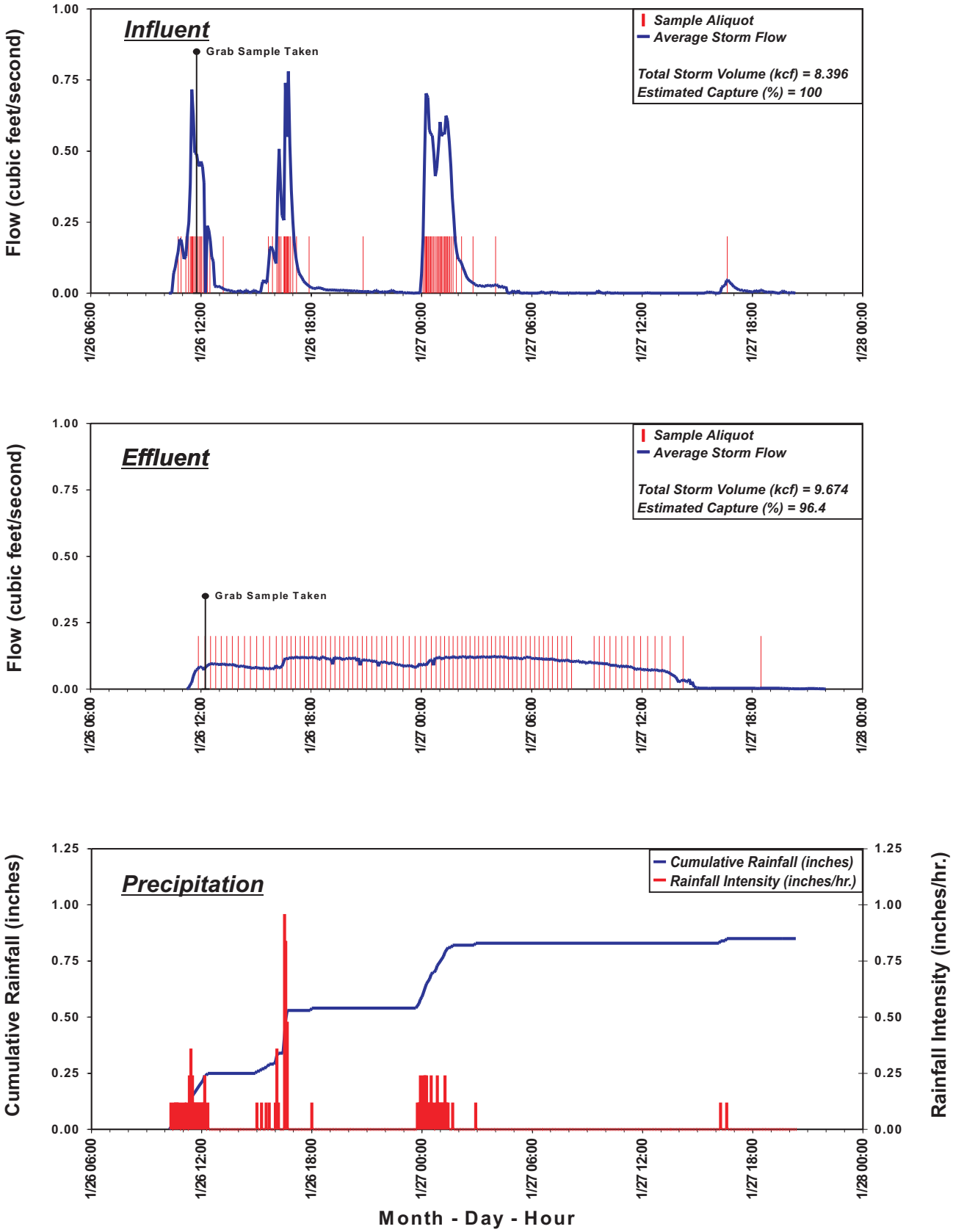


Fig. 1-39. State Route 56 & I5 - Event 5 (26-28 January 2001)

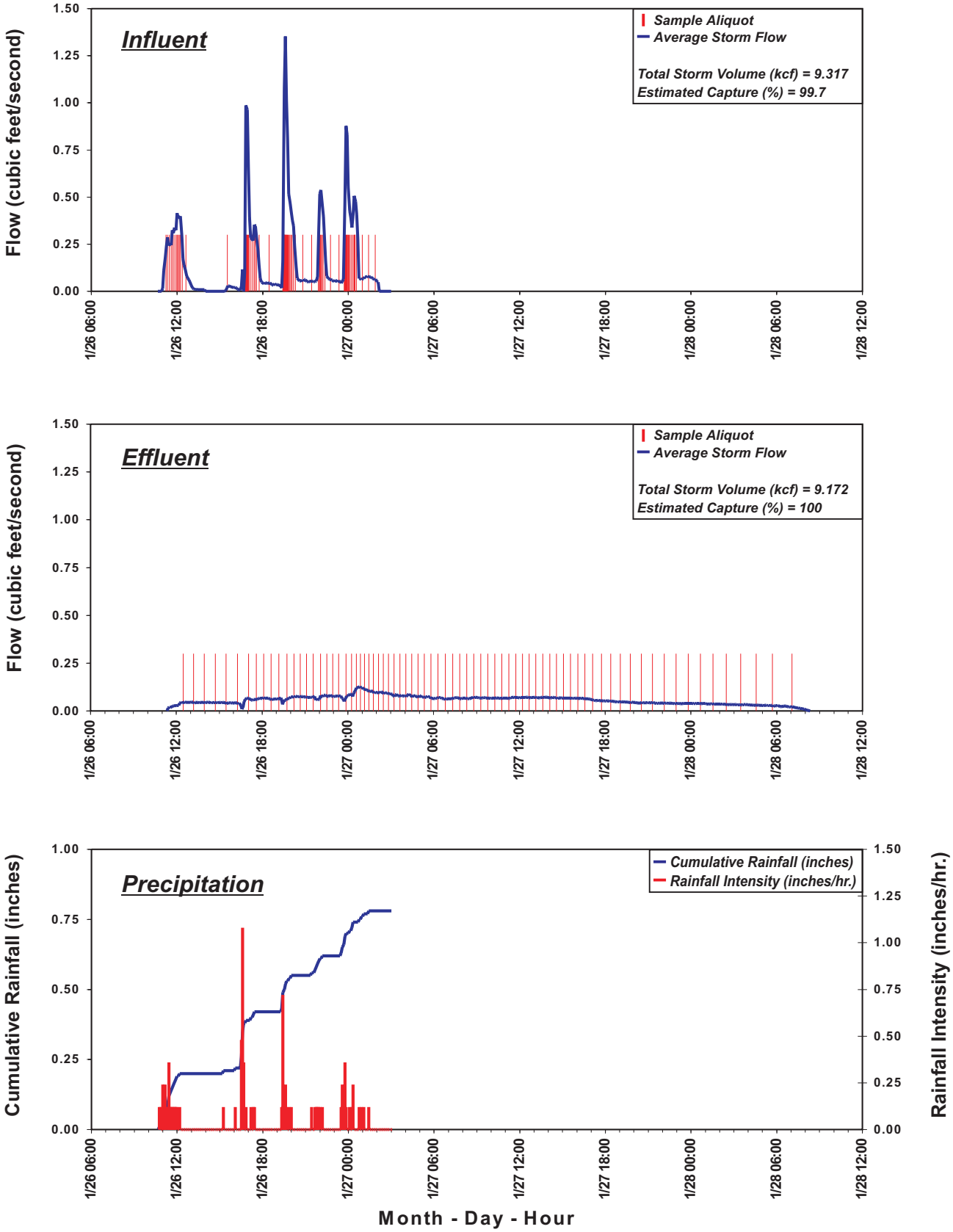


Fig. 1-40. Manchester Detention Basin - Event 5 (26-30 January 2001)

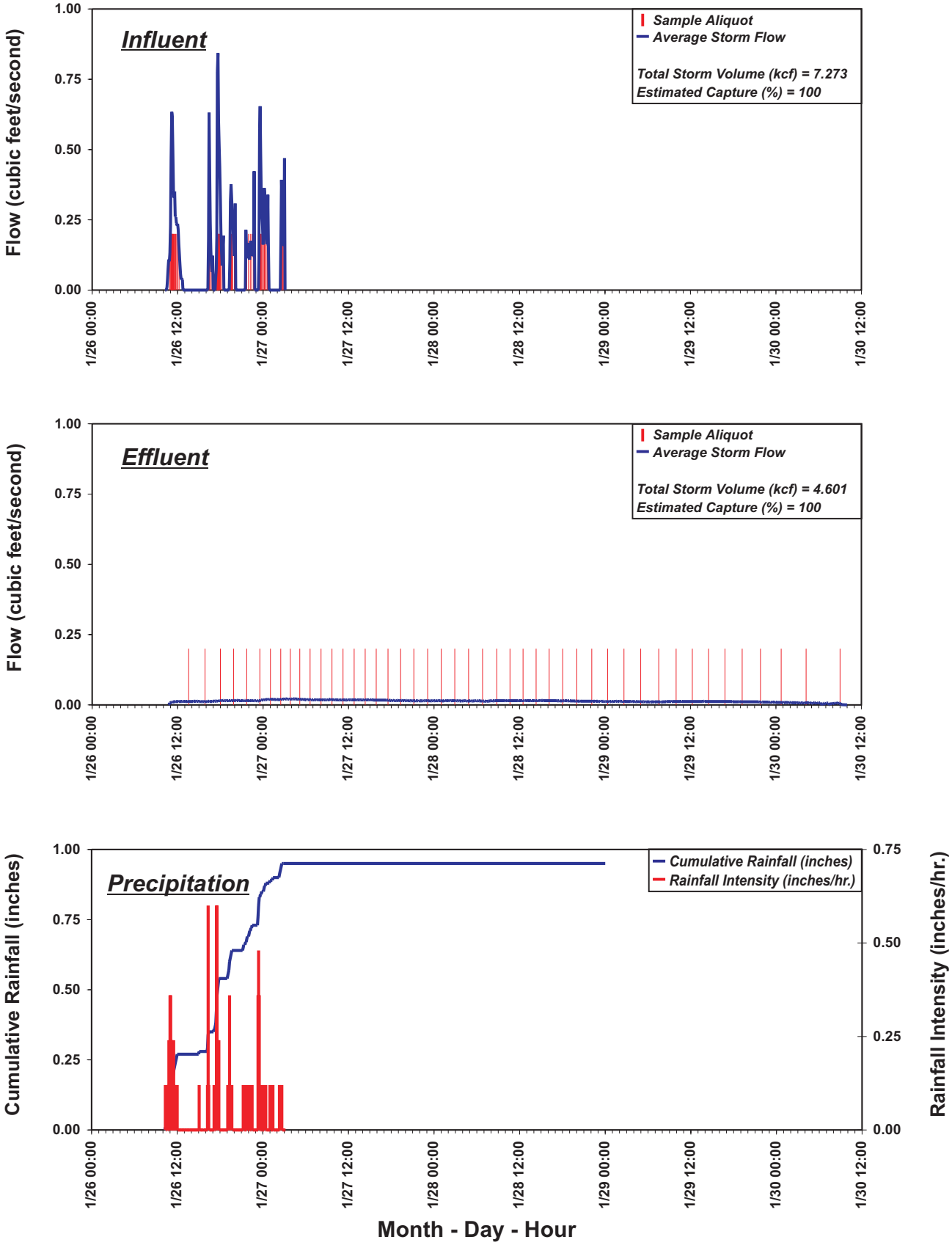


Fig. 1-41. Escondido Maintenance Station - Event 5 (26-27 January 2001)

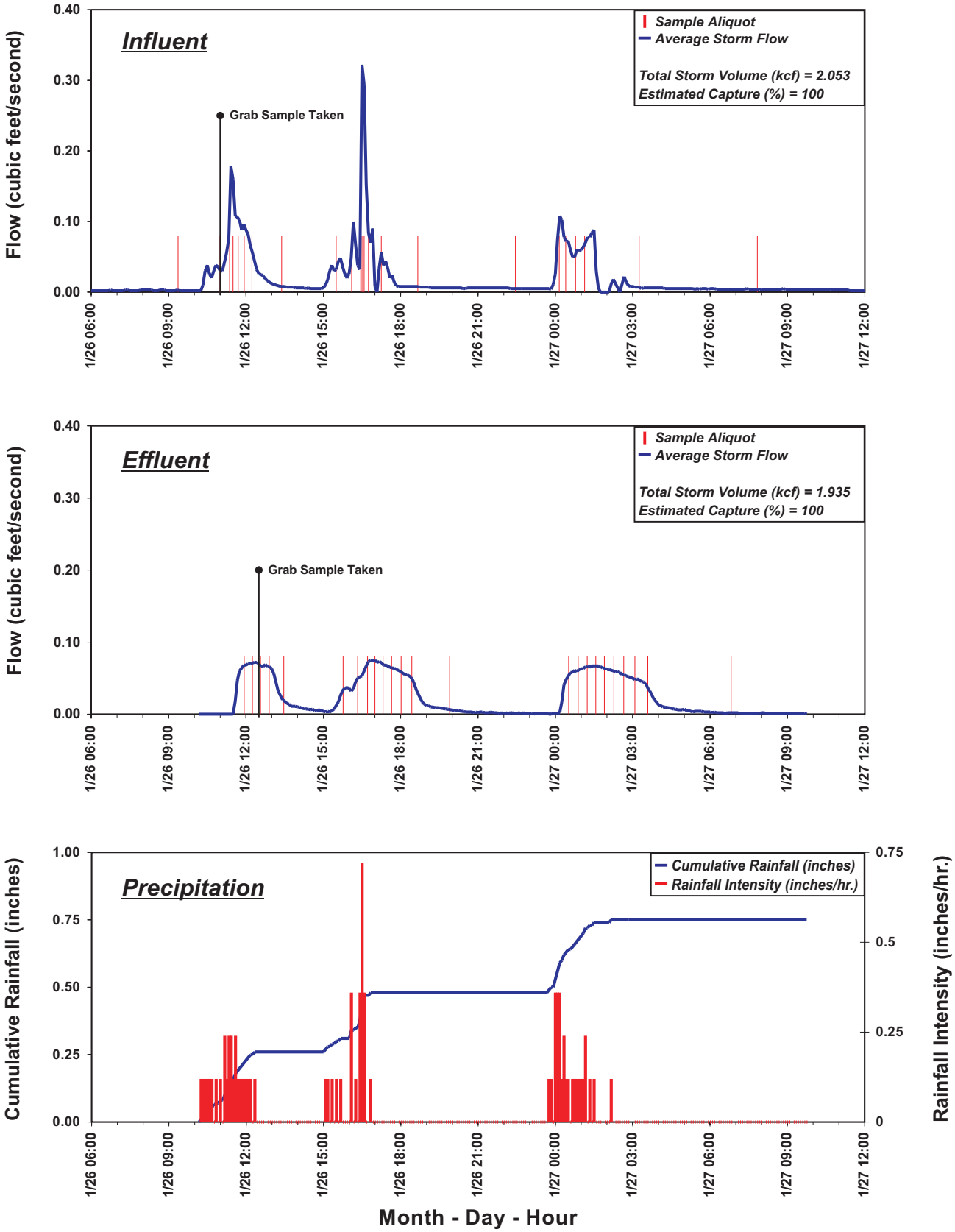


Fig. 1-42. State Route 78 & I5 Park & Ride - Event 5 (26-27 January 2001)

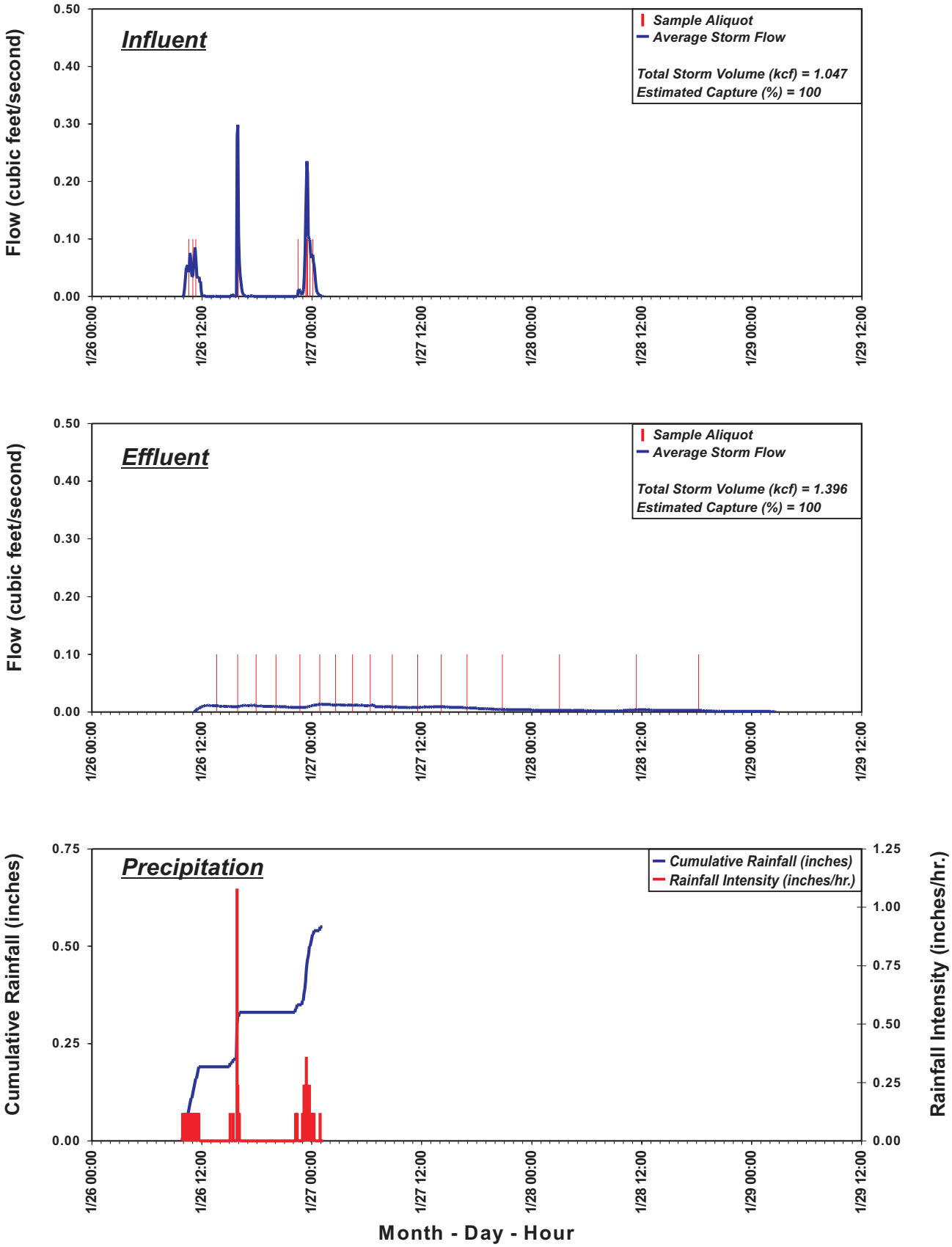


Fig. 1-43. La Costa Park & Ride - Event 5 (26-30 January 2001)

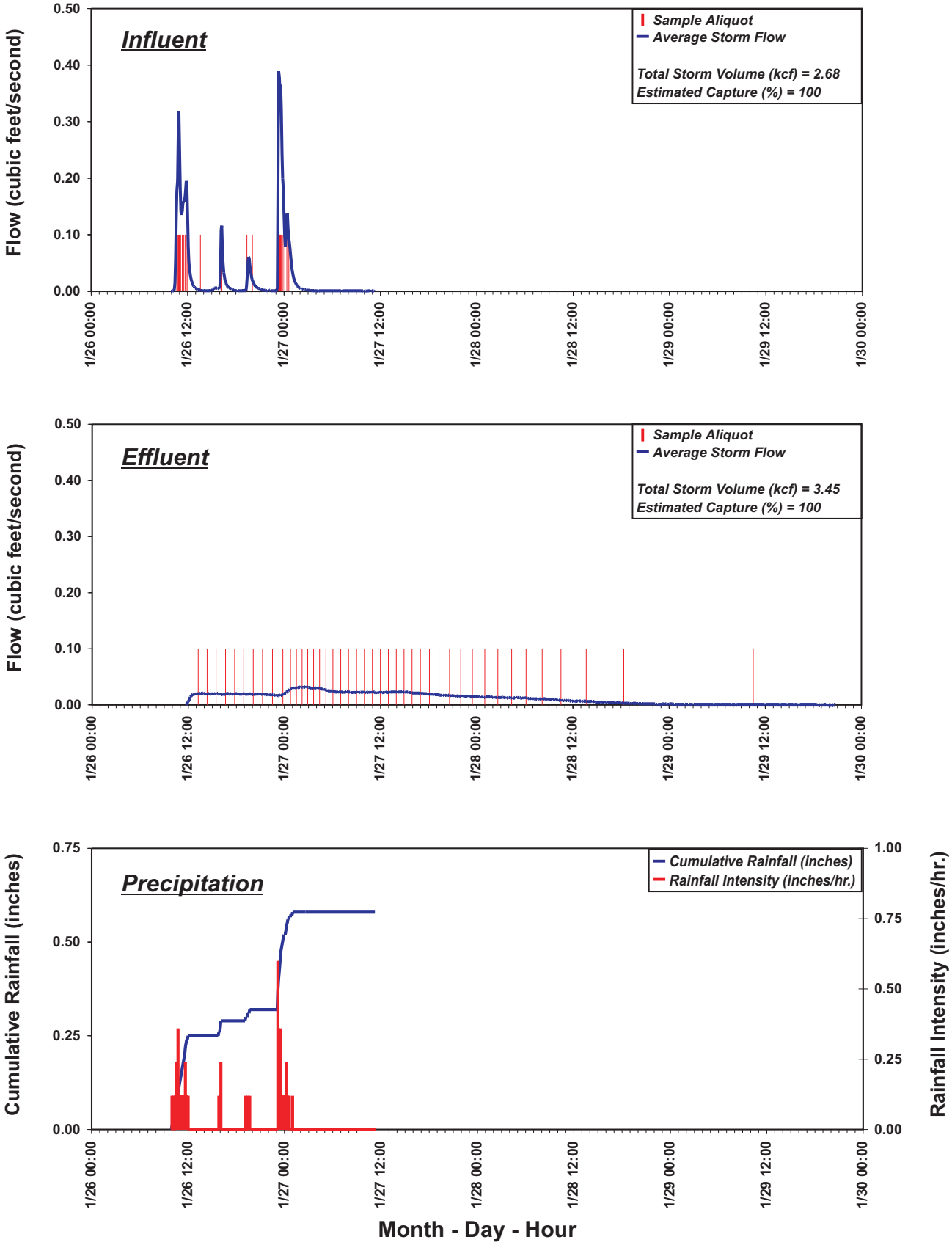


Fig. 1-44. Kearny Mesa Maintenance Station - Event 5 (26-27 January 2001)

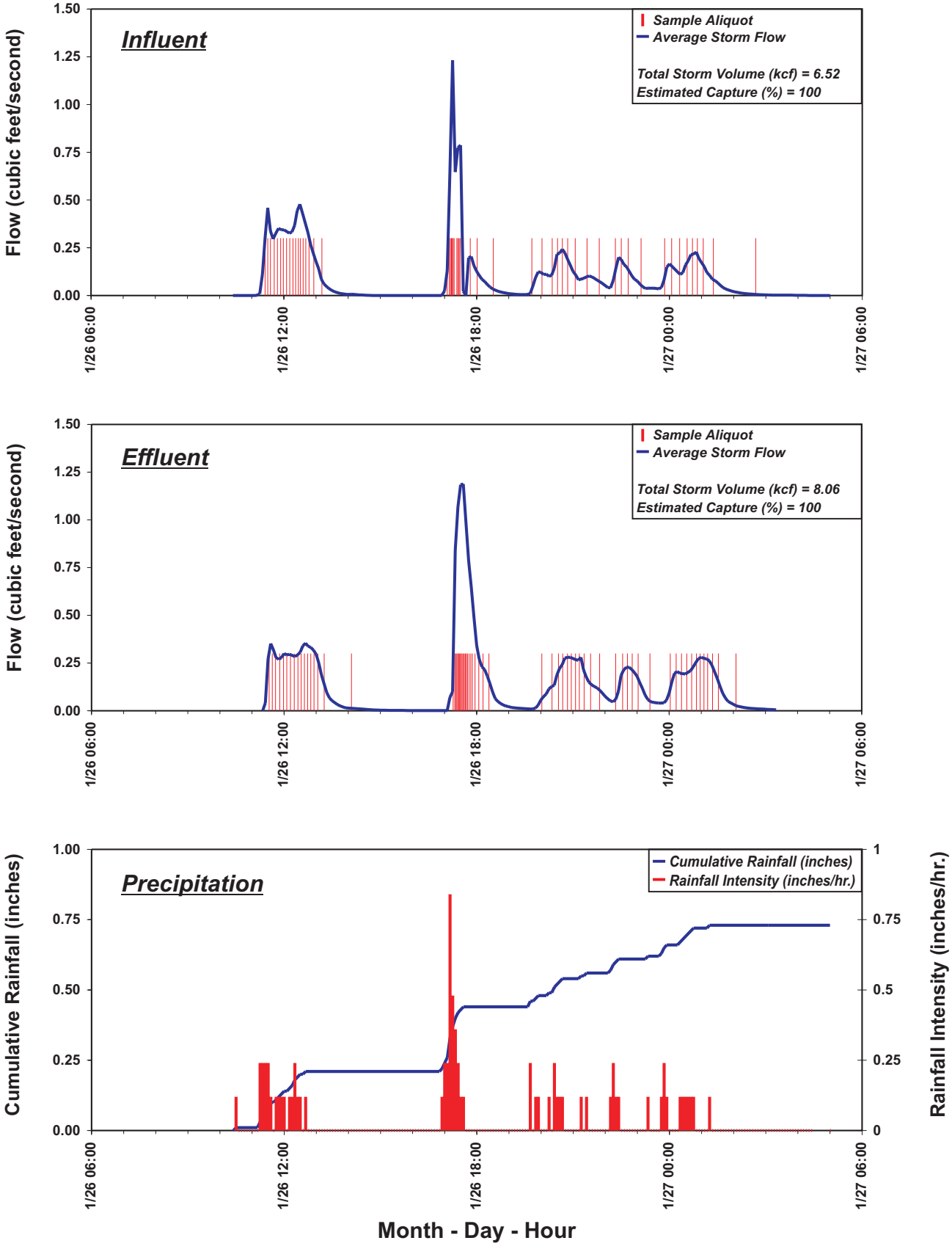


Fig. 1-45. La Costa Wet Basin - Event 5 (26-28 January 2001)

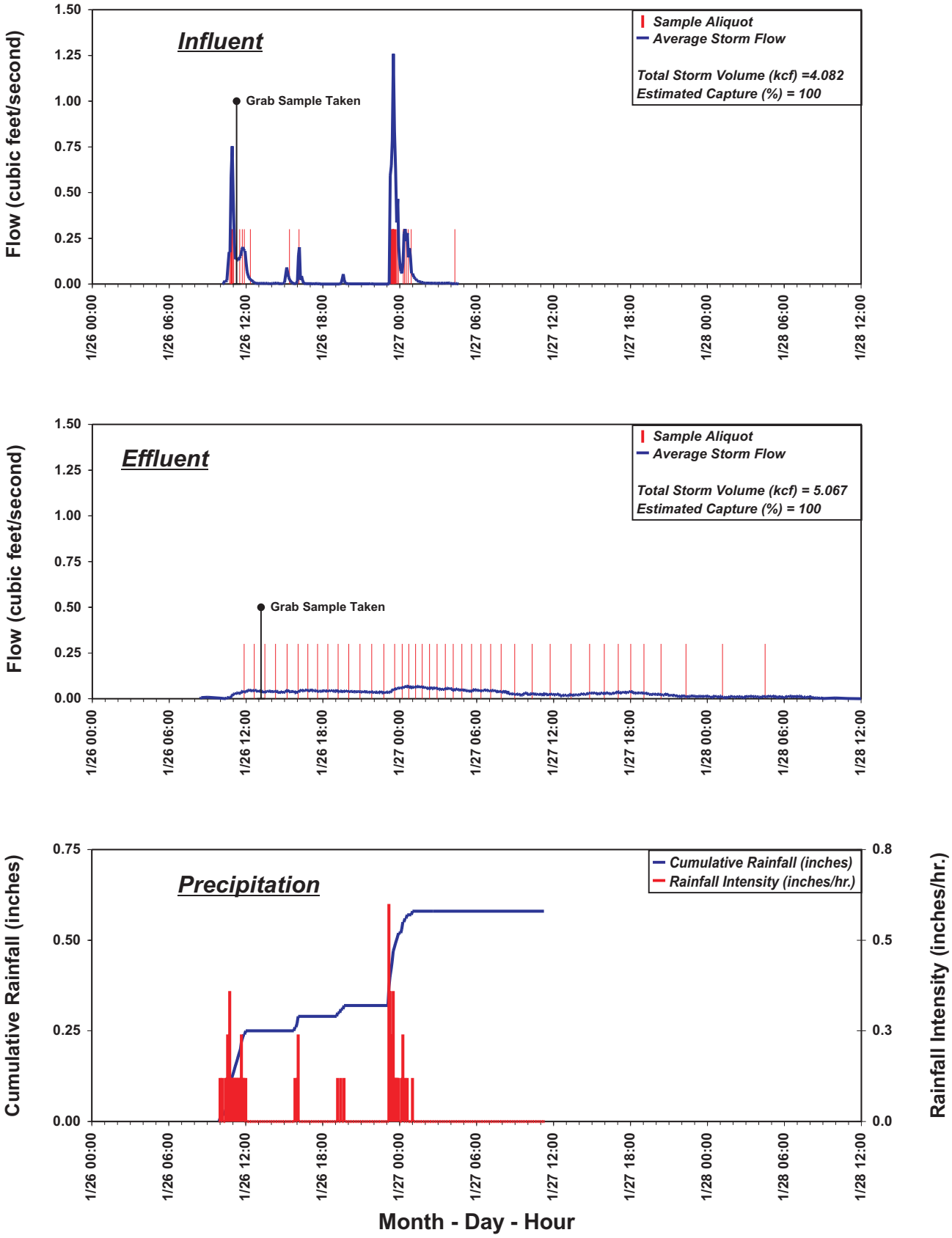


Fig. 1-46. Palomar Swale - Event 5 (26-27 January 2001)

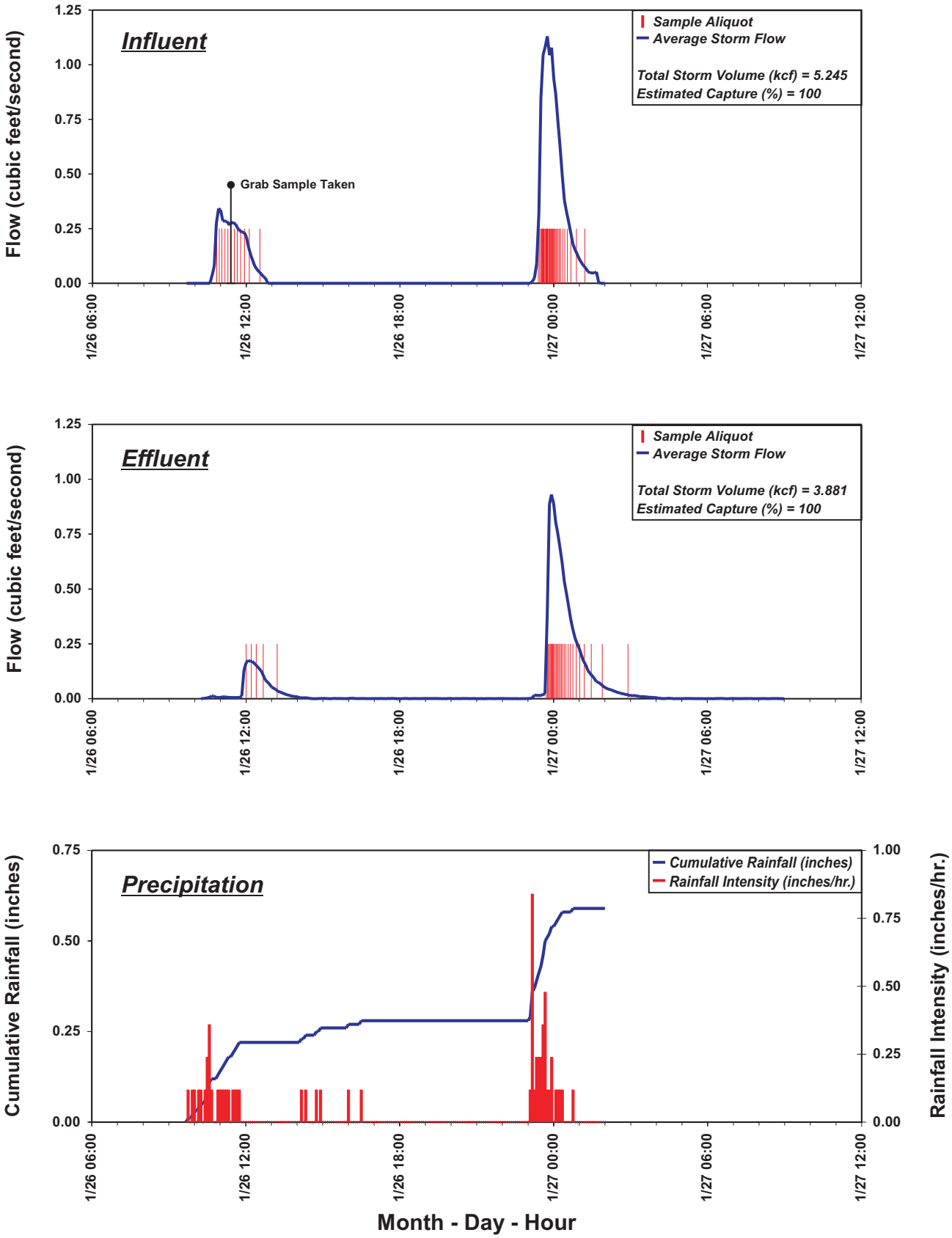


Fig. 1-47. Carlsbad Maintenance Station - Event 5 (26-27 January 2001)

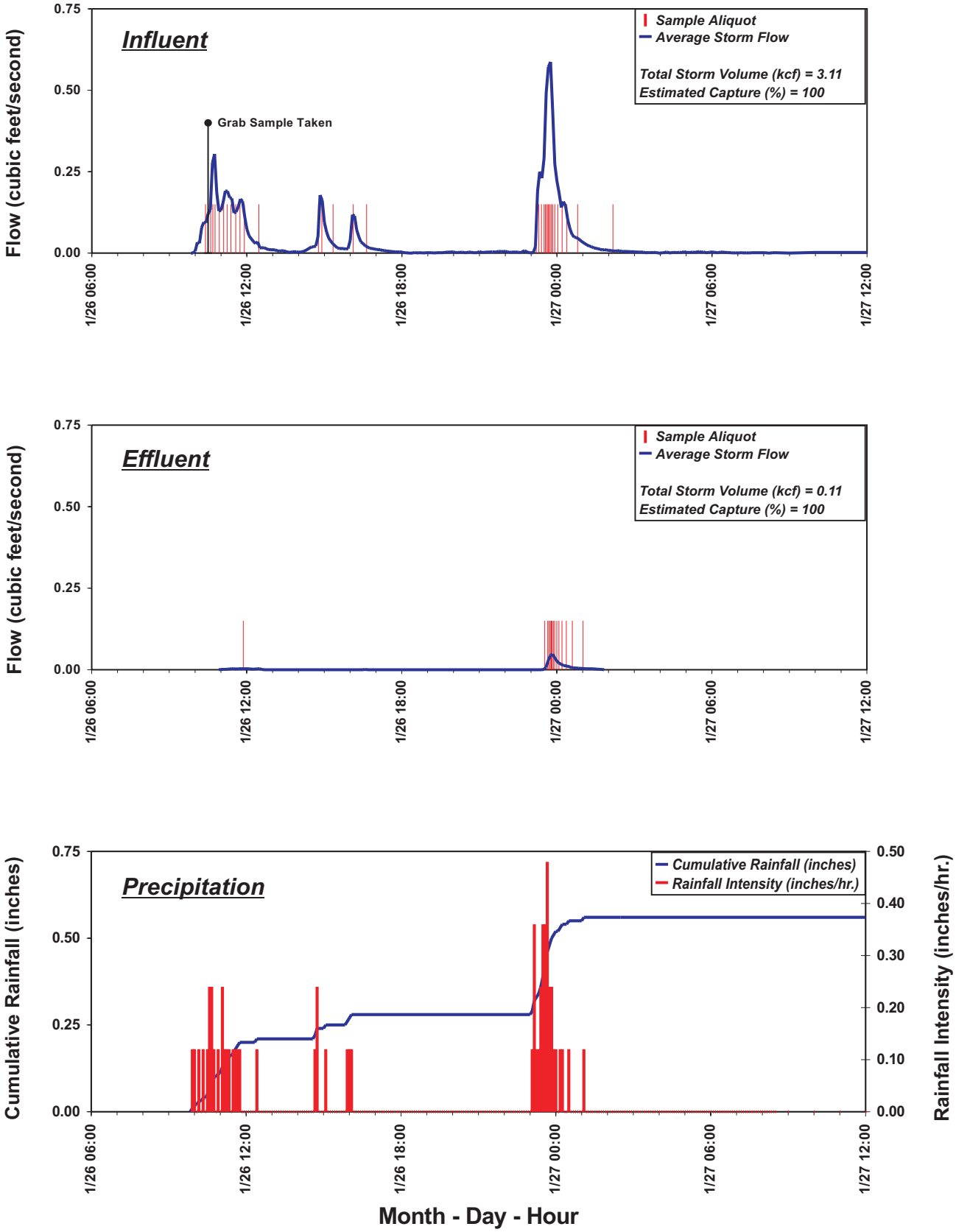


Fig. 1-48. Melrose - Event 5 (26-27 January 2001)

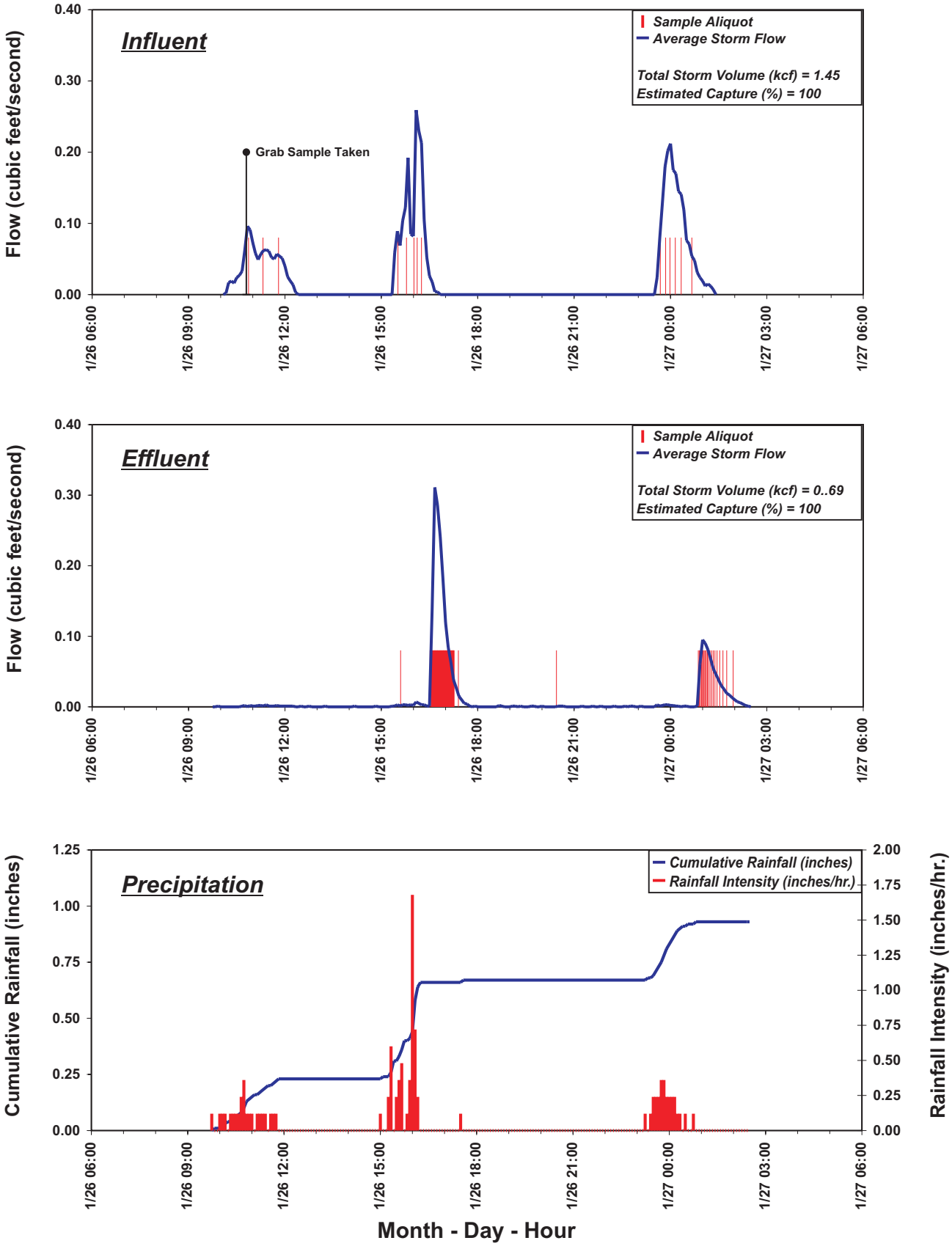


Fig. 1-49. State Route 78 & I15 - Event 6 (10-11 February 2001)

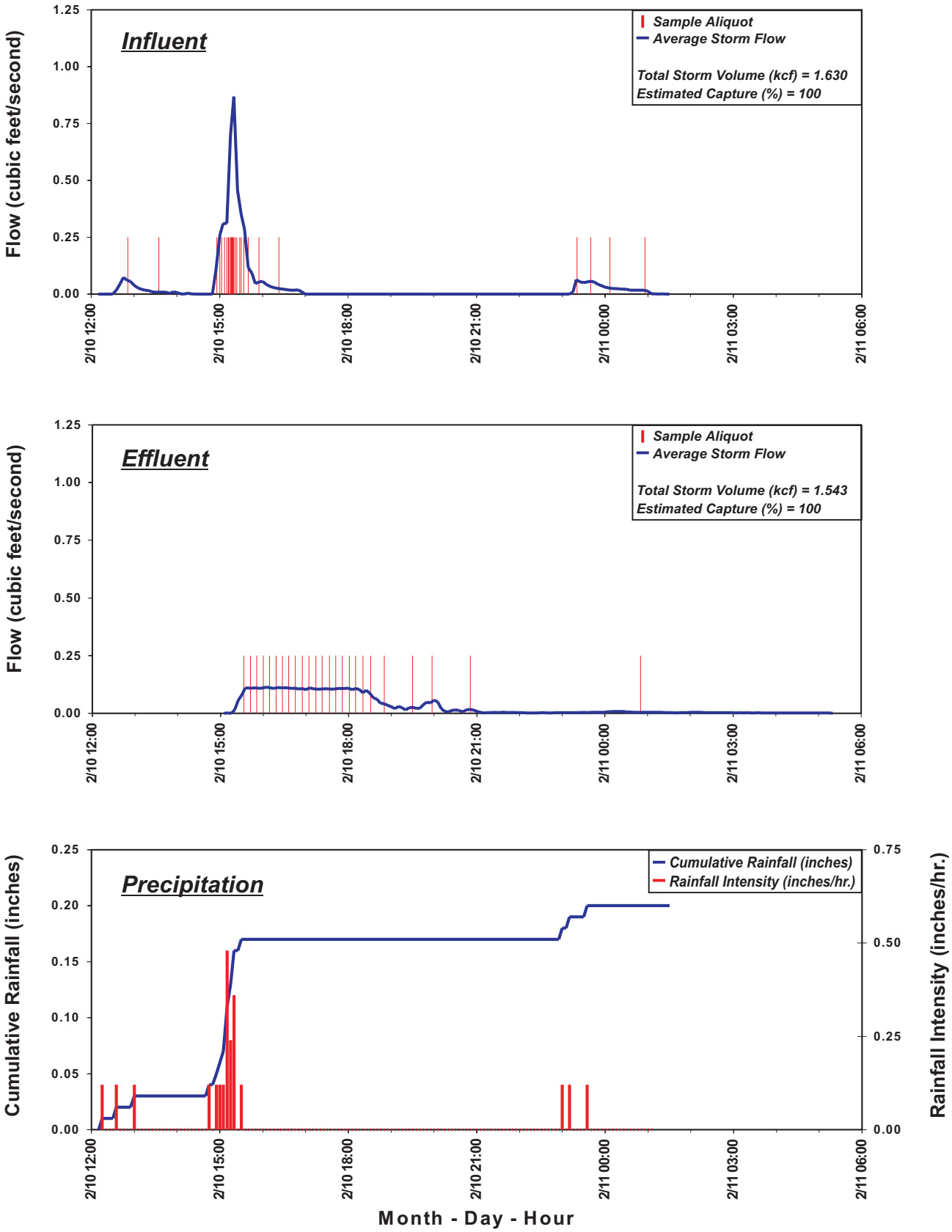


Fig. 1-50. Escondido Maintenance Station - Event 6 (10-11 February 2001)

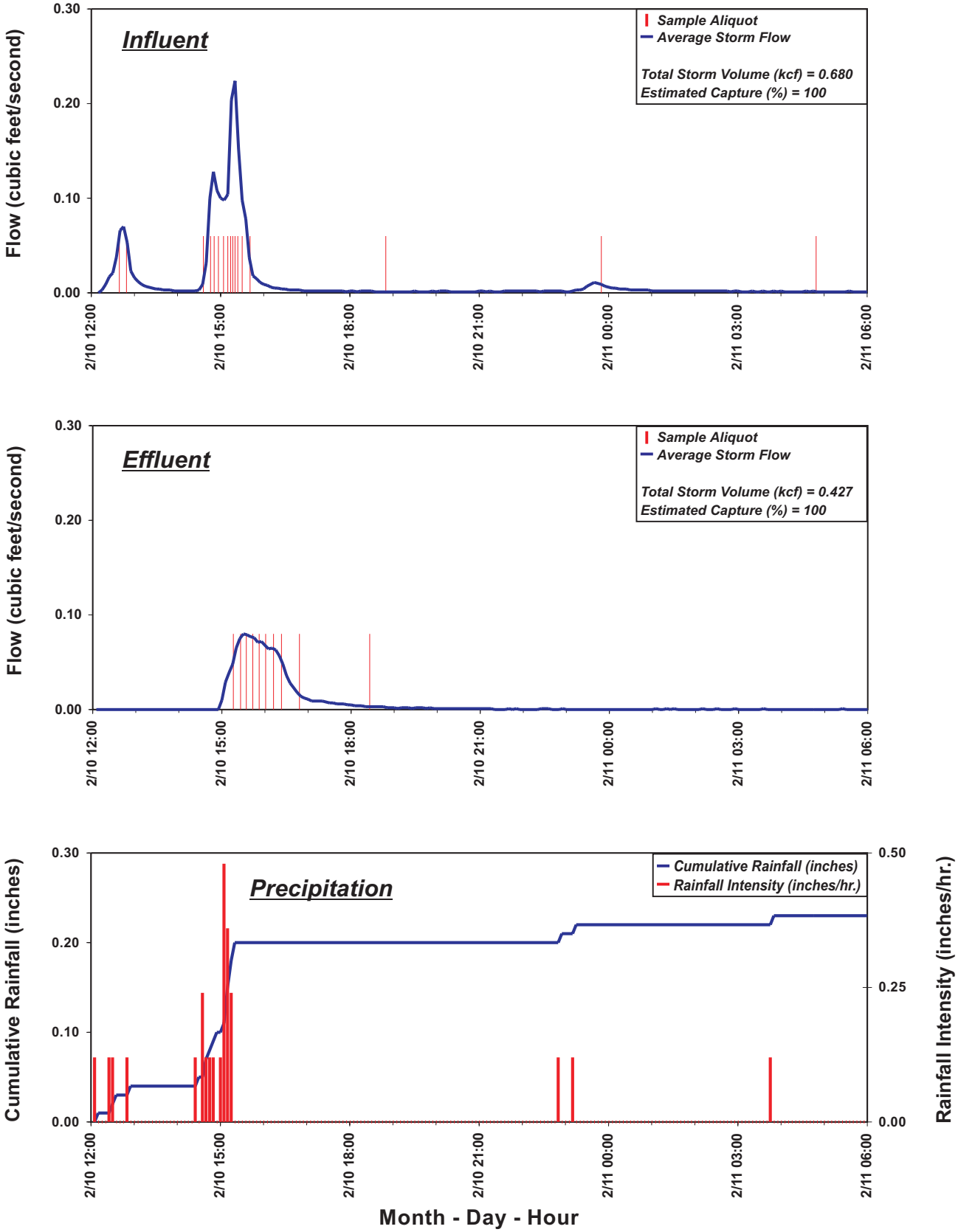


Fig. 1-51. State Route 78 & I5 Park & Ride - Event 6 (10-11 February 2001)

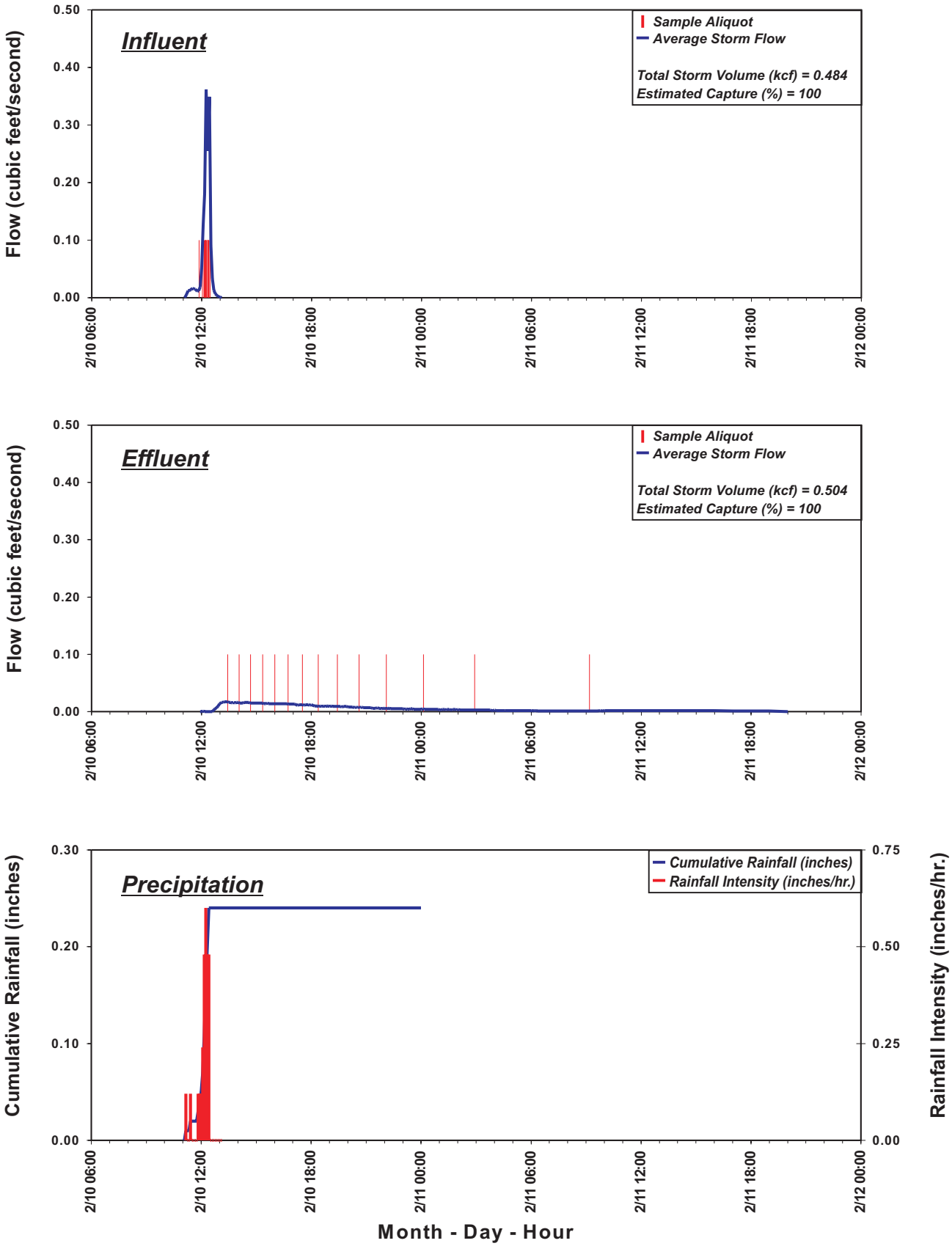


Fig. 1-52. State Route 78 & I15 - Event 7 (12-14 February 2001)

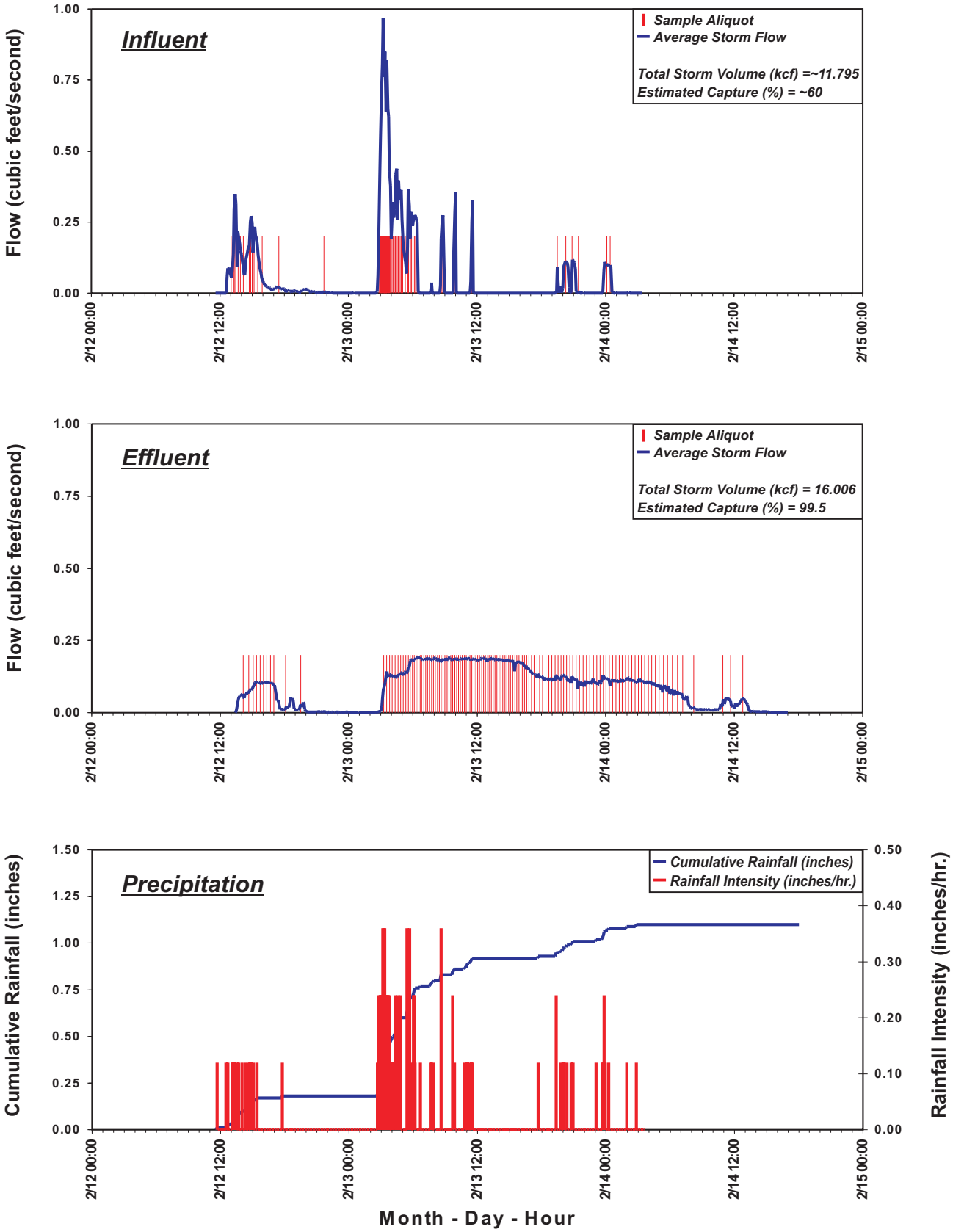


Fig. 1-53. Manchester Detention Basin - Event 7 (12-17 February 2001)

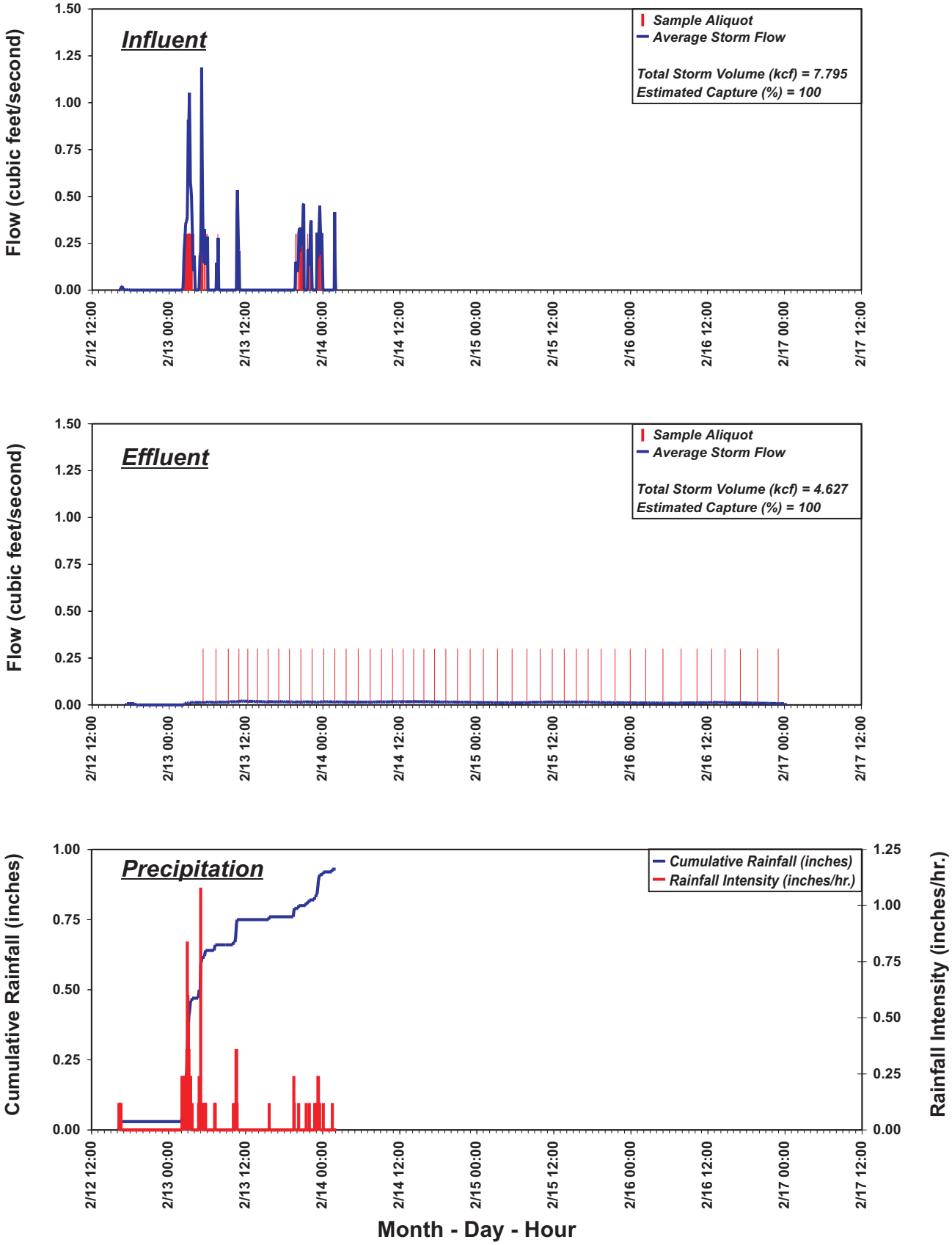


Fig. 1-54. Escondido Maintenance Station - Event 7 (12-14 February 2001)

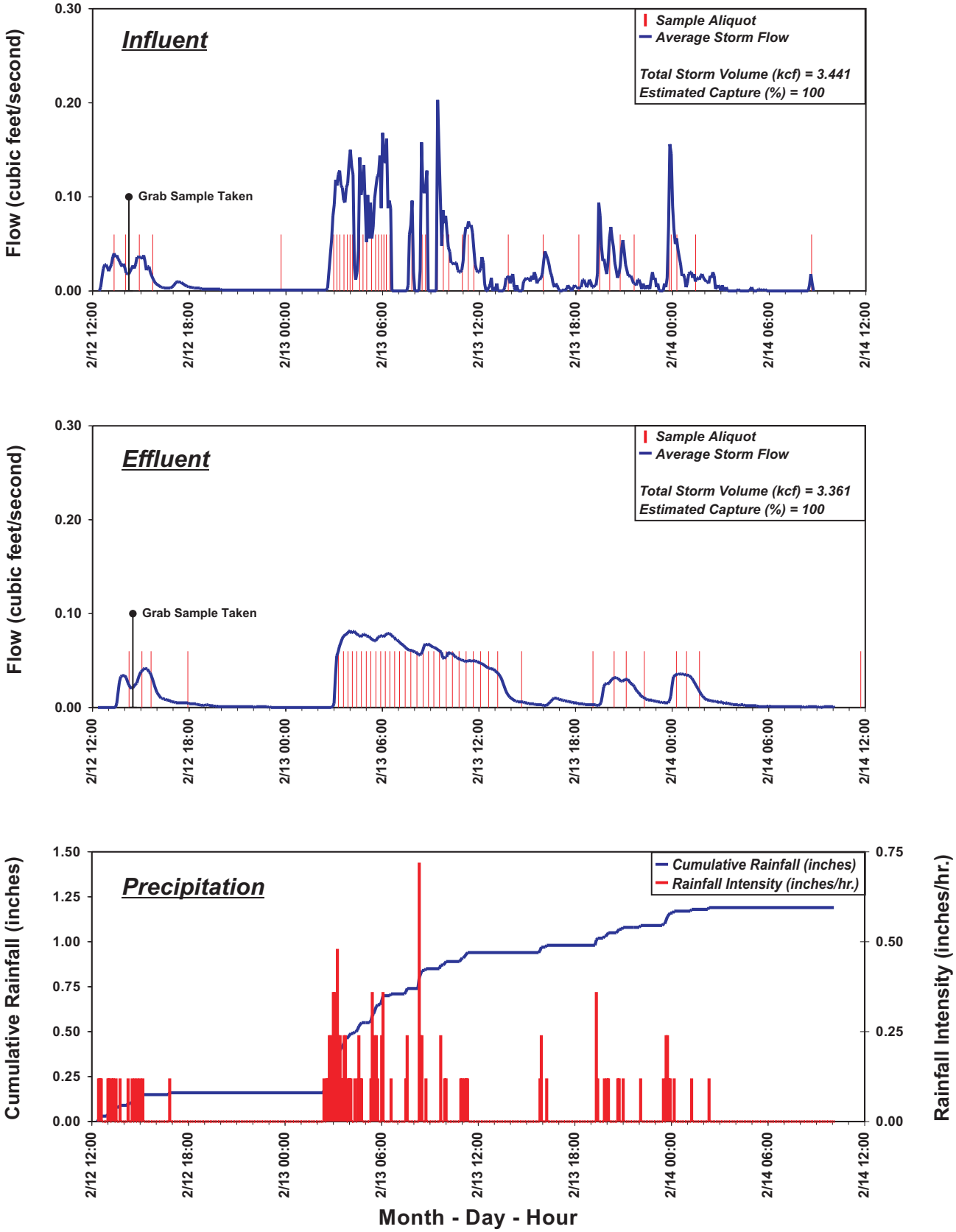


Fig. 1-55. State Route 78 & I5 Park & Ride - Event 7 (12-14 February 2001)

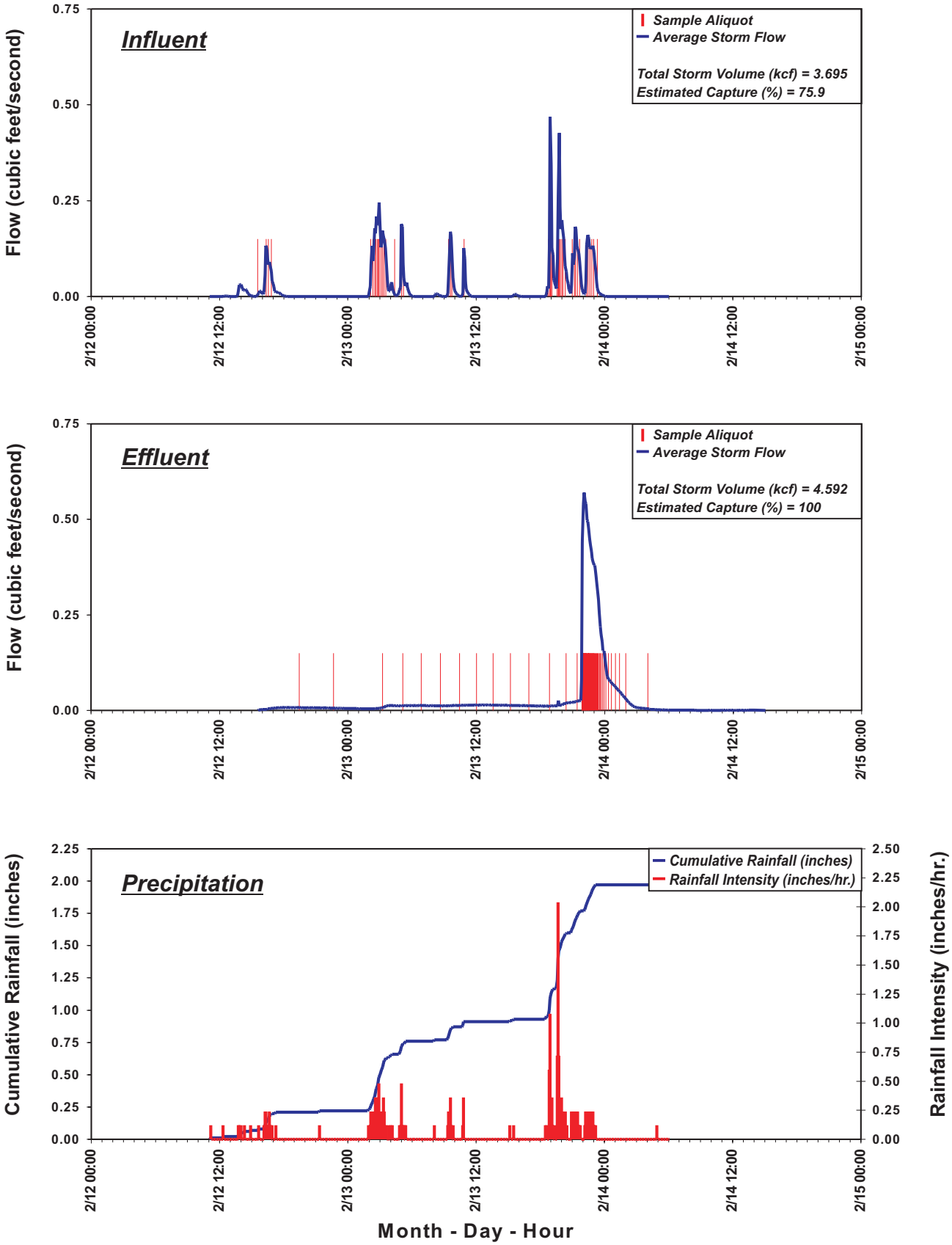


Fig. 1-56. La Costa Park & Ride - Event 7 (12-18 February 2001)

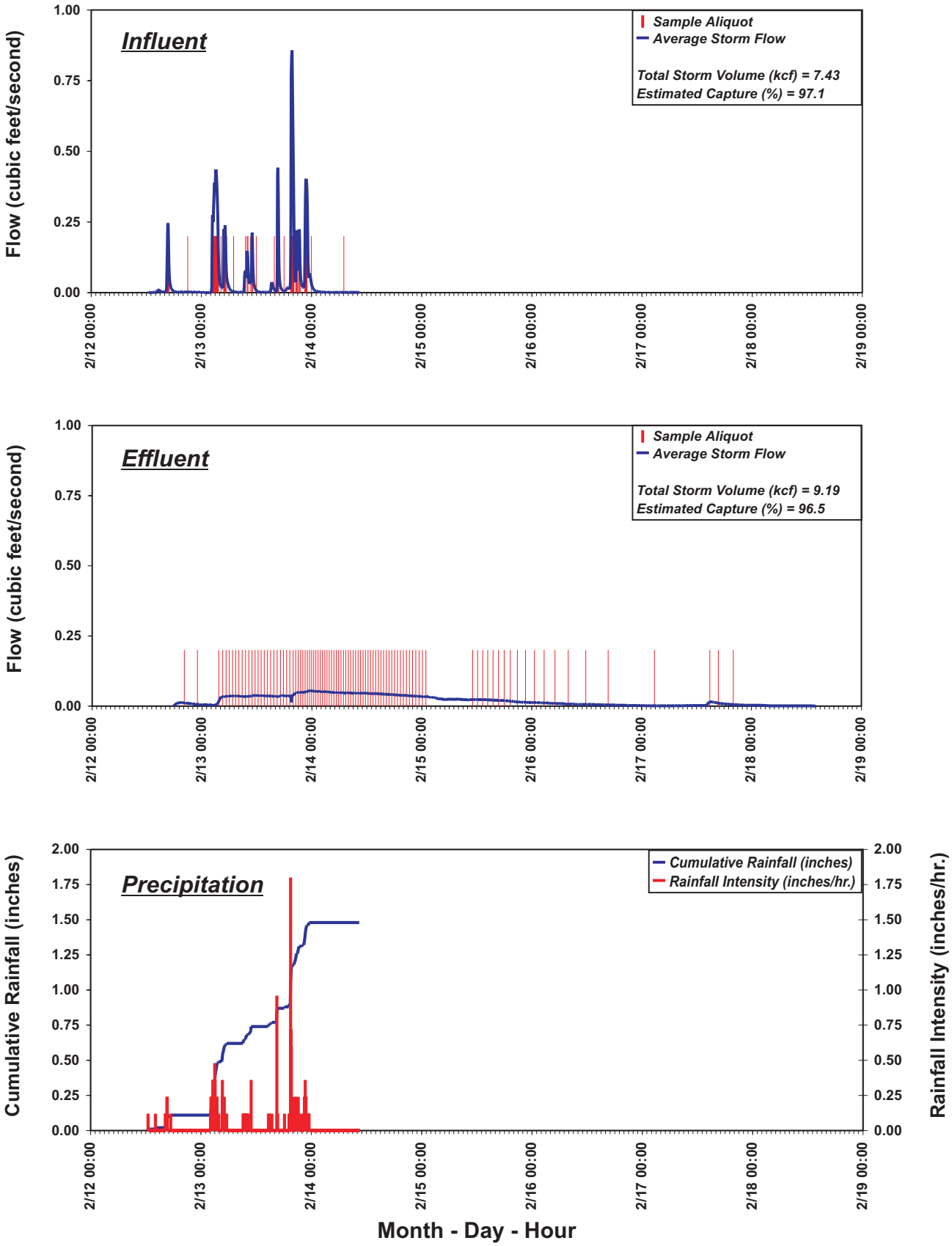


Fig. 1-57. Kearny Mesa Maintenance Station - Event 7 (13-14 February 2001)

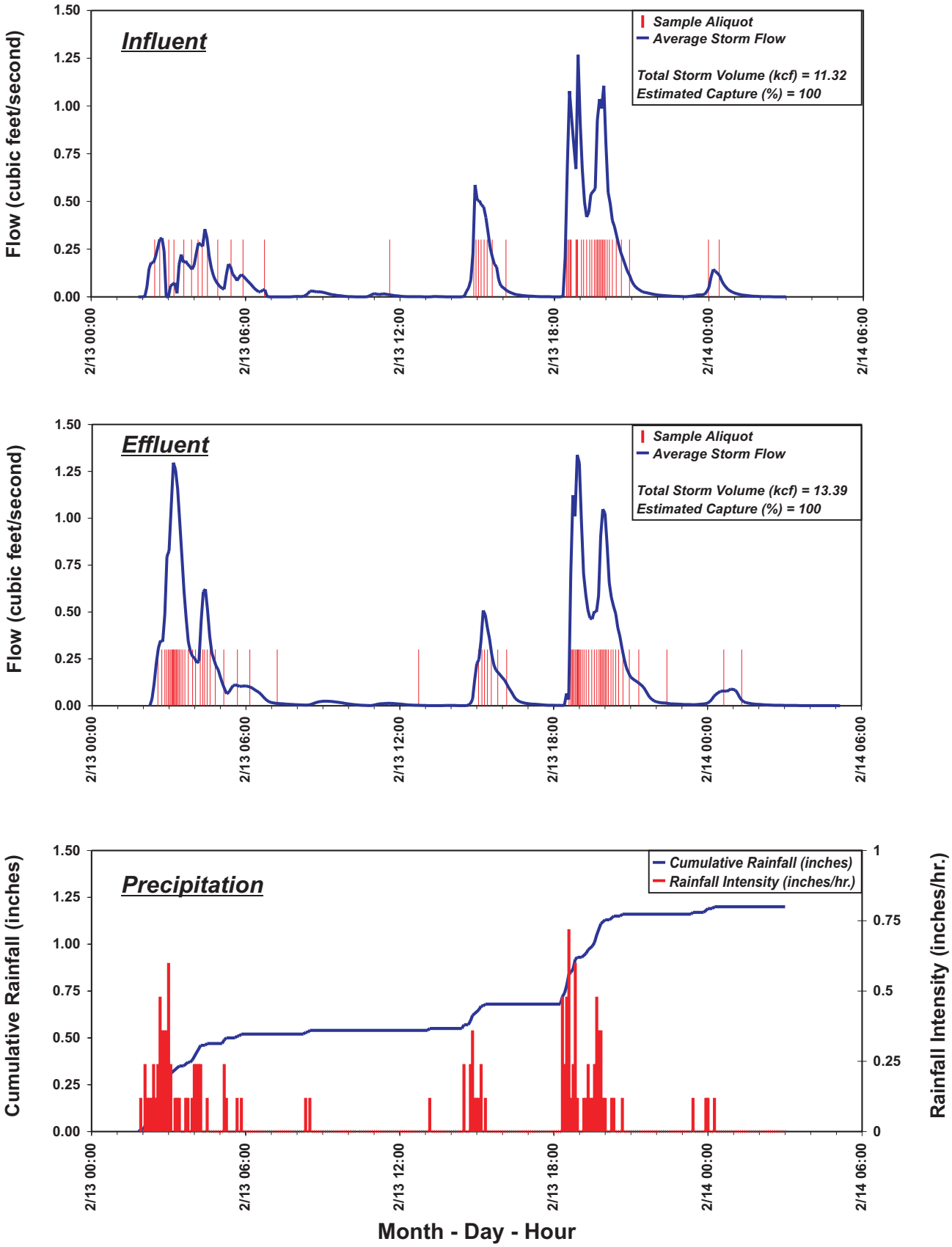


Fig. 1-58. La Costa Wet Basin - Event 7 (12-14 February 2001)

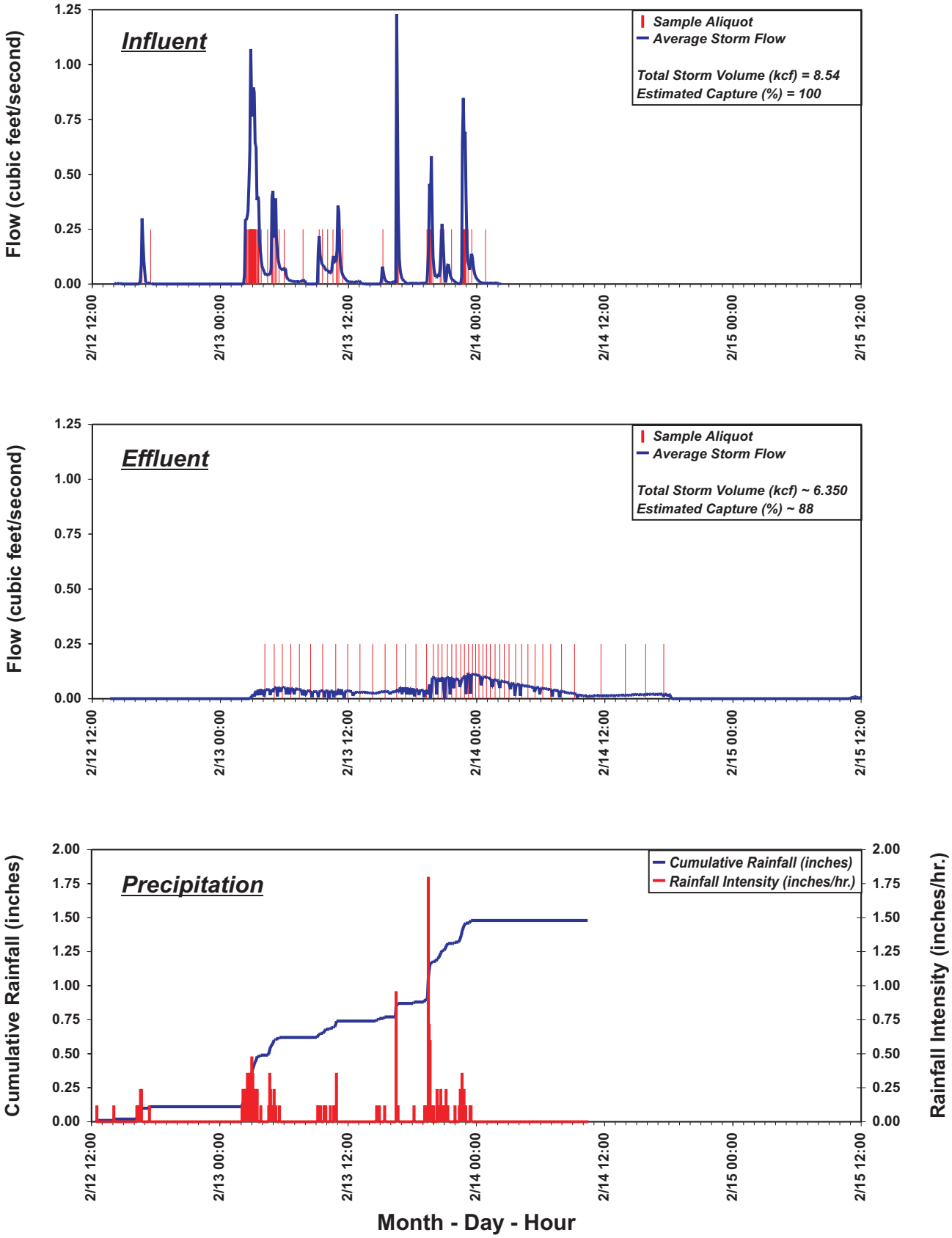


Fig. 1-59. Palomar Swale - Event 7 (12-14 February 2001)

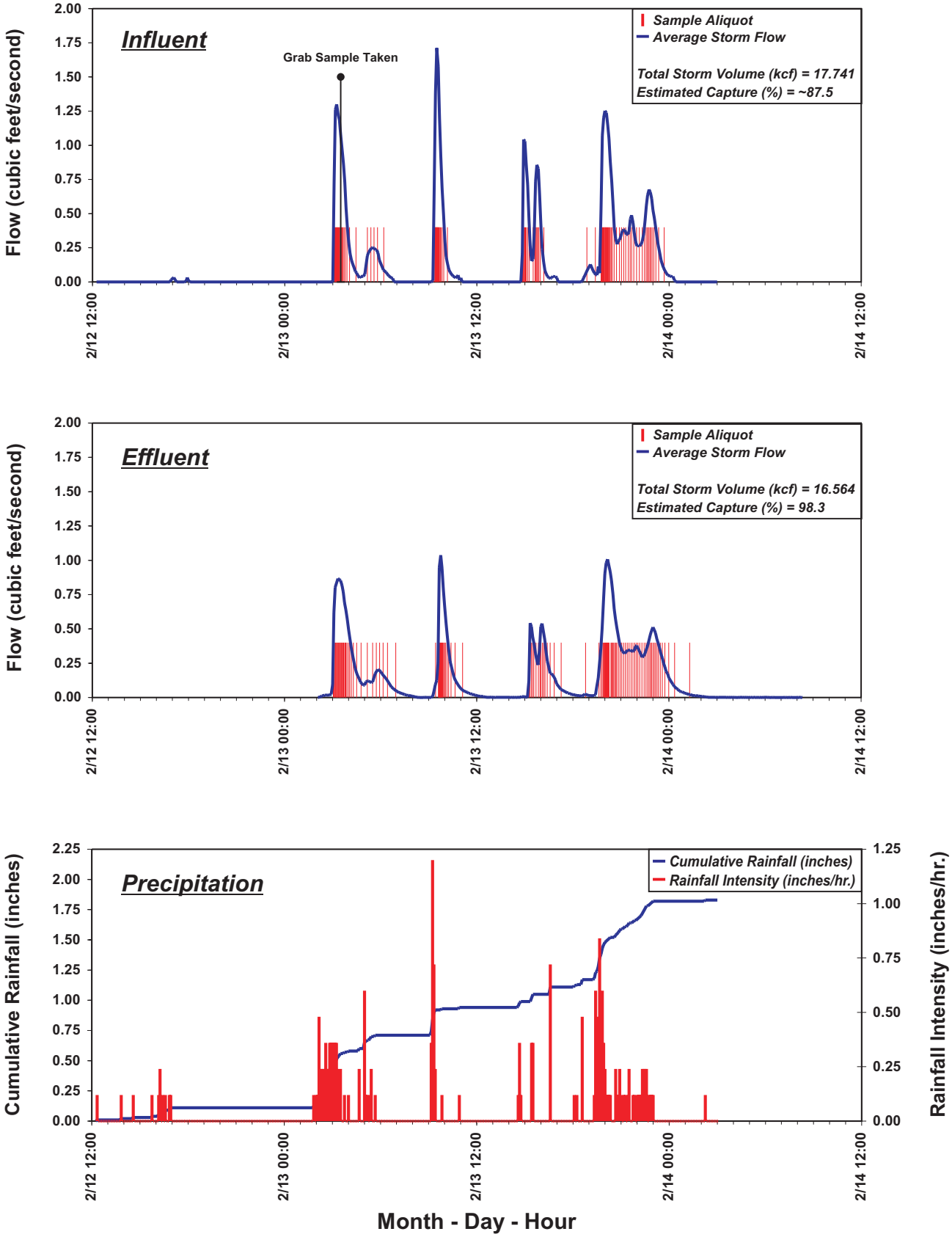


Fig. 1-60. Carlsbad Maintenance Station - Event 7 (12-14 February 2001)

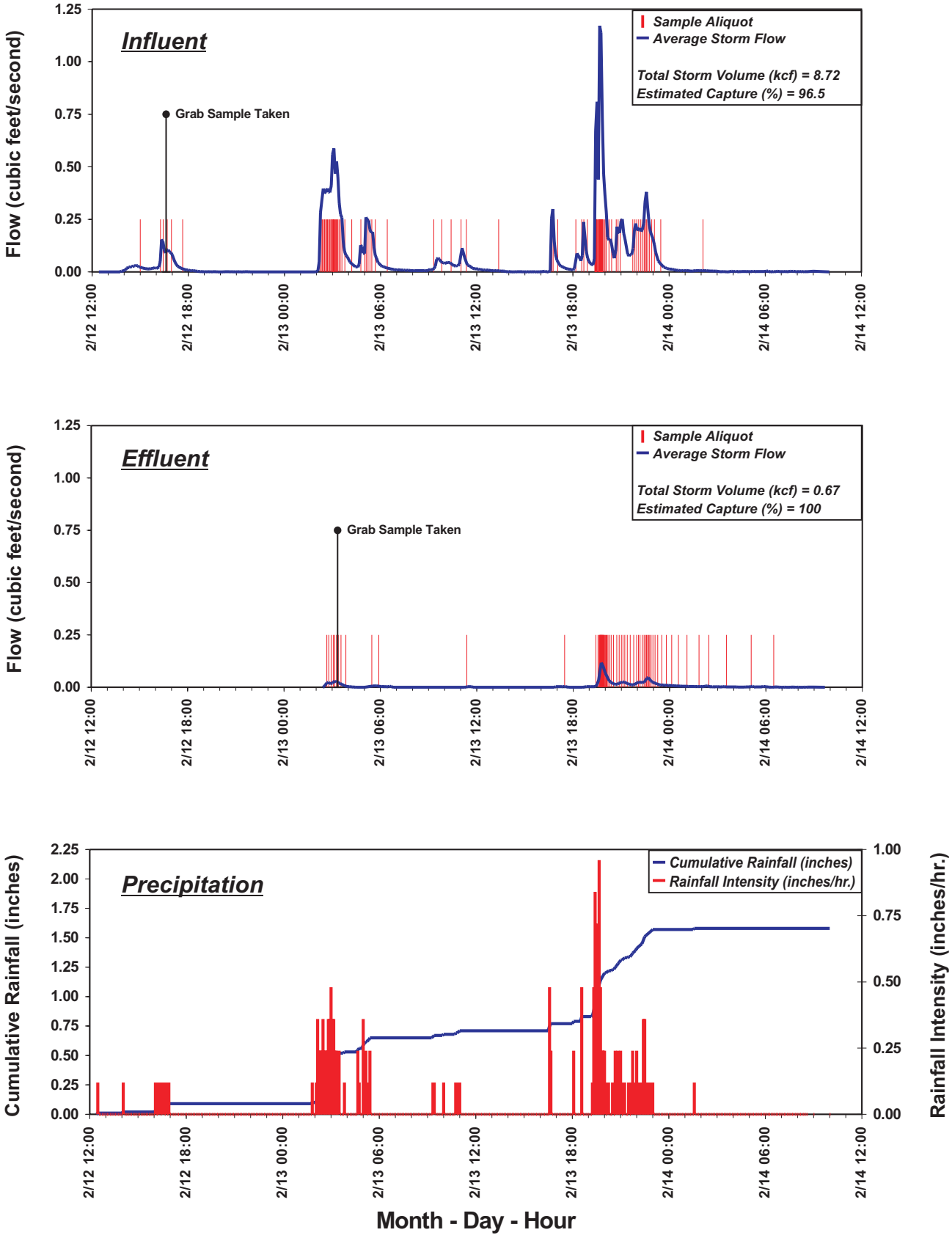


Fig. 1-61. Melrose - Event 7 (12-14 February 2001)

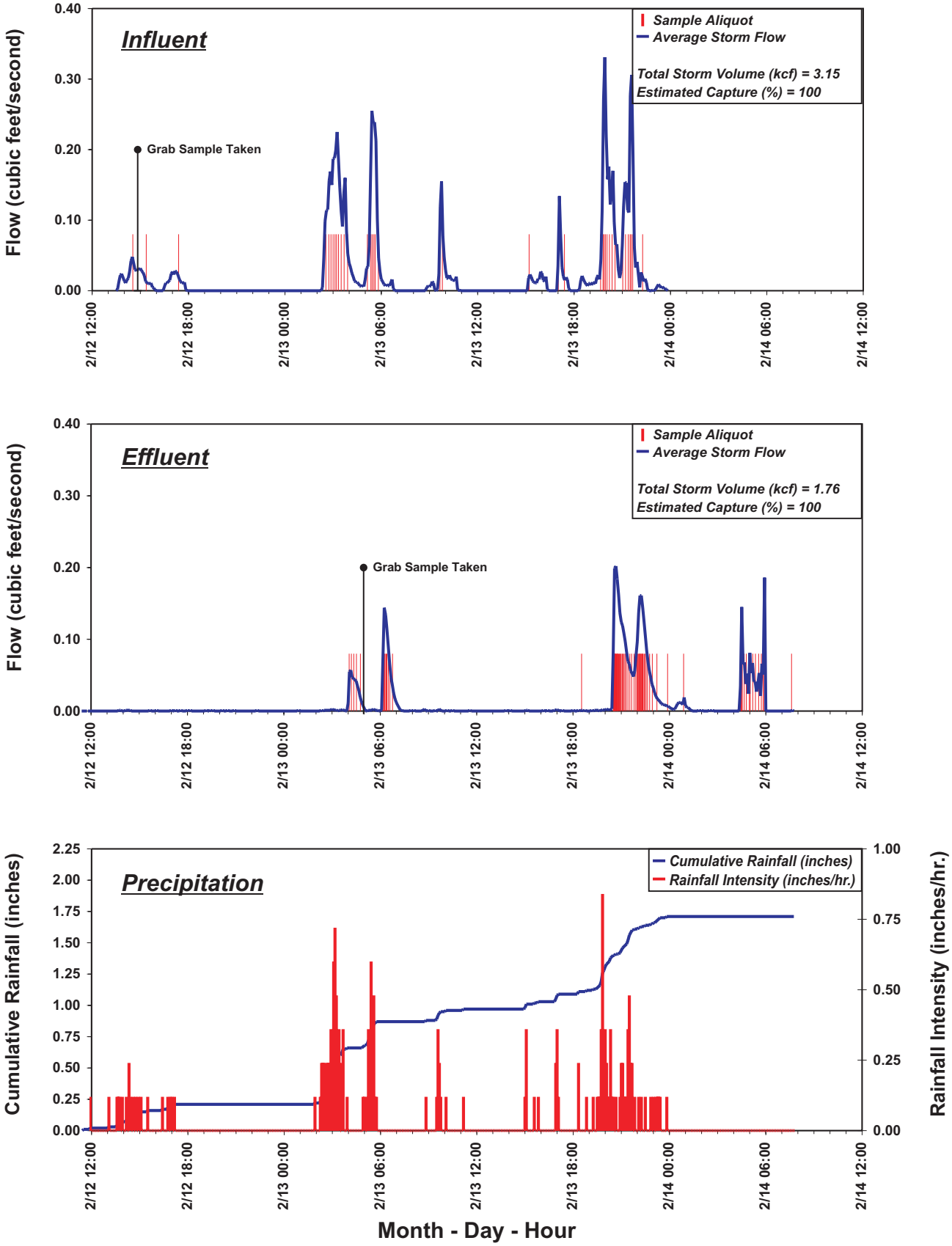


Fig. 1-62. State Route 78 & I5 Park & Ride - Event 6 (10-11 February 2001)

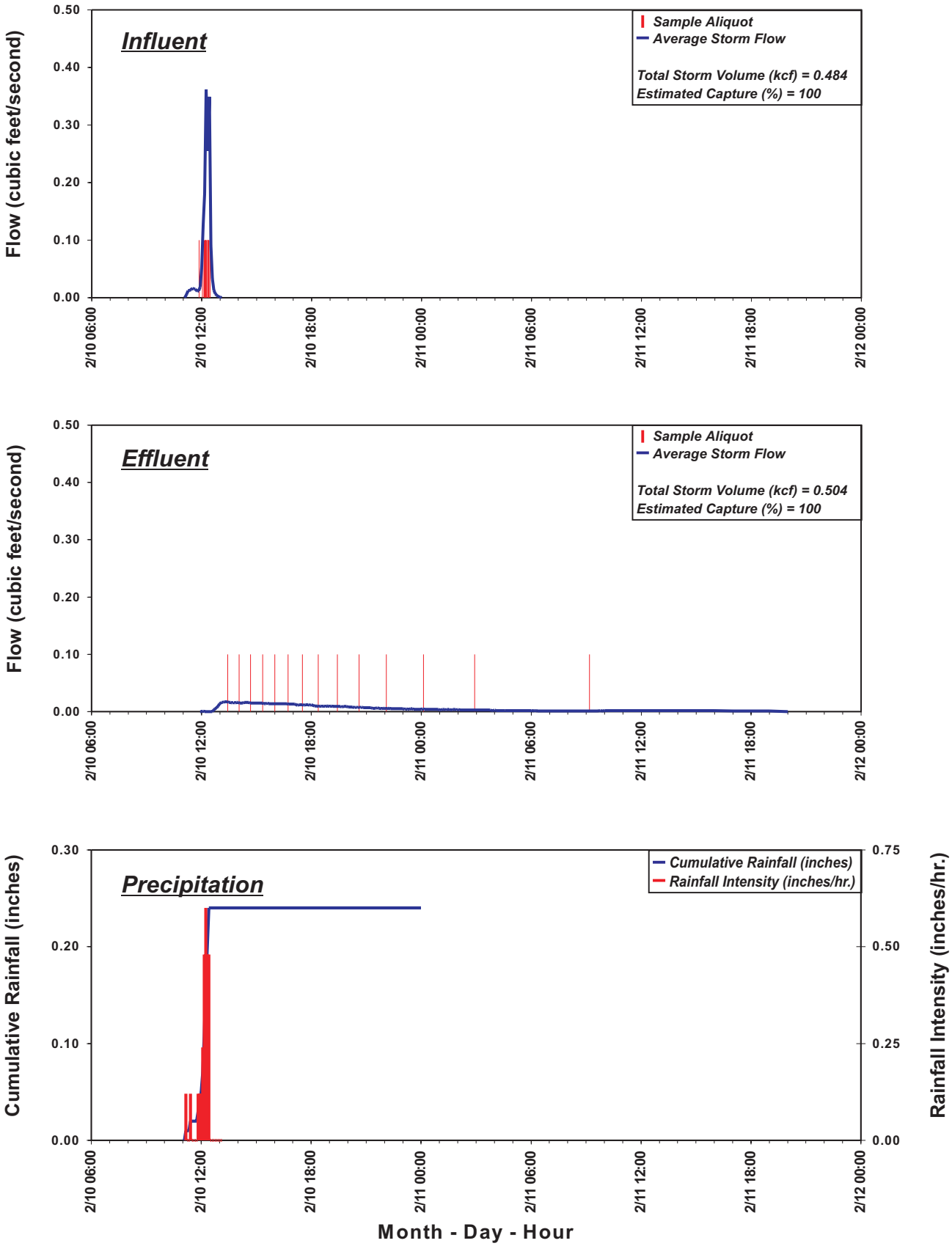


Fig. 1-63. State Route 56 & I5 - Event 8 (23-24 February 2001)

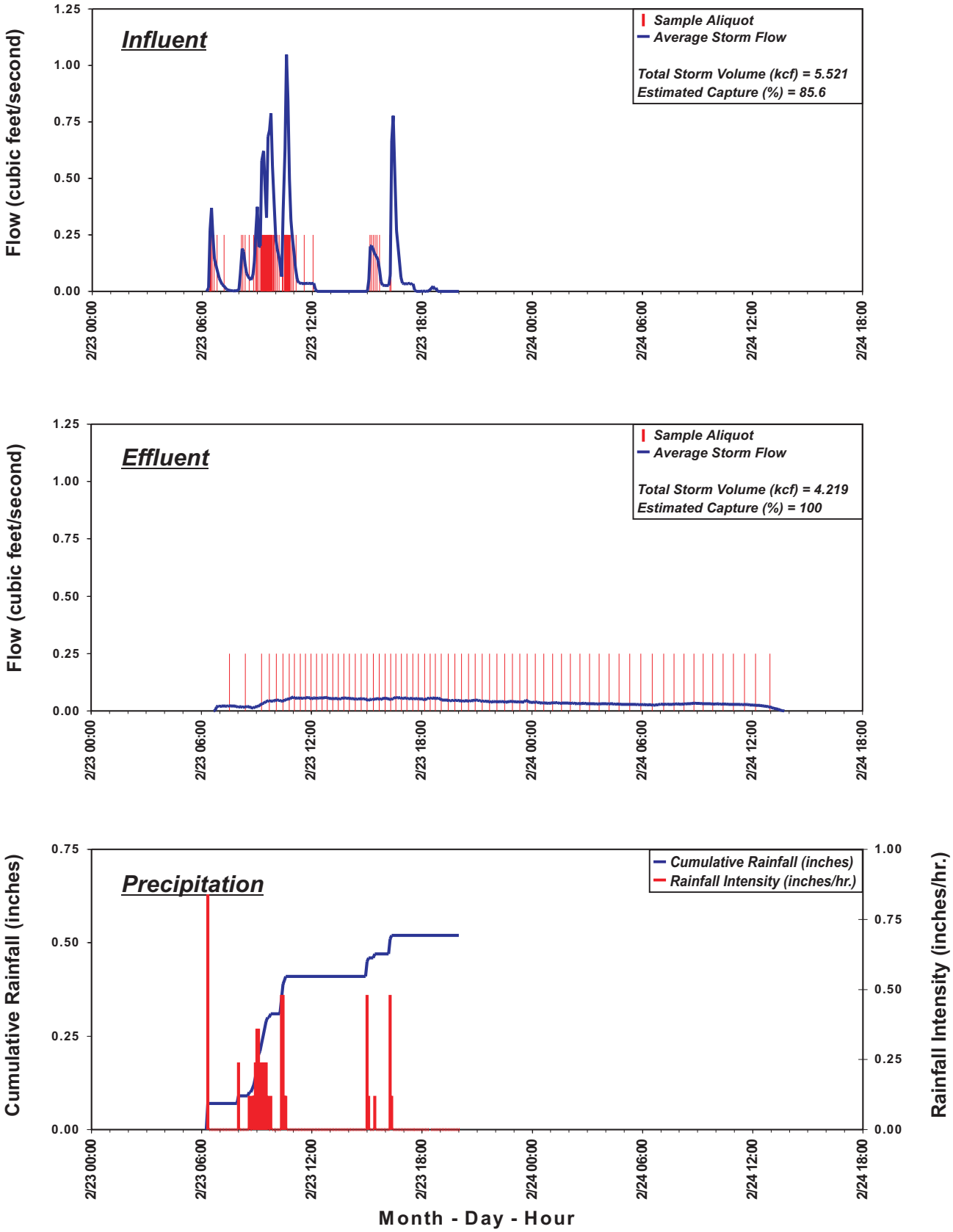


Fig. 1-64. Manchester Detention Basin - Event 8 (23 February - 4 March 2001)

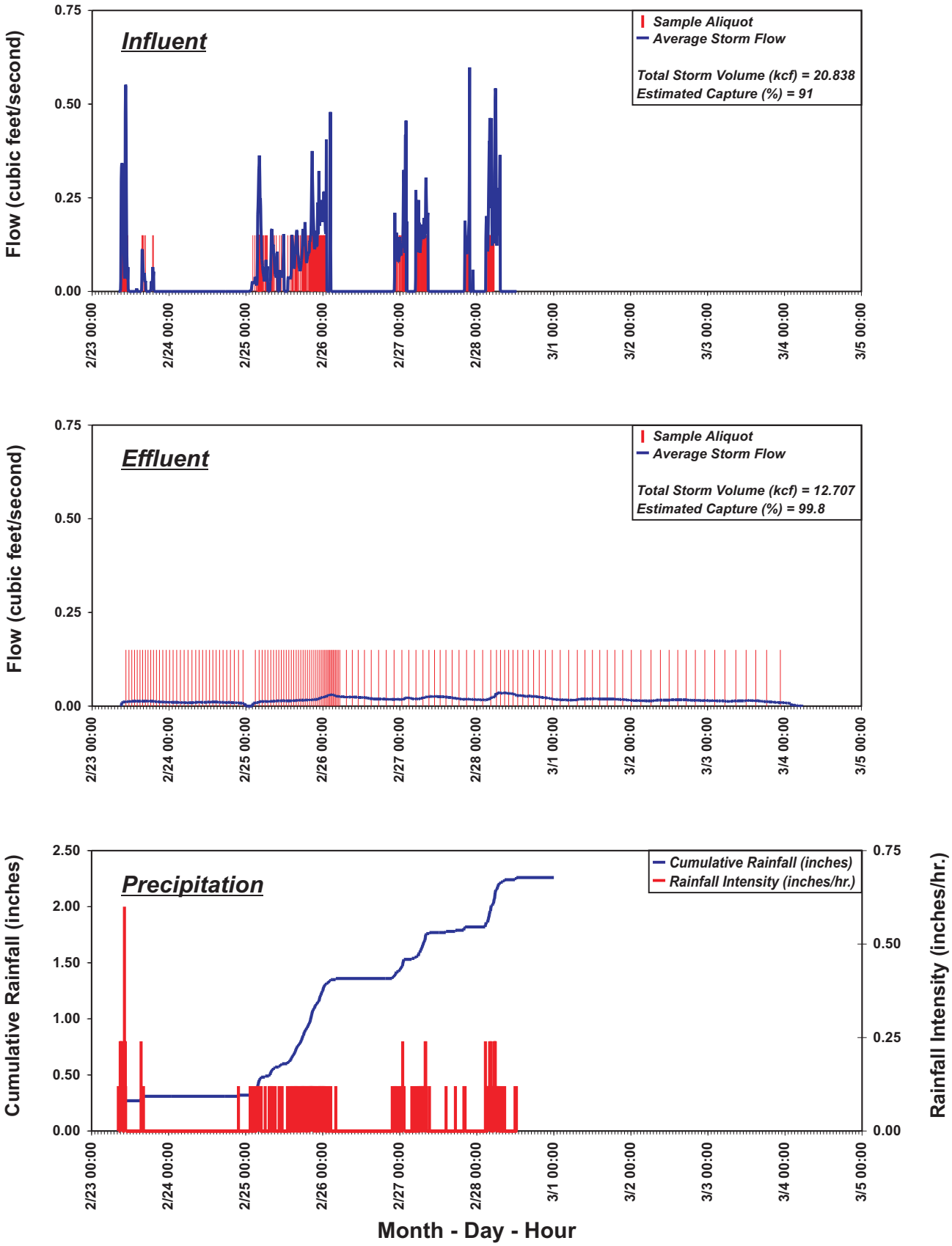


Fig. 1-65. State Route 78 & I5 Park & Ride - Event 8 (23 February 2001)

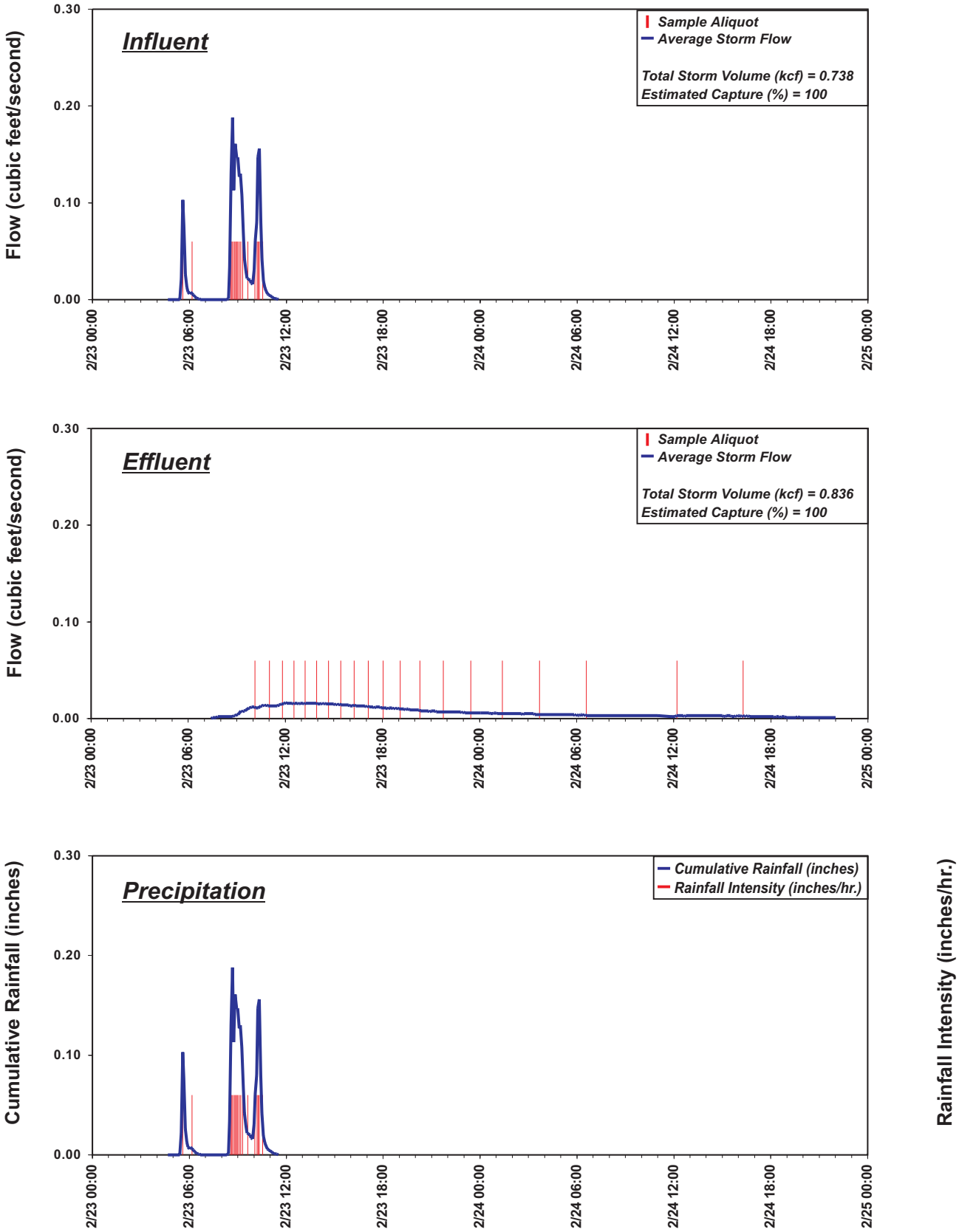


Fig. 1-66. La Costa Park & Ride - Event 8 (23 February - 2 March 2001)

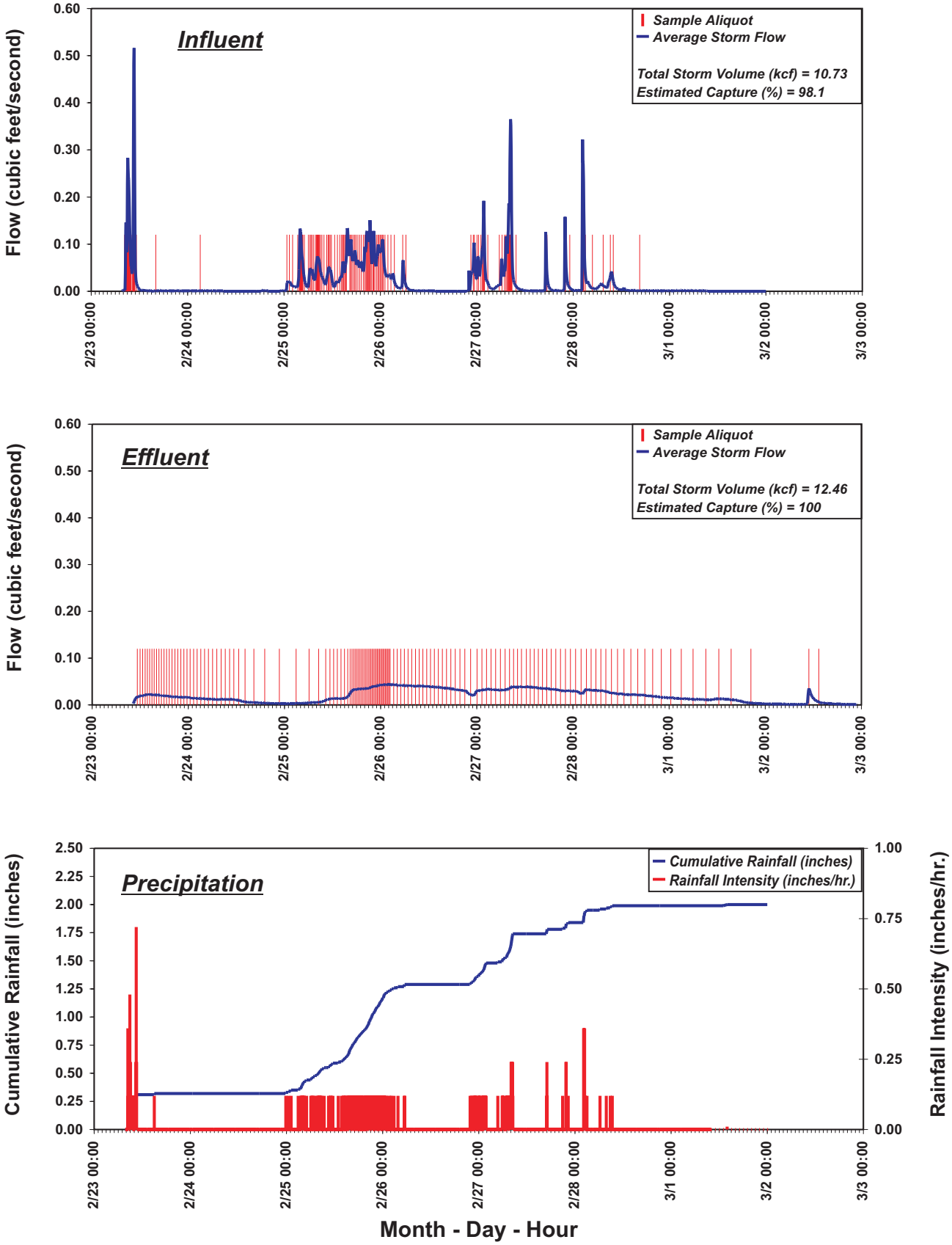


Fig. 1-67. Kearny Mesa Maintenance Station - Event 8 (23 February 2001)

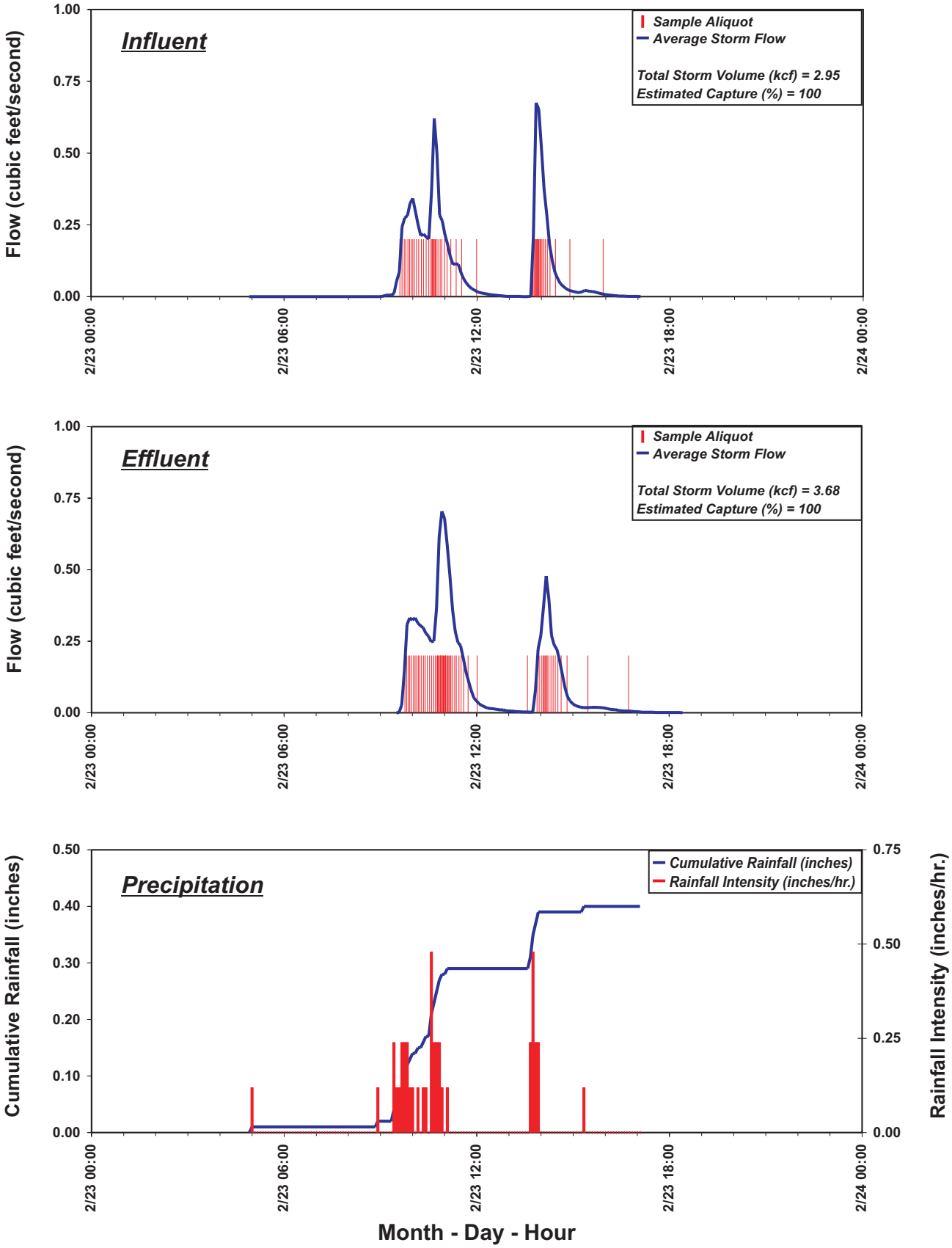


Fig. 1-68. Palomar Swale - Event 8 (23 February 2001)

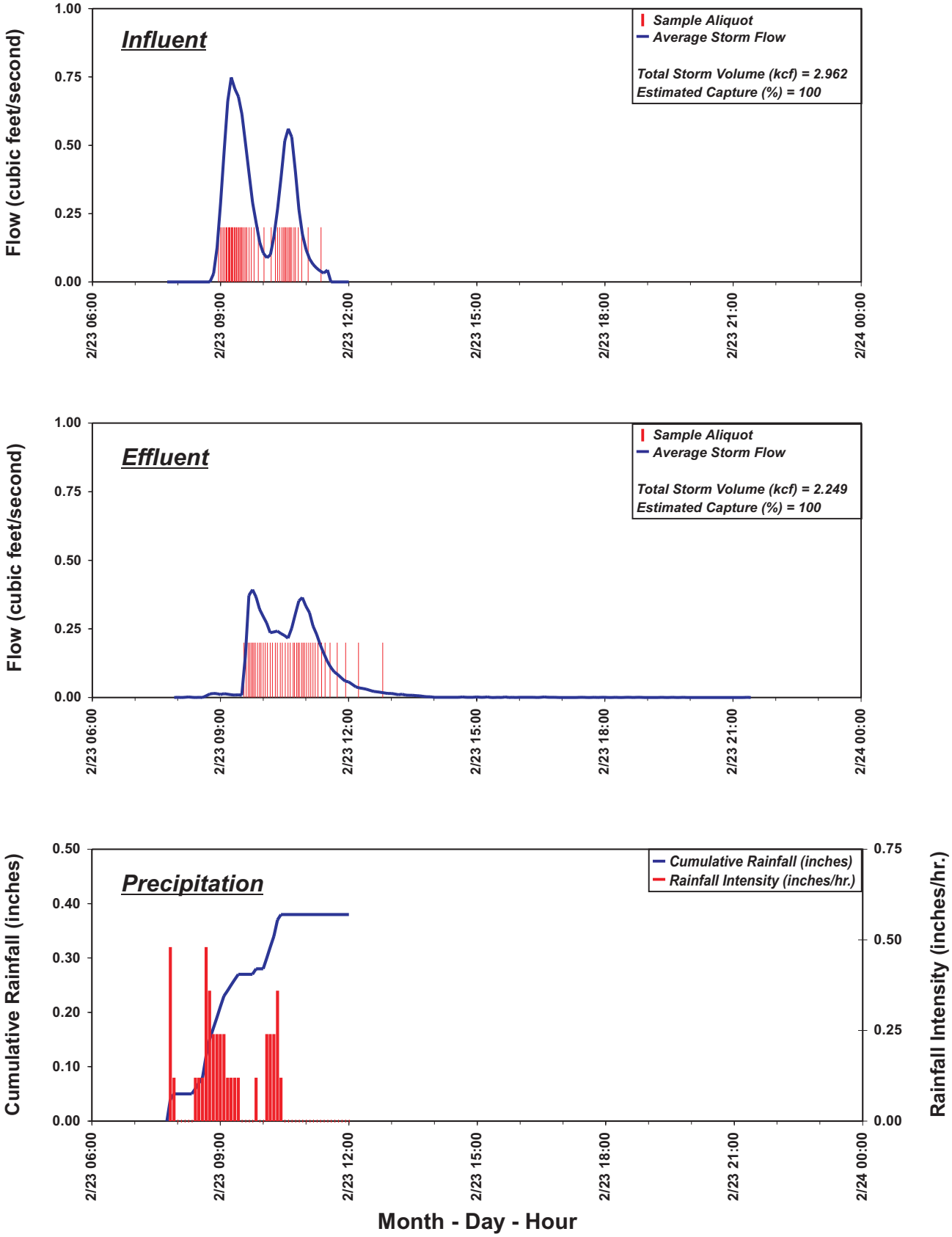


Fig. 1-69. Carlsbad Maintenance Station - Event 8 (23 February 2001)

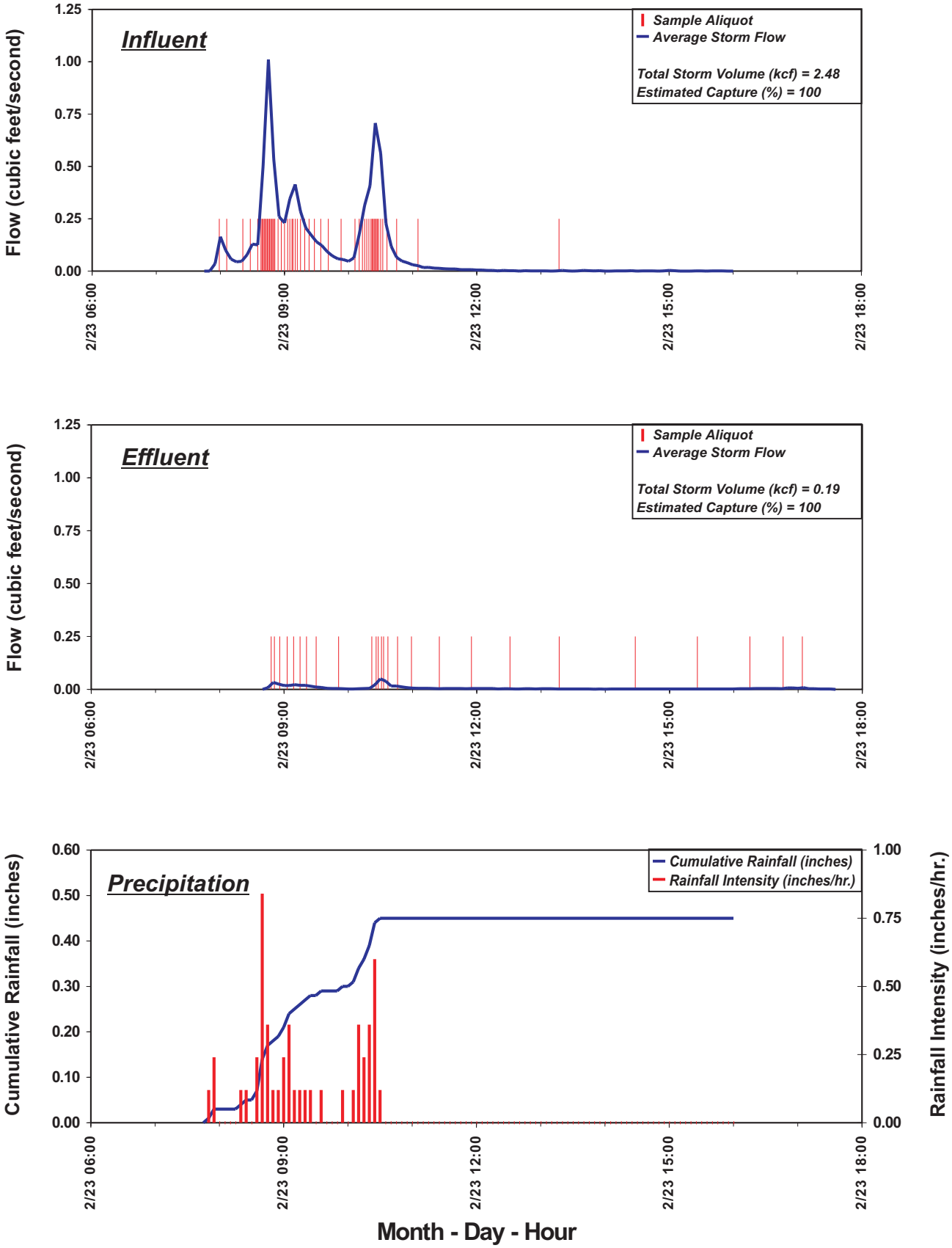


Fig. 1-70. Melrose - Event 8 (23 February 2001)

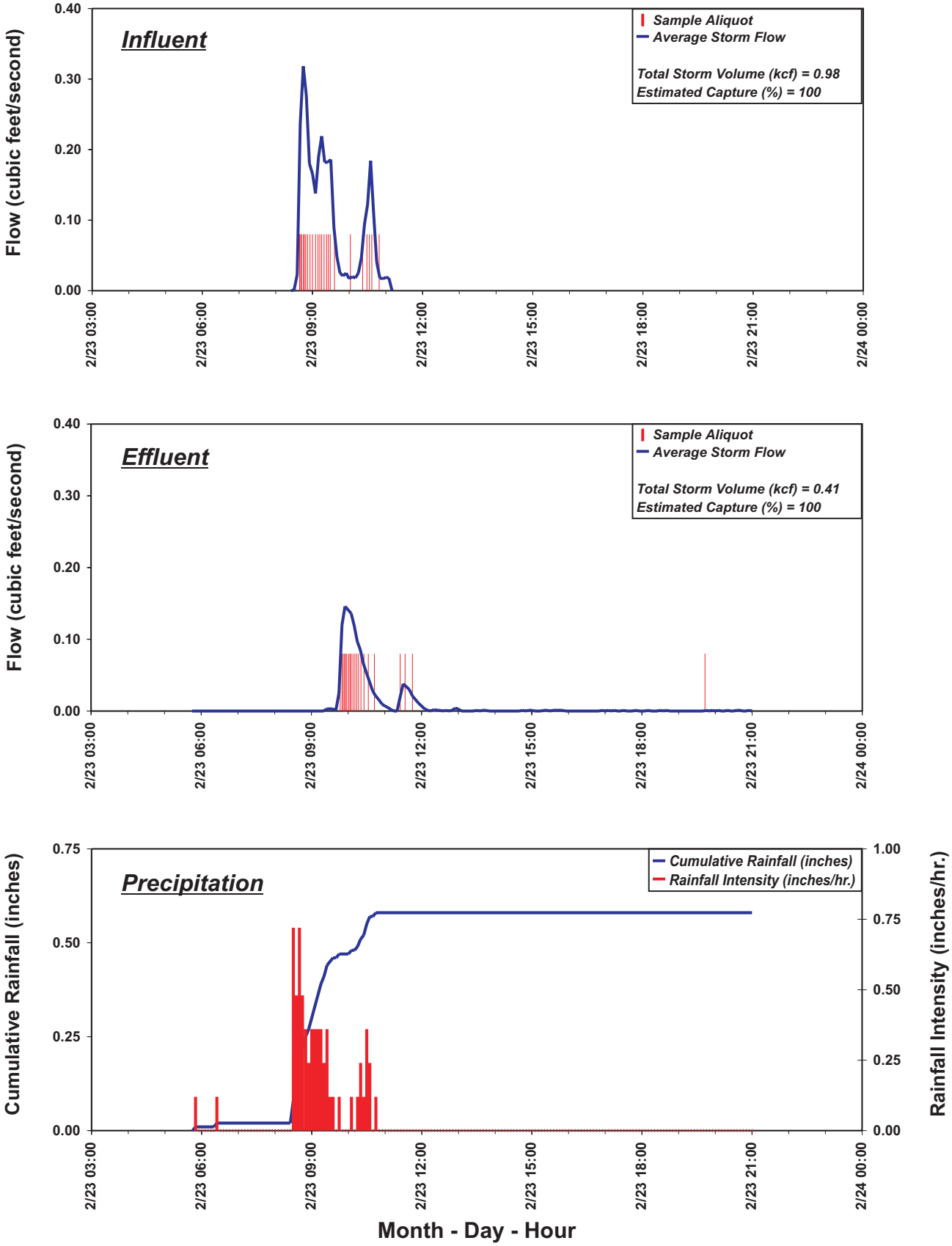


Fig. 1-71. Escondido Maintenance Station - Event 9 (25 February - 1 March 2001)

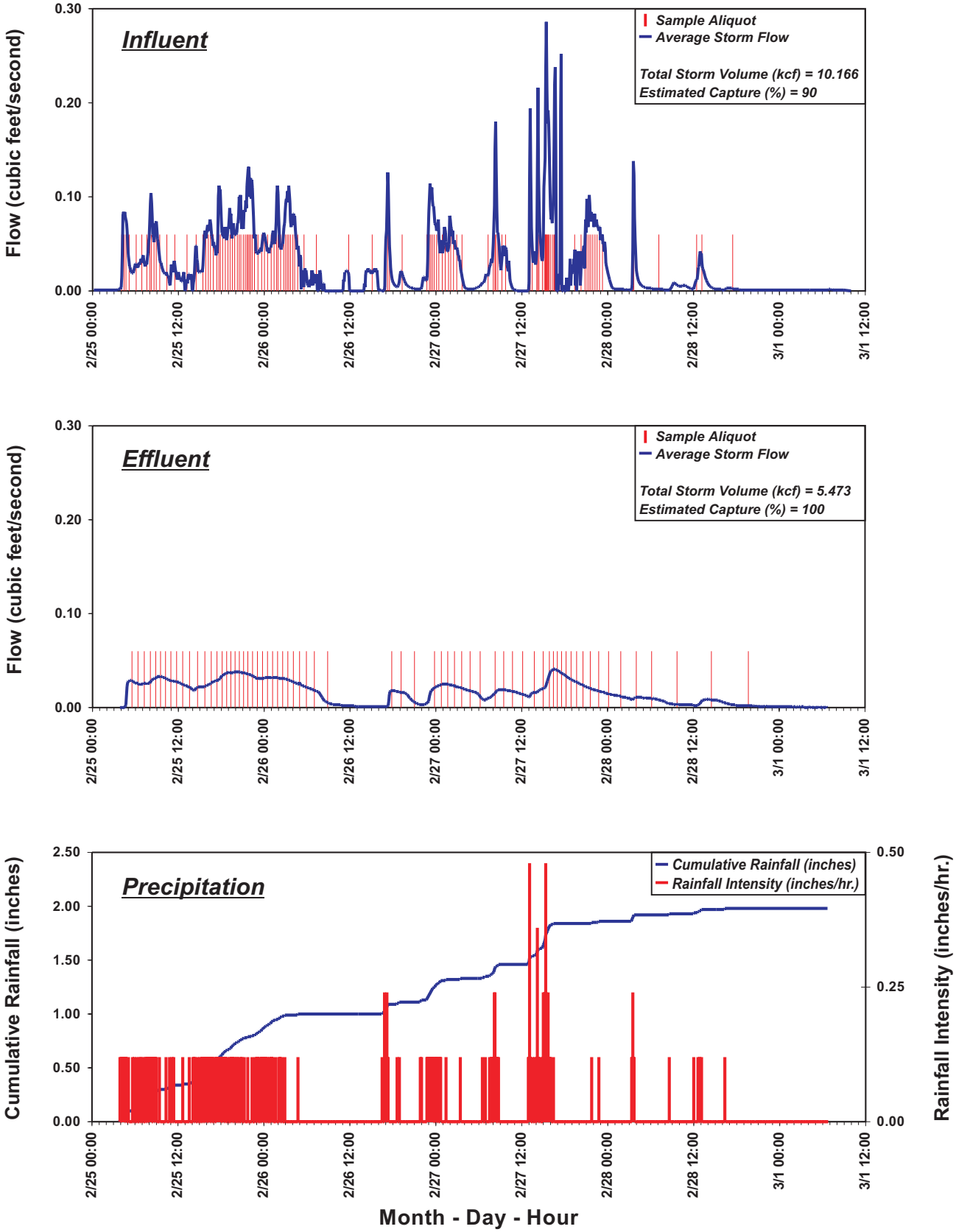


Fig. 1-72. La Costa Wet Basin - Event 9 (25 February-1 March 2001)

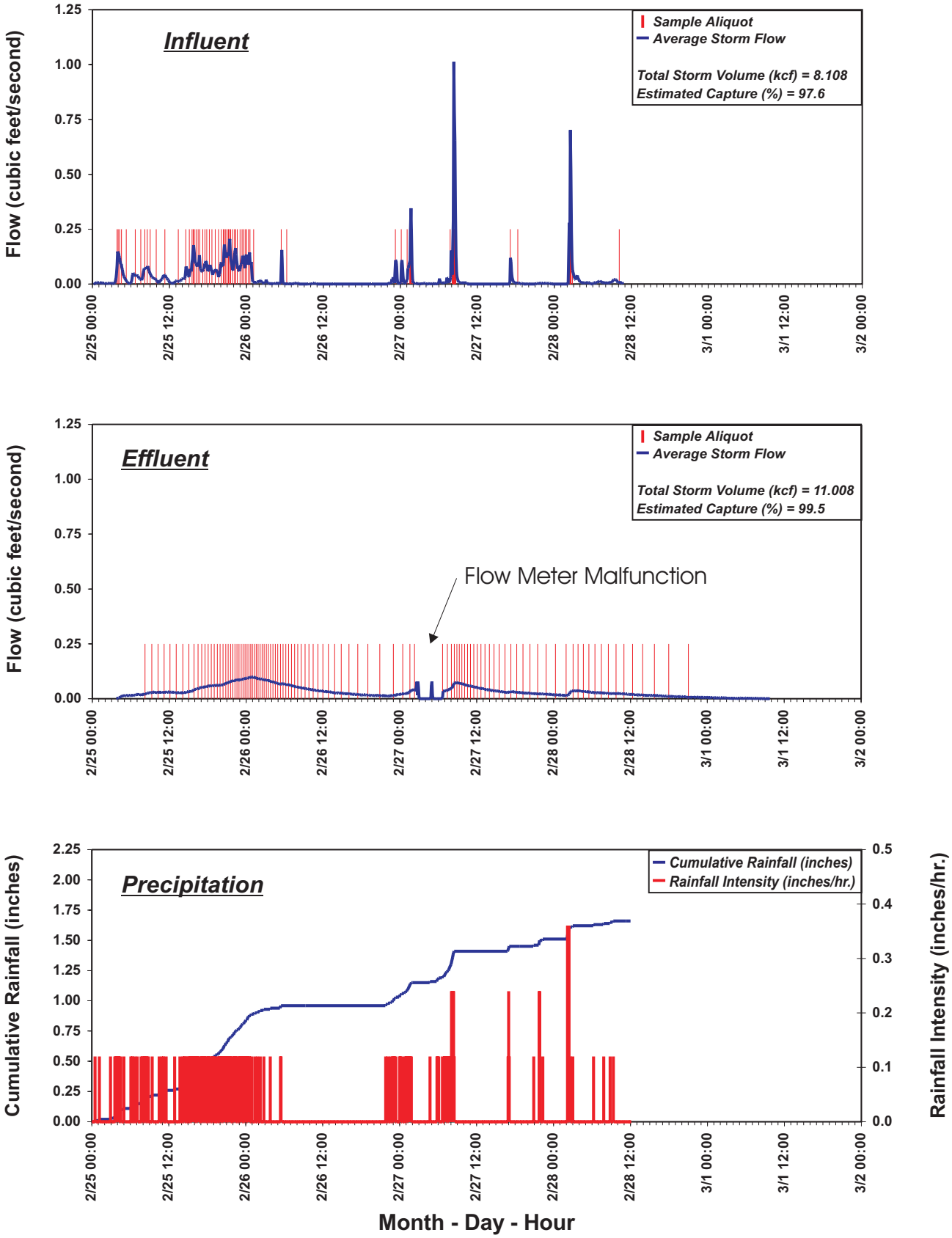


Fig. 1-73. State Route 78 & I15 - Event 10 (6-7 March 2001)

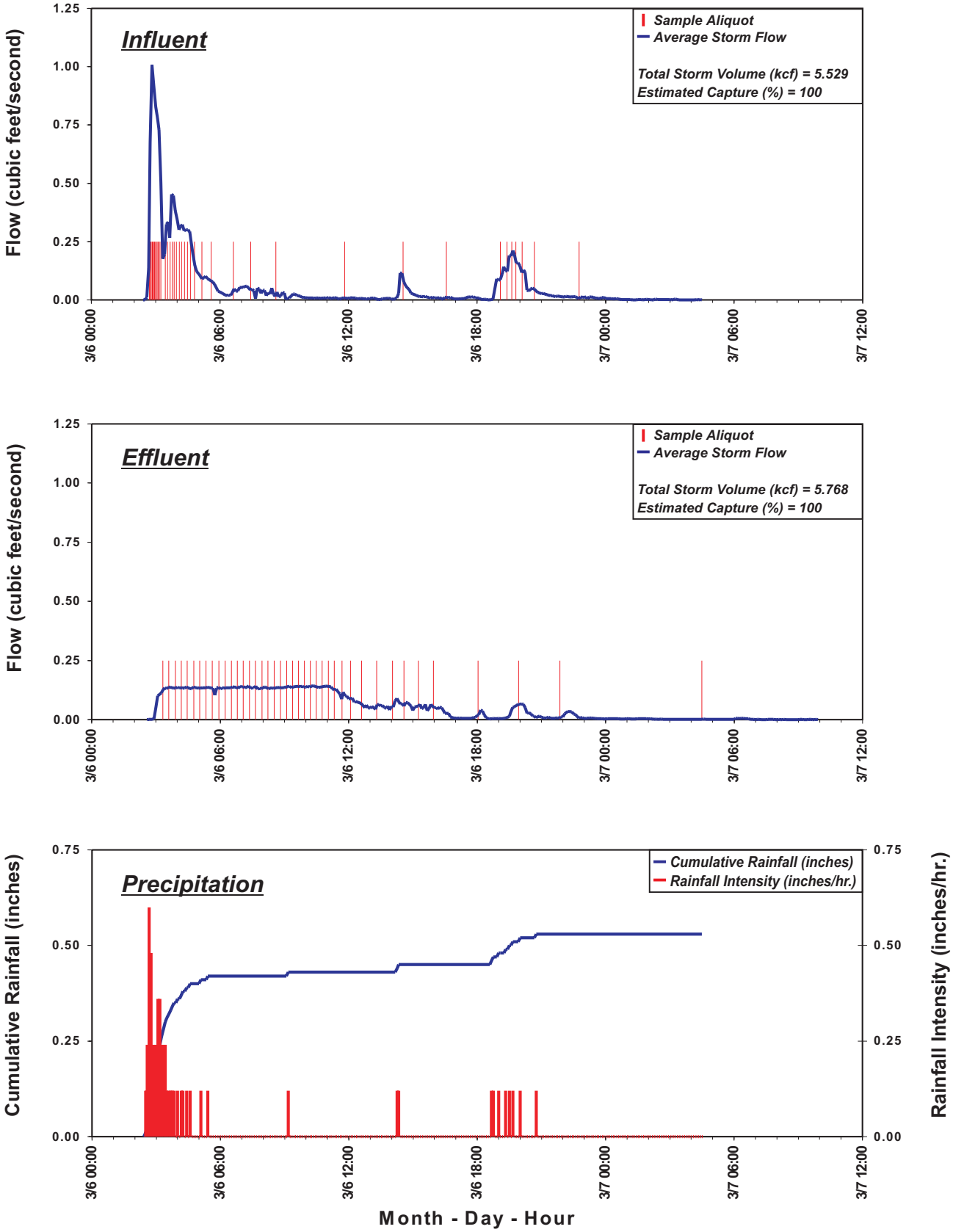


Fig. 1-74. Palomar Swale - Event 10 (6 March 2001)

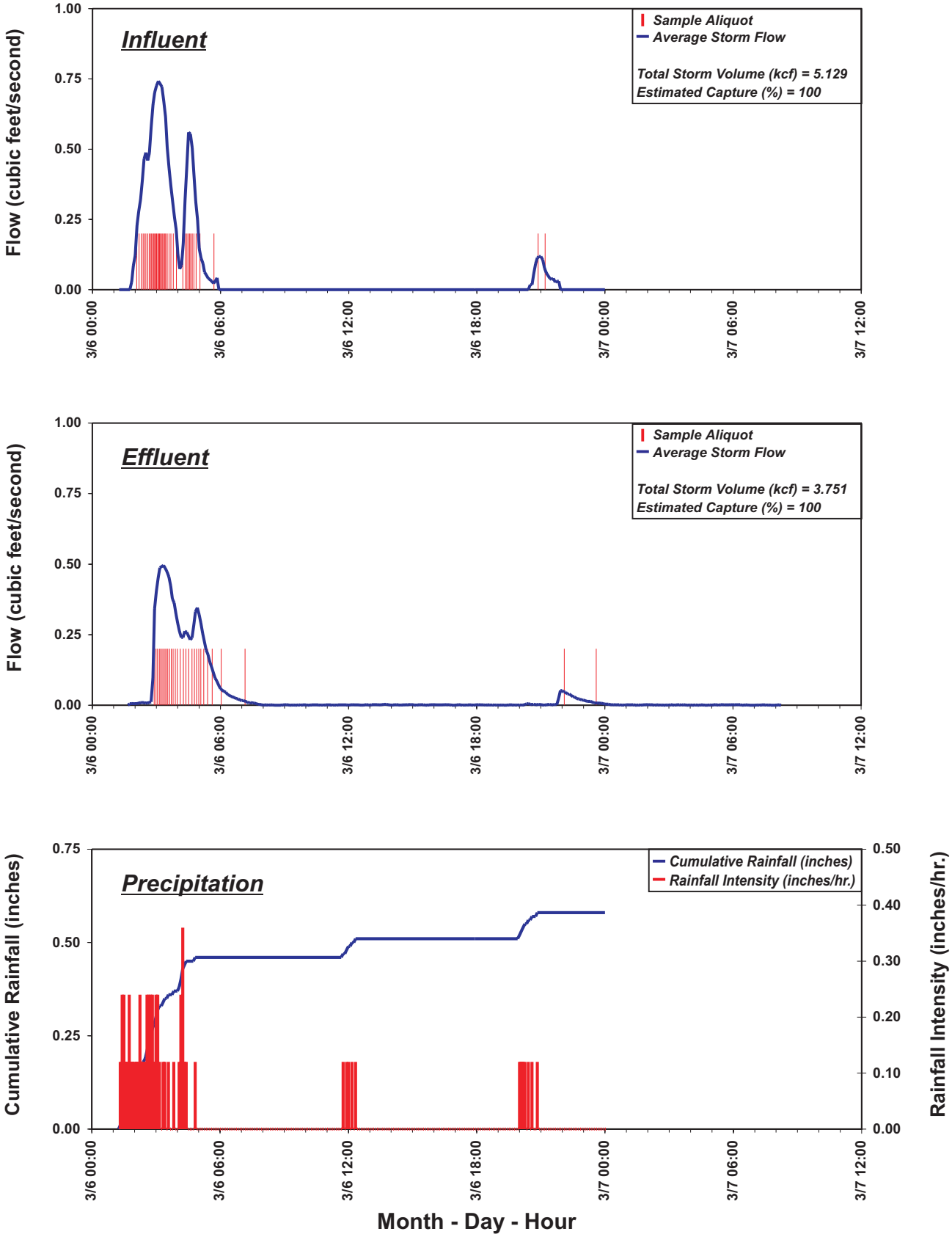


Fig. 1-75. Manchester Detention Basin - Event 10 (6-8 March 2001)

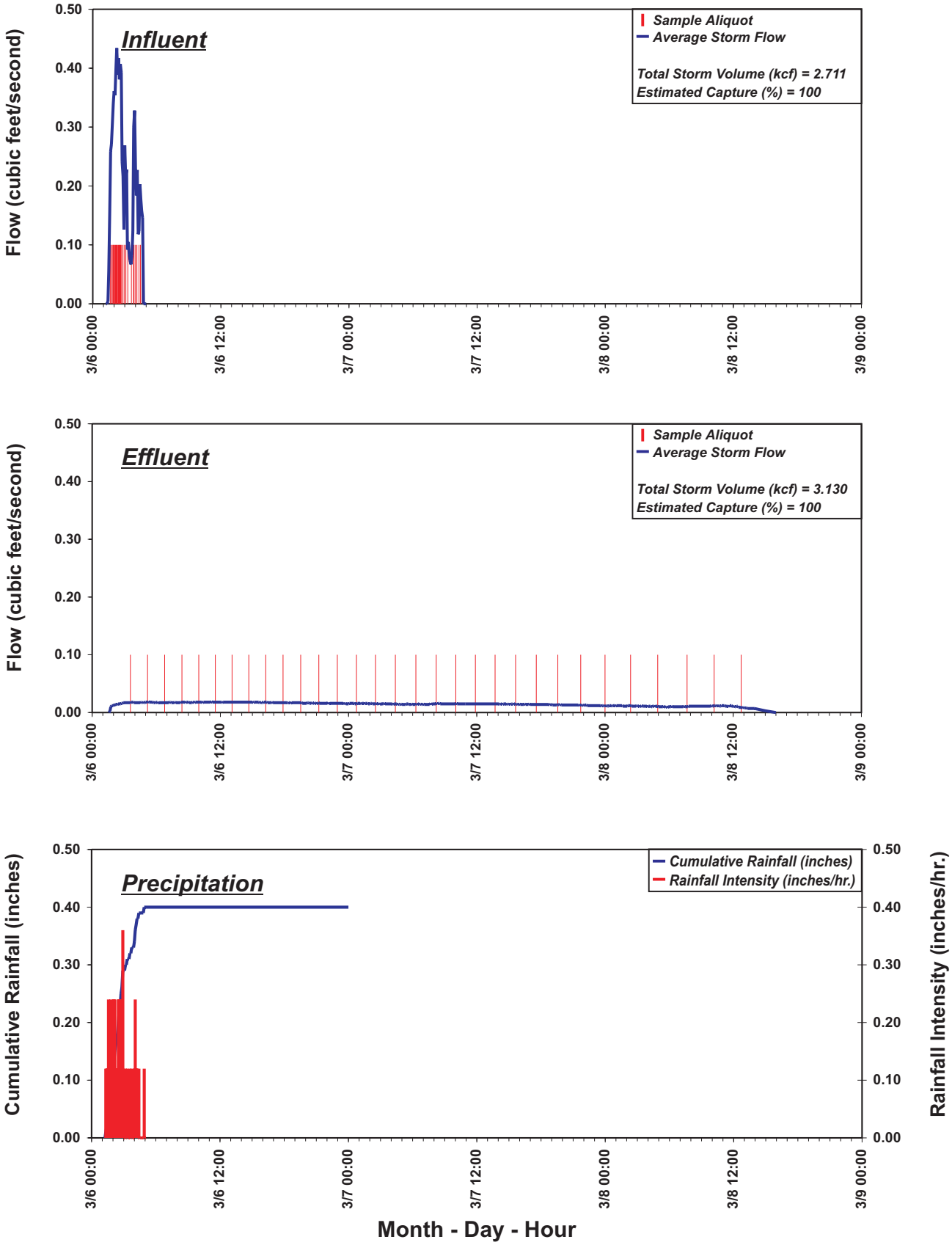


Fig. 1-76. Escondido Maintenance Station - Event 10 (6-7 March 2001)

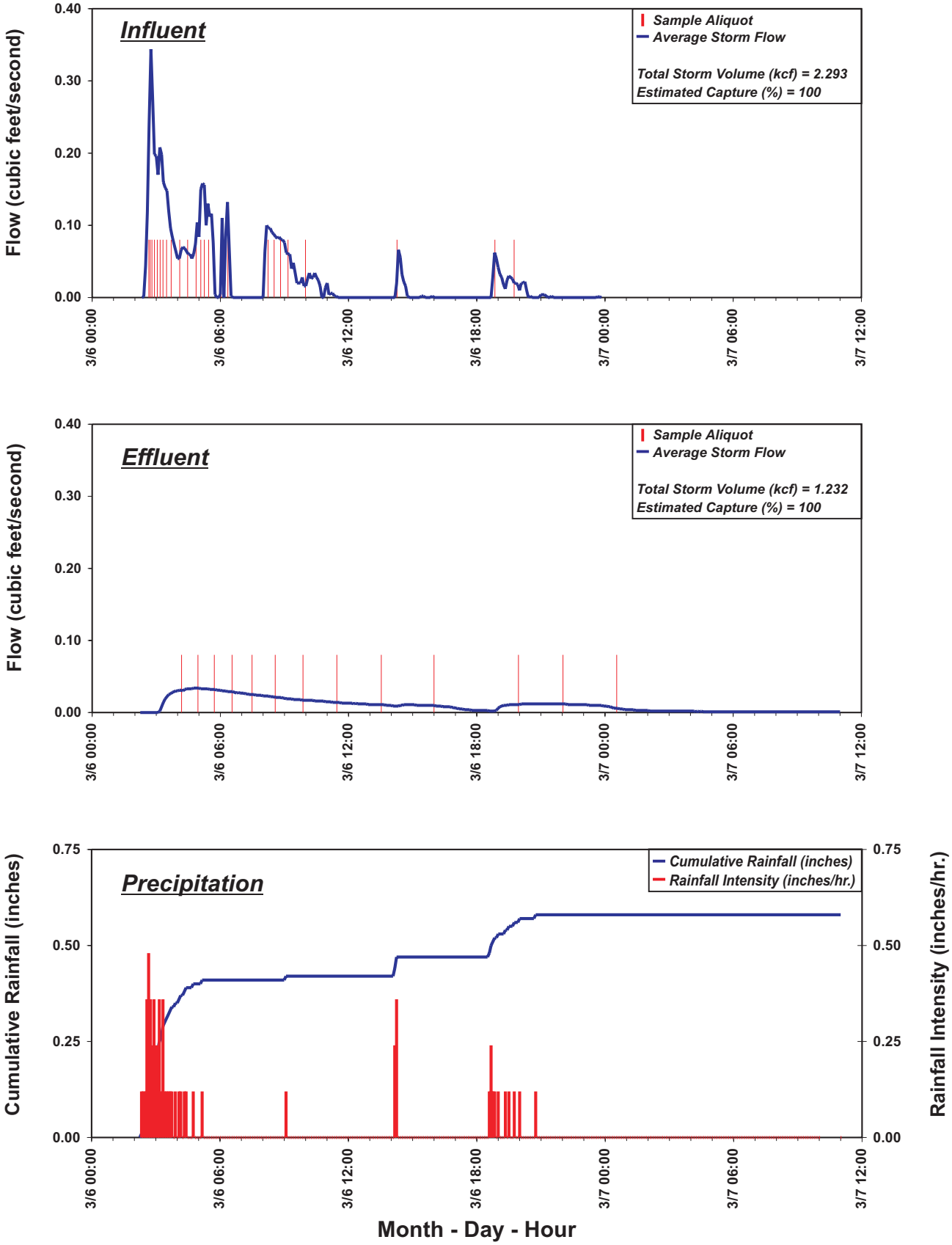


Fig. 1-77. State Route 78 & I5 Park & Ride - Event 10 (6-8 March 2001)

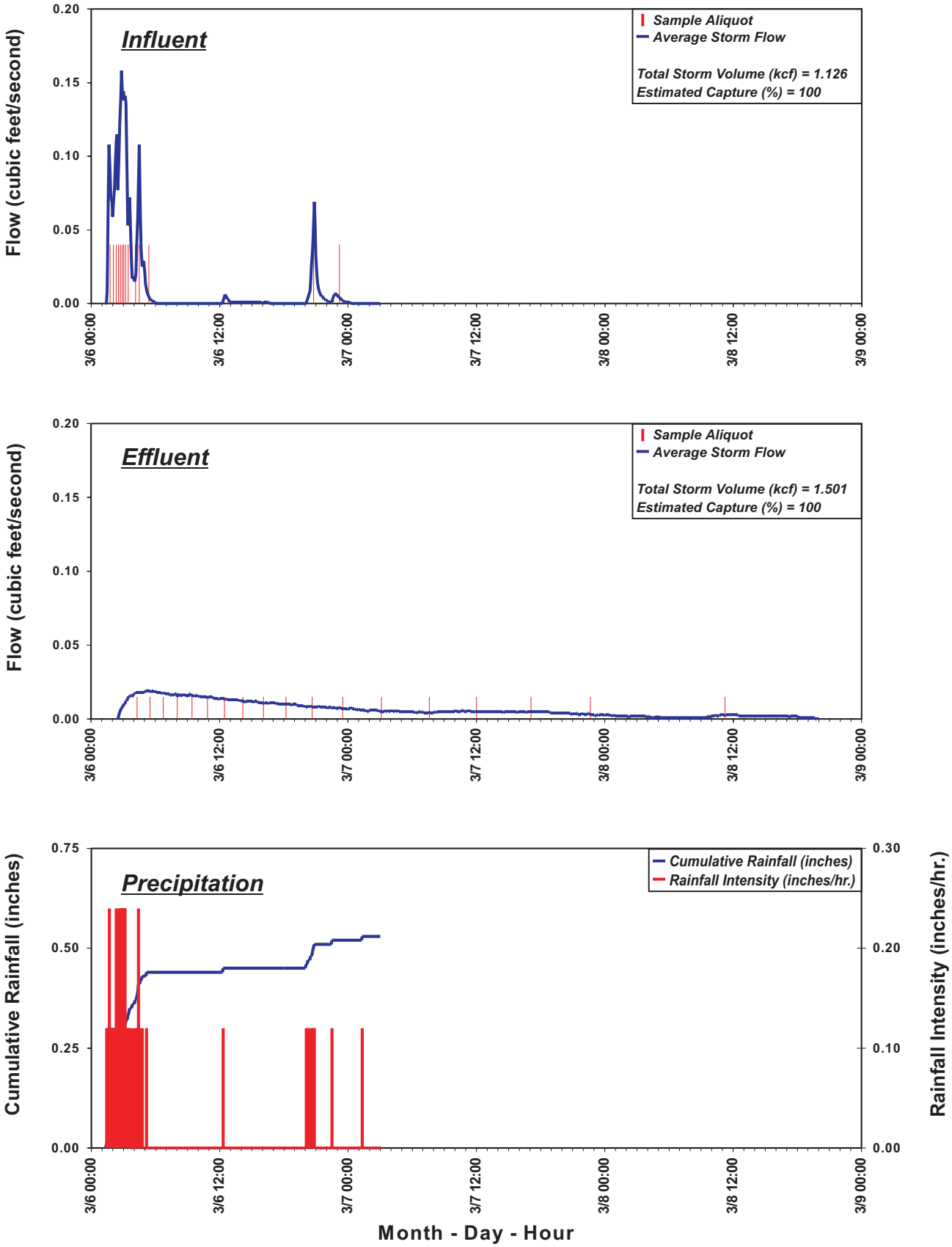


Fig. 1-78. La Costa Park & Ride - Event 10 (6-8 March 2001)

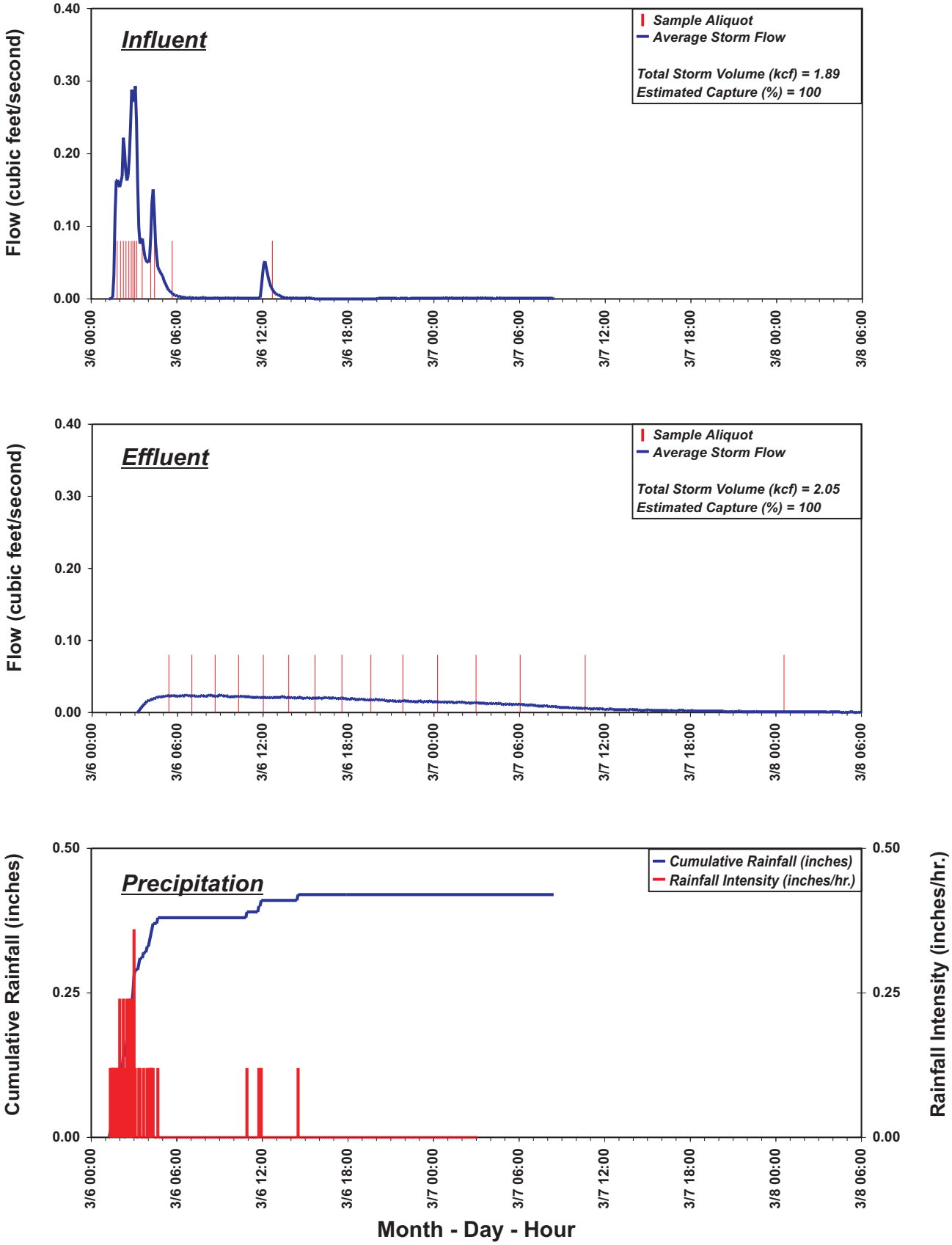


Fig. 1-79. Kearny Mesa Maintenance Station - Event 10 (6 March 2001)

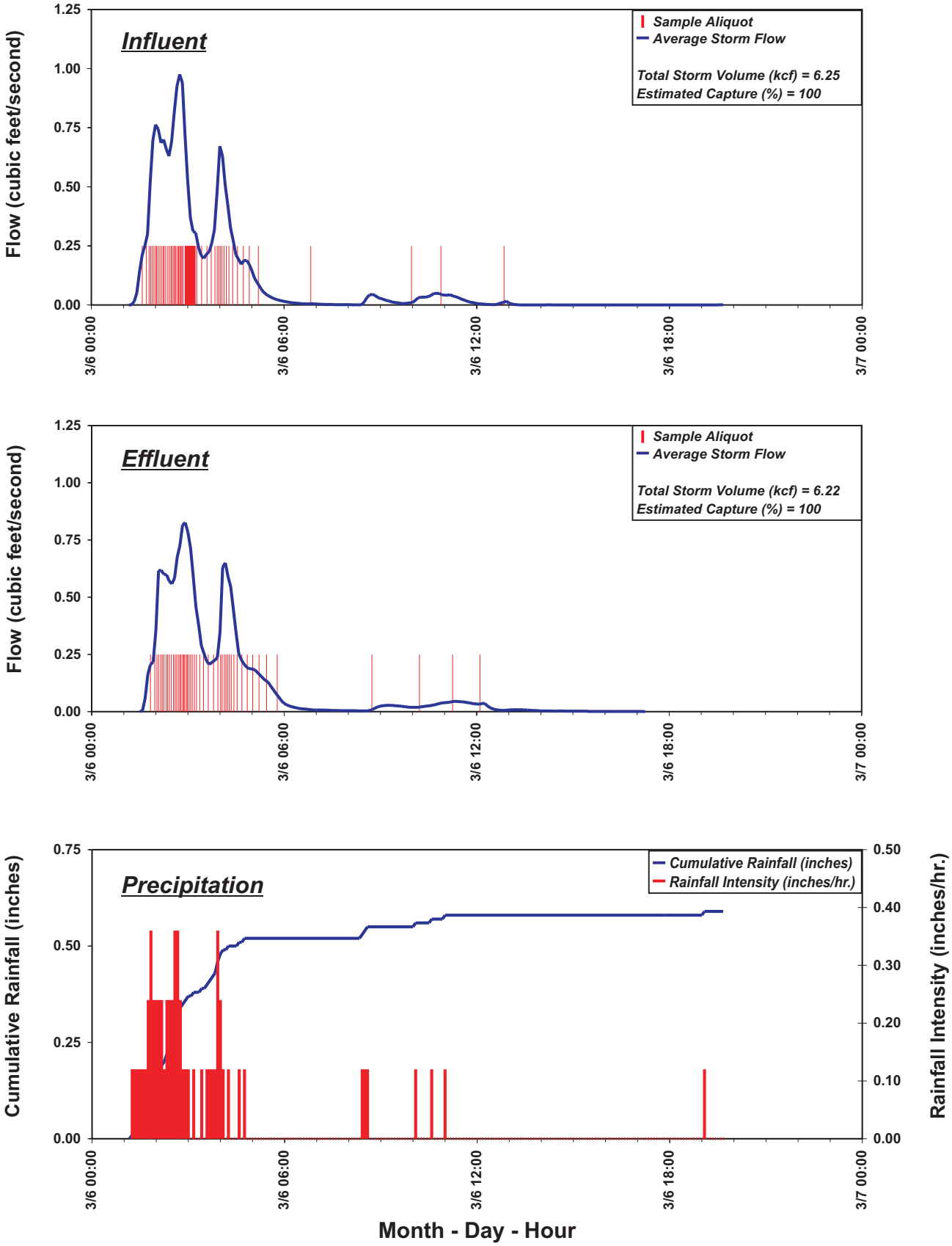


Fig. 1-80. La Costa Wet Basin - Event 10 (6-7 March 2001)

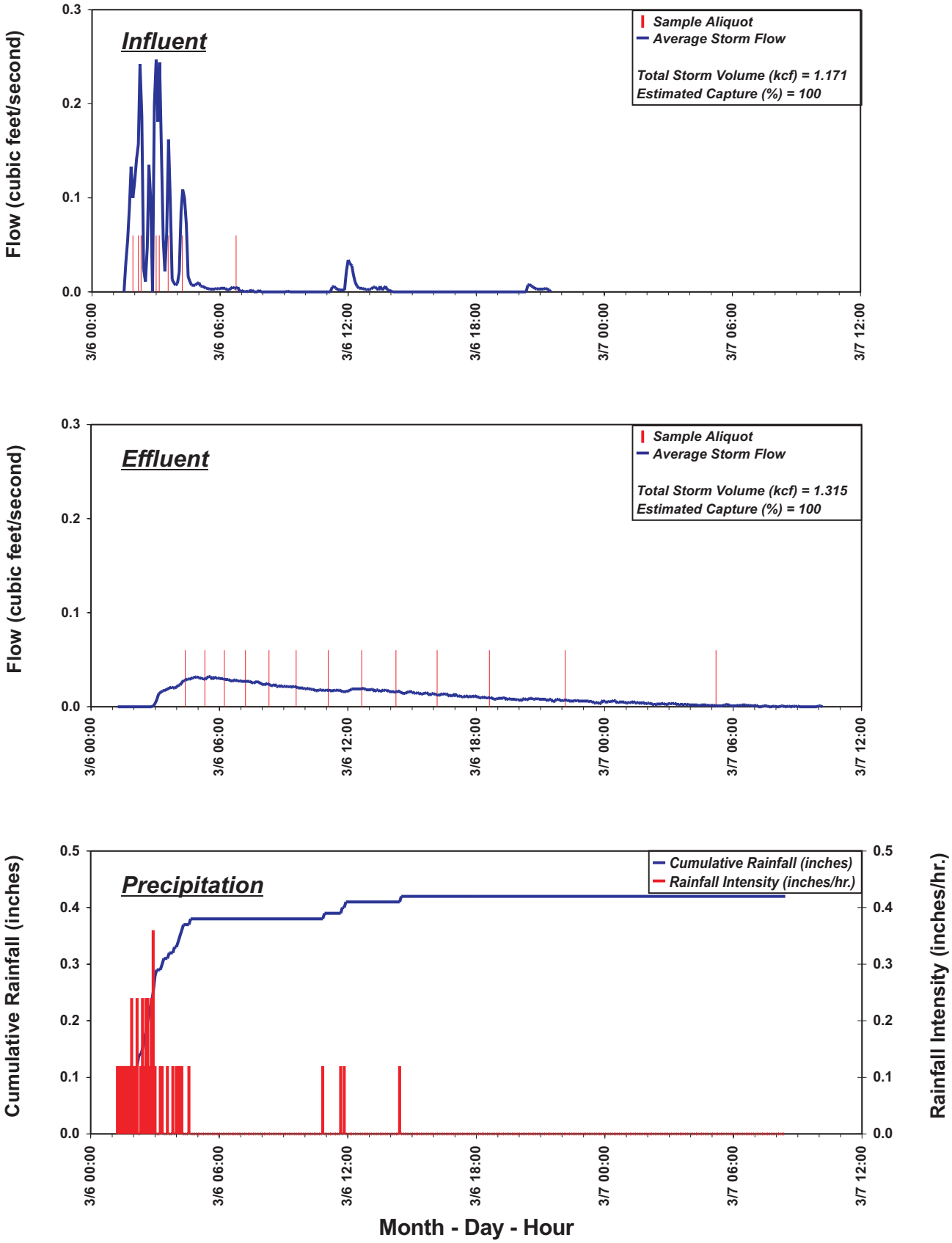


Fig. 1-81. State Route 56 & I5 -Event 10 (6-7 March 2001)

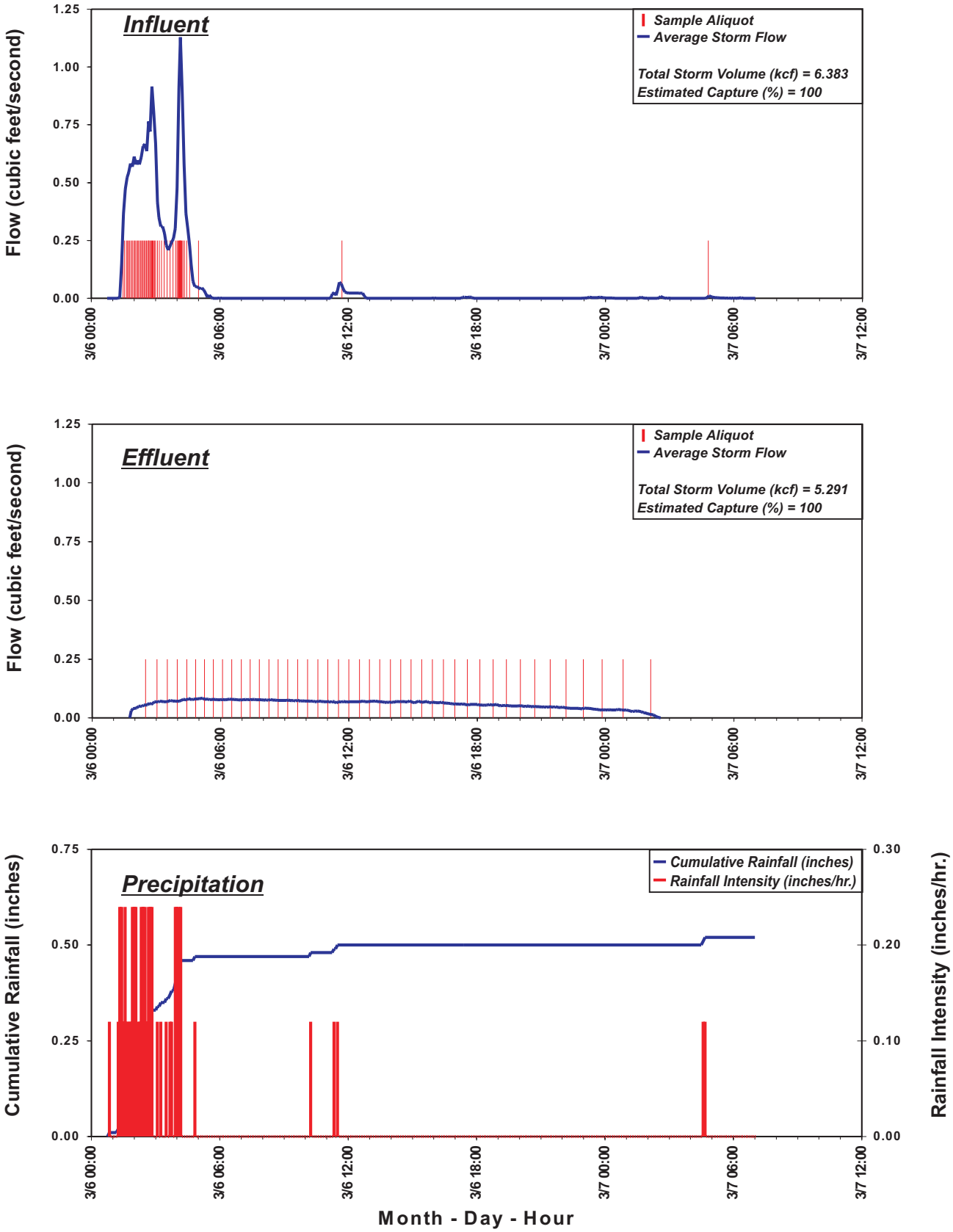


Fig. 1-82. Carlsbad Maintenance Station - Event 10 (6 - 7 March 2001)

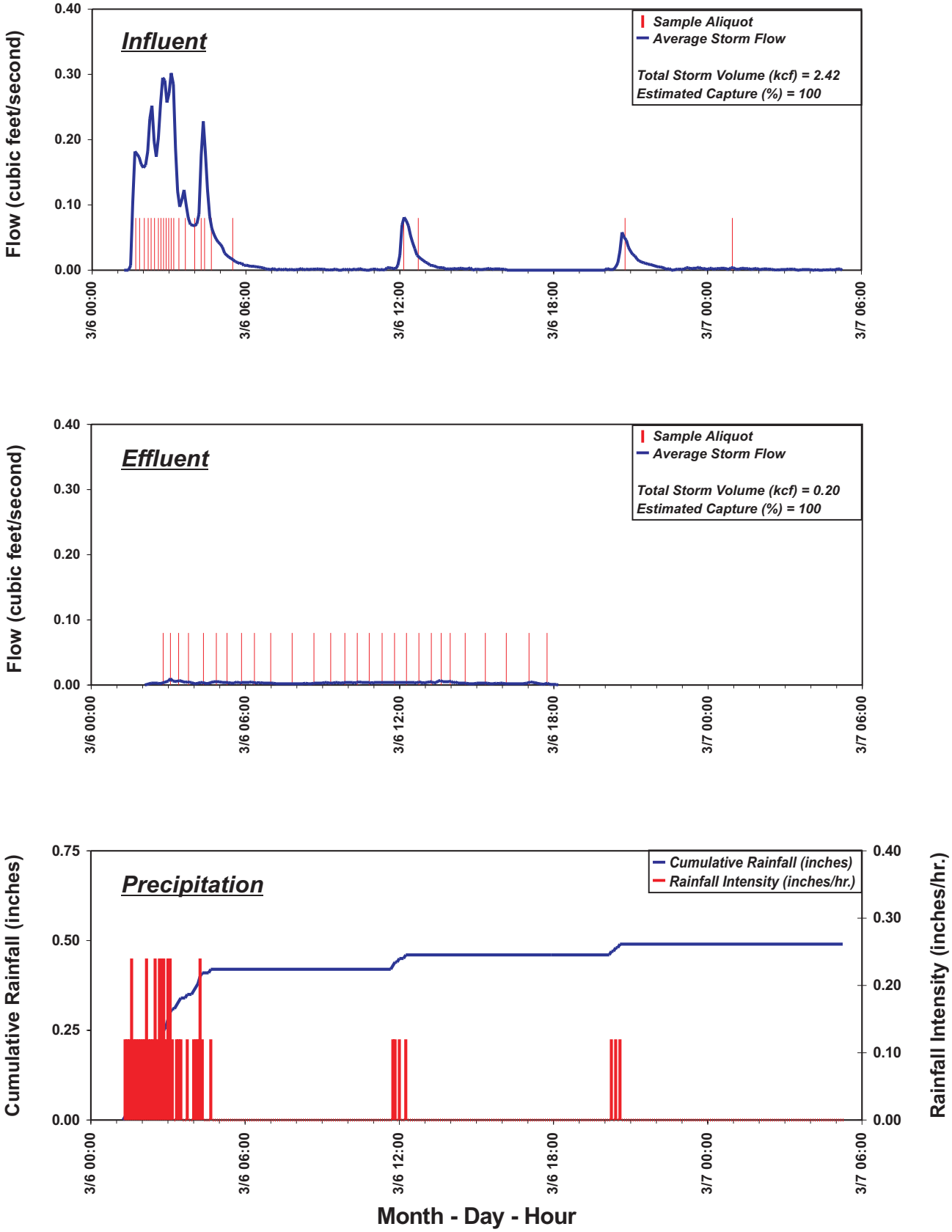


Fig. 1-83. State Route 78 & I15 - Event 11 (7-8 April 2001)

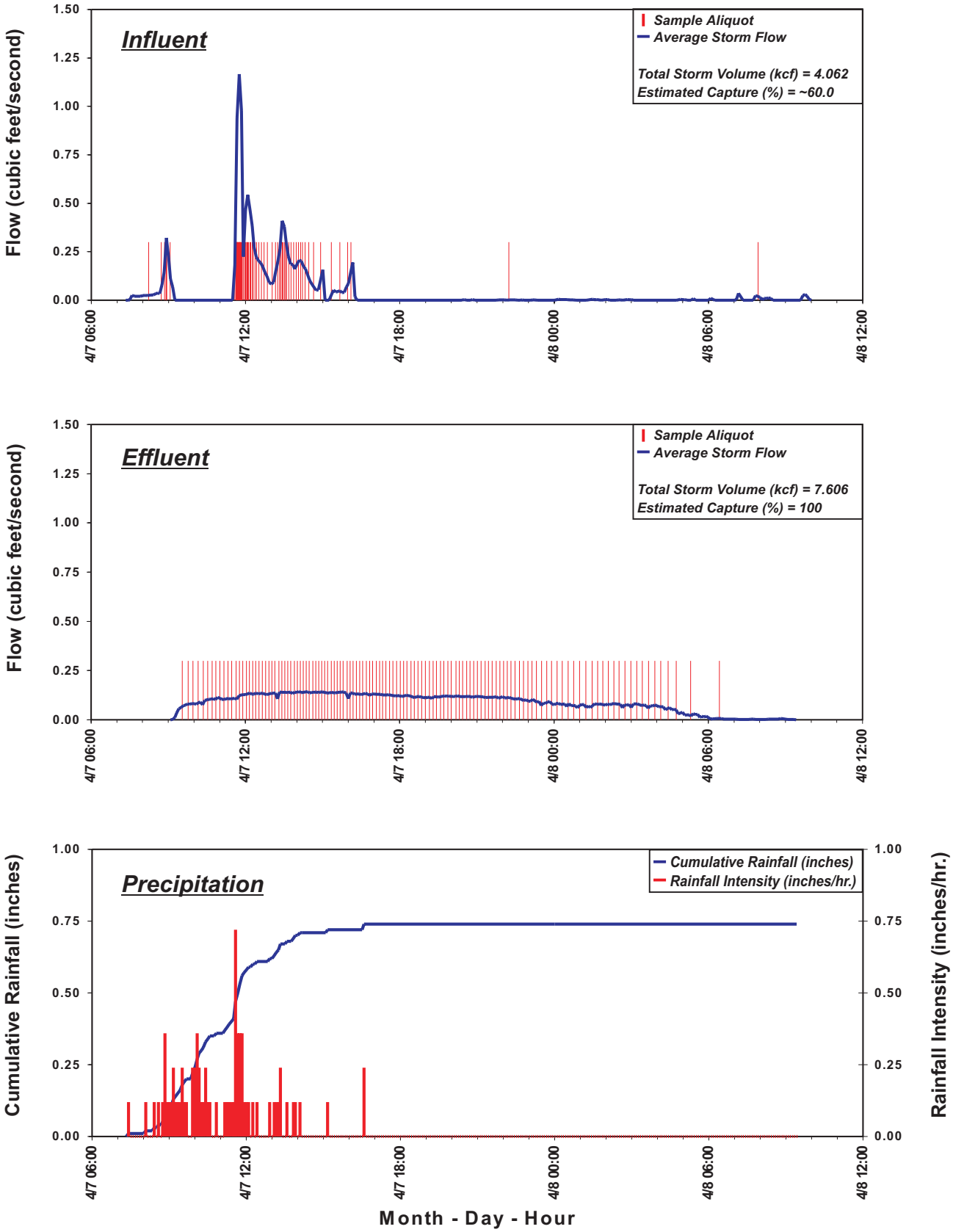


Fig. 1-84. State Route 56 & I5 - Event 11 (7-8 April 2001)

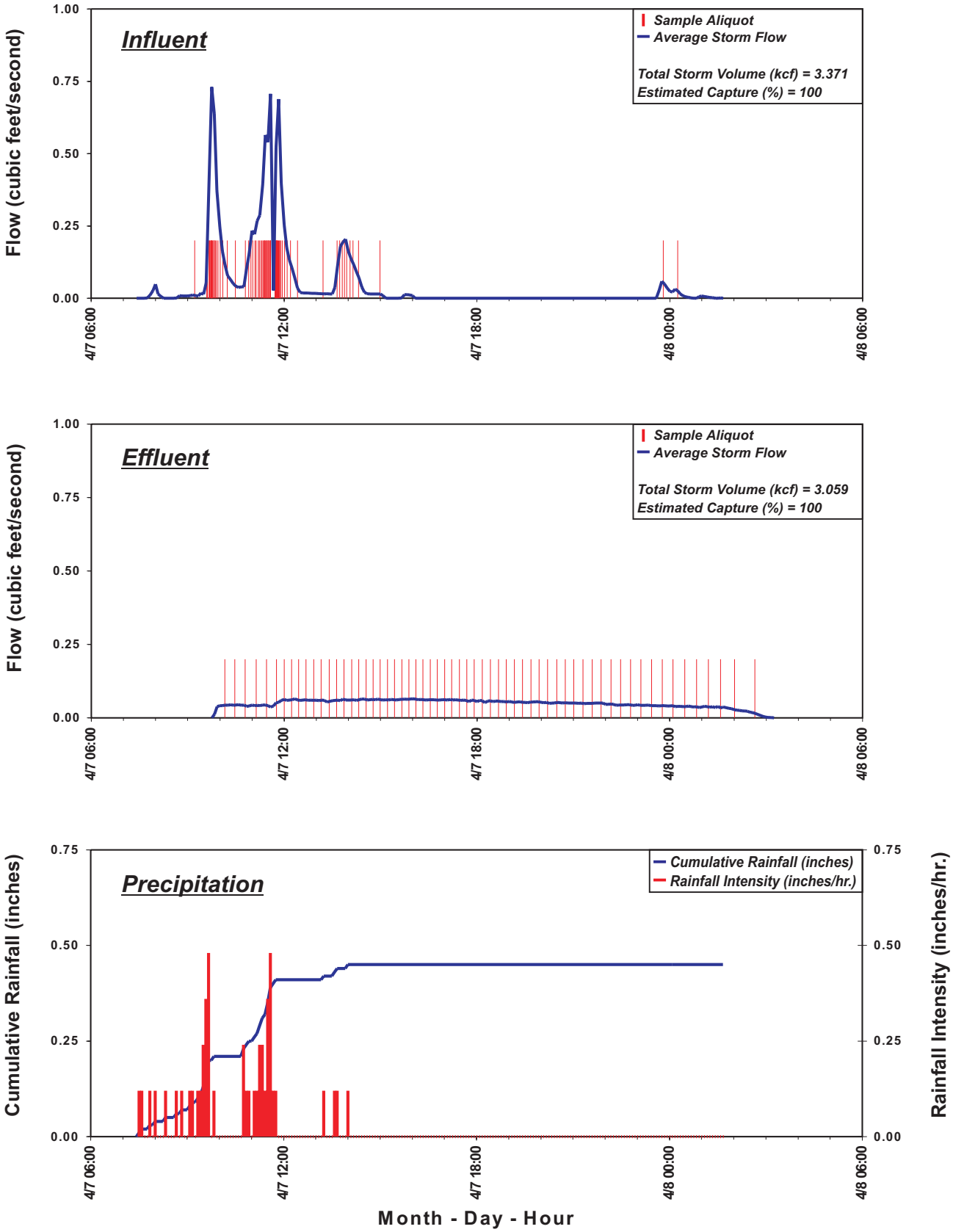


Fig. 1-85. Manchester Detention Basin - Event 11 (7-8 April 2001)

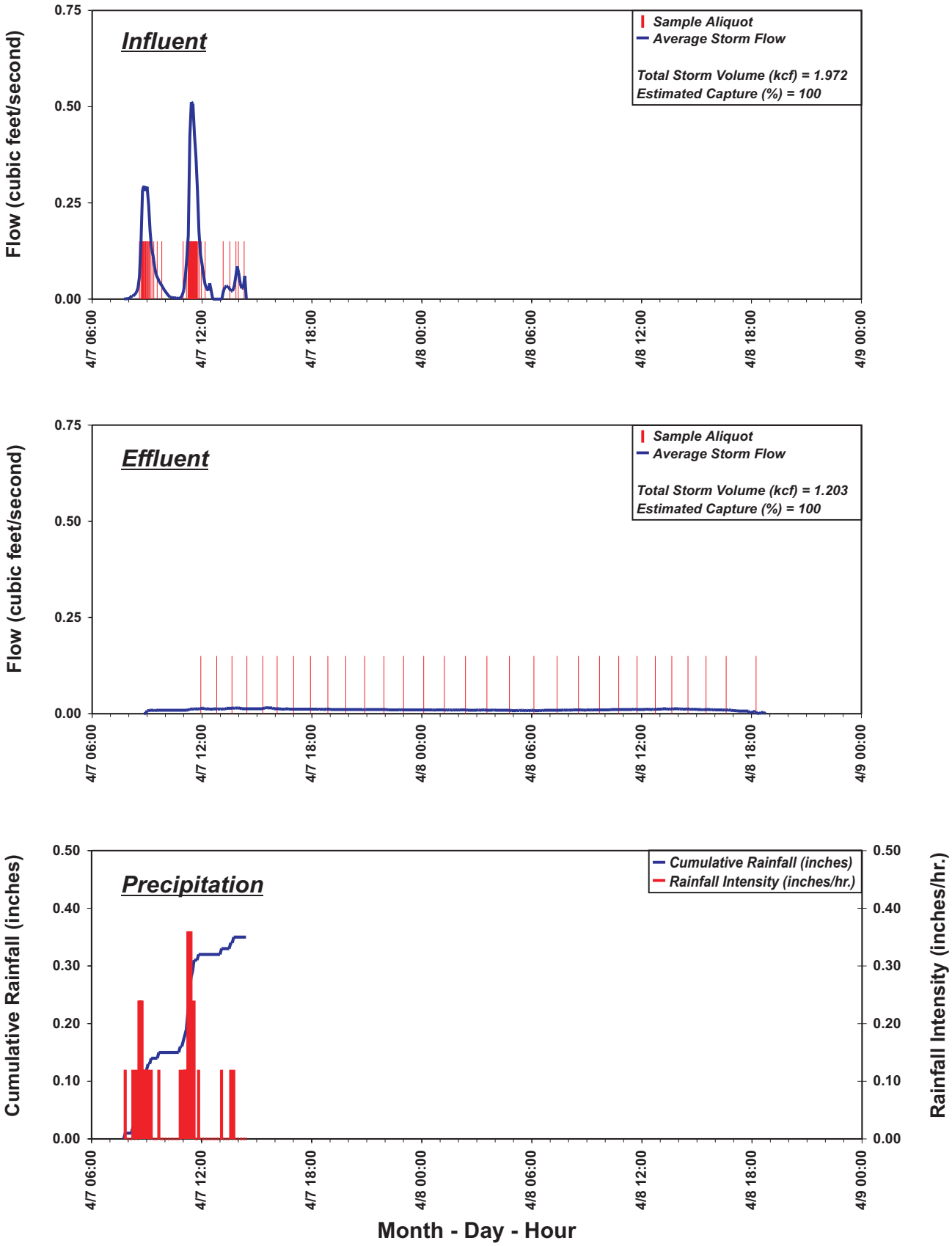


Fig. 1-86. Escondido Maintenance Station - Event 11 (7-8 April 2001)

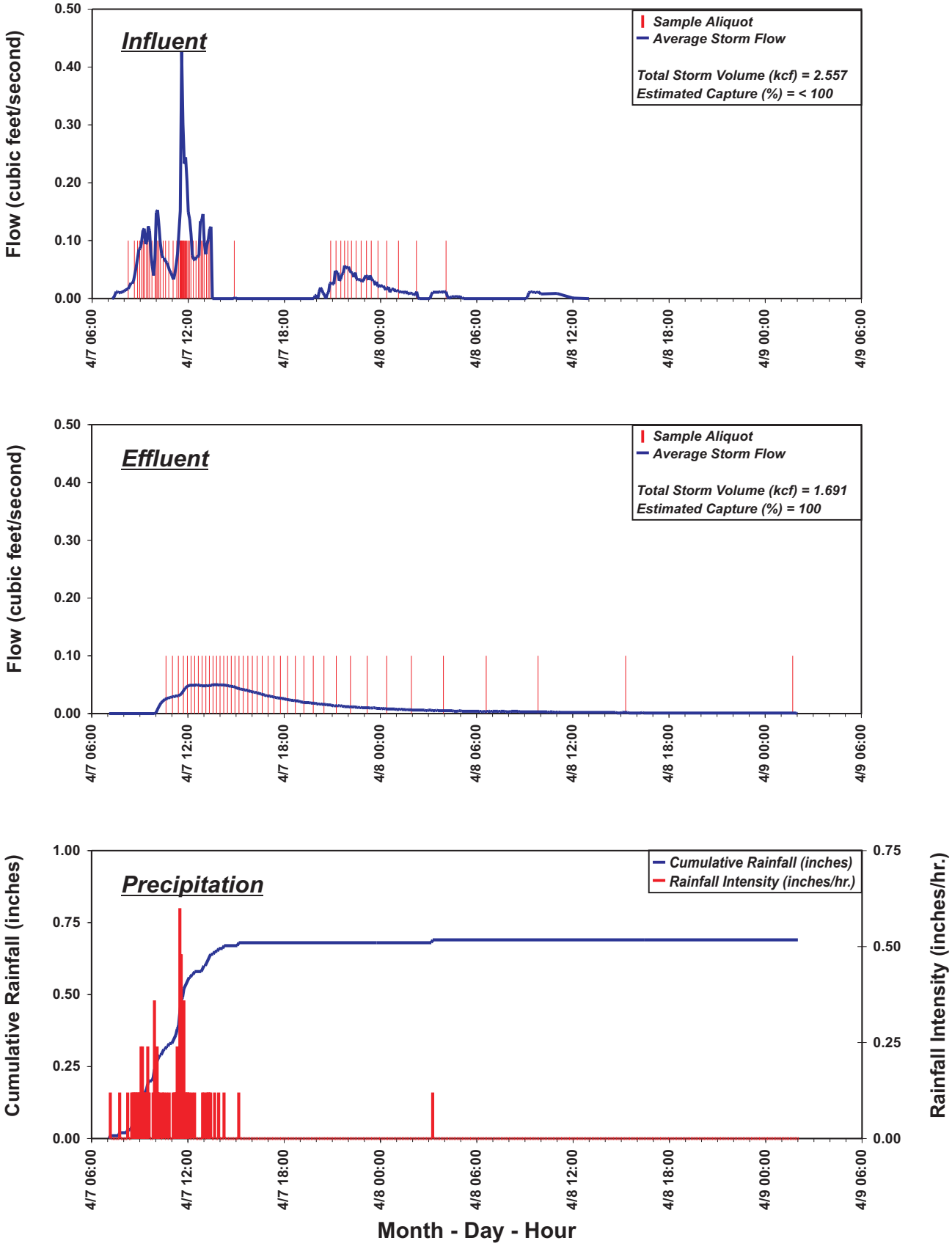


Fig. 1-87. State Route 78 & I5 Park & Ride - Event 11 (6-8 April 2001)

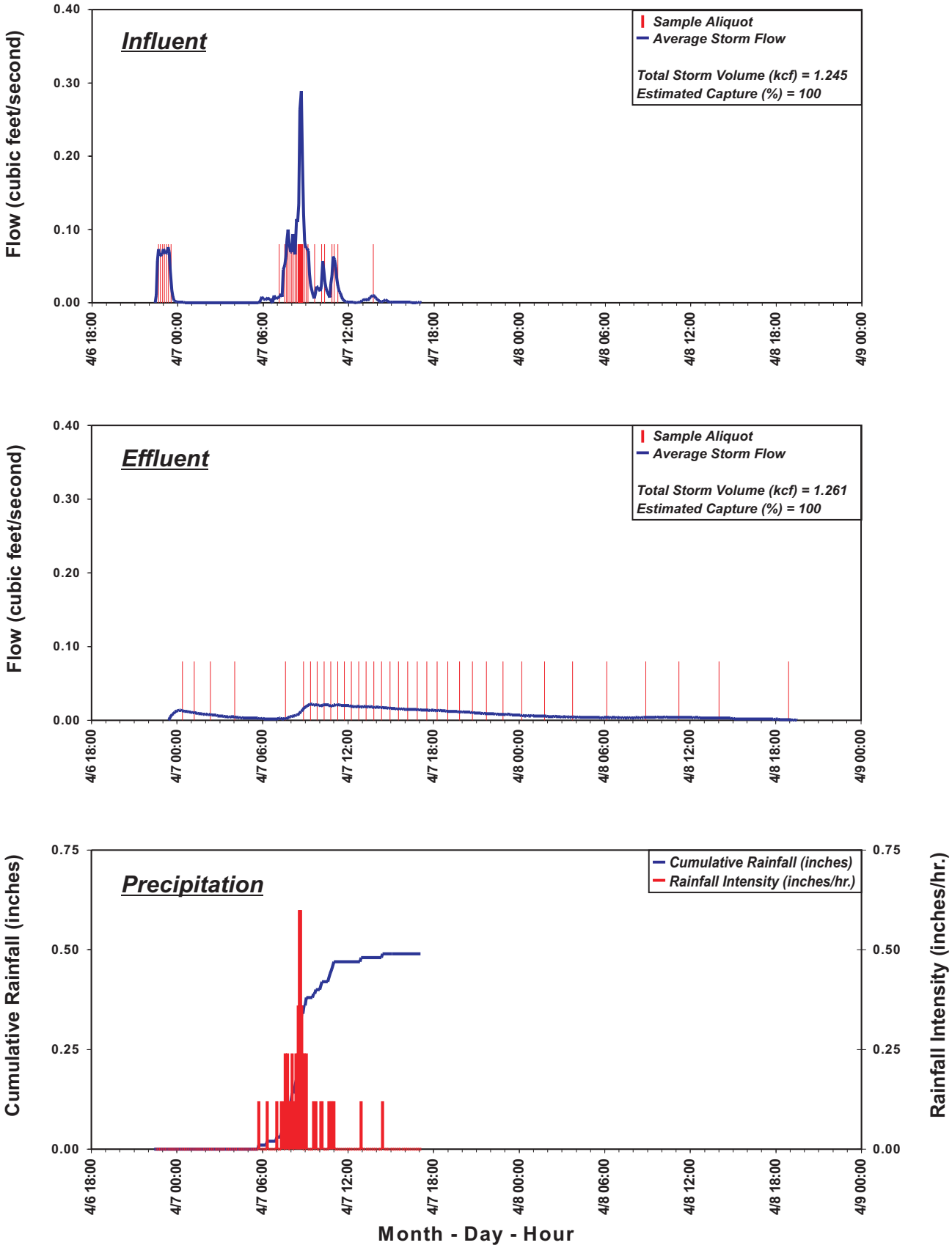


Fig. 1-88. La Costa Park & Ride - Event 11 (7-11 April 2001)

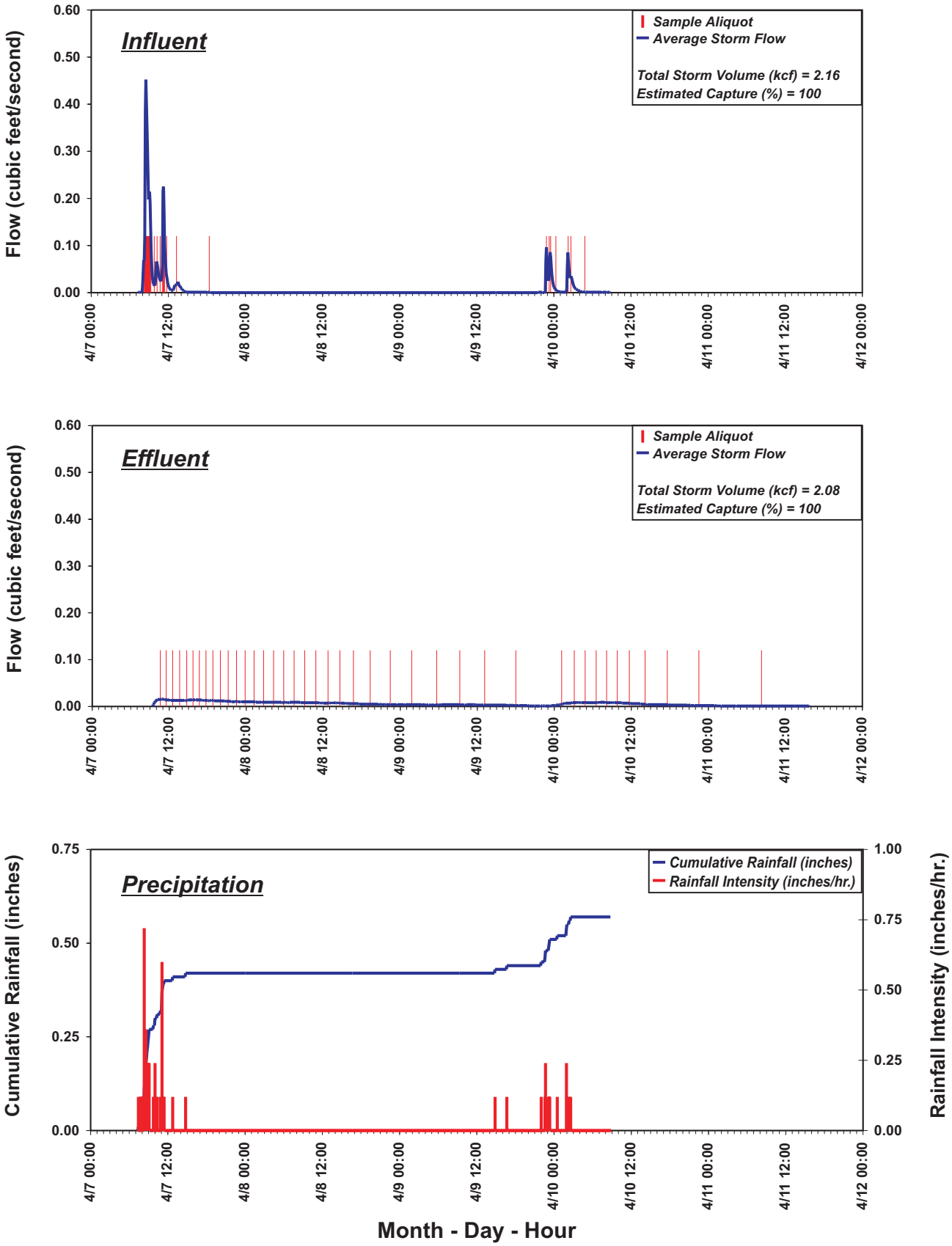


Fig. 1-89. Kearny Mesa Maintenance Station - Event 11 (7 April 2001)

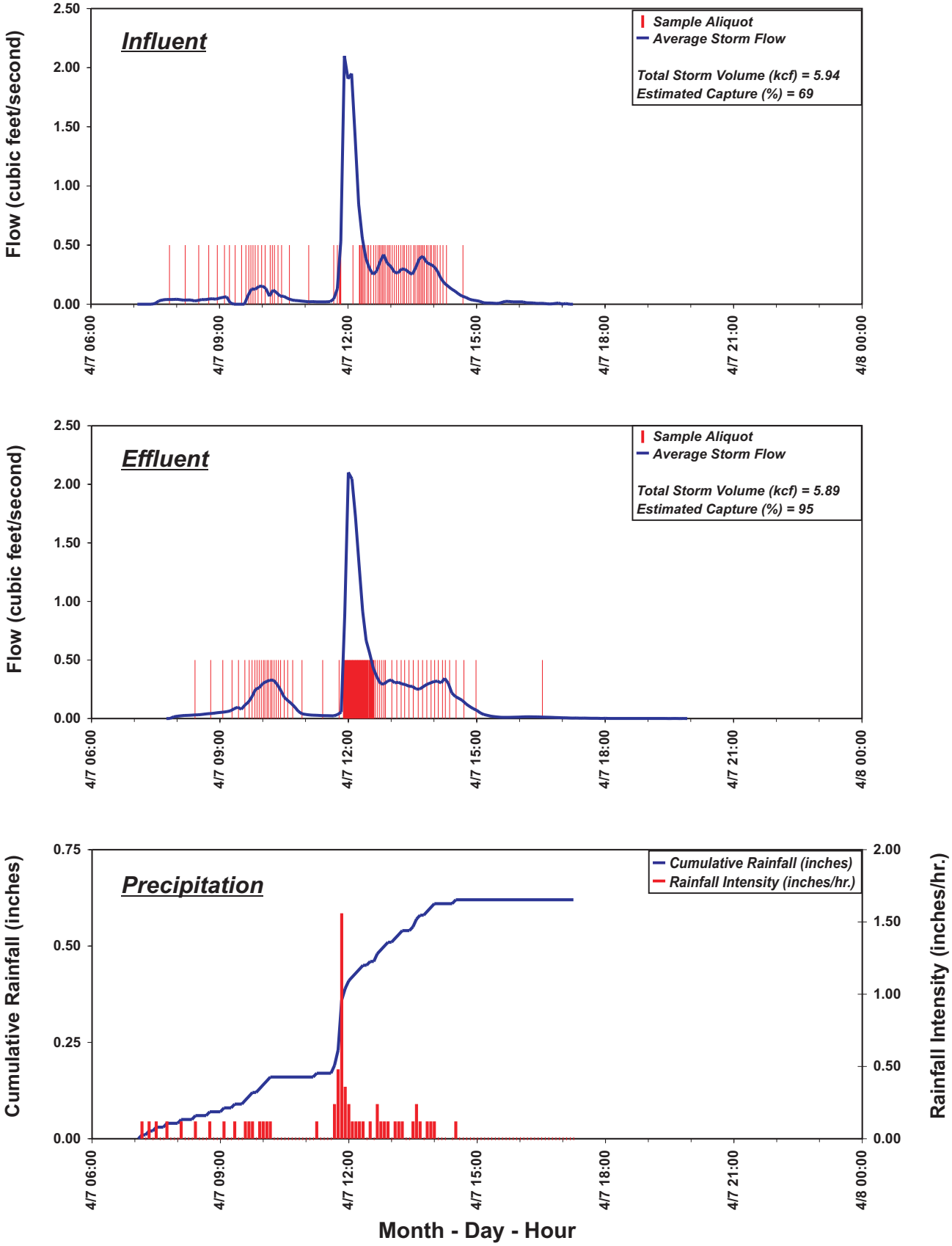


Fig. 1-90. La Costa Wet Basin - Event 11 (7-8 April 2001)

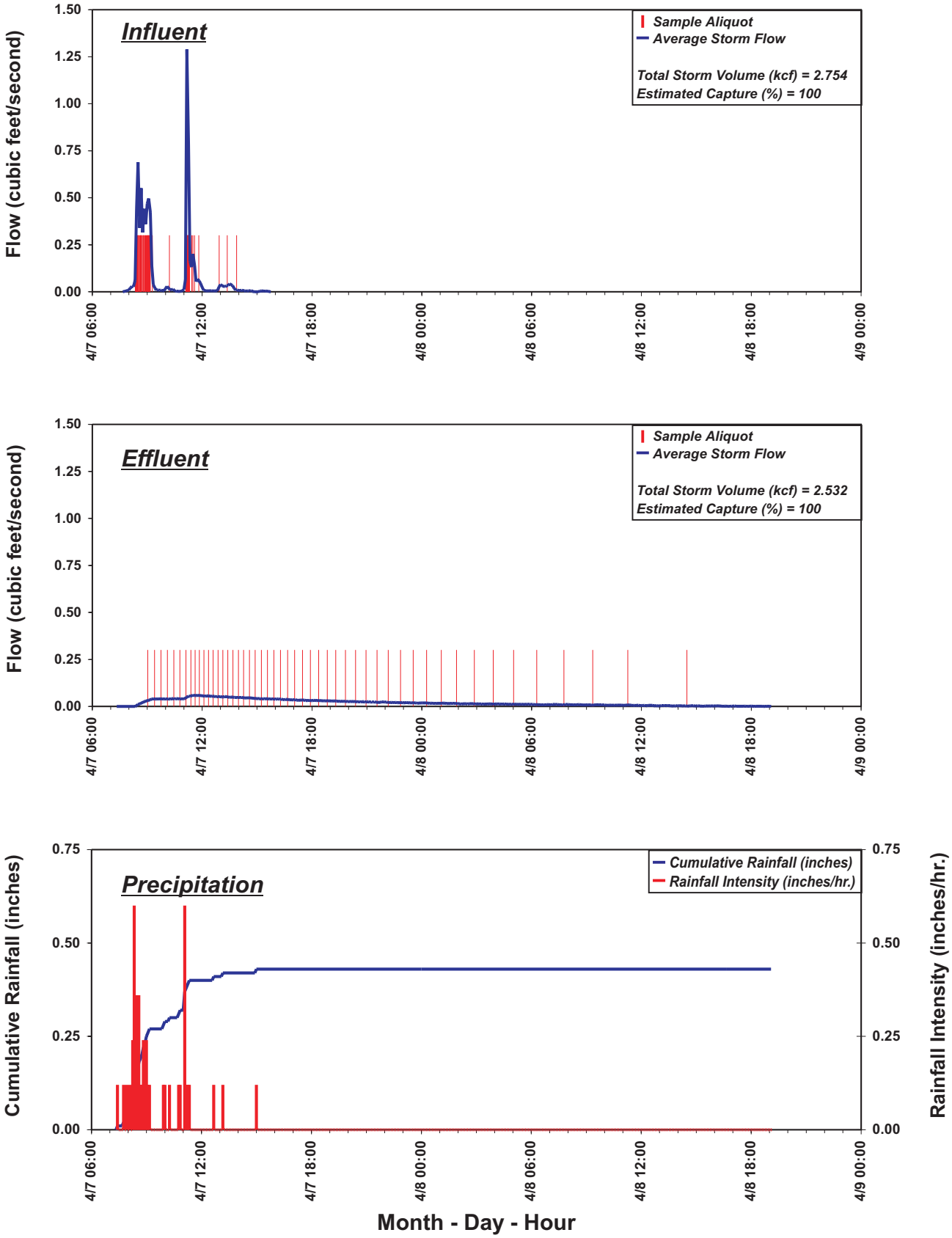


Fig. 1-91. Palomar Swale - Event 11 (7 April 2001)

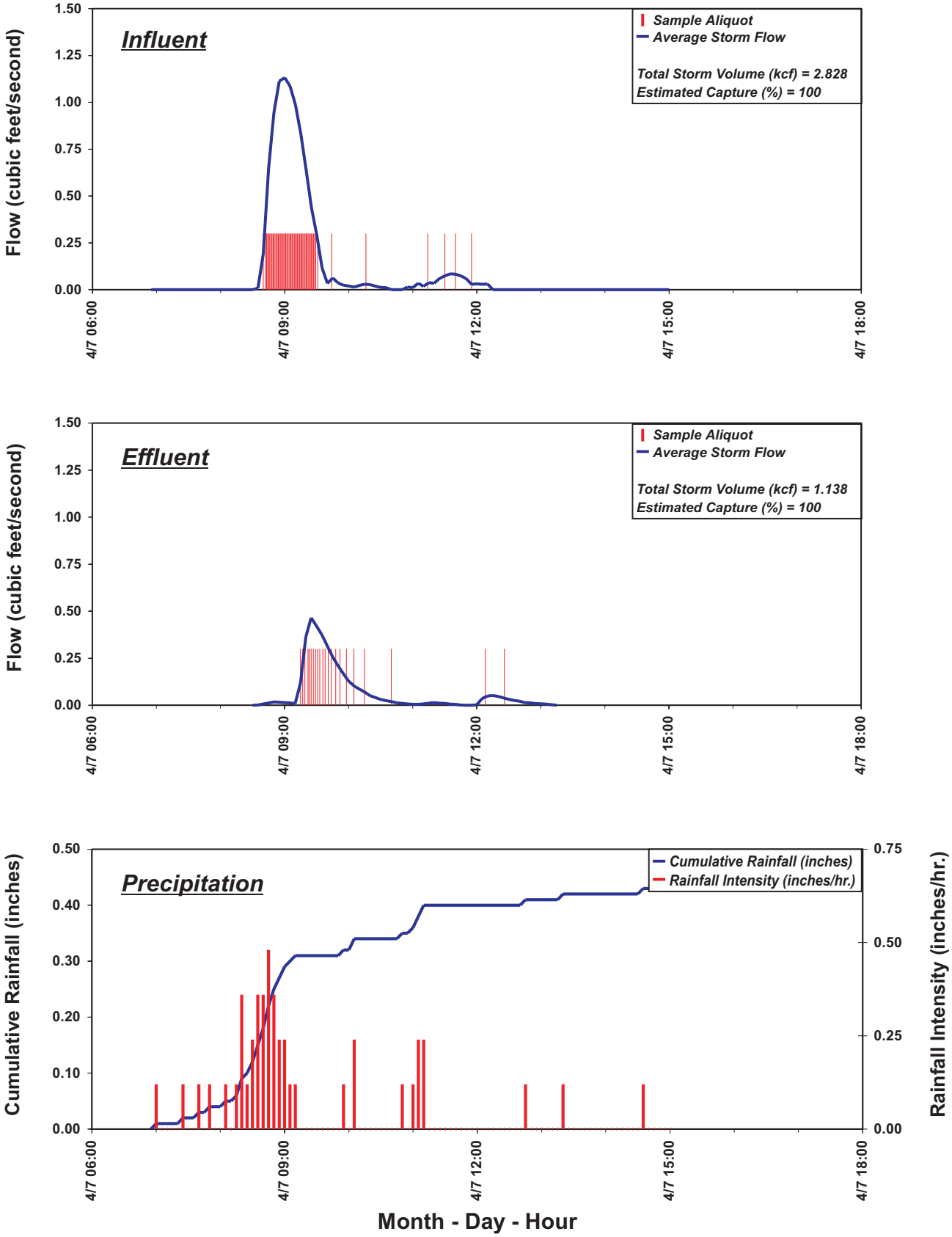


Fig. 1-92. Carlsbad Maintenance Station - Event 11 (7 April 2001)

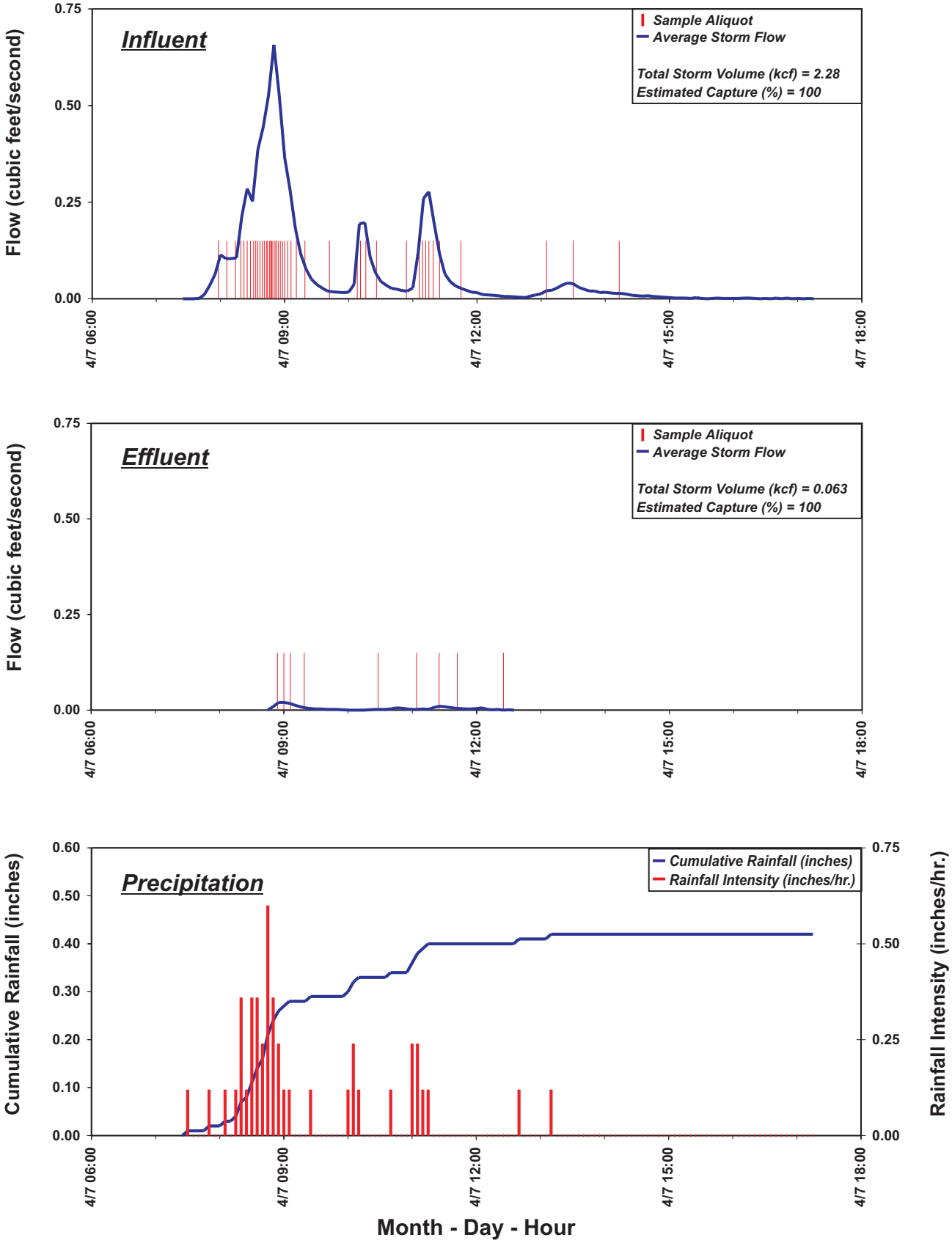


Fig. 1-93. Melrose - Event 11 (7-8 April 2001)

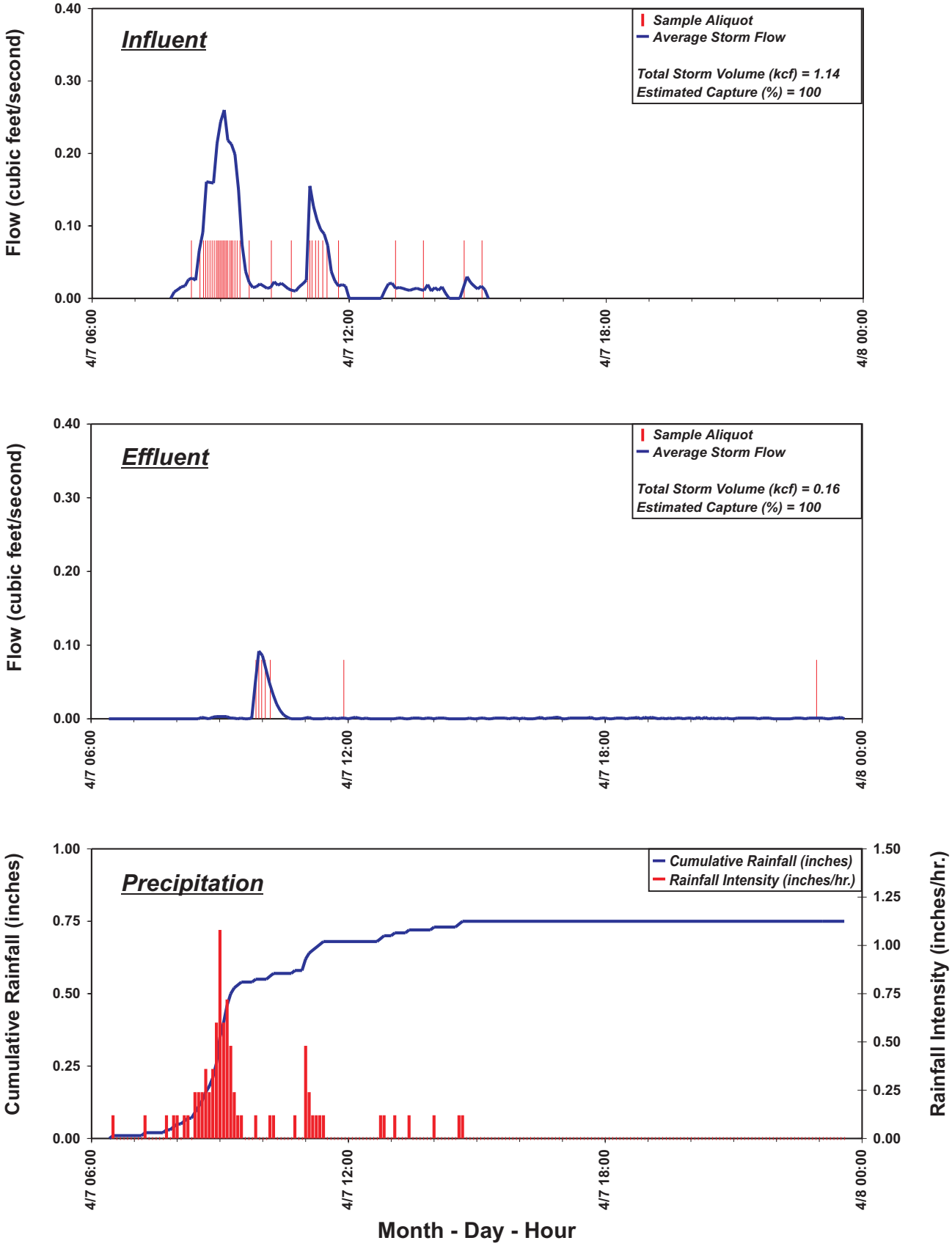


Fig. 1-94. State Route 78 & I15 - Event 12 (20-22 April 2001)

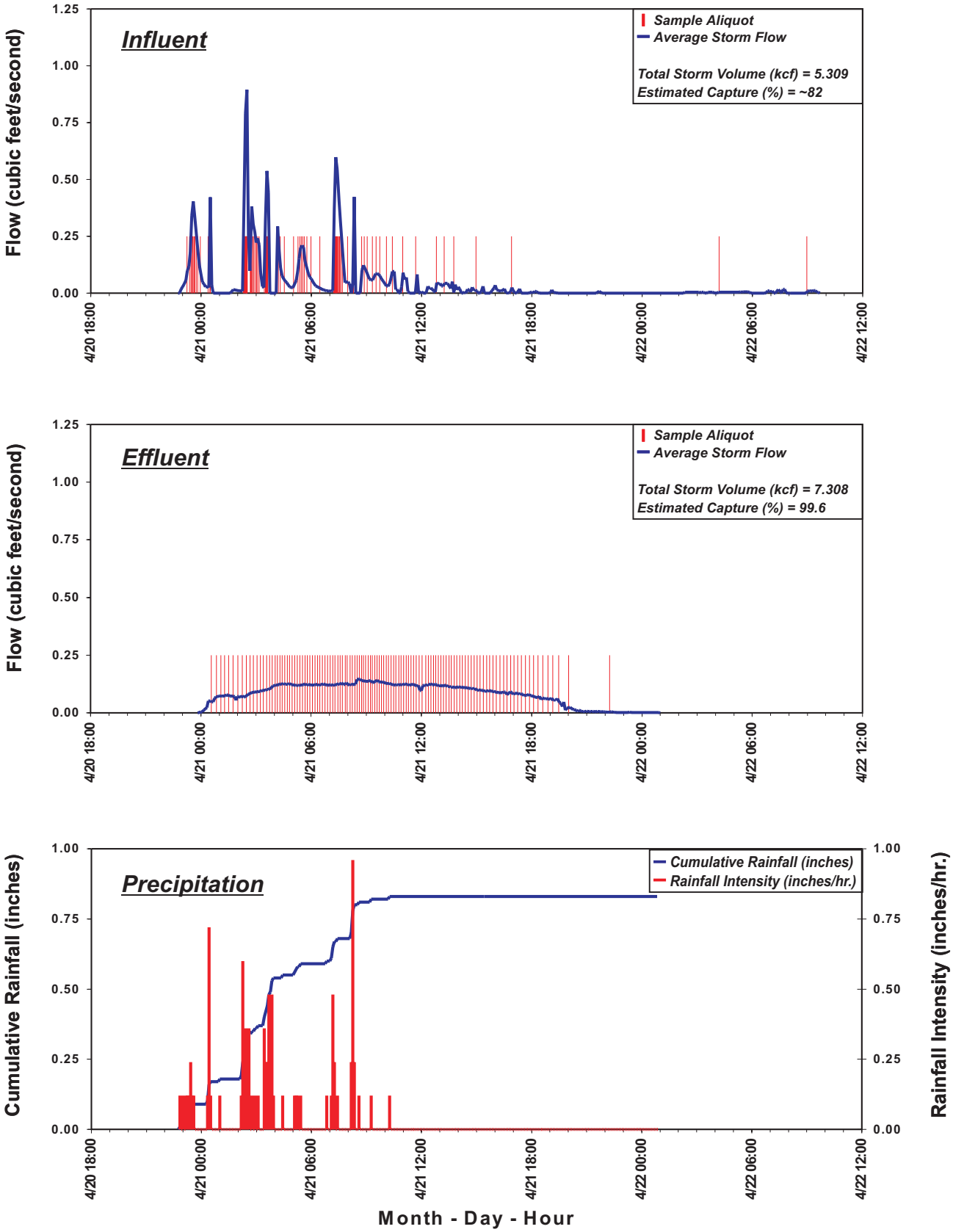


Fig. 1-95. State Route 78 & I15 - Event 12 (20-22 April 2001)

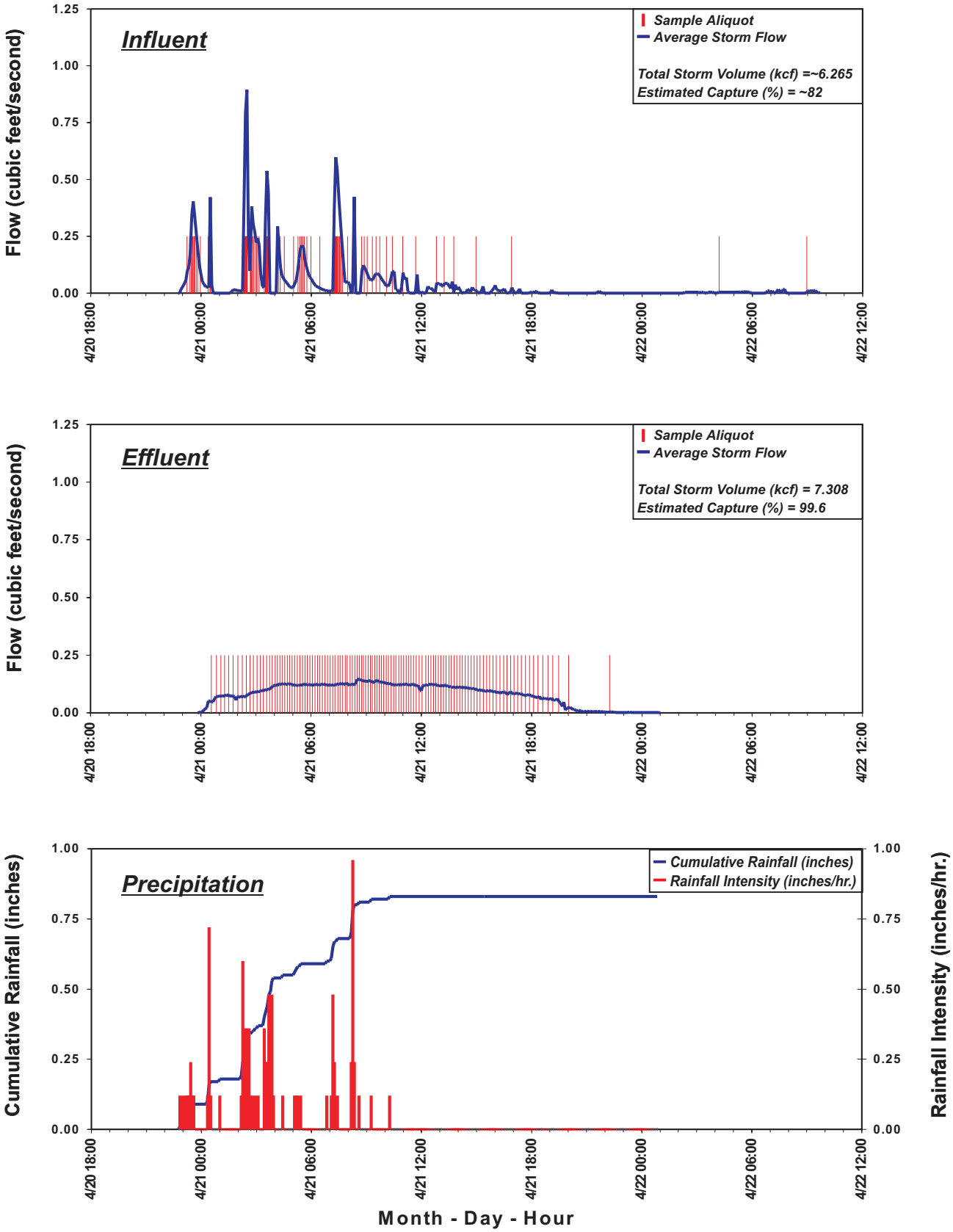


Fig. 1-96. Manchester Detention Basin - Event 12 (20-22 April 2001)

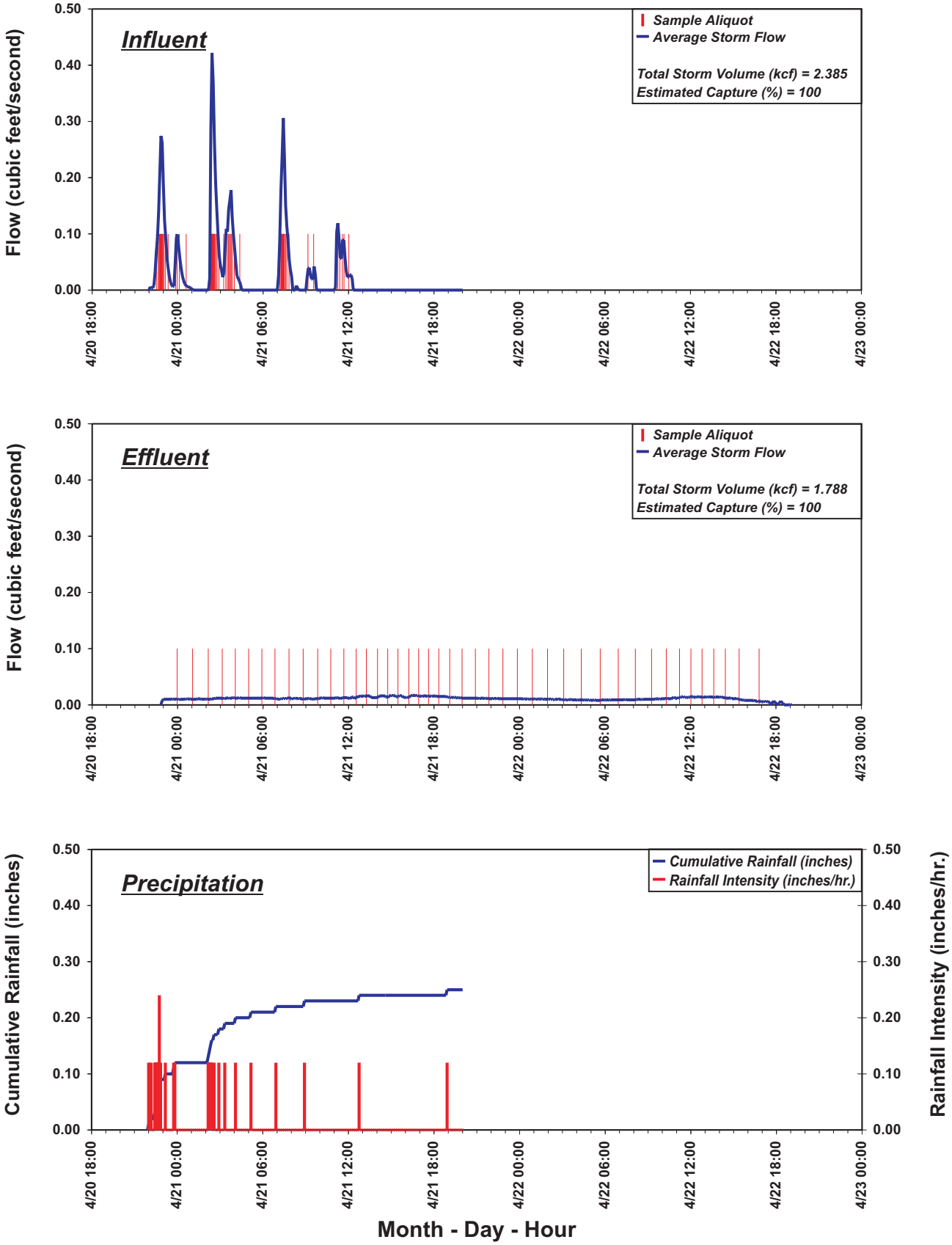


Fig. 1-97. Escondido Maintenance Station - Event 12 (20-23 April 2001)

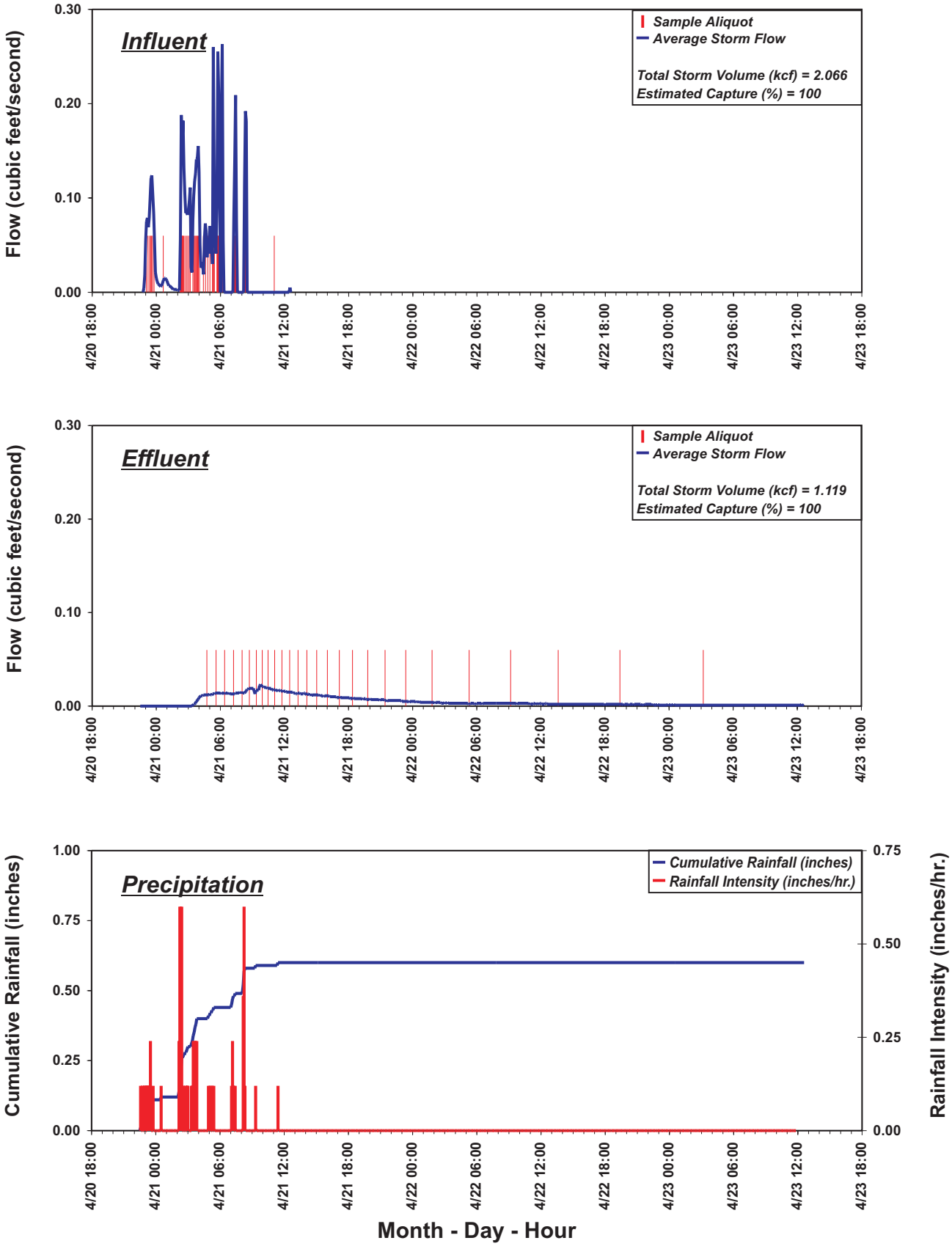


Fig. 1-98. State Route 78 & I5 Park & Ride - Event 12 (20-22 April 2001)

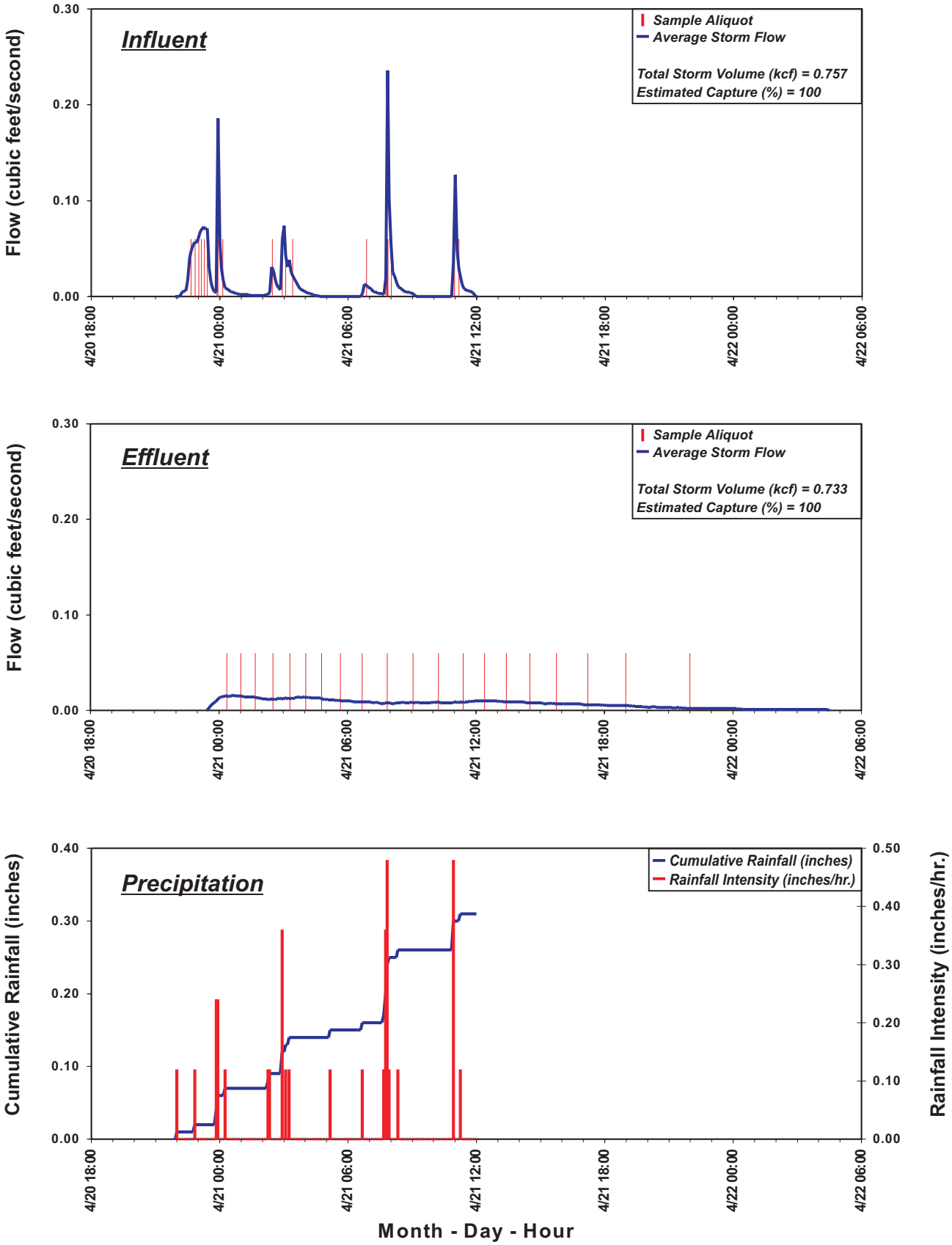


Fig. 1-99. La Costa Park & Ride - Event 12 (20-22 April 2001)

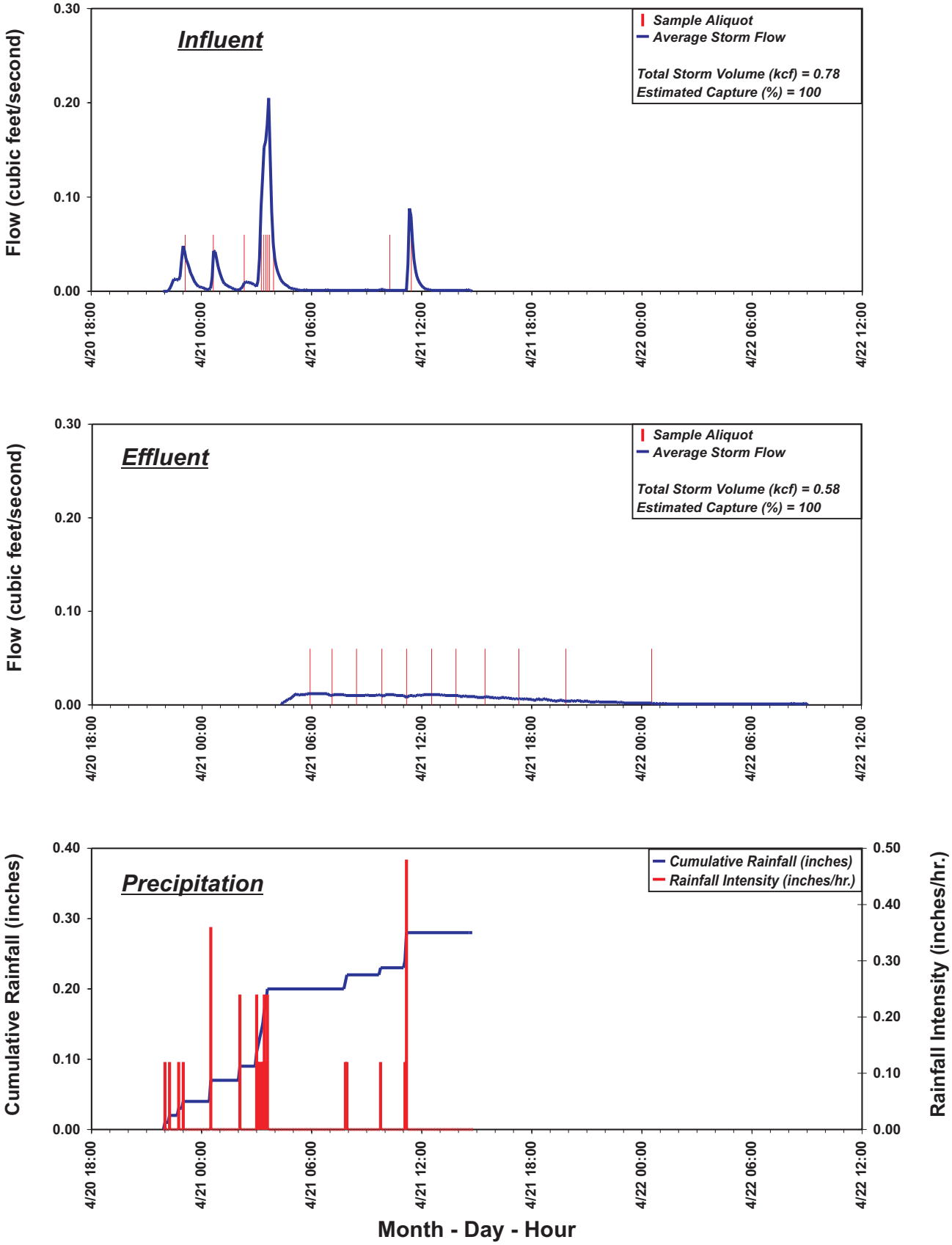


Fig. 1-100. Kearny Mesa Maintenance Station - Event 12 (20-21 April 2001)

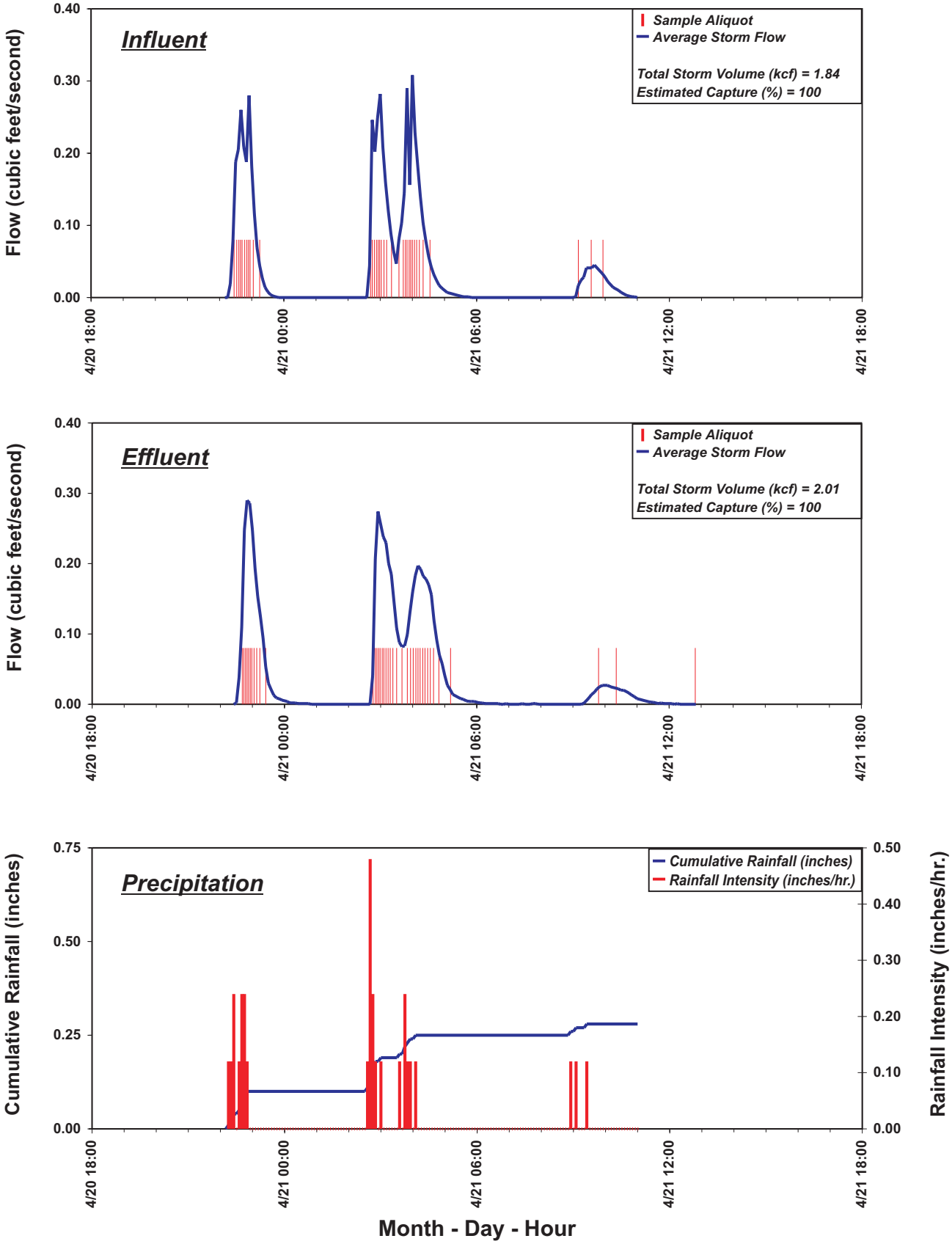


Fig. 1-101. La Costa Wet Basin - Event 12 (20-22 April 2001)

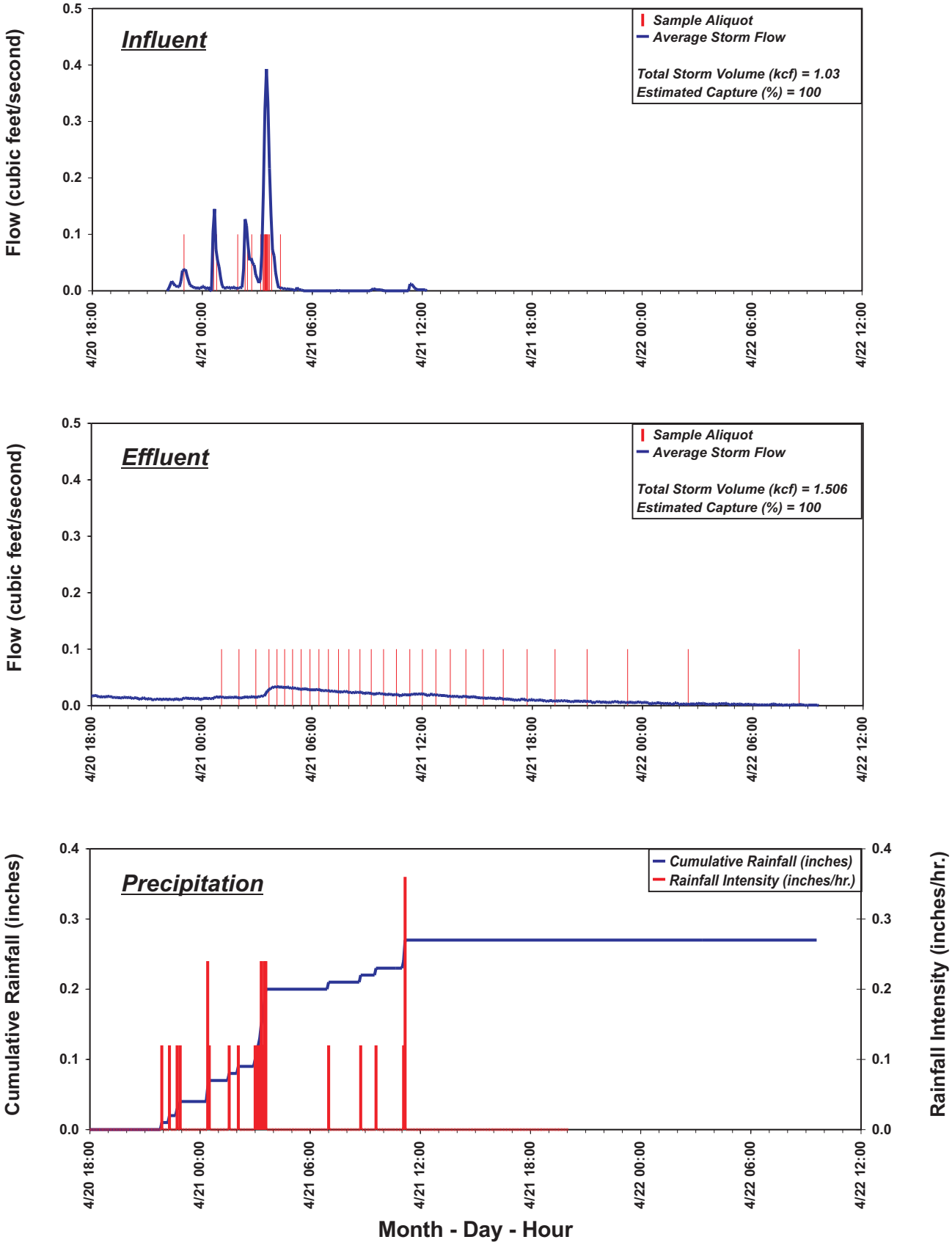


Fig. 1-102. Palomar Swale - Event 12 (20-21 April 2001)

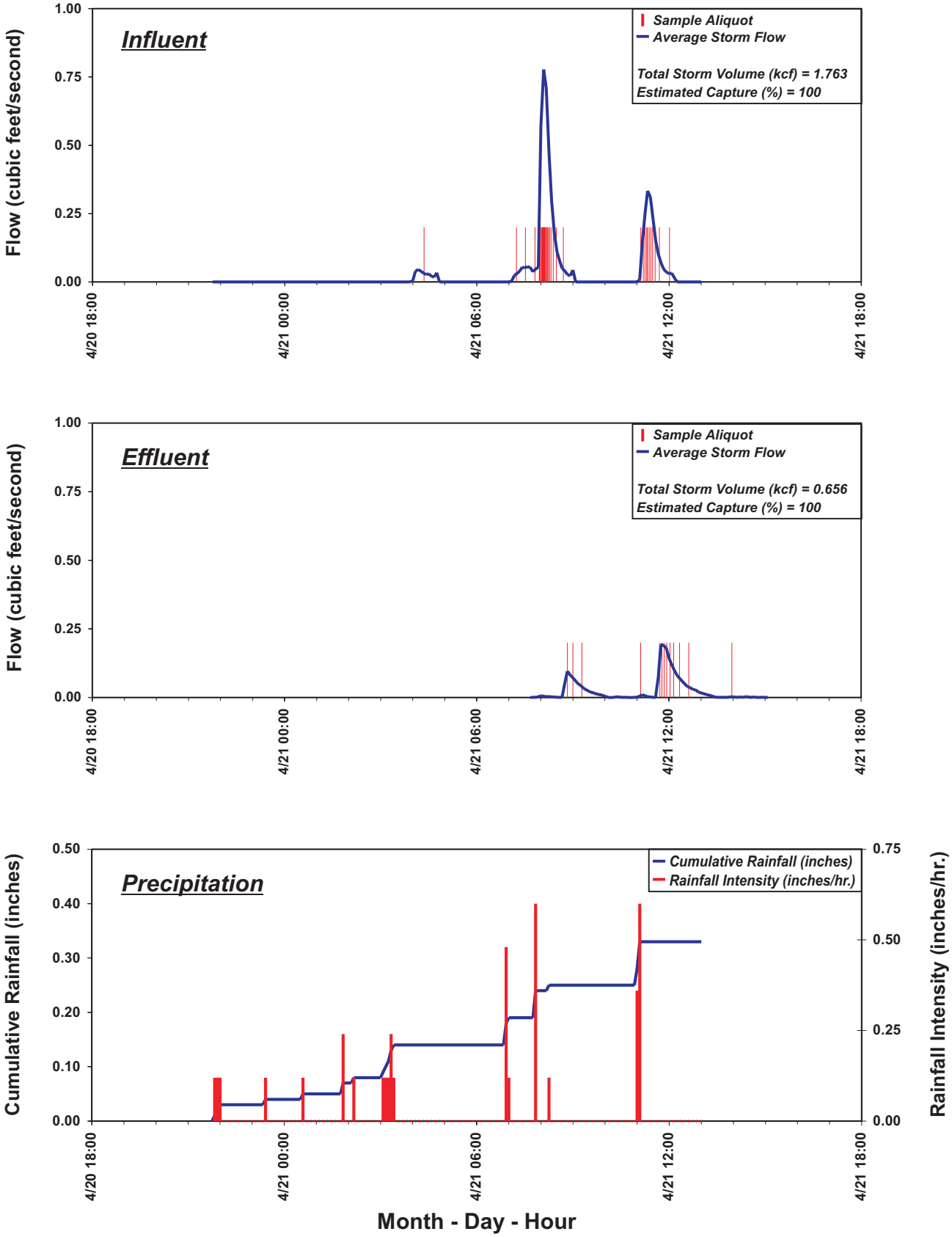


Fig. 1-103. Carlsbad Maintenance Station - Event 12 (20-21 April 2001)

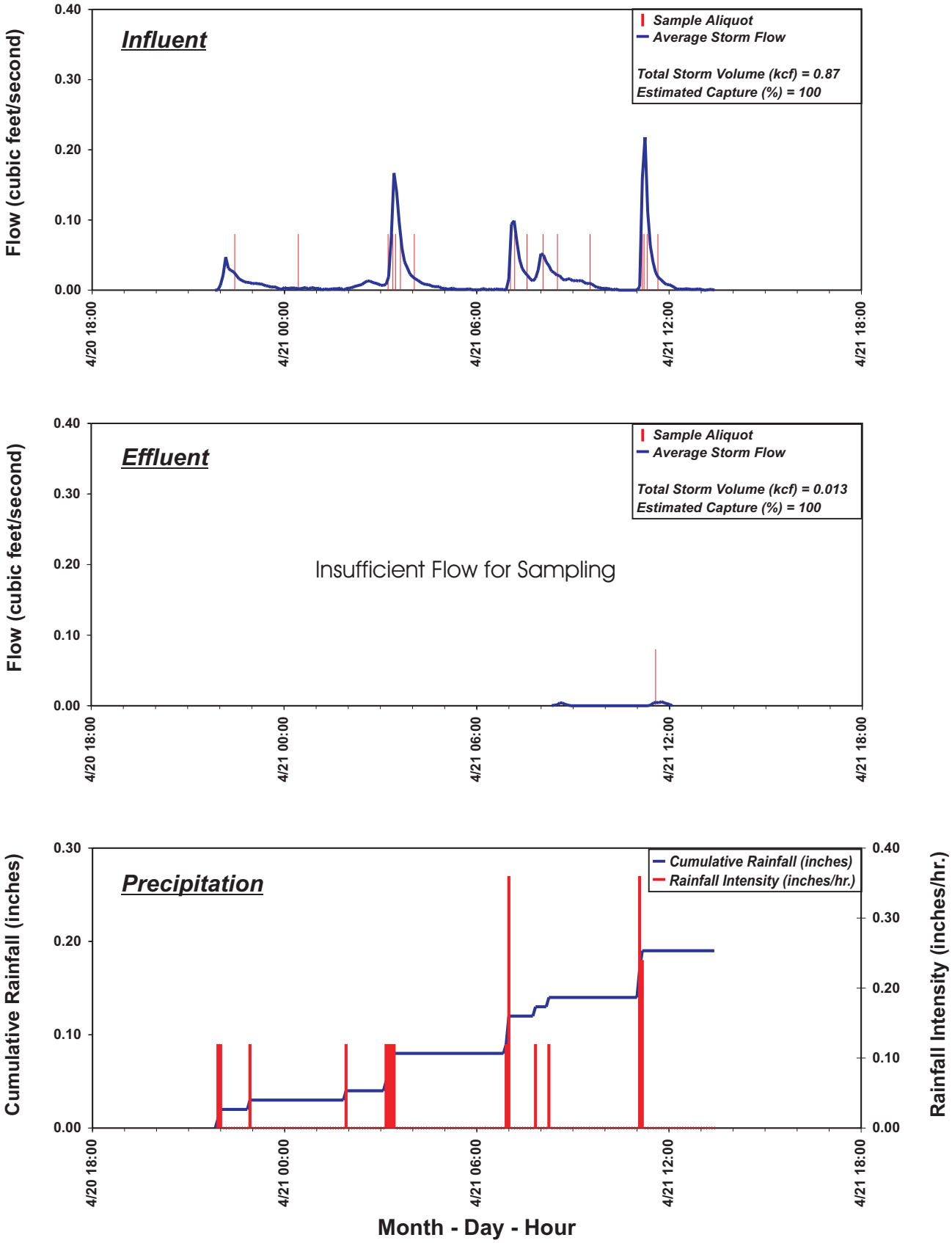


Fig. 1-104. Melrose - Event 12 (20-21 April 2001)

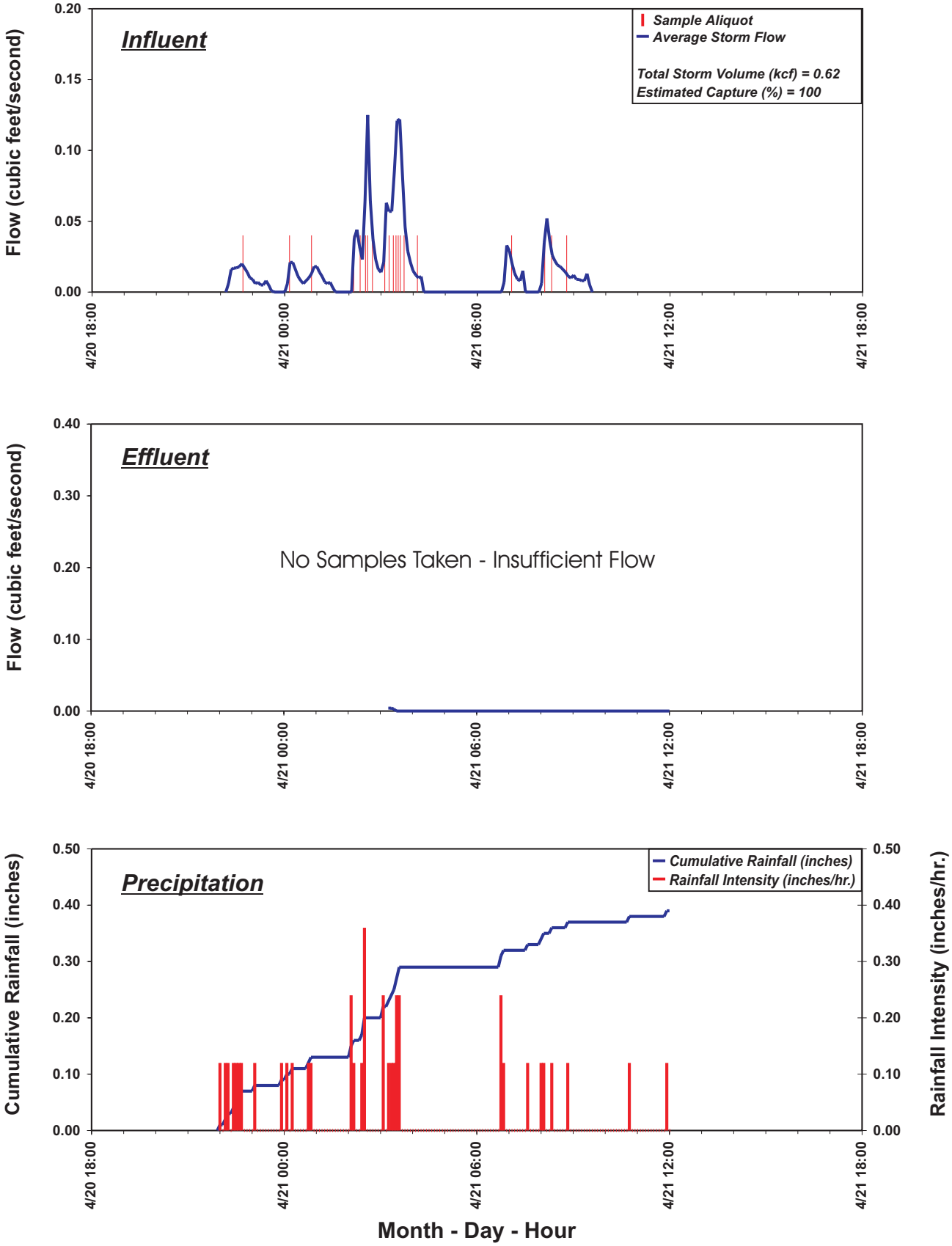
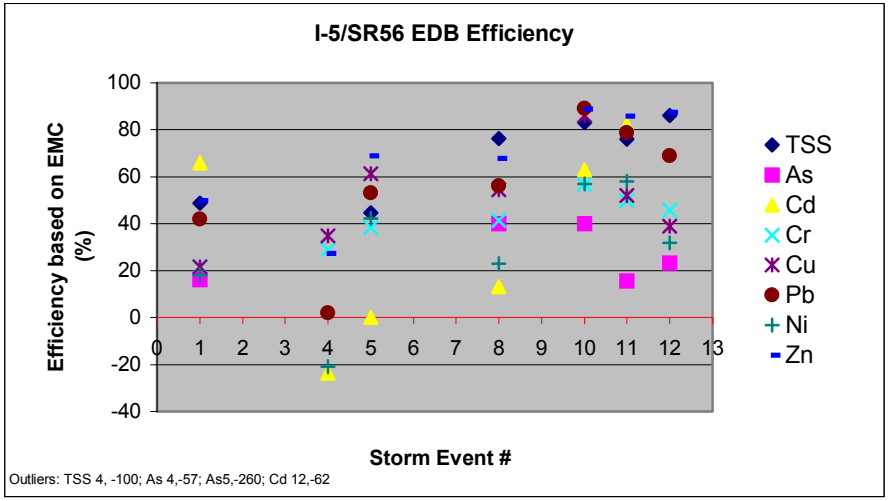
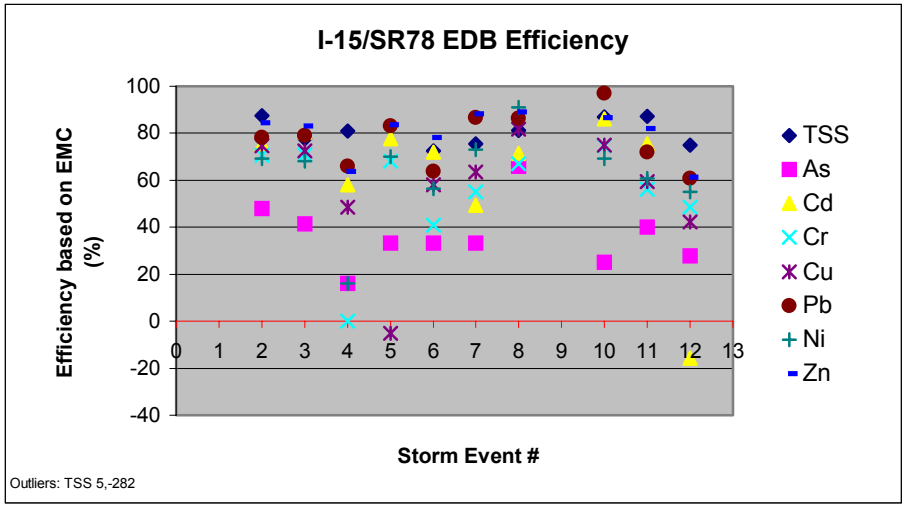
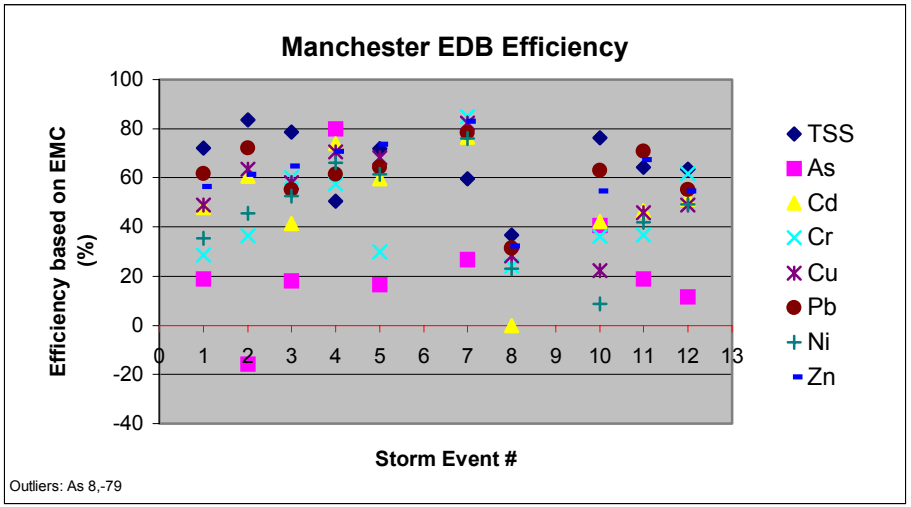


Figure 1-105a Extended Detention Basin Efficiencies for TSS and Total Metals

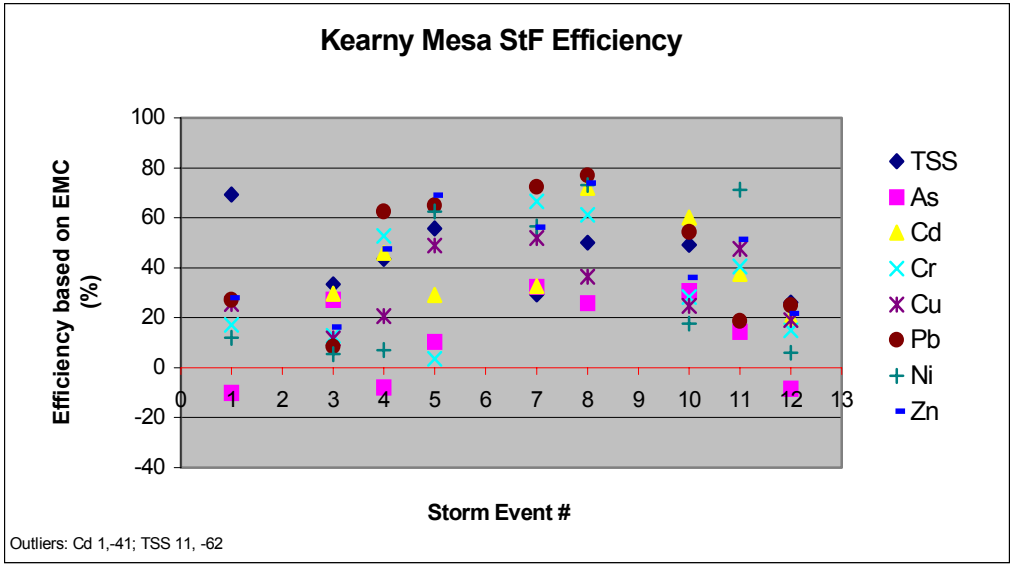






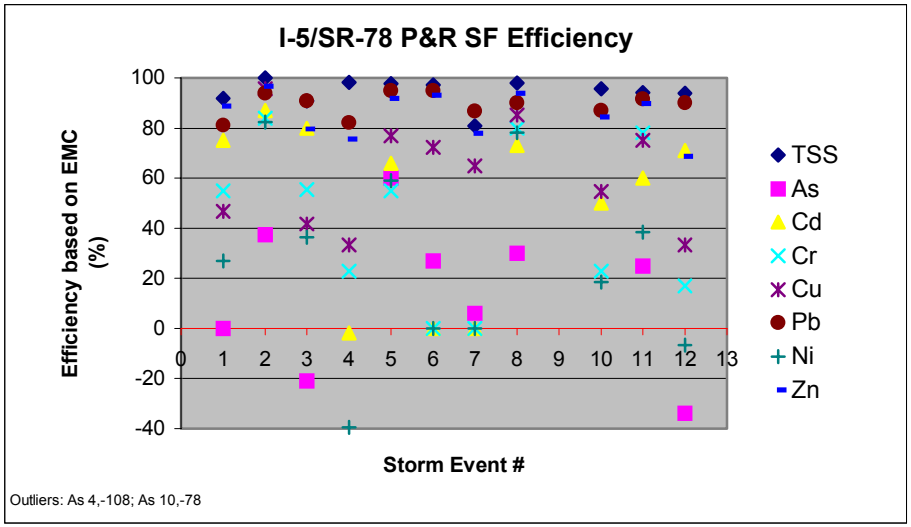
Outlier Key: [analyte] [storm event], [efficiency]

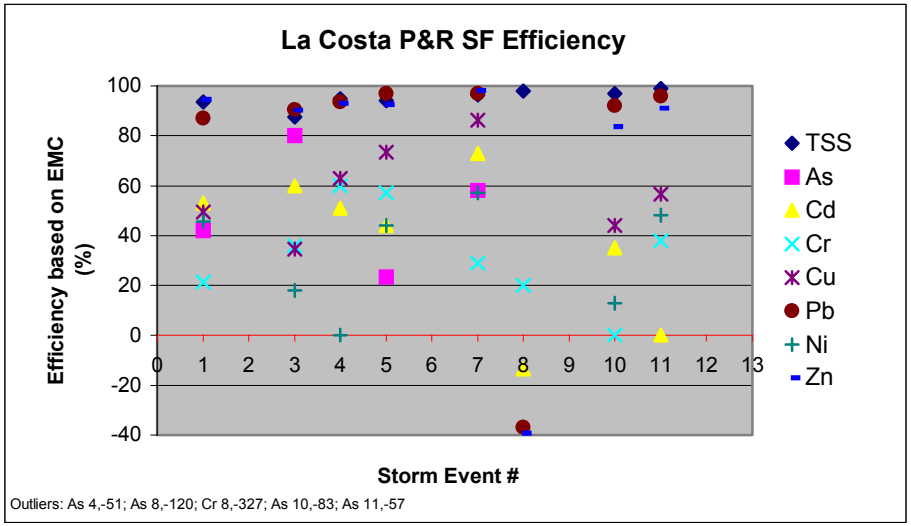
Figure 1-105b StormFilter™ Efficiencies for TSS and Total Metals

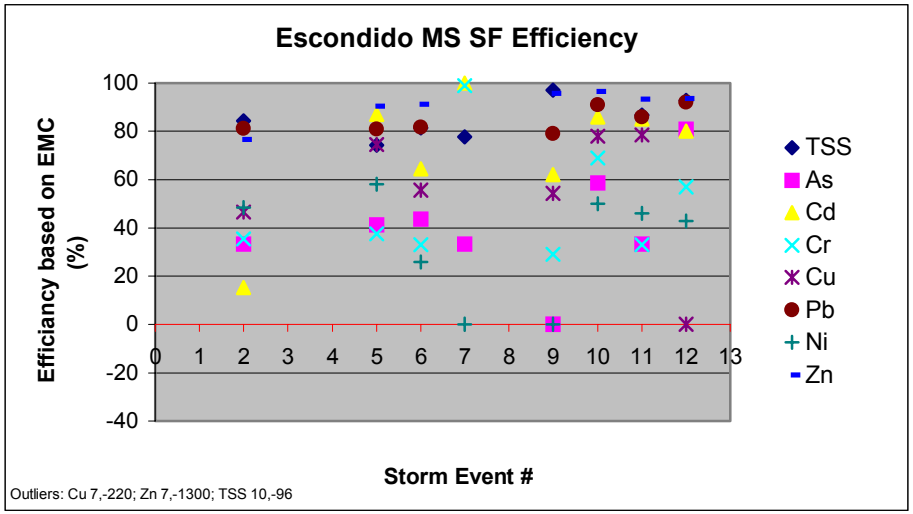


Outlier Key: [analyte] [storm event], [efficiency]

Figure 1-105c Sand Filter Efficiencies for TSS and Total Metals

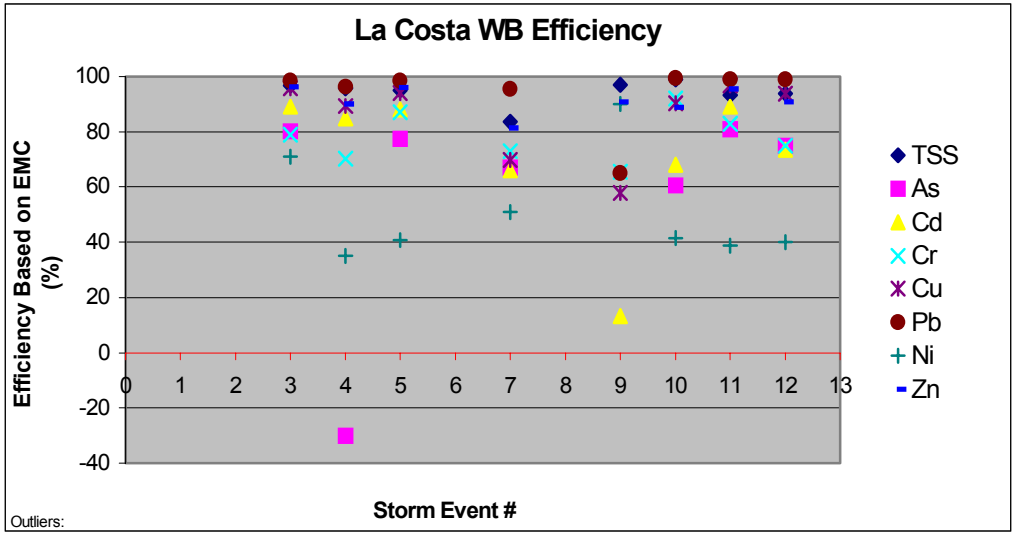






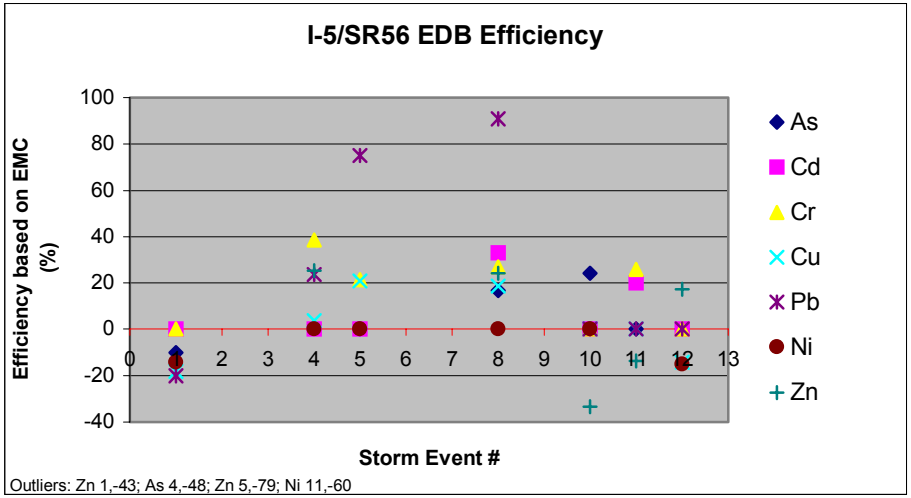
Outlier Key: [analyte] [storm event], [efficiency]

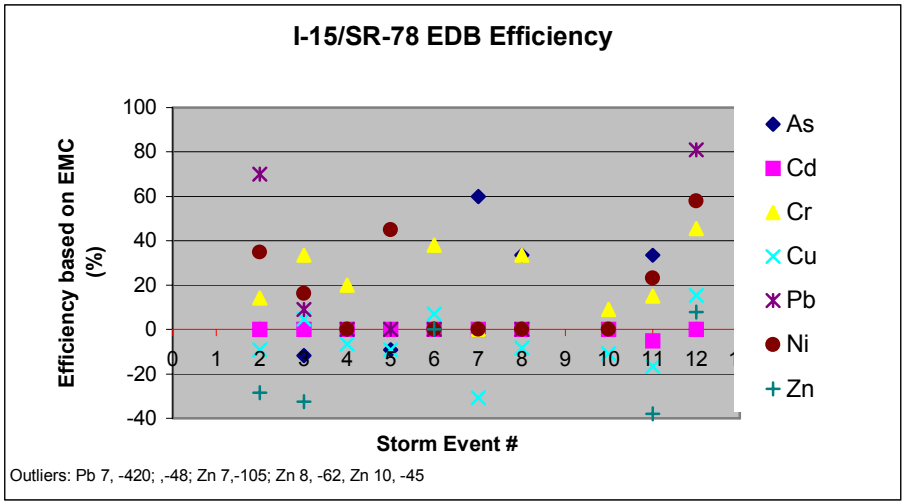
Figure 1-105d Wet Basin Efficiencies for TSS and Total Metals



Outlier Key: [analyte] [storm event], [efficiency]

Figure 1-105e Extended Detention Basin Efficiencies for Dissolved Metals





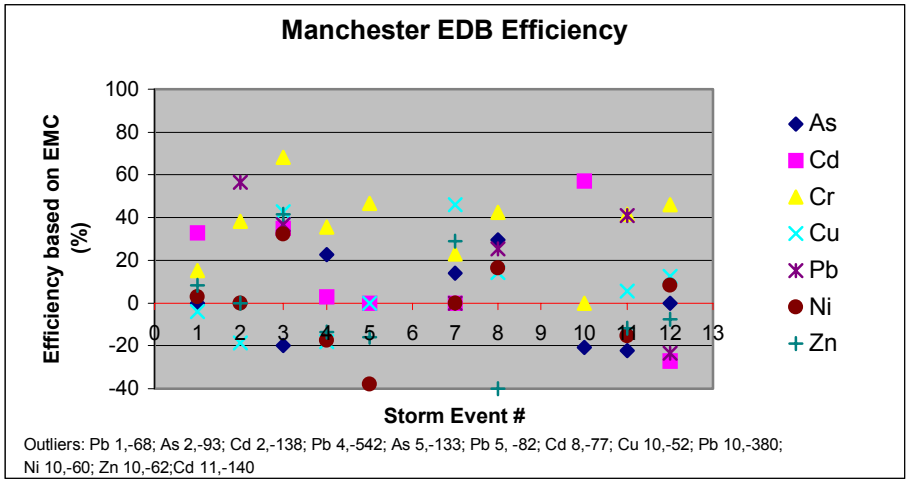


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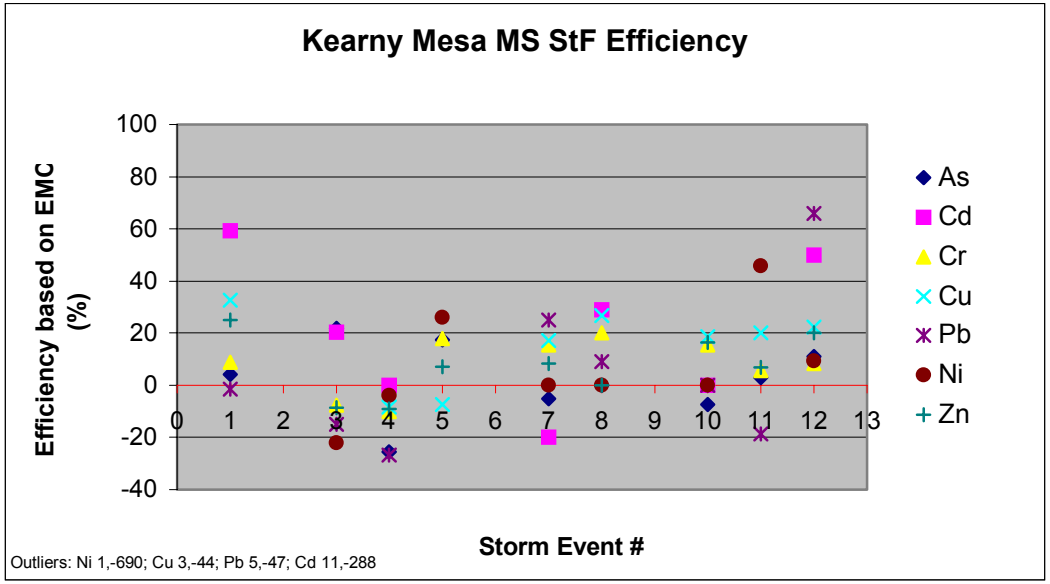
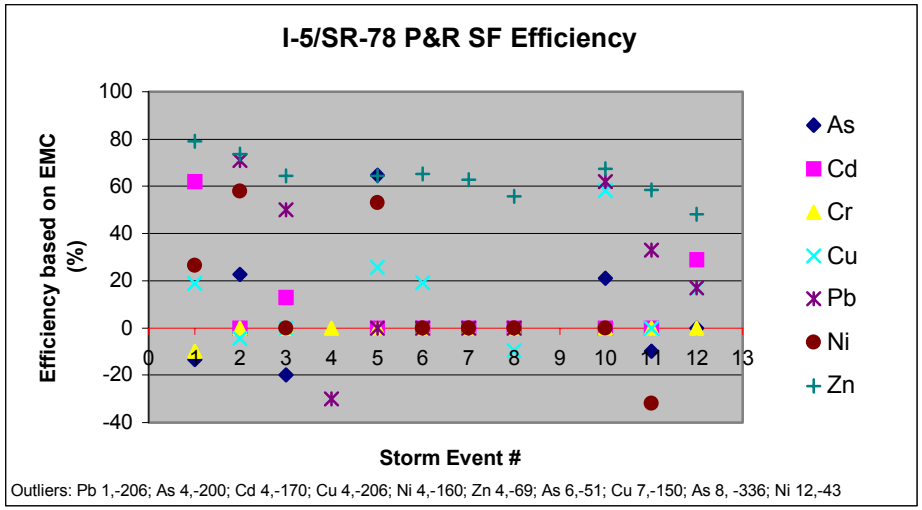
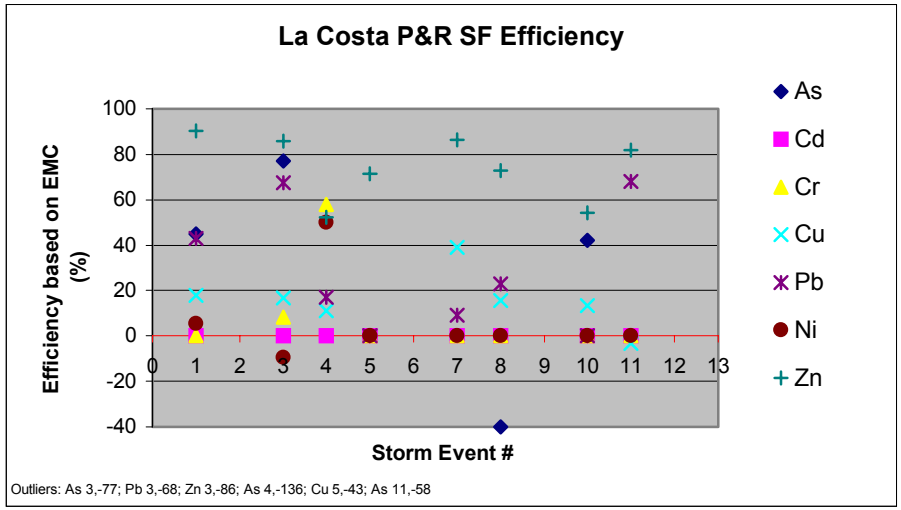
Figure 1-105f StormFilter™ Efficiencies for Dissolved Metals



Outlier Key: [analyte] [storm event], [efficiency]

Figure 1-105g Sand Filter Efficiencies for Dissolved Metals





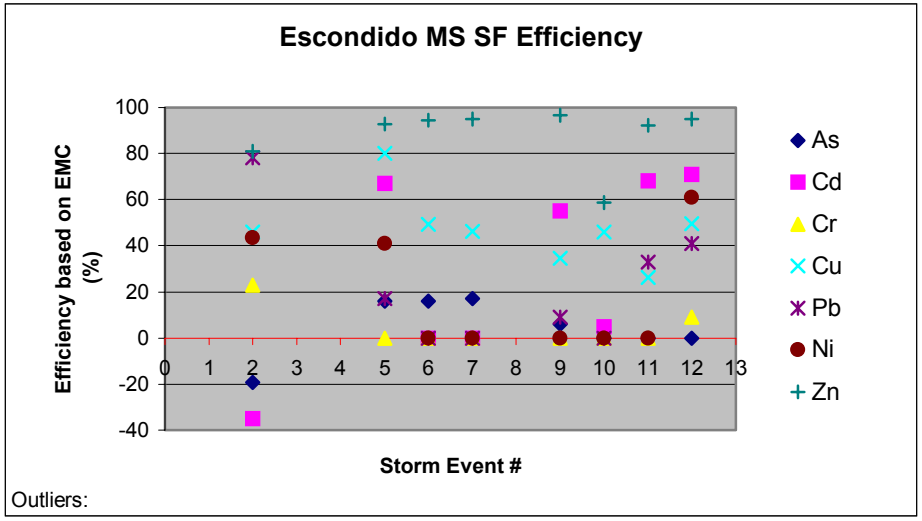


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Figure 1-105h Wet Basin Efficiencies for Dissolved Metals

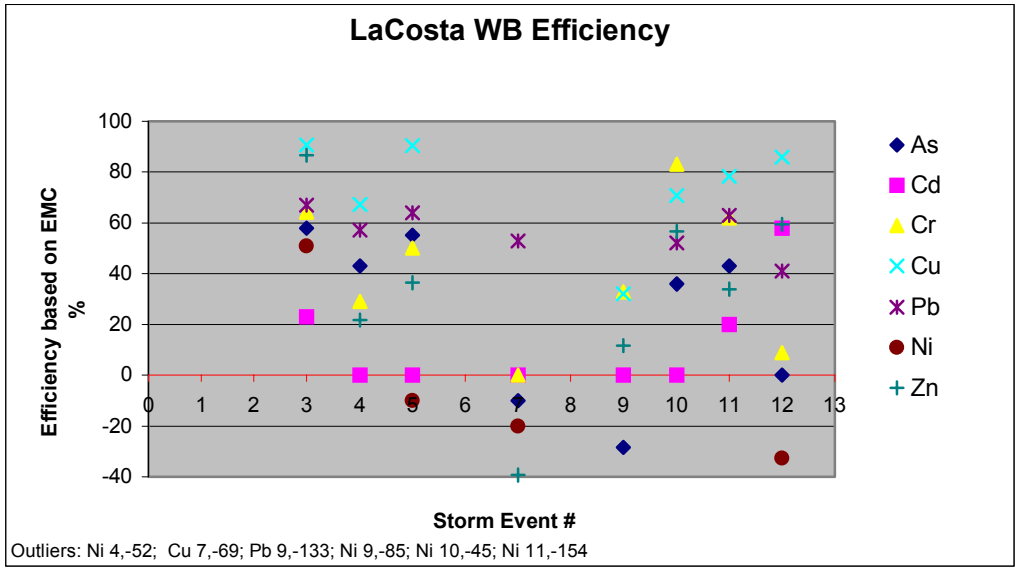

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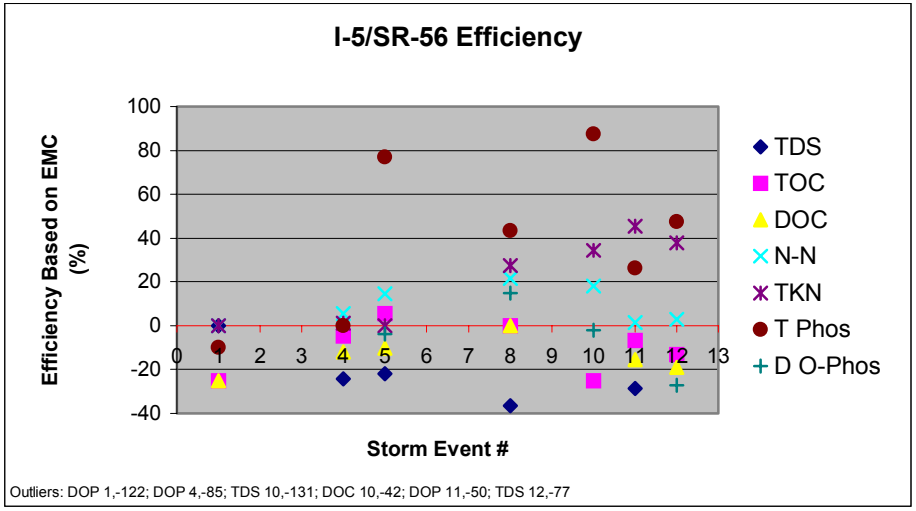
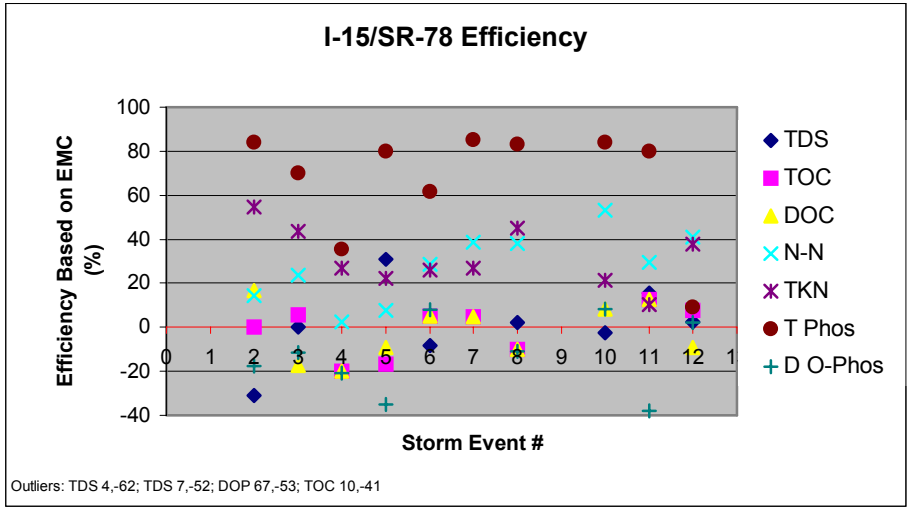
Figure 1-105i Extended Detention Basin Efficiencies for TDS, Organic Carbon, and Nutrients





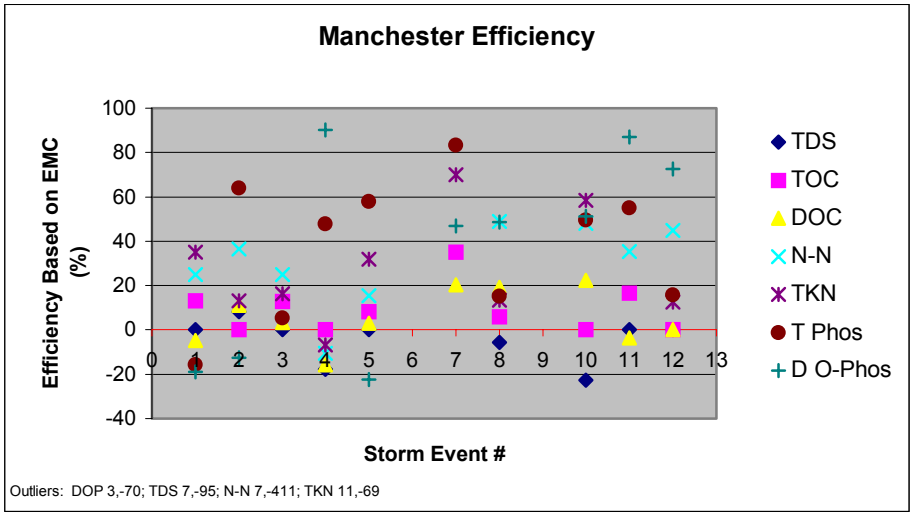


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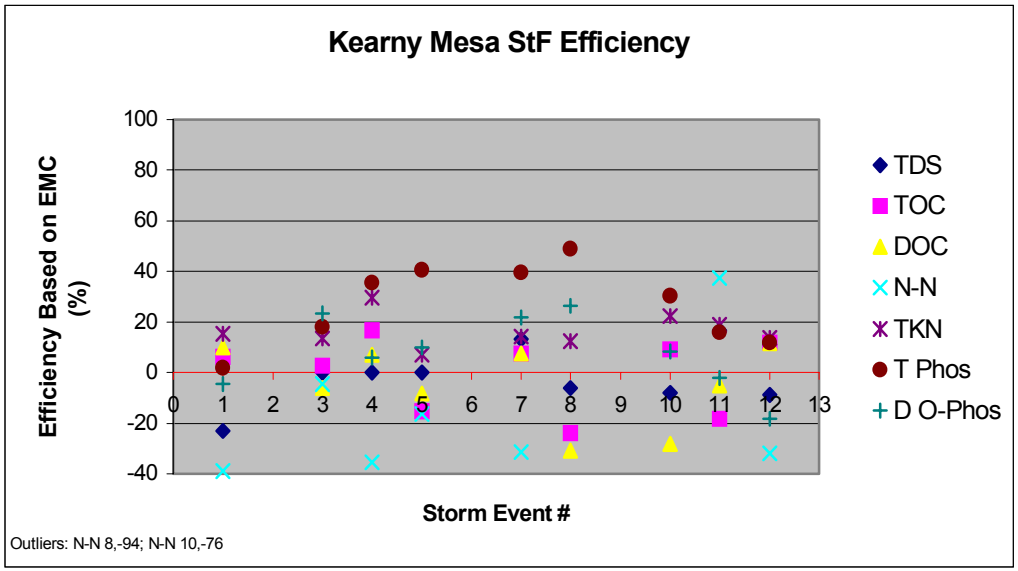
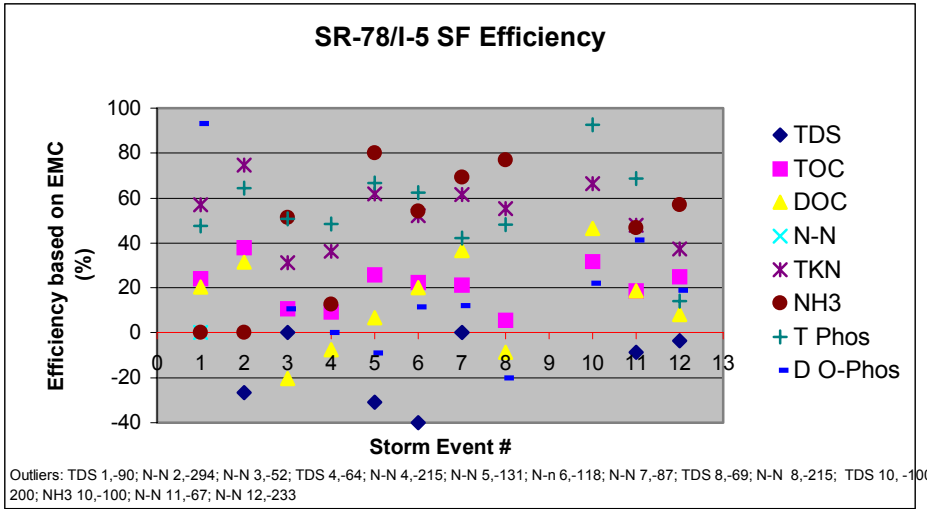
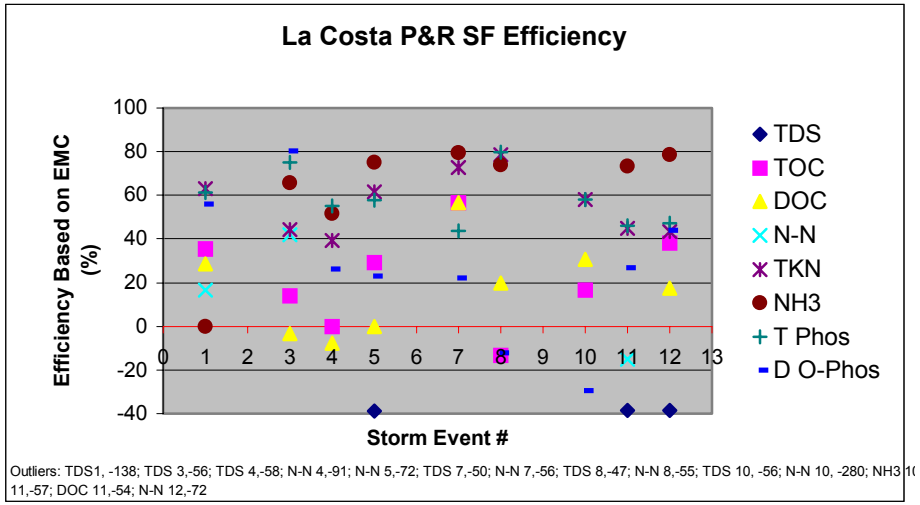
Figure 1-105j StormFilter™ Efficiencies for TDS, Organic Carbon, and Nutrients



Outlier Key: [analyte] [storm event], [efficiency]

Figure 1-105k Sand Filter Efficiencies for TDS, Organic Carbon, and Nutrients





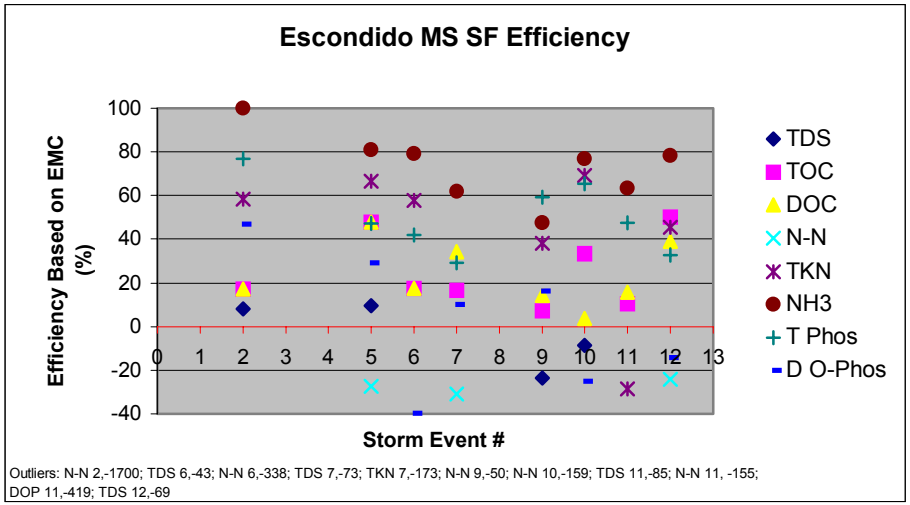


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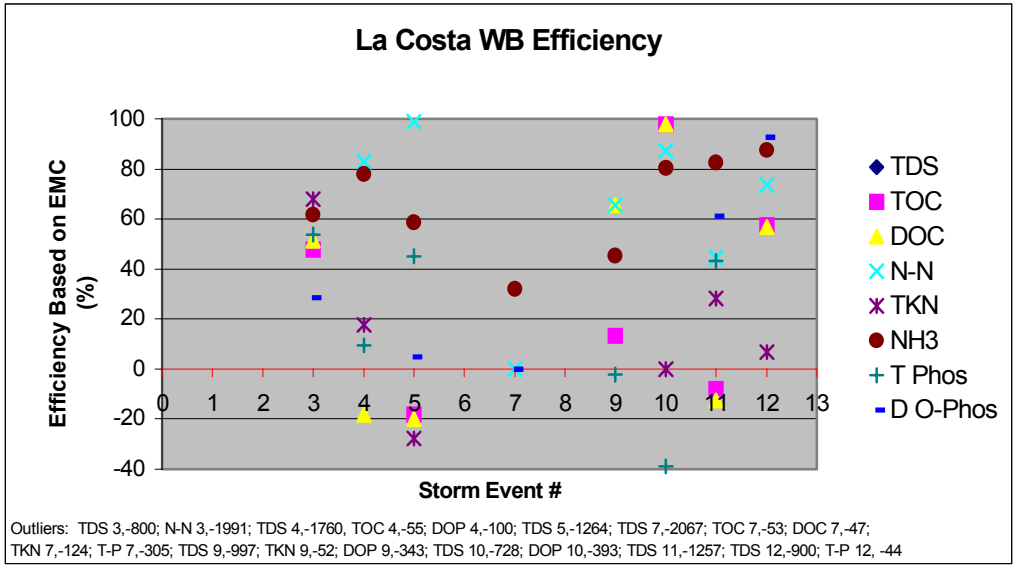
Figure 1-105l Wet Basin Efficiencies for TDS, Organic Carbon, and Nutrients



Outlier Key: [analyte] [storm event], [efficiency]

2.0 BMP OPERATIONS

Performance assessments of BMP operations were determined using empirical observations (Form H of the OMM Volume II Field Guidance Notebooks). Empirical observations were taken at variable times during monitored events. Field crews attempted to assess BMP operations at the beginning, middle and end of a storm event. Traffic, weather and sufficient light sometimes limited these observations.

Observations generally provided information on the following:

- Present meteorological characteristics
- Rainfall (start times and intensity indication)
- Hydrologic and hydraulic characteristics (flowing and/or standing water, channelization)
- Water level
- Inlet conditions (problems affecting performance)
- Evidence of debris (organic or trash), scouring, resuspension or erosion
- Description of amount and location of sediment accumulation
- Water quality appearance (visual, olfactory)
- Vegetation condition
- Outlet conditions (problems affecting performance)
- Structural condition of facility

Other site-specific observations were taken according to the checklists present in Form H.

2.1 BMPs Evaluated

Tables 2-1a through 2-1h summarize empirical observation of BMP performance. Following each table, an overall review of each BMP is provided. More detail on BMP operations is available at the following web site: http://www.rbf.com/caltrans/

2.1.1 Biofiltration Strip

Table 2-1a: Comparison of Biofiltration Strips Operational Performance

Site No. & Name	No. of Observed Events	Hydrologic/Hydraulic Characteristics	Inlet Conditions	Water Quality	Solids Deposition/Resuspension	Erosion	Vegetation	Outlet Conditions	Comments
112207a Carlsbad MS (east)	10	Flow concentrated itself in the western half of the strip	Inlet channel caused water to enter at west end	Several observations of an oil and grease sheen. One observation of a hydrocarbon odor.	Solid deposition occurred in inlet channel.	No notable observations	No notable observations	Functioned as designed	None
112207a Carlsbad MS (west)	10	Flow was diverted away from the strip due to an elevated section of the tarmac.	Matted grass due to the rabbit fence and debris caused water to divert away from the biostrip. Also See comment under Hydraulic characteristics .	Several observations of an oil and grease sheen. One observation of a hydrocarbon odor.	No notable observations	No notable observations	No notable observations	Crack observed between curb of IT and Biostrip west effluent channel allows water to flow from IT to strip effluent.	None

Overall Review

The BMP at the Carlsbad Maintenance Station uses a treatment train approach with a biofiltration strip and an infiltration trench. There are two biofiltration strips at this site. The eastern strip collects runoff from the eastern half of the maintenance station and discharges into the infiltration trench. The western strip collects runoff from the western half of the maintenance station and discharges out of the maintenance station to the access road, Paseo Del Norte. The most significant observations at this site were related to the hydrologic/hydraulic characteristics. The eastern strip inlet channel was noted to concentrate flow at the western half of its strip. Sediments collected in the influent channel and level spreader, in addition, sediment deposition was noted at the discharge point of the eastern strip at the interface with the infiltration trench. In the case of the western strip, a majority of the water that could

enter the facility was being diverted around the strip and out onto Paseo Del Norte due to a raised section of asphalt near the strip. In addition, early in the season, it was noted that the rabbit fencing and grass were causing water entering into the biostrip to slow and be diverted around the facility. Other observations included the division of the curb separating the trench from the biostrip allowing some water to flow from the trench to the strip effluent channel when the IT reaches the proper level.

Toward the end of the storm season, it was noted that the concrete trough that collects runoff from the bio-strip at the Carlsbad Maintenance Station is settling away from the bio-strip. The concrete is also cracking in places. When the standing water in the adjacent infiltration trench is at the level at which it flows out of the infiltration trench overflow, it also infiltrates into the trough through the cracks. It is then sampled as effluent from the bio-strip by the sampling equipment.

On May 1st, Martha Blaine, horticultural consultant, performed the annual inspection of the bio-strip at the Carlsbad Maintenance Station. She observed that the salt grass coverage ranged from 90% to 100%. The few bare areas of soil were the result of gopher activity. She noted a few individuals of sowthistle in the grass.

At the bio-strip associated with the infiltration trench at the Carlsbad Maintenance Station, she observed that the salt grass coverage ranged from 95% to 100%. The few bare areas of soil were the result of gopher activity. She noted a few individuals of sowthistle in the grass. She also noted that the salt grass growing through the rabbit fence that surrounds the strip had evidence of being eaten by rabbits.

2.1.2 Biofiltration Swale

Table 2-1b: Comparison of Biofiltration Swales Operational Performance

Site No. & Name	No. of Observed Events	Hydrologic/Hydraulic Characteristics	Inlet Conditions	Water Quality	Solids Deposition/Resuspension	Erosion	Vegetation	Outlet Conditions	Comments
112205 SR-78/Melrose	10	Flow was evenly distributed through swale, no channelization or ponding	Trash and sediment located at inlet spreader	No notable observations	Small amount evident at inlet spreader	Some minor erosion near inlet structure caused by gopher holes	North slope in good condition south slope with large bare spots. See below for results of M. Blane May 1 assessment.	Functioned as designed	Tall grass present at inlet
112206 I-5/Palomar	10	Flow bypassed site through a hole caused by erosion near the influent. Once past the hole, flow was evenly distributed through swale, no channelization or ponding	Some flow bypassed at inlet channel. Pine needle accumulation at inlet spreader	No notable observations	Small amounts of deposition noted near the inlet and effluent spreaders	Deep erosion in several places on FWY side before the outlet. Also occurring around guard rail posts	Grassed trimmed down to 1" by highway crews. It has never fully recovered. See below for results of M. Blane May 1 assessment	Functioned as designed	

Overall Review

There are two biofiltration swales located in Caltrans District 11, Melrose and Palomar. In the case of the Melrose Swale, field crews noted a small area the April 21,2001 that appeared to have been eroded from water coming off of the adjoining frontage road. Many noteworthy observations for were made at the Palomar site. On several occasions, it was noted that water flowed from a low spot in the swale wall near the influent and onto Avenida Encinas the adjoining frontage road. Solids of human and natural origins were deposited often. Energy dissipaters throughout the swale have slowly filled up over the season, and debris from the roadside has blown and washed into the swale. Large sections of the swale side slopes have deteriorated due to runoff coming off the freeway. Water has carved several deep cuts into the slope and around the guard rail posts. Highway crews preparing the site for maintenance trimmed vegetation in October down to 1", and the grass has never fully recovered. Gophers have been a constant struggle at this site. They have been an instigator of erosion in several of the areas where deep gouging is occurring in the slopes.

On May 1st, Martha Blane, a horticultural consultant, performed the annual assessment of the salt grass and other vegetation at the Melrose and Palomar bio-filtration swales. At the Melrose swale she observed that the coverage of salt grass in the invert of the swale was 90% to 95%. The few areas of bare soil were the result of gopher activity. The coverage adjacent to Highway 78 on the north side-slope has in excess of 90% coverage. The coverage on the south side-slope adjacent to Hacienda Avenue ranged from 30% to 50%. Much of the coverage on the south slope was made up of perennial rye. This slope is very steep and is heavily shaded. Other than the rye grass on the south slope, minimal weed growth was noted anywhere. Weeds consisted of garland chrysanthemum, prickly lettuce, western ragweed, oats, perennial rye, and brome grasses.

At the Palomar swale she made the following observations of coverage:

Swale Segment	Invert Coverage	Side Slope Coverage
North	70-80%	75-80%
Middle	40-60%	20-30%
South	20-50%	30-50%

The cause of nearly all of the bare soil areas was gopher activity. Some weeds were noted, mainly sowthistle, mustard, western ragweed, and plantain. The site had been weeded by Native Landscape on March 30th. Prior to that it had been heavily overgrown with weeds.

2.1.3 Extended Detention Basin

Table 2-1c: Comparison of Extended Detention Basins Operational Performance

Site No. & Name	No. of Observed Events	Hydrologic/Hydraulic Characteristics	Inlet Conditions	Water Quality	Solids Deposition/ Resuspension	Erosion	Vegetation	Outlet Conditions	Comments
111101 I-5/SR-56	8	Water pools at inlet riprap and berm rip-rap, trash holds at berm.	Standing water present	No notable observations	No notable observations	No notable observations	No notable observations	Flow over standpipe occurred on 1/11/2001 event	None
111102 I-15/SR-78	9	Functioned as designed	Functioned as designed	Same inlet and outlet turbidity	Sedimentation at inlet channel	No notable observations	No notable observations	No notable observations	None
111105 I-5/Manchester	10	Functioned as designed	Functioned as designed	No notable observations	Solid deposition at inlet concrete apron	Erosion around concrete wall at inlet	No notable observations	Long detention times	None

Overall Review

There are three EDBs located in Caltrans District 11: I-5/SR-56, I-15/SR-78, and I-5/Manchester. Eight events were monitored at I-5/SR-56 EDB, nine at I-15/SR-78 EDB, and 10 at Manchester. Each basin included a high rainfall event during the monitoring season ranging from 1.8-2.8 inches. Major observations noted at I-5/SR-56 site were related to a high rainfall event. Water flowed over the outlet riser on January 11, 2001 event when the total rainfall was 2.18 inches. No flow went over the emergency weir. Some erosion occurred around the inlet pipe, and sedimentation and standing water occurred at the inlet riprap. The I-15/SR-78 EDB functioned as designed. Sedimentation/sand deposits in the influent buried sensors a number of times and deposits were noted downstream from the inlet. The I-5/Manchester EDB functioned as designed with minor amounts of erosion at the inlet.

2.1.4 Infiltration Basin

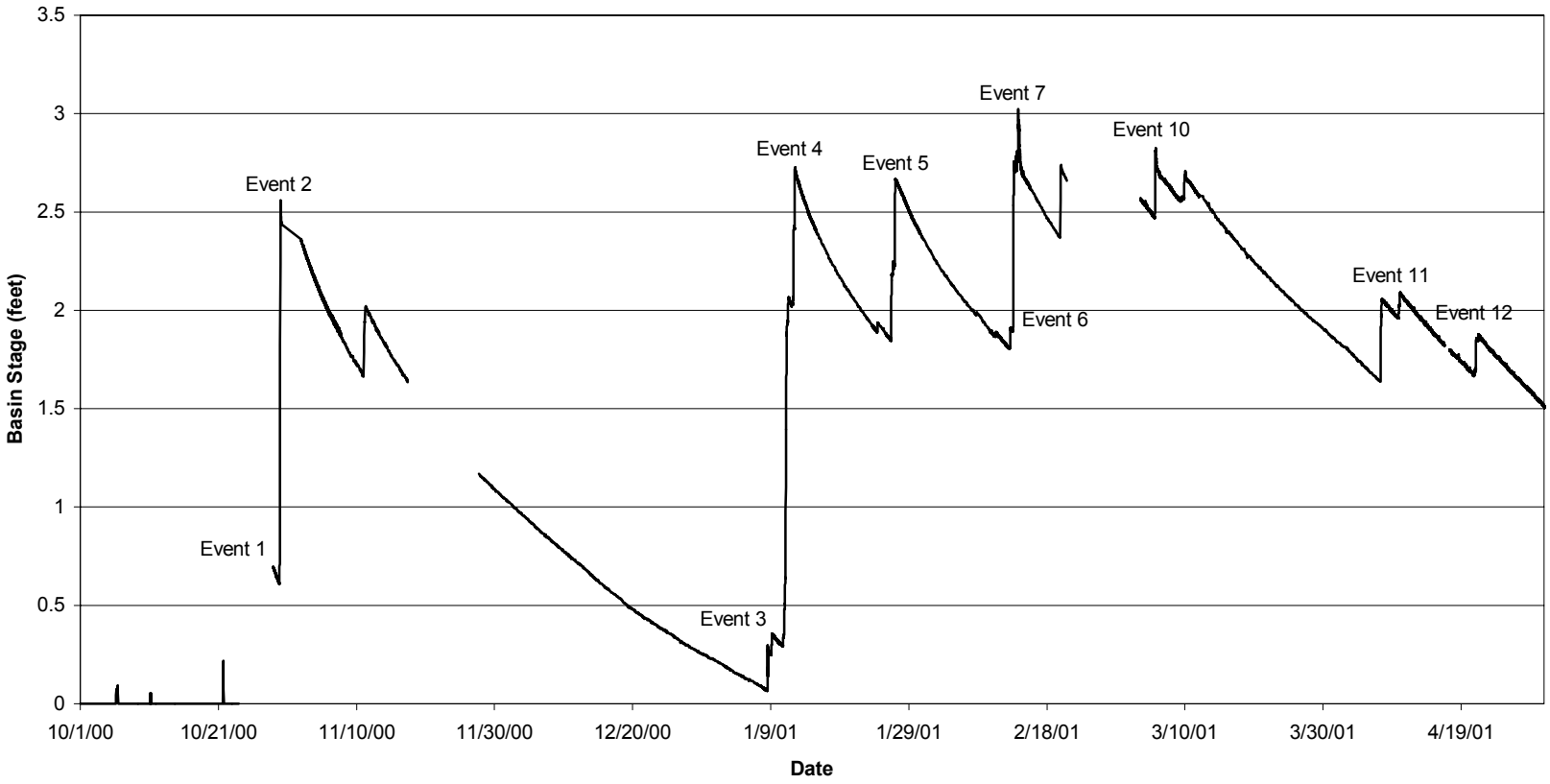
Table 2-1d: Comparison of Infiltration Basins Operational Performance

Site No. & Name	No. of Observed Events	Hydrologic/Hydraulic Characteristics	Inlet Conditions	Water Quality	Solids Deposition/Resuspension	Erosion	Vegetation	Infiltration Conditions	Comments
111103 La Costa (w)	9	After 1/10/2001 event basin overflowed onto access road	Functioned as designed	No notable observations	Trash collected at corners near influent side of basin	No notable observations	Woody wetland vegetation present	Site does not infiltrate at design rate	None

Overall Review

The basin overflowed on the January 10, 2001 event, covering parts of the access road. At the end of the February 23 event the basin staff gauge read approximately 3.0'. Figure 2-1 on the following page provides detail on basin stage throughout the 2000/2001 wet season.

Figure 2-1 La Costa Infiltration Basin Stage for the 2000-2001 Wet Season



2.1.5 Infiltration Trench

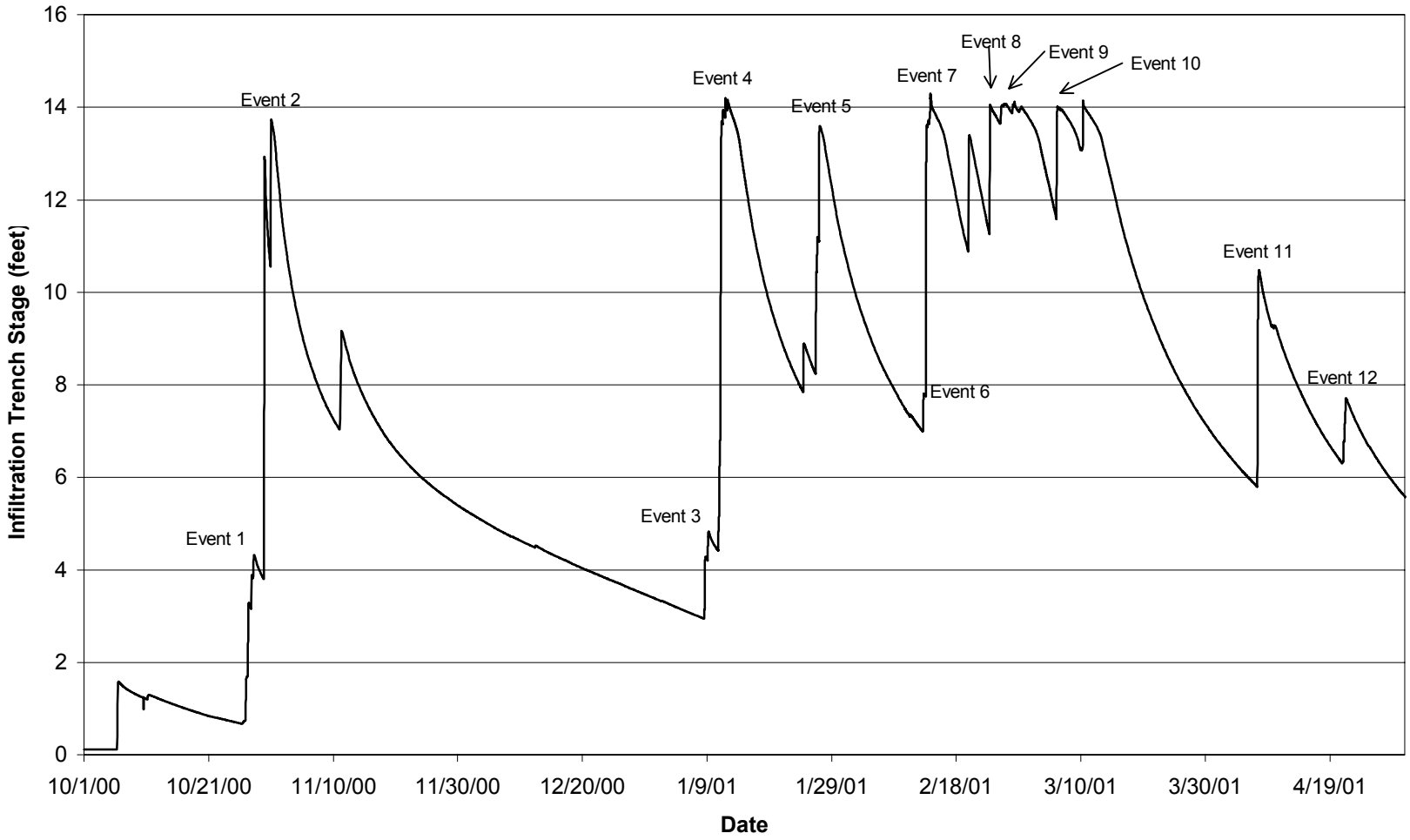
Table 2-1e: Comparison of Infiltration Trenches Operational Performance

Site No. & Name	No. of Observed Events	Hydrologic/Hydraulic Characteristics	Inlet Conditions	Water Quality	Solids Deposition/Resuspension	Infiltration Medium	Overflow Conditions	Comments
112207b Carlsbad MS	10	Bypass was observed from the trench during the 1/10, 2/13, 2/23, and 3/10/2001 events	When water filled IT, water would back out onto the accompanying biostrip.	Oil and grease sheen was the most noted observation.	Leaf litter from surrounding vegetation was noted frequently. When the trench overflowed, it was noted that the leaves were resuspended and concentrated downstream near the overflow bypass.	Infiltrates at rate slower than the designed rate	Bypass was observed from the trench during the 1/10, 2/13, 2/23, and 3/10/2001 events	None

Overall Review

The BMP at the Carlsbad Maintenance Station uses a treatment train approach with a biofiltration strip and an infiltration trench. For empirical observations regarding the biofiltration strips, please refer to section 2.1.1 page 2-2. The major observation of the infiltration trench was that bypass occurred on the January 10, February 13, and February 23, 2001 events. An observation was also noted for an occurrence on March 10, 2001, however this event was not officially monitored. The field crews recorded a maximum stage on February 23 in the observation well of 14 ft. Figure 2-2 on the following page provides more detail on stage in the observation well throughout the 2000/2001 wet season. Water was often noted to have oil and grease sheen on the surface. It should be understood that water observations for the infiltration trench were often combined with the eastern biostrip observations, due to the fact that these two media work in conjunction with each other. Water was observed on several occasions flowing between the curb of the infiltration trench and the western biostrip effluent channel.

Figure 2-2 Carlsbad MS Trench Observation Well Stage for the 2000-2001 Wet Season



2.1.6 Media Filter- Sand

Table 2-1f: Comparison of Media Filter - Sand Operational Performance

Site No. & Name	No. of Observed Events	Hydrologic/Hydraulic Characteristics	Inlet Conditions	Water Quality	Solids Deposition/Resuspension	Erosion	Media Conditions	Outlet Conditions	Comments
112202 Escondido MS	11	Functioned as designed	Functioned as designed	No notable observations	No notable observations	NA	Impediment to flow, replacement, and impediment.	Functioned as designed	None
112203 La Costa P&R	11	Standing water remained in pre-sedimentation basin for >72 hours	Functioned as designed	No notable observations	Resuspension observed at inlet to pre-sedimentation chamber	No notable observations	Water pools at eastern end	Functioned as designed, but the discharge hole was reduced in size.	None
112204 I5/SR78 P&R	10	Functioned as designed	Functioned as designed	No notable observations	Deposition evident at inlet pipe	Functioned as designed	No notable observations	Functioned as designed, but discharge hole was reduced in size.	Trash in pre-sed chamber

Overall Review

There are three sand filters located in Caltrans District 11: a Delaware type located at Escondido MS and two Austin types located at La Costa Park and Ride and I-5/SR-78 Park and Ride. Each of these BMPs experienced a monitored event of approximately 2 inches, and additional events between 1 and 1.5 inches. Due to these large rainfalls, some flow at the Escondido MS and La Costa Park and Ride was observed bypassing the inlet structure. It is believed that the I-5/SR78 site also bypassed, but no field observations were made to confirm this. The Delaware type sand filter at Escondido MS drained very slowly for the first three storm events monitored due to clogging with fine grained material. The top two inches of sand was replaced, and monitoring of the next storm event was cancelled to let the fines wash out. The BMP then operated well for the following 3-4 events but began to become impeded again

during the last two events. A slowly leaking gate valve was observed at Escondido. Attempts to be clean out sediment that be blocking the valve during between storm maintenance periods had no effect. The water leaking from the valve went untreated. The Austin sand filters at La Costa P&R and I-5/SR-78 P&R had been modified before the start of this storm season by making smaller drain metering holes from the presedimentation chamber to the sand filter. This had the effect of extending the detention times in the chambers and creating standing water issues. Overall, these two BMP worked as intended.

2.1.7 StormFilter™

Table 2-1g: Comparison of StormFilter™ Operational Performance

Site No. & Name	No. of Observed Events	Hydrologic/Hydraulic Characteristics	Inlet Conditions	Water Quality	Solids Deposition/Resuspension	Treatment Medium Condition	Outlet Conditions	Comments
112201 Kearny Mesa MS	10	All three media vaults observed to have water present during 10/28/2000, and 1/11/2001,2/13/2001	Functioned as designed	Oil and grease sheen on influent water. No sheen observed on effluent water.	Minor deposition evident in the inlet pipe and the media vaults	Functioned as designed	Water surcharged during 10/28/2000 storm. No bypass observed, Functioned as designed	None

Overall Review

The StormFilter™ at the Kearny Mesa Maintenance Station generally functioned as designed throughout the 2000/2001 wet season. Two large storms (1.29 inches and 1.20 inches total rain) were included in the 10 observed events, with others being between 0.28 and 0.73 inches total. The October 28, 2000 event totaled 0.7 inches of rain, but had a very high rainfall intensity of 3 inches/hour. This caused a very high rate of flow through the BMP causing the influent pipe to surcharge. Water flowed into and filled all three bays of the BMP, causing the effluent pipe to surcharge in addition to the influent. During this event, the site was at the limits of it hydraulic capacity, but no bypass overflow was observed. Surcharging of the flumes was also measured on subsequent events by the flow meters. While looking at the data, Storm Control suspected that the facility was discharging water before the cartridges activated. During the January 8, 2001 storm event, field personnel were instructed to observe start times for the influent and effluent flow. Upon arrival personnel noted that the level in the first bay was approximately 5 inches with no effluent flow. Six minutes later, the effluent began to flow with the chamber only reaching a level of 6 inches. An hour after beginning observations, effluent flow was continuing, but the cartridges still had not tripped. Other observations at Kearny Mesa included an oil and grease sheen on water entering the structure but upon departure, it was most often clear with no observed sheen. There was sediment deposition evident in the inlet pipe and the first media chamber where approximately 0 – 2-inches were deposited, less was noted in the second and third media chambers.

2.1.8 Wet Basin

Table 2-1h: Comparison of Wet Basins Operational Performance

Site No. & Name	No. of Observed Events	Hydrologic/Hydraulic Characteristics	Inlet Conditions	Water Quality	Solids Deposition/Resuspension	Erosion	Vegetation	Outlet Conditions	Comments
111104 La Costa (se)	10	Functioned as designed with retrofit plumber's test plug.	Some sediment and trash build up at influent	Effluent quality improved over season as the reeds grew back from being cut back	Minor sand deposits at influent	No notable observations	Good growth	Functioned as designed	None

Overall Review

The major observation at the La Costa Wet Basin, was that with the 6-inch plumber's test plug installed to close the 6-inch pipe, the BMP operated very well. Minor sediment and trash deposits occurred at the influent, and a channel was developing through the reeds near the mouth of the influent pipe. Sandbags used to control the height of the pond were displaced during most storm events, but this did not affect the performance of the BMP due to the above mentioned test plug. Visual effluent water quality appeared to improve through the season as the reeds grew back from being cut back. Water went from being brown and cloudy, to green with no turbidity.

On May 1st Martha Blane, a horticultural consultant, performed an assessment of the vegetation in and surrounding the wet basin. The majority of wetlands vegetation in zones 1 and 2 consisted of cattails (70-80%) and *Scirpus californica* (20-30%). Very few *Scirpus robustus* were noted. Also, few weeds were noted, with rabbitsfoot grass being the primary weed observed. The willows, mulefat, and ground cover plantings looked healthy and normal for that time of year. Overall cover ranged from 40-95%. Minimal weed growth was noted. Weeds consisted of mustard, wild radish, *Limonium* spp., cocklebur, *Melitotus* spp., garland chrysanthemum, prickly lettuce, bur-clover, and brome grasses.

3.0 BMP AND SITE MAINTENANCE

The primary objective of this maintenance program is to ensure that each site and BMP is properly maintained to achieve optimum performance. Preventive and corrective maintenance measures were undertaken during the 2000/2001-year in accordance with the OMM Plan and the Maintenance Indicator Document (MID). These measures included:

- Removal of standing water.
- Sediment erosion control and removal.
- Structural integrity.
- Landscape management.
- Graffiti removal.
- Trash and debris removal.
- General facility maintenance.

Regularly scheduled maintenance inspections were conducted monthly, with weekly surveys being performed during extended periods of wet weather. Maintenance visits were also conducted after each large storm event (greater that 0.5-inches). During the visits, maintenance observations and needs were documented on the "BMP Site Inspection Checklist" (Form C of the OMM Volume II Field Guidance Notebooks). Based on this documentation, any immediate maintenance needs were arranged

3.1 Summary of Inspection and Maintenance Activities

The following sections describe maintenance activities performed at each BMP site from June 2000 through April 2001. A comparison of maintenance needs along with frequencies required at each BMP is graphically shown in Figures 3-1a through 3-1g. More detail on BMP maintenance is available at the following web site: http://www.rbf.com/caltrans/. As maintenance frequency is sometimes a function of how long a BMP has been operational, Table 3-1 provides a list of the BMPs in District 11 and the date that each BMP became operational.

Table 3-1 District 11 BMP Operational Dates

Site ID.	BMP Location	BMP Type	Operation Date
111101	I-5/SR-56	Extended Detention Basin	1/24/99
111102	I-15/SR-78	Extended Detention Basin	1/24/99
111103	I-5/La Costa Ave (W)	Infiltration Basin	1/24/99
111104	I-5/La Costa Ave (SE)	Wet Basin	10/1/99
111105	I-5/Manchester Ave	Extended Detention Basin	10/1/99
112201	Kearny Mesa MS	Media Filter StormFilter™	10/1/99
112202	Escondido MS	Media Filter Sand Delaware	2/16/99
112203	I-5/La Costa Ave Park & Ride	Media Filter Sand Austin	2/16/99
112204	I-5/SR-78 Park & Ride	Media Filter Sand Austin	2/26/99
112205	SR-78/Melrose Dr	Biofiltration Swale	3/1/99
112206	I-5/Palomar Airport Rd	Biofiltration Swale	10/1/99
112207	Carlsbad MS	Bio-strip / Infiltration Trench	10/1/99

3.1.1 Biofiltration Strip

Figure 3-1a Frequency of Maintenance Activities at a Biofiltration Strip

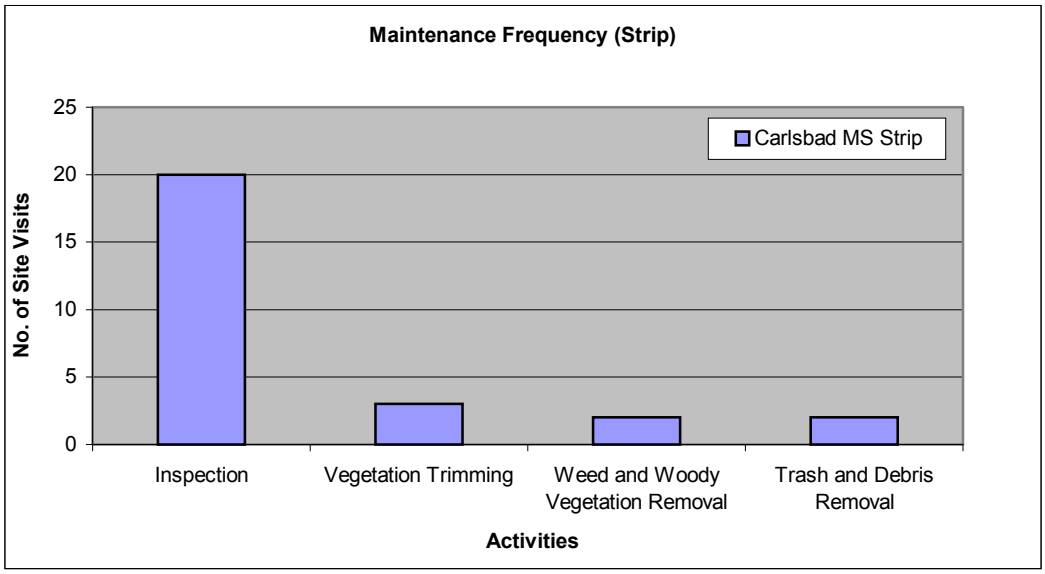
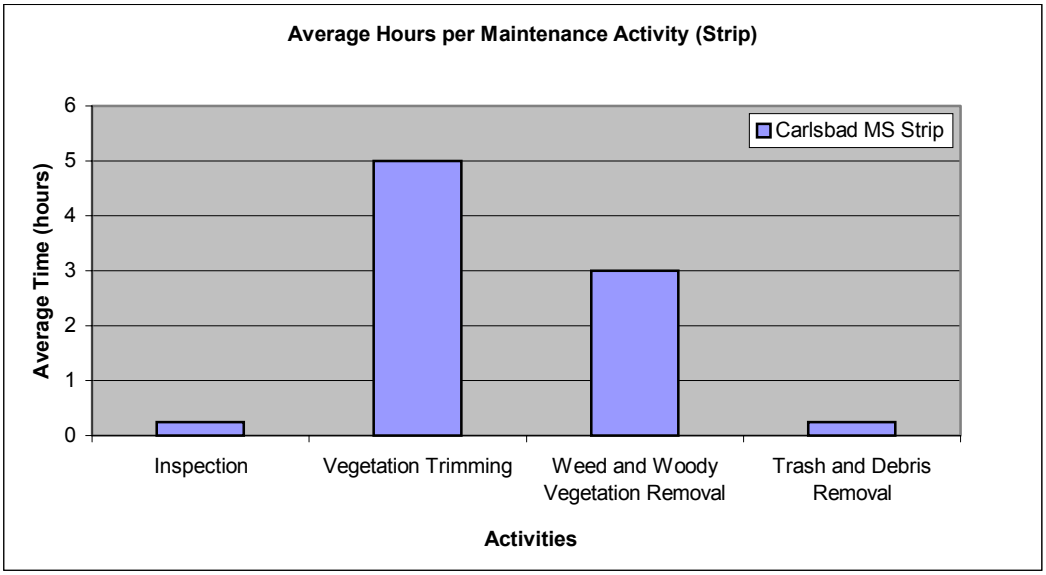


Figure 3-1b Average Hours per Maintenance Activity at a Biofiltration Strip



Overall Review

The Carlsbad MS bio-filtration strip was first operational in October 1999. Initially, the most common maintenance activity on the strip had been irrigation. Once operational in October 1999, irrigation was discontinued. Irrigation was not carried out during the following storm season, during the following summer, or during this 2000/2001-storm season. The irrigation system itself was removed later (May 2000). The most common maintenance activity at the Carlsbad MS strip was vegetation trimming followed by woody vegetation removal. Vegetation trimming was done three times, and took an average of five man-hours to accomplish. Weeds and woody vegetation removal was done twice and required approximately three man-hours. Trash and debris removal requiring special trips to the site occurred twice, but trash and debris were also routinely removed during the monthly and post-storm site inspections. These inspections were carried out 20 times during this reporting period, at an average time of 0.25 hours.

3.1.2 Biofiltration Swale

Figure 3-1c Frequency of Maintenance Activities at a Biofiltration Swale

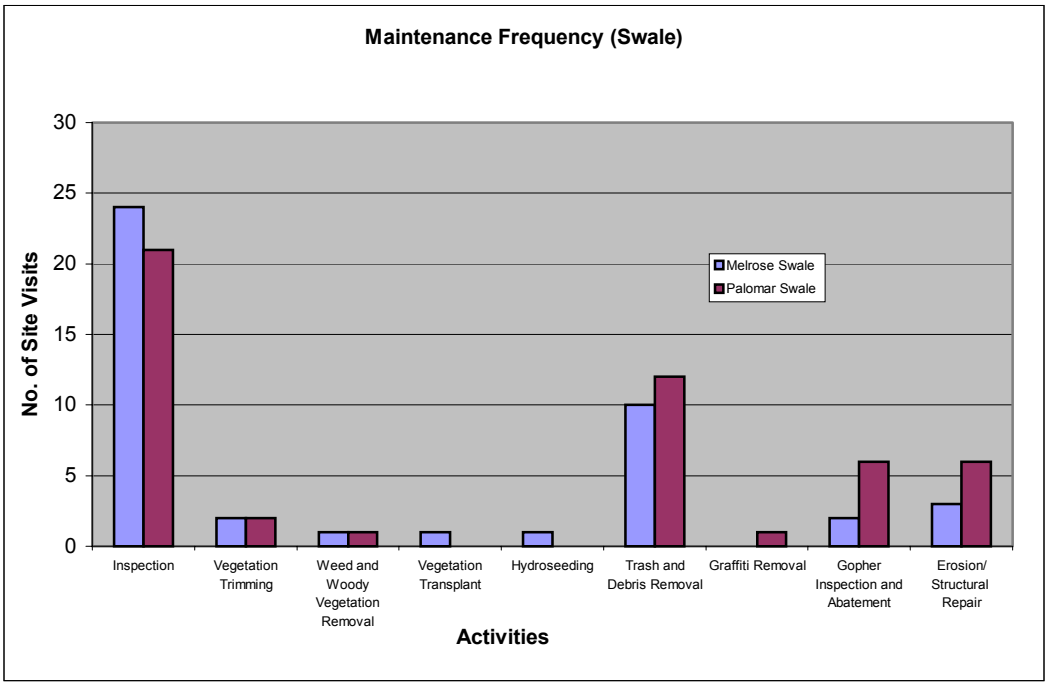
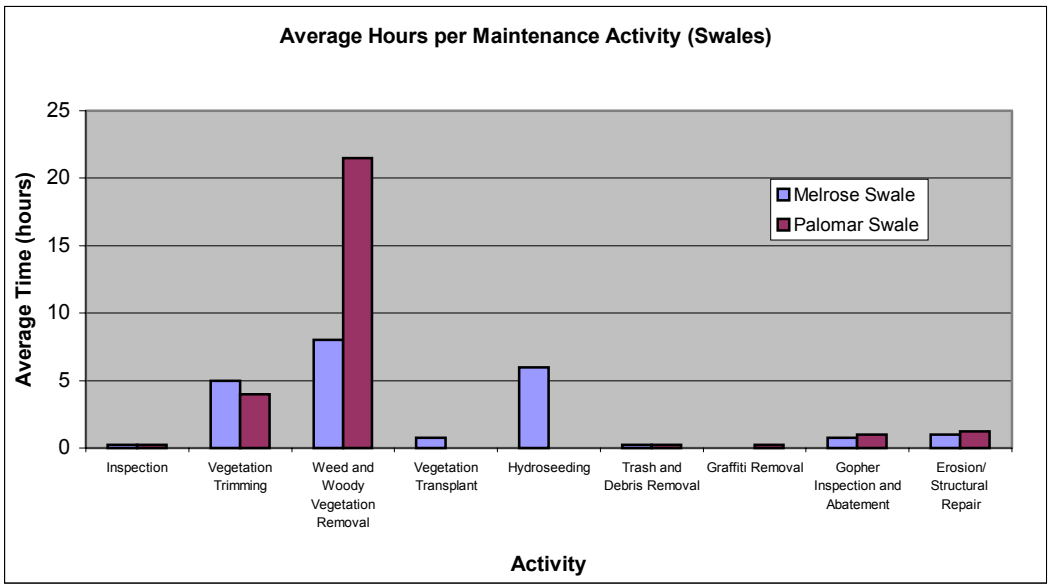


Figure 3-1d Average Hours per Maintenance Activity at a Biofiltration Swale



Overall Review

The Melrose bio-filtration swale was first operational on 3/1/99 and the Palomar swale was operational on 10/1/99. Initially, the most common maintenance activity at Melrose was irrigation, while the Palomar site was automatically irrigated. Irrigation was terminated at the start of last years storm season (10/1/99) and irrigation has not occurred since at Melrose. The automatic irrigation system at the Palomar site is under control of Caltrans, and is it still operational. Trash and debris removal at these sites immediately adjacent to the freeway occurred ten times at Melrose and 12 times at Palomar and averaged 0.25 man-hours, This is in addition to the minor removal of trash that is done during site inspections (20-23 inspections at 0.25 hours each).

Vegetation trimming occurred twice at each swale and required approximately four man-hours each. Woody vegetation removal occurred once at each swale. It took eight hours at Melrose but 21.5 hours at Palomar. More weeds were encountered this year than last at both swales. At Palomar, the Adopt-A-Highway organization accidental mowed the salt grass and vegetation on the side slopes to two inches in height. This was done in preparation for seeding from Cannon Road to Palomar Airport Road with a native plant mixture. The mowing occurred at the end of October just as the salt grass was going dormant. This allowed the weeds to out compete the salt grass during the following wet period. In addition, gophers have been a continual problem at the Palomar site in spite of abatement efforts of collapsing holes during the frequent inspection or maintenance visits. The south slope of the Melrose swale was hydroseeded once taking six man-hours.

Erosion and structural repair was not necessary at Melrose. Erosion control activities, such as sand bagging, and repairing/filling eroded gullies on the highway side slopes at Palomar was necessary on six occasions. It required an average of 1.25 man-hours each time. These six operations also included cleaning up the debris left by Adopt-A-Highway and placing warning signs in the swale. Warning signs designating the area as an environmental test area were placed in the swales and on the fences at both swales.

3.1.3 Extended Detention Basin

Figure 3-1e Frequency of Maintenance Activities at an Extended Detention Basin

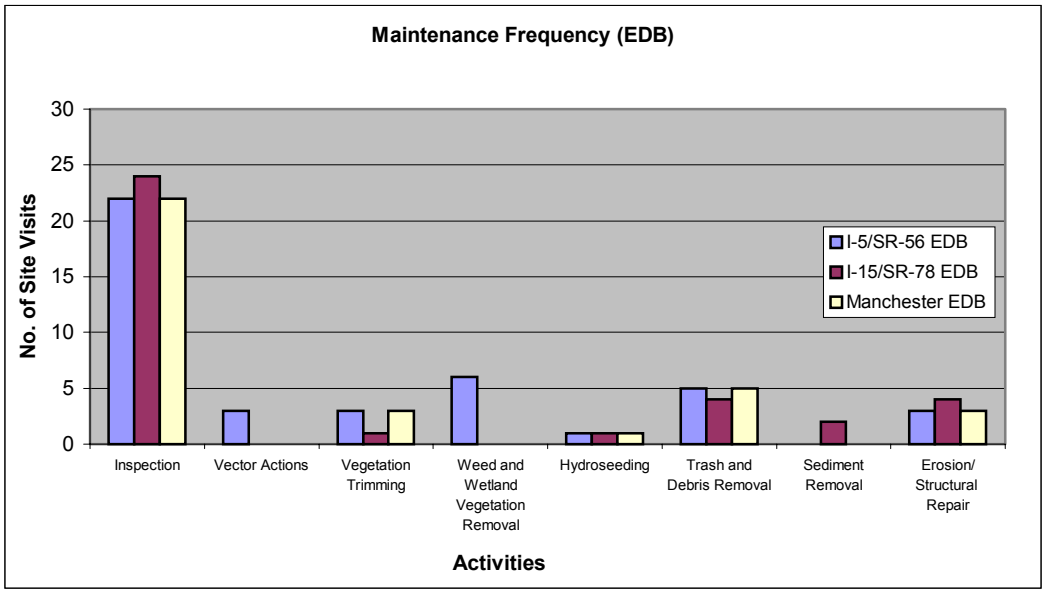
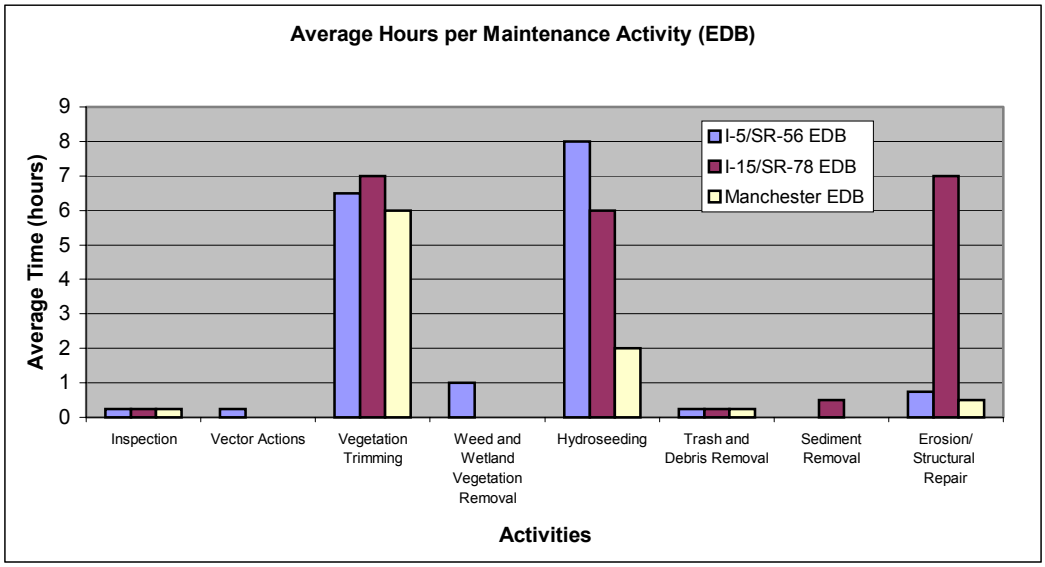


Figure 3-1f Average Hours per Maintenance Activity at an Extended Detention Basin



Overall Review

The I-5/SR-56 and the I-15/SR-78 EDBs were operational on 1/24/99, and the Manchester EDB became operational on 10/1/1999. At these open detention basin sites located near the freeways, trash and debris removal was necessary four to five times per site at an average time of 0.25 hours. Vegetation trimming occurred three times at the SR-56 site, one time at the SR-78 site, and three times at the Manchester site. An average of six man-hours was required each time. Wetland vegetation and weed trimming was necessary only at I-5/SR56. It was necessary six times due to vegetation in the two areas of rip-rap located in the energy dissipater at the foot of the inlet and down the middle of the basin.

Hydroseeding was performed once this year at each of these EDB sites at expended times ranging from two to eight hours each. The vegetation coverage on the side slopes exceeded 70% coverage. The growth on the invert of the basins sprouts after the initial storms of the season, but then becomes bare after several storms. When considered together, the coverage of the entire EDB did not meet the requirements of the Maintenance Indicator Document, so reseeding was necessary. Scarifying was not done at any of the sites due to the vegetation coverage on the side slopes.

Minor sediment removal was necessary two time at the SR-78 site to better facilitate influent flow metering. It required an expenditure of 0.5 hours for each incident.

3.1.4 Infiltration Basin / Infiltration Trench

Figure 3-1g Frequency of Maintenance Activities at an Infiltration Basin / Trench

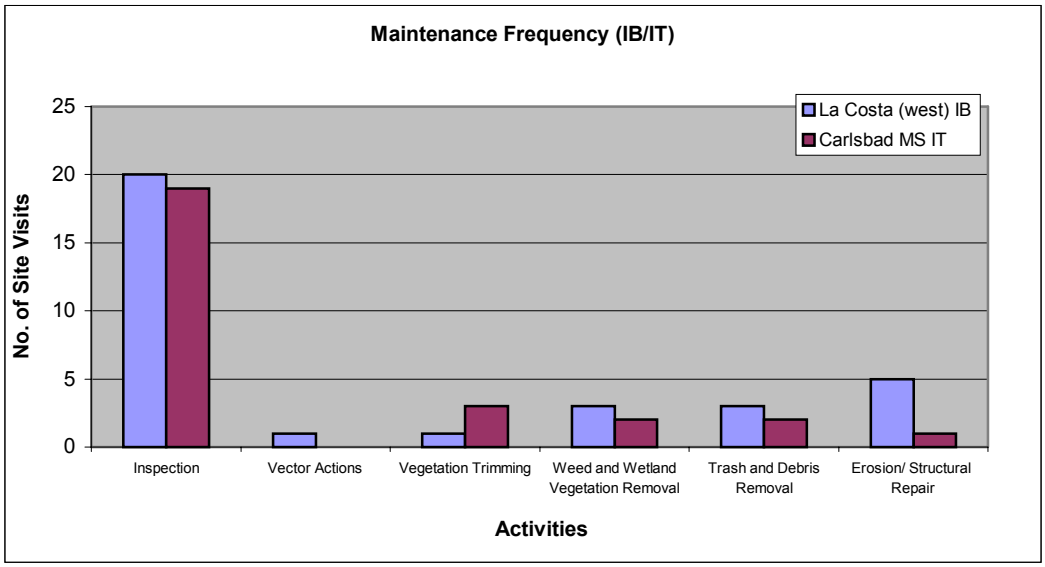
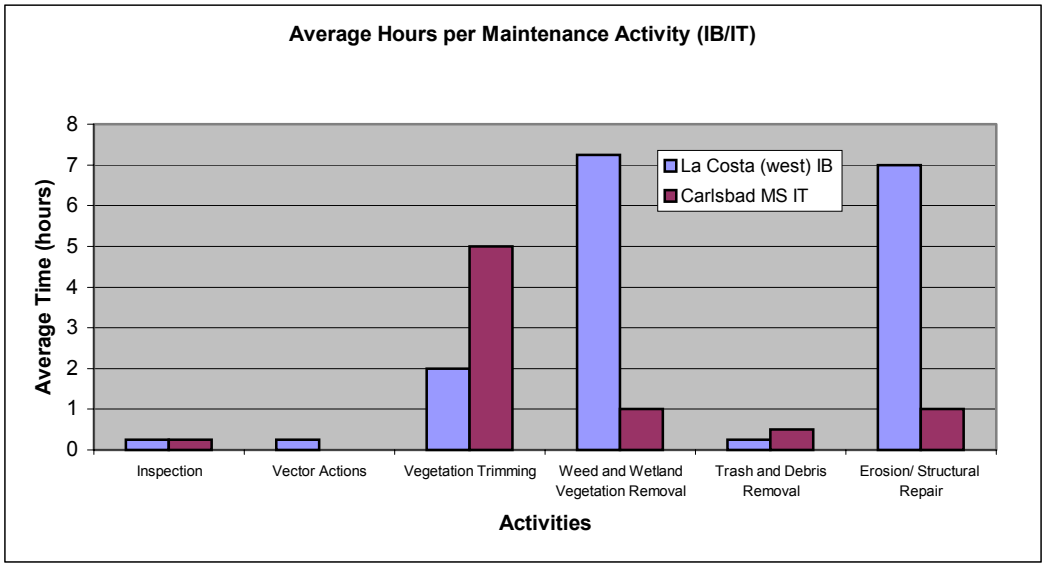


Figure 3-1h Average Hours per Maintenance Activity at an Infiltration Basin / Trench



Overall Review

The La Costa (West) infiltration basin first became operational on 1/24/99 and the Carlsbad MS infiltration trench became operational on 10/1/99. This year, wetland vegetation removal was carried out three times at the La Costa infiltration basin averaging about 7.5 hours each time. Trash and debris removal (0.25-0.50 hours) was carried out three times at the La Costa site and twice at the Carlsbad trench. Structural repairs associated with fence repair and replacement of the bird netting guy wires occurred five times at the La Costa infiltration basin with an average time per trip of seven man-hours. The structural repairs included adding guy wires to support some of the posts that support the bird netting and resetting one post in cement. These actions were necessary because the saturated soil that the posts are set in does not adequately anchor the posts. Other structural repairs at La Costa involved replacing components of the hinges on the gate to the facility and replacing cables and clamps for the guying system. These items were stolen in two separate incidents during the year.

One structural repair was performed at the Carlsbad infiltration trench. A leaking joint in the level spreader was caulked. The operation took approximately one man-hour.

Vegetation in the bio-filter strip was trimmed three times at the Carlsbad infiltration trench and once on the side slopes at La Costa. Wetland vegetation was removed from invert at La Costa three times. Tall weeds were removed from the bio-filter strip associated with the infiltration trench at Carlsbad on two occasions.

3.1.5 Media Filter- Sand

Figure 3-1i Frequency of Maintenance Activities at a Sand Filter

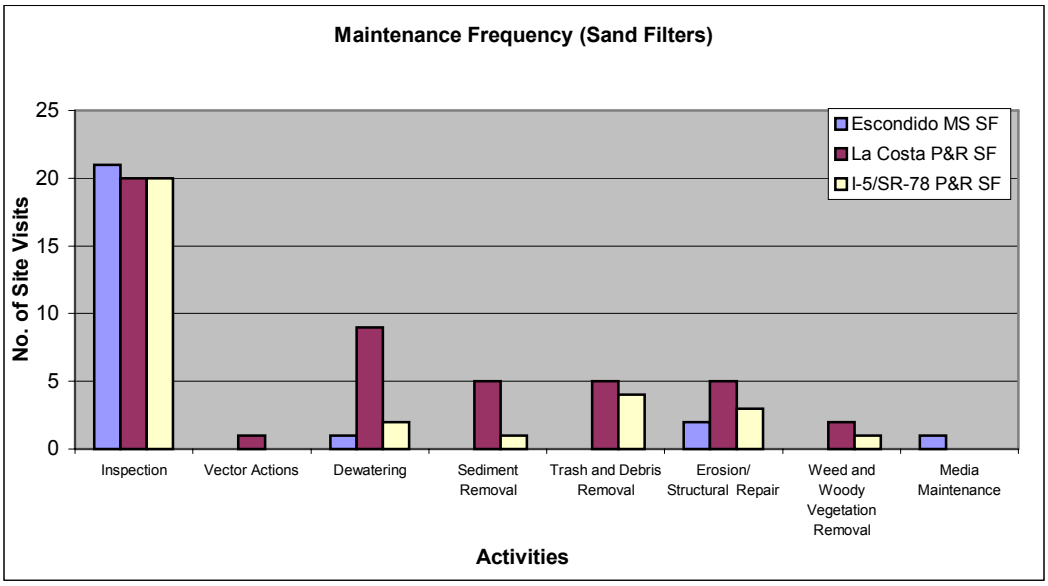
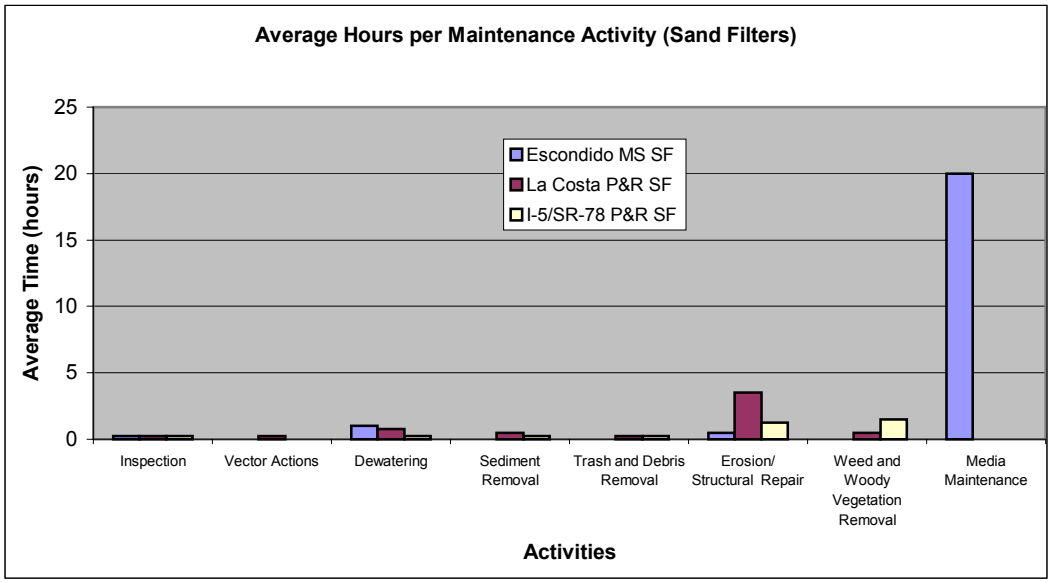


Figure 3-1j Average Hours per Maintenance Activity at a Sand Filter



Overall Review

The Escondido MS and the La Costa MS sand filters became operational on 2/16/99. The I-5/SR-78 Park & Ride sand filter became operational on 2/26/99. Trash and debris removal was carried out five times at the La Costa site and 4 times at the I-5/SR-78 P&R site for an average of 0.25 hours in addition to minor trash pickup that done during site inspections. No additional trips were made to remove trash from the Escondido sand filter site. It is located in the Maintenance Station where it is isolated from the public. There is little trash accumulation around the BMP. Removal of wetland vegetation from the sand filter was done two times at the La Costa facility. It required 0.5 man-hours each time.

The top two inches of sand was replaced once at the Escondido Delaware type sand filter. The operation took about 20 man-hours. Media replacement was not necessary at the two Austin type filters. Sediment removal from the spreader trough was necessary at the La Costa and SR-78 BMPs five times and one time respectively, and required 0.5 or 0.25 hours each. Sediment accumulates in the troughs after the pre-sediment basins are de-watered. The La Costa was de-watered basins was de-watered nine times versus two times at I-5/SR78.

Structural repair incidences, five at La Costa and three at I-5/SR-78 accounted for average times of 3.5 and 1.25 hours respectively for each incidence. At the La Costa and the I-5/SR-78 sand filter sites structural changes were made to the metering device between the pre-sediment chamber and the sand filter. The butterfly valves that were originally installed to meter flow from the pre-sediment chamber to the sand filter were replaced with a faceplate with a drilled metering orifice. In addition, the annual removal and reinstallation of the bird netting was done at both these sites.

At the Escondido sand filter there was a persistent flow of water past the gate valve in the sediment chamber drain. The disk and seat of the gate valve were cleaned in an attempt to stop the leaking. The leak persists. Also at this, site a part of the concrete pad for the influent monitoring equipment was removed to improve the storm water bypass. The pad was partial blocking overflow. This was causing localized flooding and overflow onto adjacent property during intense rains. These incidences averaged 1.25 hours each.

De-watering the pre-sedimentation chambers due to weep hole blockage was necessary five times at the La Costa site and two times at the I-5/SR-78 site averaging 0.75 hours and 0.25 hours respectively, similar to last year's experience.

3.1.6 StormFilter™

Figure 3-1k Frequency of Maintenance Activities at a StormFilter™

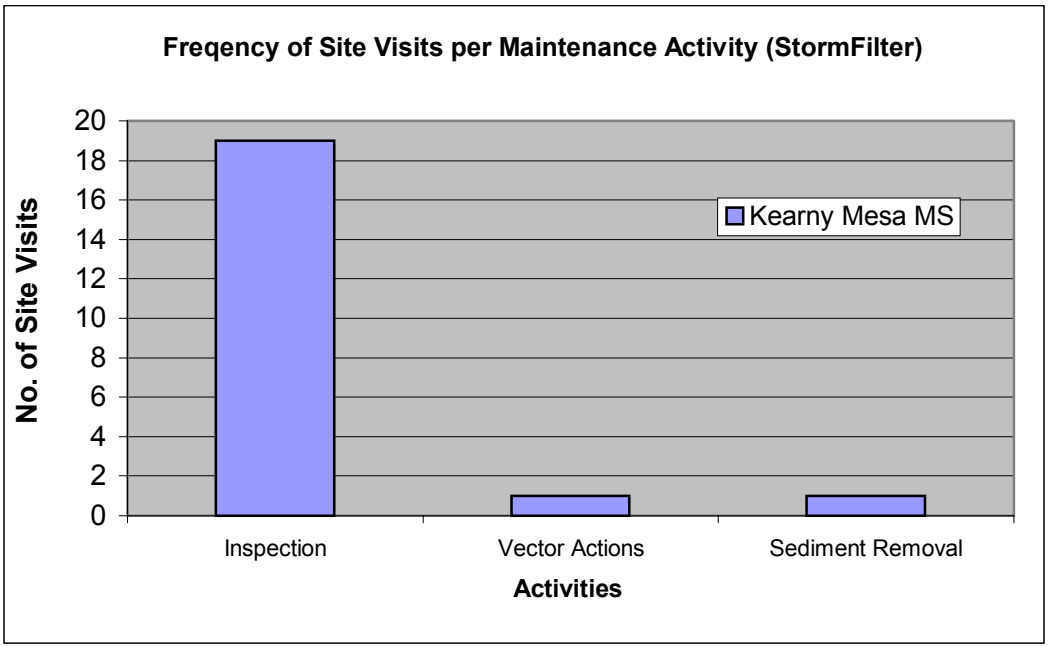
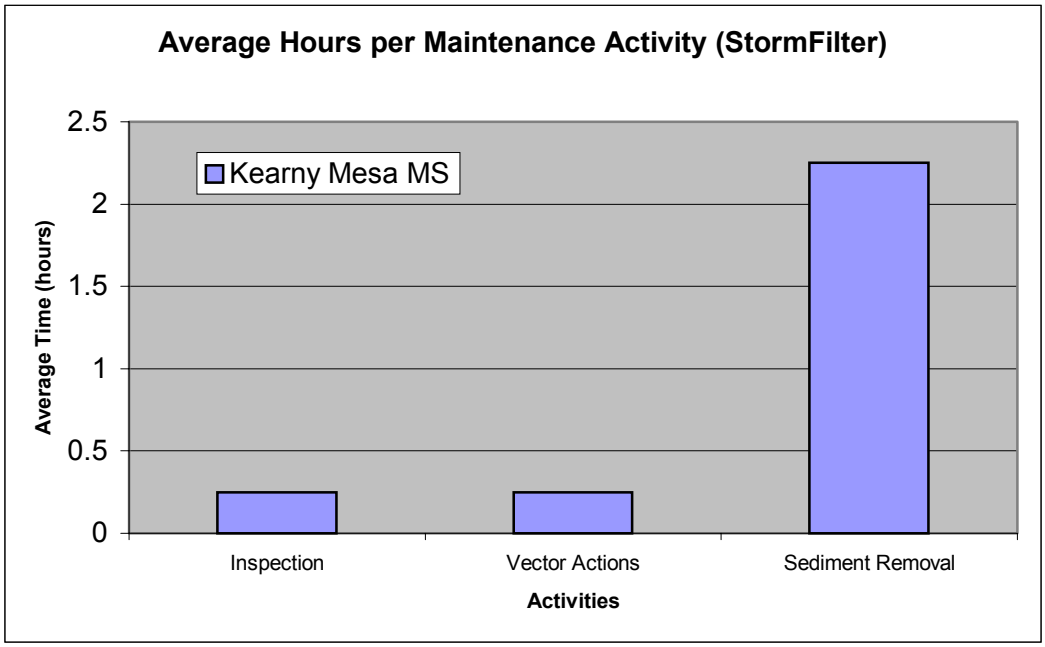


Figure 3-1l Average Hours per Maintenance Activity at a StormFilter™



Overall Review

Scheduled inspections were carried out 19 times at the StormFilter™ BMP per the MID and the manufacturer's suggestions. The inspections included two manufacturer's suggested annual inspection. The average time per inspection was 0.25 hour. Sediment removal was performed once at this BMP for a total of 2.25 hours of effort. Accumulated sediment was removed from the first and second canister chambers.

3.1.7 Wet Basin

Figure 3-1m Frequency of Maintenance Activities at a Wet Basin

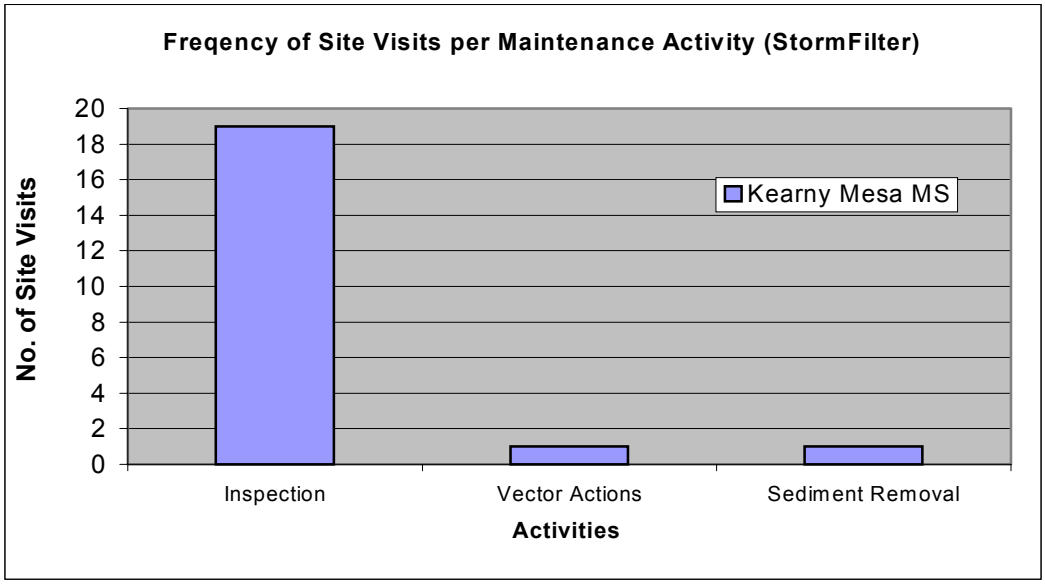
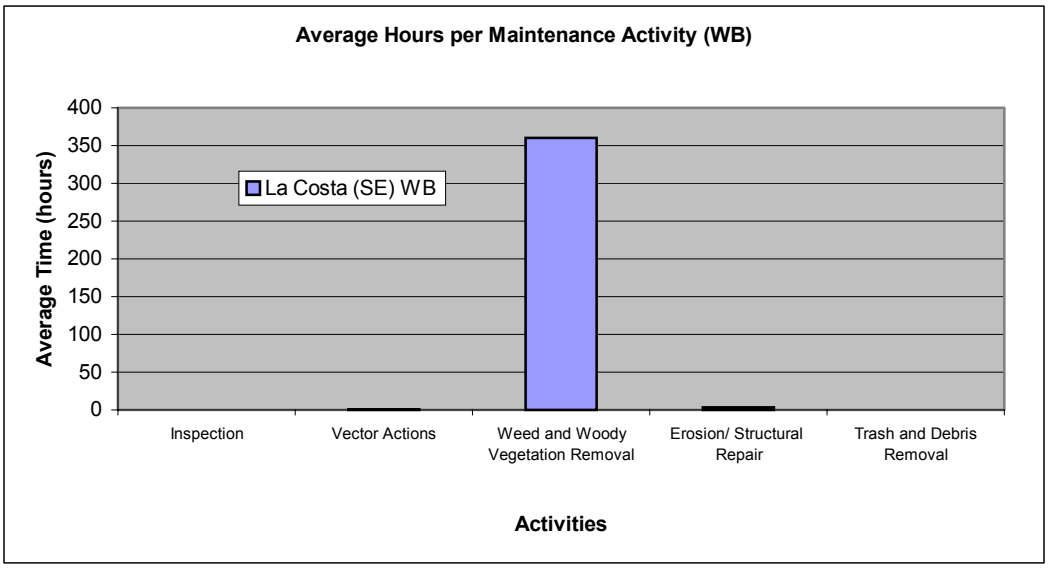


Figure 3-1m Average Hours per Maintenance Activity at a Wet Basin



Overall Review

The La Costa wet basin was put into service 10/1/99 and this year was the second year of operation. Trash and debris removal was necessary twice at the La Costa wet basin BMP (0.25 hours) in addition to the incidental trash removal during the site inspections. Structural repairs were performed eight times. The sandbag dam that diverts dry weather flow to the basin from the trapezoidal channel was rebuilt six times following storm events that were not sampled. This was in addition to rebuilding the dam following every sampled storm. In addition, an eroded area of the basin floor was repaired when a bubble in the Geofabric appeared toward the end of the period that the basin was drained down for vegetation thinning. These repairs averaged 2.25 hours per incident.

The largest maintenance item at the La Costa wet basin was the annual removal of vegetation from zone 1 and thinning in zone 2 of the basin. This removal/thinning is done annually. This was the first time it has been performed. This effort required 360 man-hours of effort. Approximately 150 cubic yards of vegetation was removed. The weight of the vegetation was approximately six tons.

4.0 COST SUMMARY

Cost summaries for maintenance of the BMPs during the 2000/2001-year are provided in the following spreadsheets. Individual summaries are given for the 13 BMPs located at 12 site locations in District 11 that were operational for the 2000/2001-year. These 12 sites represented nine different BMP designs: extended detention basins, infiltration basins, wet basins, perlite/zeolite media filters, sand filters type I, sand filters type II, biofiltration swales, biofiltration strips, and infiltration trenches. Included in this spreadsheet are the man-hours and generic rates associated with 5 different maintenance tasks: administration, operation, maintenance, vector control, and direct costs.

APPENDIX G:
BIOLOGICAL SURVEY REPORTS

CALTRANS BMP Retrofit Pilot Program
Districts 7 and 11

BIOLOGICAL MONITORING REPORT
for
February 2001

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INTRODUCTION

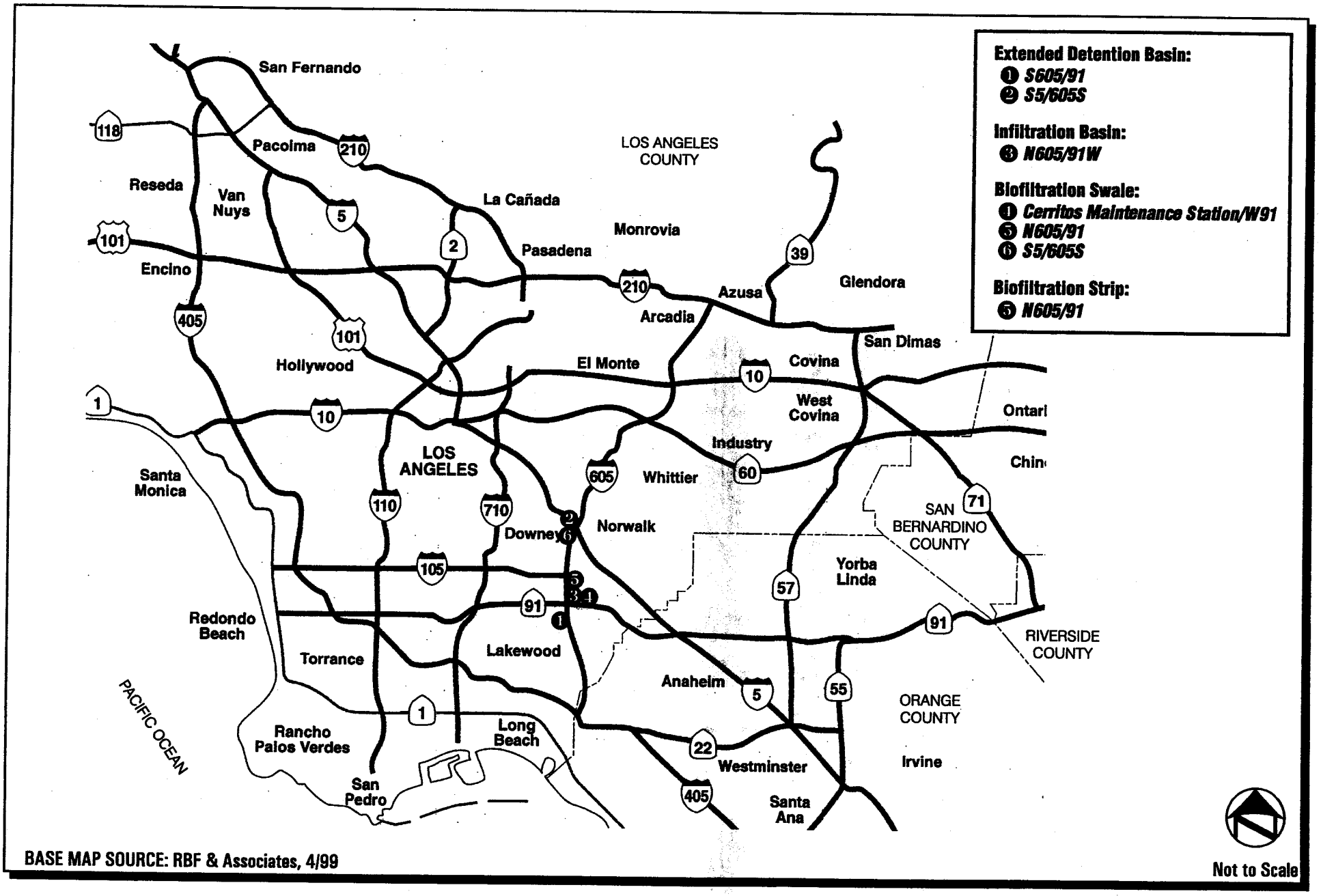
This report is intended to describe biological monitoring efforts in regards to the California Department of Transportation (Caltrans) Best Management Practices facilities (BMP) pilot study occurring in Districts 7 and 11 (Los Angeles and San Diego respectively). The pilot study, BMP locations, and BMP descriptions have been well described previously by Robert Bein, William Frost and Associates (RBF 1999).

Six District 7 BMP sites (*Figure 1*) and nine District 11 BMP sites (*Figure 2*) are monitored monthly by Dudek and Associates, Inc. (DUDEK). DUDEK previously determined that the 15 sites may have the potential to become significant from a wildlife perspective. DUDEK wildlife biologist Jeff D. Priest conducted visits for the District 11 BMPs and District 7 BMP's on February 26 and 28, 2001. Survey conditions were marginal for detection of wildlife (*i.e.*, overcast skies, intermittent rain, cool temperatures and light breezes).

Table 1 presents a synopsis of potential issues related to each BMP site. A discussion of each BMP site follows the table.

TABLE 1
BMP LOCATIONS, TYPE, POTENTIAL BIOLOGICAL ISSUES AND SUMMARY OF FINDINGS

Location; BMP Type	Sensitive Species Activity/Type	Action	Gopher Mounds/ Action*	Ground Squirrel Holes/ Action*	Nesting Birds	Standing Water	Species Observed
I-605/SR-91; InfBa	No	N/A	Yes/None	No	No	Yes	rock dove
I-5/I-605; ExtDB	No	N/A	Yes/None	No	No	Yes	common raven
I-605/SR-91; BiofSt	No	N/A	Yes/None	No	No	Yes	None
Cerritos MS; BiofSw	No	N/A	Yes/None	Yes/none	No	Yes	rock dove and common raven
I-5/I605; BiofSw	No	N/A	Yes/None	No	No	Yes	None
I-605/SR-91; BiofSw	No	N/A	Yes/None	No	No	Yes	None
I-5/Manchester; ExtDB	No	N/A	Yes/None	No	No	Yes	rock dove, house finch and common raven
I-5/SR-56; ExtDB	No	N/A	Yes/None	No	No	Yes	California towhee, red-winged blackbird and black phoebe
I-15/SR-78; ExtDB	No	N/A	Yes/None	Yes/None	No	Yes	mourning dove
I-5/La Costa W; InfBa	No	N/A	No	No	No	Yes	Costa's hummingbird, red-tailed hawk and black phoebe
I-5/La Costa SE; WetBa	No	N/A	Yes/None	Yes/None	No	Yes	red-winged blackbird, coot, mallard, house finch and scrub jay

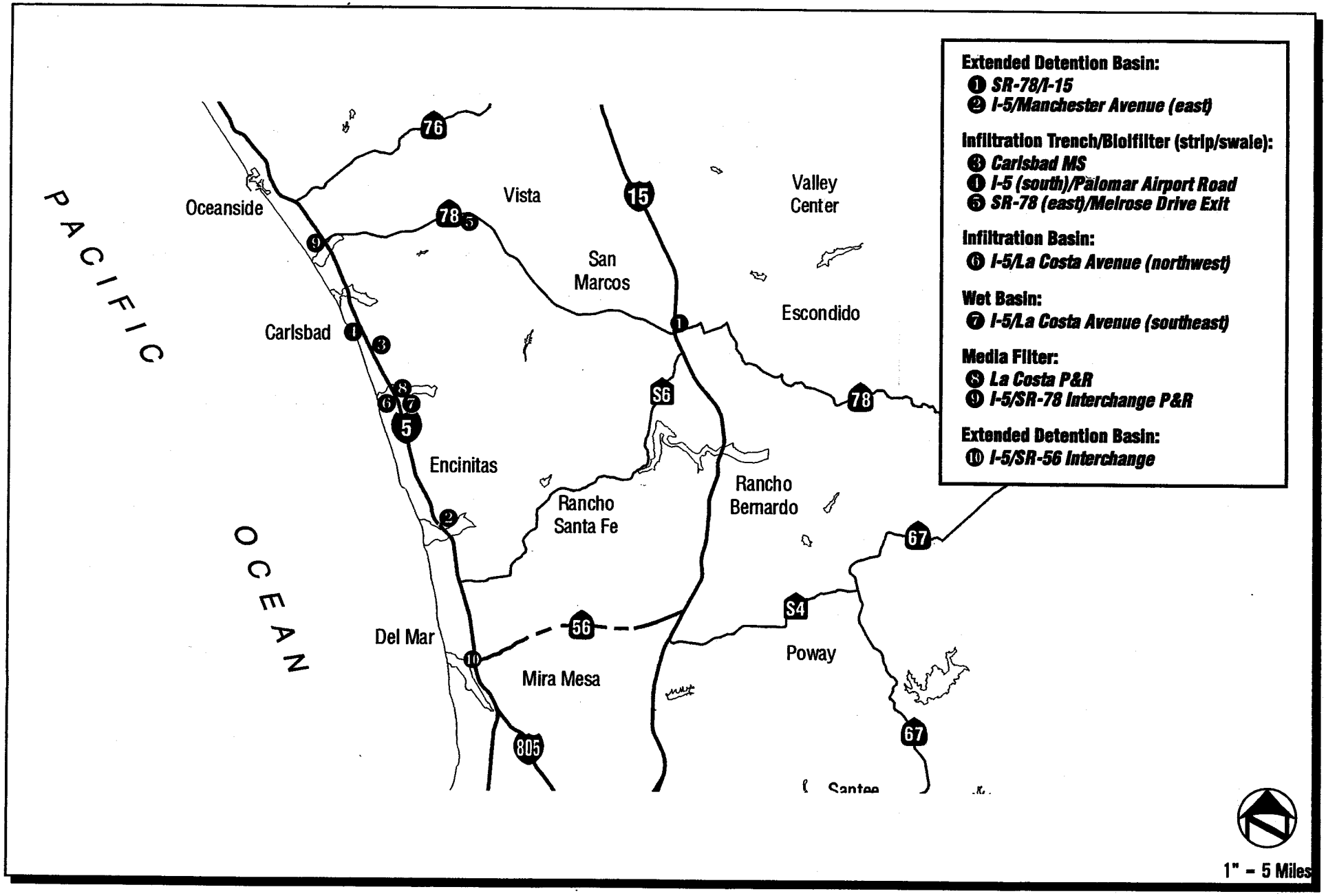


BASE MAP SOURCE: RBF & Associates, 4/99

Caltrans BMP Retrofit Pilot Program, LA & SD Counties - Biological Monitoring Report

Regional Location Map - District 7, Los Angeles

FIGURE 1



Caltrans BMP Retrofit Pilot Program, LA & SD Counties - Biological Monitoring Report

Regional Location Map - District 11, San Diego

FIGURE 2

TABLE 1 (*Continued*)
BMP LOCATIONS, TYPE AND POTENTIAL BIOLOGICAL ISSUES

Location; BMP Type	Sensitive Species Activity/Type	Action	Gopher Mounds/ Action*	Ground Squirrel Holes/ Action*	Nesting Birds	Standing Water	Species Observed
SR-78/Melrose; BiofSw	No	N/A	Yes/None	Yes/None	No	Yes	bushtit
I-5/Palomar Airport; BiofSw	No	N/A	Yes/None	Yes/None	No	Yes	None
I-5/La Costa P&R; MedFi	No	N/A	No	No	No	Yes	common yellowthroat, song sparrow, great egret, anna's hummingbird and house finch
I-5/SR-78 P&R; MedFi	No	N/A	No	No	No	Yes	mourning dove

InfBa - Infiltration Basin
ExtDB - Extended Detention Basin
BiofSw - Biofiltration Swale
BiofSt - Biofiltration Strip
WetBa - Wet Basin
MedFi - Media Filter

* Action needed to protect against potential sensitive species occupation – does not account for any actions required to protect site from herbivory, erosion, or other problems caused by fossorial mammals.

DISTRICT 7 (LOS ANGELES) BMP SITES

605/91 Interchange Biofiltration Swale

Water was seeping and puddling in the swale at the time of the visit, however, the flow was not strong enough to reach the down stream end of the swale. The swale, equipment and caution tape around the swale were intact. No sensitive species were present or expected.

There are no recommendations at this time.

605/91 Interchange Biofiltration Strip

The concrete drain along the edge of the strip opposite from the freeway supported a small flow which started approximately two thirds of the way down the strip. No sensitive species were detected or expected.

No recommendations are required at this time.

605/91 Interchange Infiltration Basin

Approximately 30 square meters of standing water (approximately one to two inches deep) was present at

the time of the visit. The caution tape around the basin was intact. No sensitive species were detected or expected.

There are no maintenance recommendations at this time.

5/605 Interchange Extended Detention Basin

At the time of the visit, the basin was full of standing water up to within 2" of concrete liner. Water level registered at 1'2" on the measuring pipe adjacent to the basin drain. The water appeared to be draining properly and the basin equipment was intact. No sensitive species were detected or expected.

There are no recommendations at this time.

5/605 Interchange Biofiltration Swale

Water was flowing through the swale at the time of the survey. In addition, the equipment and swale were intact and the caution tape around the swale was degrading. No sensitive species were detected or expected.

There are no recommendations at this time.

Cerritos Maintenance Station/91 Biofiltration Swale

Flowing water was present at the time of the survey, however, the upstream instrument was not submerged in the flowing water due to a sediment load. The sediment was cleaned away during the monitoring visit, although, the flowing water did not reach the down stream instrument. Water was exiting the side of the swale through holes created by gopher damage. No sensitive species were detected or expected.

There are no recommendations at this time.

DISTRICT 11 (SAN DIEGO) BMP SITES

I-5/56 Interchange Extended Detention Basin

During the visit, the basin was saturated and standing water covered approximately 95% of the rip-rap strip in the bottom of the basin. The water surface level was at 1.14 feet on the measuring pipe adjacent to the drain. Overall, the water was clear, except around the basin drain. No invertebrates were observed in the water. Water in rain measuring device was at 0.8. No sensitive species were detected or expected.

There are no recommendations at this time.

I-5/Manchester Avenue Extended Detention Basin

The basin was full of standing water at the time of the visit. The water was cloudy and no invertebrates were observed. The measuring pipe adjacent to the drain displayed the water level at 2.3 feet. The rain measuring device was not observed. There are no sensitive species issues at this time.

There are no recommendations at this time.

I-5/La Costa Avenue Wet Basin

Water was present in both the basin and adjacent storm channel. Water within the channel was cloudy and water within the basis was clear. Neither mosquito fish or invertebrates were observed within either the basin or channel. Water in the rain measuring device was at 1.0. There are no sensitive species issues at this time.

There are no recommendations at this time.

La Costa Avenue Media Filter

Standing water was present at a level of 1.7 feet on the south side of the media filter. Approximately half of the north side of the filter was covered with standing water approximately one to two inches deep. Water in the rain measuring device was at 1.3.

There are no recommendations at this time.

I-5/La Costa Avenue Infiltration Basin

Standing water was present within the basin and extended over the rim, as well as across the asphalt perimeter of the basin. No invertebrates were observed in the water. The net exclusion device was sagging and touching the water in one place, however, it was still intact and appeared to function properly as far as

excluding nesting attempts by local birds. Water in the rain measuring device was at 1.3. No sensitive species were detected or expected at this time.

There are no recommendations at this time.

I-5/Palomar Airport Road Biofiltration Swale

A small flow of water was entering the swale, but was not sufficient to reach the downstream instrument. In addition, the 'keep off the grass' signs were degraded at the time of the visit. There were no sensitive species issues.

There are no recommendations at this time.

SR-78/Melrose Drive Biofiltration Swale

At the time of the survey, the swale was wet and supported limited standing water in the form of small, scattered puddles, however, the swale did not support a flow across it's length. Fresh growth of grass and weeds was present and the 'keep off the grass' signs were intact. In addition, the solar panel was missing and the wires leading to the panel were cut. No sensitive species were present during the survey.

There are no recommendations at this time.

SR-78/I-15 Extended Detention Basin

The basin was full of standing water at the time of the survey. Water level registered 0.9 feet on measuring pipe next to the drain. No invertebrates were observed within the water. Water within the rain measuring device was at 0.815. No sensitive species were detected.

There are no recommendations at this time.

I-5/SR-78 Media Filter

Standing water at a depth of 3.05 feet was present in the north side of the media filter and approximately 75% of the south side was also covered with water at a depth of one to two inches. No invertebrates were observed in the water. There were no issues at the media filter.

There are no recommendations.

COMMENTS

During this period, DUDEK conducted a site visit to all BMP's. Water was present at all of the 15 BMP sites addressed in this report. Photos were taken of each of the BMP sites and are available upon request.

Presently, nesting birds may constrain maintenance activities, however, at the time of the site visits, no nesting birds or sensitive species were detected.

LITERATURE CITED

Robert Bein, William Frost and Associates. 1999. Project Information for Selected Best Management Practice (BMP) Sites in Caltrans Districts 7 and 11. 27pp.

CALTRANS BMP Retrofit Pilot Program
Districts 7 and 11

BIOLOGICAL MONITORING REPORT
for
March 2001

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INTRODUCTION

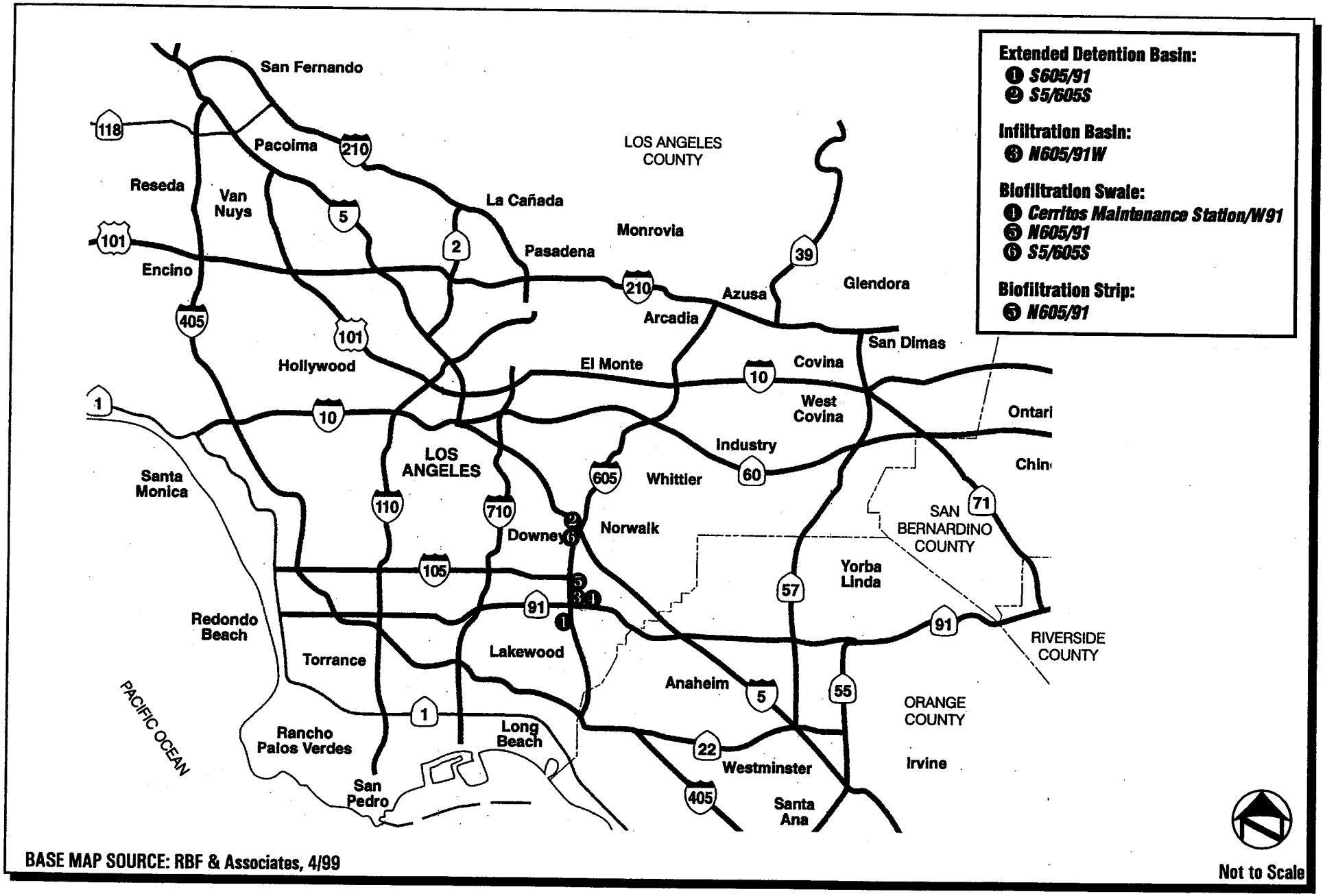
This report is intended to describe biological monitoring efforts in regards to the California Department of Transportation (Caltrans) Best Management Practices facilities (BMP) pilot study occurring in Districts 7 and 11 (Los Angeles and San Diego respectively). The pilot study, BMP locations, and BMP descriptions have been well described previously by Robert Bein, William Frost and Associates (RBF 1999).

Six District 7 BMP sites (*Figure 1*) and nine District 11 BMP sites (*Figure 2*) are monitored monthly by Dudek and Associates, Inc. (DUDEK). DUDEK previously determined that the 15 sites may have the potential to become significant from a wildlife perspective. DUDEK wildlife biologist Jeff D. Priest conducted visits for the District 11 BMPs and District 7 BMP's on March 23, 26, 27 and 29, 2001. Survey conditions were appropriate for detection of wildlife (*i.e.*, partly cloudy to clear skies, mild temperatures, light breezes).

Table 1 presents a synopsis of potential issues related to each BMP site. A discussion of each BMP site follows the table.

TABLE 1
BMP LOCATIONS, TYPE, POTENTIAL BIOLOGICAL ISSUES AND SUMMARY OF FINDINGS

Location; BMP Type	Sensitive Species Activity/Type	Action	Gopher Mounds/ Action*	Ground Squirrel Holes/ Action*	Nesting Birds	Standing Water	Species Observed
I-605/SR-91; InfBa	No	N/A	Yes/None	No	No	No	mourning dove
I-5/I-605; ExtDB	No	N/A	Yes/None	No	No	No	cabbage white butterfly and common raven
I-605/SR-91; BiofSt	No	N/A	Yes/None	No	No	No	west coast lady and cabbage white butterflies
Cerritos MS; BiofSw	No	N/A	Yes/None	Yes/none	No	No	western fence lizard and common raven
I-5/I605; BiofSw	No	N/A	Yes/None	No	No	No	common raven
I-605/SR-91; BiofSw	No	N/A	Yes/None	No	No	No	cabbage white butterfly
I-5/Manchester; ExtDB	No	N/A	Yes/None	No	No	Yes	California towhee, southern blue butterfly, house finch, European starling, northern rough-winged swallow, mourning dove and common raven
I-5/SR-56; ExtDB	No	N/A	Yes/None	No	No	No	red-winged blackbird, common yellowthroat, black phoebe, house finch, common raven, barn swallow, western tiger swallowtail butterfly and western fence lizard

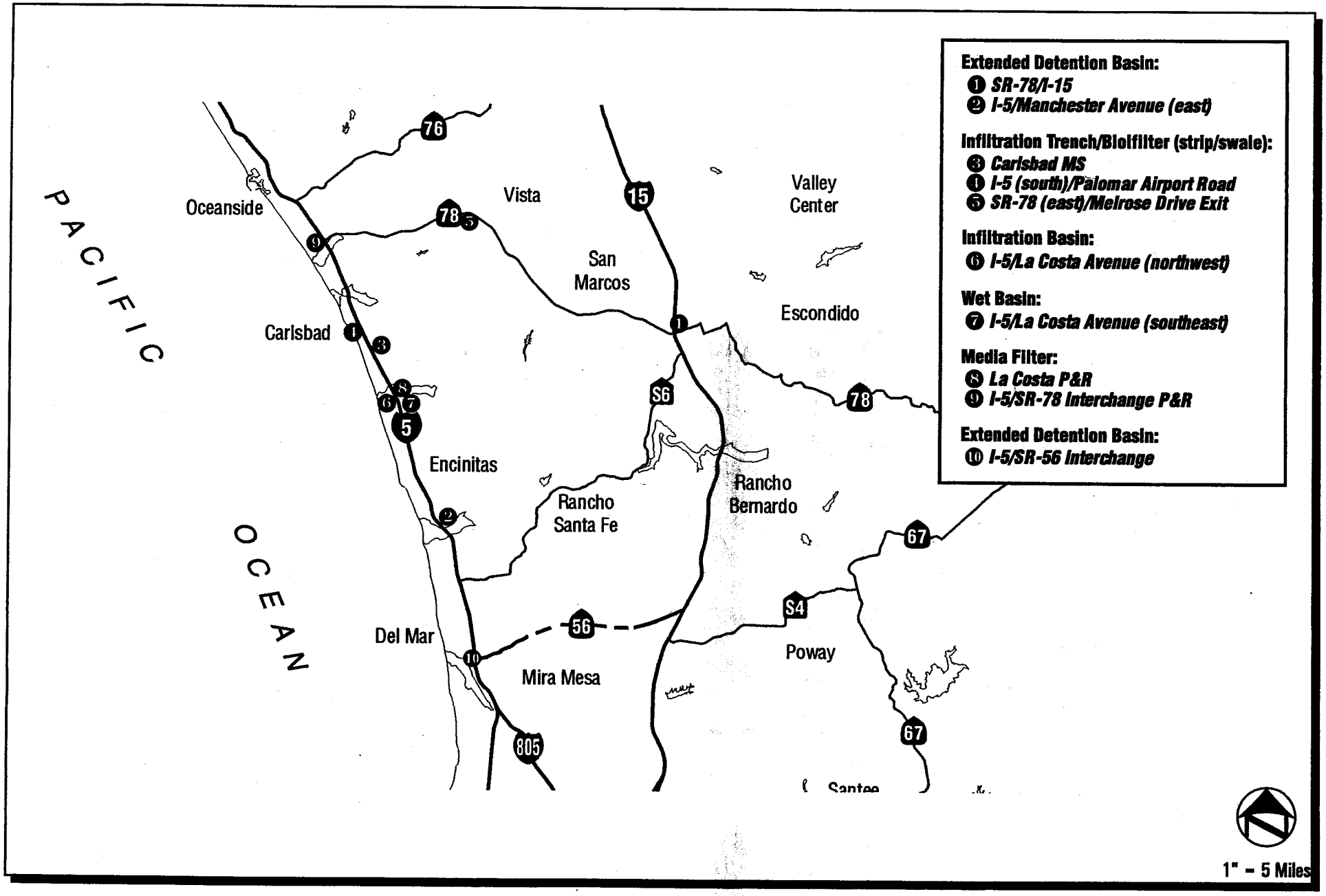


BASE MAP SOURCE: RBF & Associates, 4/99

Caltrans BMP Retrofit Pilot Program, LA & SD Counties - Biological Monitoring Report

Regional Location Map - District 7, Los Angeles

FIGURE 1



Caltrans BMP Retrofit Pilot Program, LA & SD Counties - Biological Monitoring Report

Regional Location Map - District 11, San Diego

FIGURE 2

TABLE 1 (*Continued*)
BMP LOCATIONS, TYPE AND POTENTIAL BIOLOGICAL ISSUES

Location; BMP Type	Sensitive Species Activity/Type	Action	Gopher Mounds/ Action*	Ground Squirrel Holes/ Action*	Nesting Birds	Standing Water	Species Observed
I-15/SR-78; ExtDB	No	N/A	Yes/None	Yes/None	No	No	None
I-5/La Costa W; InfBa	No	N/A	No	No	No	Yes	house finch, black phoebe and bushtit
I-5/La Costa SE; WetBa	No	N/A	Yes/None	Yes/None	No	Yes	red-winged blackbird, mallard, house finch, bushtit, black phoebe, California towhee, common raven, red-tailed hawk
SR-78/Melrose; BiofSw	No	N/A	Yes/None	Yes/None	No	No	house finch and bushtit
I-5/Palomar Airport; BiofSw	No	N/A	Yes/None	Yes/None	No	No	None
I-5/La Costa P&R; MedFi	No	N/A	No	No	No	No	California towhee, common yellowthroat, bushtit and common raven
I-5/SR-78 P&R; MedFi	No	N/A	No	No	No	Yes	common raven and mourning dove

InfBa - Infiltration Basin
ExtDB - Extended Detention Basin
BiofSw - Biofiltration Swale
BiofSt - Biofiltration Strip
WetBa - Wet Basin
MedFi - Media Filter

* Action needed to protect against potential sensitive species occupation – does not account for any actions required to protect site from herbivory, erosion, or other problems caused by fossorial mammals.

DISTRICT 7 (LOS ANGELES) BMP SITES

605/91 Interchange Biofiltration Swale

No water was present during this monitoring period. The caution tape and equipment were intact at the time of the site visit. Grass and weeds throughout the strip were approximately two feet tall. No sensitive species were present or expected.

There are no recommendations at this time.

605/91 Interchange Biofiltration Strip

No water was present during this month's monitoring effort. A very high level of weeds including cheese

weed and wild raddish was present throughout the strip at the time of the visit. No sensitive species were detected or expected.

No recommendations are required at this time.

605/91 Interchange Infiltration Basin

No water was present during this month's monitoring effort. The caution tape present around the basin and the equipment were both intact at the time of the survey. Ground cover within the basin was very dense and included dense patches of yellow sweet clover *(Melilotus indica)*. No sensitive species were detected or expected.

There are no maintenance recommendations at this time.

5/605 Interchange Extended Detention Basin

No water was present during the survey. The caution tape, basin and equipment were all intact. In addition, the rebar structures previously stored around the basin have been removed. No sensitive species were detected or expected.

There are no recommendations at this time.

5/605 Interchange Biofiltration Swale

No water was present during the survey. In addition, the mule fat (*Baccharis salicifolia*) recruits previously growing adjacent to the swale have been removed. The caution tape around the swale has degraded and the equipment and swale were intact. No sensitive species were detected or expected.

There are no recommendations at this time.

Cerritos Maintenance Station/91 Biofiltration Swale

No water was present during the survey. The gopher damage within the swale has been repaired since the last visit. No sensitive species were detected or expected.

There are no recommendations at this time.

DISTRICT 11 (SAN DIEGO) BMP SITES

5/56 Interchange Extended Detention Basin

At the time of the visit, the basin was damp and standing water was present among the rip rap strip located in the bottom of the basin. In addition, standing water was also present in front of the basin inlet, however, the water level was not sufficient to reach the basin drain. No sensitive species were detected or expected.

There are no recommendations at this time.

5/Manchester Avenue Extended Detention Basin

Water was present and draining properly at the time of the survey. The deepest point of standing water was approximately six inches. In addition, mosquitos were abundant in and around the water. There are no sensitive species issues at this time.

There are no recommendations at this time.

5/La Costa Avenue Wet Basin

Water was present in both the basin and adjacent storm channel. At the time of the visit, approximately half of the water surface area in the basin and storm channel was covered with algae. In addition, many wild flowers were in bloom on the slopes surrounding the basin. There are no sensitive species issues at this time.

There are no recommendations at this time.

La Costa Avenue Media Filter

No water was present at the time of the survey, however, water stains were present on approximately half of the north side of the media filter. In addition, the fence, structure and equipment were all intact.

There are no recommendations at this time.

5/La Costa Avenue Infiltration Basin

Standing water was present up to the rim of the basin at the time of the survey. No invertebrates were observed in the water except for a few water skimmers on the surface. In addition, one of the stabilizing wires for the net exclusion device was missing. As a result, the concrete foundation of the northwest corner post is becoming undermined, causing the post to lean over and the net to sag. Some freshwater marsh vegetation (*i.e.*, cattails {*Typha* sp.}) is coming up in the basin. No sensitive species were detected or expected at this time.

It is recommended that the northwest corner post of the net exclusion device be repaired.

I-5/Palomar Airport Road Biofiltration Swale

No water was present during the survey. In addition a high level of weeds was present within the swale. The equipment and swale were both intact. There were no sensitive species issues.

There are no recommendations at this time.

78/Melrose Drive Biofiltration Swale

Neither sensitive species nor water was present during the survey. In addition, a high level of weeds was present within the swale.

There are no recommendations at this time.

SR-78/I-15 Extended Detention Basin

No water was present during the survey. In addition, the equipment and basin were intact. No sensitive species were detected.

There are no recommendations at this time.

I-5/78 Media Filter

At the time of the visit, the net exclusion device was present over the south side of the media filter and the fence and structure were intact. No standing water was present, however, spray-paint graffiti was present within the north side of the structure.

There are no recommendations.

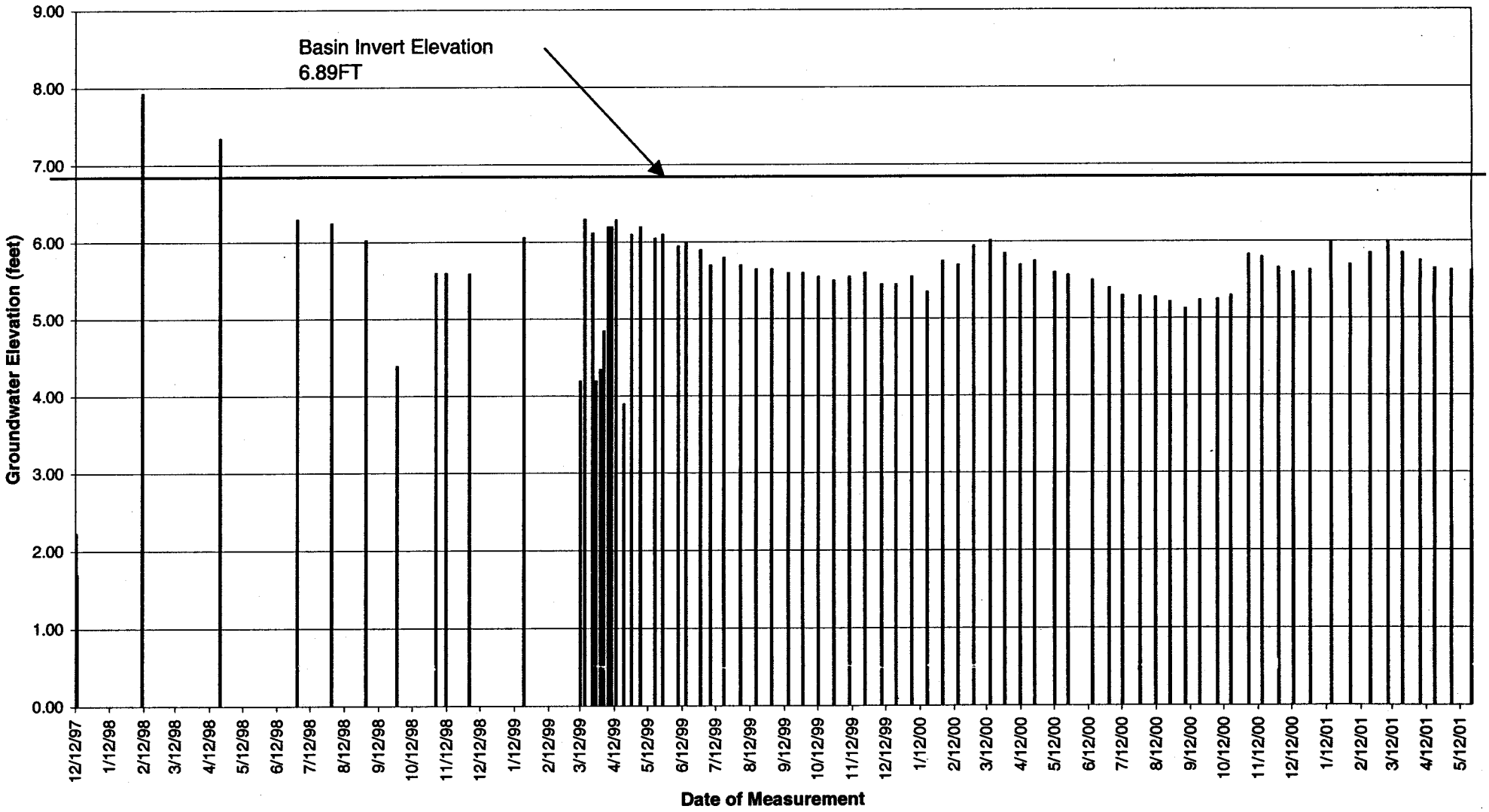
COMMENTS

During this period, DUDEK conducted a site visit to all BMP's. Water was present at four of the 15 BMP sites addressed in this report (District 11- I-5/Manchester Extended Detention Basin, La Costa Wet Basin, La Costa Infiltration Basin and the I-5/I-78 Media Filter). Photos were taken of each of the BMP sites and are available upon request.

Presently, nesting birds may constrain maintenance activities, however, at the time of the site visits, no nesting birds or sensitive species were detected.

APPENDIX H:
LA COSTA INFILTRATION BASIN LOG

Groundwater Level Monitoring at I-5/La Costa Infiltration Basin Site



BMP RETROFIT PILOT PROGRAM
PS&E LOCATION 3
I-5/LA COSTA AVE INFILTRATION BASIN

TABLE 1
WATER SURFACE ELEVATION SUMMARY SHEET

Date	Time	Field Reading		Pond Depth*	Groundwater Elev (FT)*	Delta	By	Comment
		Headwall (FT)	Monitoring Well (FT)	(FT)		(FT)		
12/12/97	---	---	BORING WW-1	---	2.22	4.67	GDC	Existing surface elevation: 10.22 ft (3.117m)
12/13/97	---	---	BORING WW-2	---	1.69	5.20	GDC	Existing surface elevation: 10.69 ft (3.258m)
12/23/97	---	---	---	---	No groundwater encountered.	---	GDC	SD-7 Initial investigation monitoring well installed. (Bottom at 5 ft bgs.)
2/10/98	---	---	3.00	---	7.92	-1.03	GDC	Reading after a series of rain storms. Adjacent ground saturated and surface ponding observed.
4/21/98	---	---	5.85	---	7.34	-0.45	GDC	SDMW-1 Permanent monitoring well installed. (Bottom at 20 ft bgs.)
6/30/98	10:00am	---	6.90	---	6.29	0.60	KLI	
7/31/98	4:15pm	---	6.95	---	6.24	0.65	KLI	
8/31/98	11:57am	---	7.17	---	6.02	0.87	KLI	
9/28/98	---	---	---	---	4.38	---	RBF	Exploratory hole excavated by contractor. Ground water elevation 0.54ft below original design invert, 4.92ft (1.5m)
11/2/98	4:04pm	---	7.60	---	5.59	1.30	KLI	
11/11/98	4:55pm	---	7.60	---	5.59	1.30	KLI	
12/2/98	---	---	7.61	---	5.58	1.31	KLI	
12/17/98	---	---	---	---	0.00	---	CT RE	Exploratory holes excavated 10.2 feet below invert elevation. No groundwater observed.
1/20/99	7:05am	---	7.14	---	6.05	0.84	GDC	
2/24/99	10:15am	2.08	---	---	---	---	GC	No signs of mosquitoes. Surface has 2"-3" dia algae.
3/2/99	2:00pm	1.88	---	---	---	---	AW	.
3/9/99	11:00am	1.73	---	---	---	---	GC	- no algae present from 2/24/99.
3/12/99	1:00pm	1.86	9.00	1.45	4.19	2.70	AW	, < 0.1in rain on 3/11/99, no algae.
3/16/99	4:55pm	1.98	6.90	1.57	6.29	0.60	AW	, < 0.2in rain on 3/15/99, 2mm dia algae scattered on water surface. Dried high-algae-line observed on headwall at 2.84ft mark.
3/23/99	10:00am	1.76	7.08	1.35	6.11	0.78	AW	, no algae.
3/26/99	10:20am	2.48	9.00	2.07	4.19	2.70	AW	, < 0.5in rain on 3/25/99, no algae.
3/30/99	9:05am	2.28	8.85	1.87	4.34	2.55	AW	, 6-sf algae at NW corner. Vector Control District treated basin with Altosid briquettes and stocked basin with mosquito fish.
4/2/99	8:15am	2.89	8.35	2.48	4.84	2.05	AW	, <0.5in rain on 4/1/99, no algae.
4/6/99	2:00pm	2.69	7.00	2.28	6.19	0.70	AW	, no algae.
4/9/99	10:00am	2.67	7.00	2.26	6.19	0.70	AW	, 1mm dia algae, 8sf at NW corner.
4/13/99	10:00am	2.89	6.91	2.48	6.28	0.61	AW	, <0.8in rain on 4/11/99, <1mm dia algae approx 8sf.
4/20/99	9:50am	2.52	9.30	2.11	3.89	3.00	AW	, alga mats at NW corner.
4/27/99	2:25pm	2.50	7.10	2.09	6.09	0.80	AW	, 6-1-2ft dia alga mats.
5/5/99	1:10pm	2.06	7.00	1.65	6.19	0.70	AW	, few scattered 1-5mm dia algae.
5/18/99	5:55pm	1.66	7.15	1.25	6.04	0.85	AW	collection of small floating algae mats varying 4-8" wide and approx. 10ft long.
5/25/99	5:40pm	1.50	7.10	1.09	6.09	0.80	AW	, 6-12" wide alga mat at perimeter of the basin.
6/8/99	5:40pm	1.30	7.25	0.89	5.94	0.95	AW	, alga mats at perimeter and interior of the basin. <0.14" Rain rcvd June 1,2,3
6/15/99	1:45pm	1.10	7.20	0.69	5.99	0.90	AW	, alga mats at perimeter and interior of the basin.
6/28/99	1:50pm	0.82	7.30	0.41	5.89	1.00	AW	, alga mats at perimeter and scattered 2/3 length within basin interior.
7/7/99	12:45pm	0.62	7.50	0.21	5.69	1.20	AW	, alga mats 2/3 length of the basin at perimeter and scattered 10inch mats within interior.
7/19/99	10:30am	0.43	7.40	0.02	5.79	1.10	AW	, alga mats cover 60% of basin.
8/3/99	11:45am	0.22	7.50	-0.19	5.69	1.20	AW	, alga mats cover 90% of basin.
8/17/99	10:50am	0.12	7.55	-0.29	5.64	1.25	AW	Basin is empty. Residual water is ponded in the scour hole at the outlet (approximately 2ft x 2ft). .
8/31/99	9:50am	0.12	7.55	-0.29	5.64	1.25	AW	Basin is empty. Surface of the southern portion of the basin is dry. Residual water is ponded in the scour hole at the outlet (approximately 2ft x 2ft). .
9/15/99	11:45am	-0.26	7.60	-0.67	5.59	1.30	AW	Basin is empty. Surface of the southern portion of the basin is dry. A 1sft, 1in deep puddle of water is located at the scour hole adjacent to the outlet. .
9/28/99	11:55am	0.08	7.60	-0.33	5.59	1.30	AW	Basin is empty. Surface of the southern portion of the basin is dry. Residual water is ponded in the scour hole at the outlet (approximately 2ft x 2ft). .
10/12/99	10:05am	0.08	7.65	-0.33	5.54	1.35	AW	Basin is empty. Surface of the southern portion of the basin is dry. Residual water is ponded in the scour hole at the outlet (approximately 2ft x 2ft). .
10/26/99	3:00pm	0.08	7.70	-0.33	5.49	1.40	AW	Basin is empty. Surface of the southern portion of the basin is dry. Residual water is ponded in the scour hole at the outlet (approximately 2ft x 2ft). .
11/9/99	2:35pm	0.08	7.65	-0.33	5.54	1.35	AW	Basin is empty. Surface of the southern portion of the basin is dry. Residual water is ponded in the scour hole at the outlet (approximately 2ft x 2ft). .
11/23/99	4:05pm	No standing water.	7.60	No standing water.	5.59	1.30	FP	Basin is empty. Surface of the basin is dry. The invert of the scour hole at the outlet is saturated. No ponding was observed. .
12/8/99	10:15am	No standing water.	7.75	No standing water.	5.44	1.45	AW	Basin is empty. Surface of the basin is dry. The invert of the scour hole at the outlet is saturated. No ponding was observed. .
12/21/99	3:30pm	No standing water.	7.75	No standing water.	5.44	1.45	AW	Basin is empty. Surface of the basin is dry. The invert of the scour hole at the outlet is saturated. No ponding was observed. .
1/4/00	12:20pm	No standing water.	7.65	No standing water.	5.54	1.35	AW	Basin is empty. Surface of the basin is dry. The invert of the scour hole at the outlet is saturated. No ponding was observed. .
1/18/00	8:50am	No standing water.	7.85	No standing water.	5.34	1.55	AW	Basin is empty. Surface of the basin is damp. The invert of the scour hole at the outlet is saturated. No ponding was observed. .
2/1/00	10:15am	Small Pools.	7.45	No standing water.	5.74	1.15	CW	Ponding was observed in several small pools in center of basin. Strong H2S smell from well.
2/15/00	4:45pm	1.60	7.50	1.19	5.69	1.20	MZ	Strong H2S smell from well. Basin has a large pool of water at 1.6ft. .
2/29/00	12:30pm	2.90	7.25	2.49	5.94	0.95	MZ	Groundwater was sampled for water quality. Strong H2S smell from well. Basin at capacity with a 2.9 ft stage. .
3/15/00	2:30pm	2.90	7.18	2.49	6.01	0.88	CW	Strong H2S smell from well. Basin at capacity with a 2.9 ft stage. .
3/28/00	11:15am	1.51	7.35	1.10	5.84	1.05	CW	Strong H2S smell from well. Basin stage has dropped to 1.51 feet. .

BMP RETROFIT PILOT PROGRAM
PS&E LOCATION 3
I-5/LA COSTA AVE INFILTRATION BASIN

TABLE 1
WATER SURFACE ELEVATION SUMMARY SHEET

Date	Time	Field Reading		Pond Depth*	Groundwater Elev (FT)*	Delta	By	Comment
		Headwall (FT)	Monitoring Well (FT)	(FT)		(FT)		
4/11/00	10:00am	1.20	7.50	0.79	5.69	1.20	BJ	Strong H2S smell from well. Basin level continues to drop during dry weather.
4/24/00	9:30am	1.60	7.45	1.19	5.74	1.15	MZ	Strong H2S smell from well and groundwater very saline. Basin level has risen from last observation because of April 17 storm event.
5/12/00	10:00am	0.78	7.60	0.37	5.59	1.30	CW	Strong H2S smell. . Woody wetland vegetation present in basin
5/24/00	2:10pm	0.59	7.63	0.18	5.56	1.33	MZ	Weak H2S smell. . Woody wetland vegetation present in basin
6/15/00	11:30am	0.47	7.70	0.06	5.49	1.40	BJ	Weak H2S smell. . Basin level continues to drop during dry weather.
6/30/00	10:30am	No standing water.	7.80	No standing water.	5.39	1.50	BJ	Weak H2S smell. . Basin is now dry.
7/12/00	11:30am	No standing water.	7.90	No standing water.	5.29	1.60	CW	H2S odor not present. Basin is dry.
7/28/00	12:10am	No standing water.	7.91	No standing water.	5.28	1.61	VG	Musty odor present. Basin is dry.
8/11/00	1:00pm	No standing water.	7.92	No standing water.	5.27	1.62	CW	No odor. Basin Dry.
8/24/00	9:45am	No standing water.	7.98	No standing water.	5.21	1.68	VG	No odor. Basin Dry.
9/7/00	11:15am	No standing water.	8.07	No standing water.	5.12	1.77	CW	No odor. Basin Dry.
9/20/00	10:00am	No standing water.	7.96	No standing water.	5.23	1.66	BB	No odor. Basin Dry.
10/6/00	11:00 AM	No standing water.	7.95	No standing water.	5.24	1.65	CW	No odor. Basin Dry.
10/18/00	11:45 AM	No standing water.	7.9	No standing water.	5.29	1.60	BJ	H2S odor present. Basin is dry.
11/3/00	3:00 PM	2.60	7.37	2.19	5.82	1.07	VG	H2S odor present. Basin is full and near capacity. One of the bird determet netting support poles has fallen.
11/15/00	12:00 PM	2.10	7.4	1.69	5.79	1.10	VG	H2S odor present. Basin is full and near capacity. One of the bird determet netting support poles has fallen.
11/30/00	1:58 PM	1.25	7.54	0.84	5.65	1.24	BB	H2S Odor present.
12/13/00	3:30 PM	0.98	7.6	0.57	5.59	1.30	BJ	H2S Odor present.
12/28/00	10:35 AM	0.46	7.57	0.05	5.62	1.27	CW	H2S Odor present.
1/16/01	11:15 AM	2.5	7.21	2.09	5.98	0.91	CW	No odor.
2/2/01	11:40 AM	2.6	7.5	2.19	5.69	1.20	BJ	No odor.
2/20/01	11:50 AM	2.9	7.35	2.49	5.84	1.05	BJ	No odor. Basin overflowing onto access road.
3/8/01	10:23 AM	2.9	7.20	2.49	5.99	0.90	BJ	Strong H2S odor present.
3/21/01	10:30 AM	2.3	7.35	1.89	5.84	1.05	BJ	H2S odor present.
4/6/01	10:10 AM	2.2	7.45	1.79	5.74	1.15	BJ	Slight H2S odor present.
4/19/01	12:00 PM	1.8	7.55	1.39	5.64	1.25	BJ	H2S odor present after first purge.
5/4/01	10:55 AM	1.65	7.57	1.24	5.62	1.27	VG	H2S odor present.
5/22/01	10:57 AM	1.05	7.58	0.64	5.61	1.28	BB	No odor present.

Temporary Well: Well Cover elevation 10.99 ft (3.35m). Well rim elevation 10.92 ft.
WSE at monitoring well = Well cover elevation (FT) - Monitoring Well Reading (FT)

*

Permanent Well: Monitoring well notch at elevation 13.186 ft (4.02m)
WSE at monitoring well = Notch elevation (FT) - Monitoring Well Reading (FT)
Monitoring Well reading = Distance to groundwater surface

*

Pond Depth = Headwall Field Reading (FT) - Pipe Invert Location on the Headwall Gauge (FT)
Pipe Invert Location on the Headwall Gauge (FT) = 0.41 ft
Note: Negative Pond Depths indicate ponded water is below invert.
This is due to scour and settlement of the invert material.

Delta = Basin Invert - Groundwater elevation
Basin Invert = 6.89 FT (2.1m)

AW- RBF
FP- RBF
GC- RBF
GDC-Group Delta Consultants (Formerly LKR- The LKR Group, Consulting Geotechnical Engineers)
KLI- Kinnetic Laboratories, Inc.
CT RE- Caltrans Resident Engineer

APPENDIX I
OPERATION AND MAINTENANCE COST SUMMARY

APPENDIX J:
PROJECT CALENDAR

February 2001

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
				1 Biweekly Conference Call	2	3
4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19	20 Biweekly Report Due	21	22 Biweekly Conference Call-10:00am	23	24
25	26	27	28			

Jan 2001

S	M	T	W	T	F	S
	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29	30	31			

Mar 2001

S	M	T	W	T	F	S
				1	2	3
4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	28	29	30	31

March 2001

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
				1 Quaterly Status Report due to Plaintiffs	2	3
4	5	6	7	8	9	10
11	12	13	14 Quarterly Status Meeting No.12 at RBF 9:30-2:30	15	16	17
18	19	20	21	22	23	24
25	26	27 Biweekly Report Due	28	29 Biweekly Conference Call at 10:00 am	30	31

Feb 2001

S	M	T	W	T	F	S
				1	2	3
4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	28			

Apr 2001

S	M	T	W	T	F	S
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30					

April 2001

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24 BMP Pilot Visit (San Diego)	25 BMP Pilot Visit (Los Angeles)	26	27	28
29	30					

Mar 2001

S	M	T	W	T	F	S
				1	2	3
4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	28	29	30	31

May 2001

S	M	T	W	T	F	S
		1	2	3	4	5
6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30	31		

May 2001

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
Apr 2001 S M T W T F S 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30		1	2	3	4	5
6	7	8 Biweekly report due.	9	10 Biweekly Conference Call 10:00 am	11 O/M Cost Meeting at RBF 9:30 am with D. D11, Consultants, Plaintiffs.	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30	31	Jun 2001 S M T W T F S 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30	

June 2001

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
					1	2
3	4	5	6	7	8	9
10	11	12 MID and Final Report Meeting at RBF Tuesday June 12	13 Quarterly Status Meeting No. 13 at RBF. 9:30 am to 12:00 pm	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28	29	30

May 2001

S	M	T	W	T	F	S
		1	2	3	4	5
6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30	31		

Jul 2001

S	M	T	W	T	F	S
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30	31				

July 2001

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30	31				

Jun 2001

S	M	T	W	T	F	S
					1	2
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28	29	30

Aug 2001

S	M	T	W	T	F	S
			1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30	31	

August 2001

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
Jul 2001 S M T W T F S 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31		Sep 2001 S M T W T F S 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30	1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30	31	

APPENDIX K:
CORRESPONDENCE

EARTHWORKS
Construction & Design

DATE: May 4, 2001

TO: Mr. Ed Othmer
LAW

FROM: Margot Griswold
EARTHWORKS Construction & Design

SUBJECT: Biofilter Saltgrass (*Distichlis spicata*) Review

I reviewed the sites on Wednesday May 2, 2001. The following notes are based on the field review of the sites. All the biofilter strips and swales have over 90 percent cover of vegetation. However, the majority of the sites have been overrun with either weedy species and species form the erosion control mix. This year the above average rainfall favored weedy species over the saltgrass at sites with any adjacent fast-growing vegetation such as weeds or the designated erosion control species. There is one exception to this pattern. At the 91/605 biofilter strip, the saltgrass remains dense with only minimal weeds. It should be noted that this site has few weeds that can blow into the filter strip since the strip is immediately adjacent to the roadway. The prevailing wind from weather and traffic comes from the direction of the roadway, thus few weed seeds either blow into or wash into the biofilter strip.

The conclusion from this season's monitoring are:

- While saltgrass is an excellent competitor in moist saline soils, saltgrass does not appear to be a good competitor against winter weeds in soils that are not saline and that are not naturally moist or irrigated. Therefore, it is likely that winter weeds such as annual grasses would eventually outcompete saltgrass without intensive maintenance in the non saline soils generally found in the biofilter strips and swales.
- Saltgrass needs irrigation to establish at a minimum at initial planting. Once established, saltgrass continues to grow without irrigation mainly in the more coastal areas where temperatures are cooler and foggy conditions allow the grass to persist through the summer months.
- The erosion control mix contains many of the species that were originally considered for the biofilter strips and swales before the issue of timing and achieving the 90 percent cover requirement forced the saltgrass sod specification. The erosion control mix is designed to germinate quickly and is composed of both annual and perennial

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species. With modification, this mix may prove to be more effective over a broader range of conditions than saltgrass.

- Disturbance within the biofiliter strips and swales allows weedy species to invade.

Altadena Maintenance Station BMP Pilot Study Site #073211

This biofilter strip has been over run by weedy species. The site was mowed per the maintenance schedule in January before the majority of rain fell this season. Thus, the timing of the rains and maintenance favored the annual grasses and weedy broadleaf species more than the saltgrass. Approximately, half of the site is vegetated by weedy annual grasses (*Bromus diandrus*, *Hordeum leporinum*, *Bromus mollis*, *Lolium* sp, *Avena* sp.) as well as broadleaf weeds (*Sonchus oleraceus* and *Cornopus didymus*). The remainder of the strip is covered in bermuda grass (*Cyndon dactylon*). There are two small areas of slatgrass left in the middle of the biofilter strip. With the weedy species included, this biofilter strip meets the vegetation cover requirements.

Cerritos Maintenance Station BMP Pilot Study Site #073223

The biofilter swale has the required vegetative cover including the erosion control mix and weedy species. As noted during the last inspection, the majority of the vegetation is bermuda grass (*Cyndon dactylon*) with only a small amount of saltgrass. Additionally, species from the erosion control mix (*Hordeum californicum*, *Hordeum vulgare*, and *Bromus arizonicus*) as well as weedy species are found in the site (*Bromus diandrus*, *Hordeum leporinum*, *Bromus mollis*, *Lolium* sp, *Avena* sp., *Malva parviflora*). Saltgrass has been out-competed at this site mainly by the bermuda grass.

I-605/SR-91 Interchange BMP Pilot Study Site #073222a and 073222b

#073222a - The swale has the required vegetative cover including saltgrass, erosion control species and weedy species. Saltgrass persists throughout the swale; however, there are dense areas of annual weeds in the center of the swale. Erosion control species (*Hordeum californicum*, *Hordeum vulgare*, and *Bromus arizonicus*) occur mainly at either end of the swale. Weedy species, mainly annual grasses (*Bromus diandrus*, *Hordeum leporinum*, *Bromus mollis*, *Lolium* sp, *Avena* sp.) and some broadleaf weeds (*Sonchus oleraceus*, *Latuca serriola* and *Chenopodium album*) are found throughout the swale.

#073222b – The strip has the required vegetative cover with virtually all of the swale vegetated with saltgrass. There are some annual grasses in the strip that appear to develop around disturbed soil from gopher activity. No other species are immediately upwind of the biofilter strip, which may be the main difference in relation to saltgrass cover between this strip and the two biolfilter swales that are in the vicinity. Seeds of other species do not blow, fall or wash into the strip.

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I-605/Del Amo Avenue BMP Pilot Study Site #073225

The swale has the required vegetative cover including weedy species. The bermuda grass noted in the last site review has increased in cover, while the saltgrass has decreased. Additionally, some of the species from the erosion control mix (*Nassella pulchra*, *Hordeum californicum*, and *Bromus arizonicus*) have developed in the swale. Other weedy species include annual grasses and broadleaf weeds (*Sonchus oleraceus* and *Malva parviflora*).

I-5/I605 BMP Pilot Study Site #073224

As noted in the last review, this site is mainly vegetated by bermuda grass and other weedy species including annual grasses (*Bromus diandrus*, *Hordeum leporinum*, *Bromus mollis*, *Lolium* sp, *Avena* sp.) and broadleaf weeds (*Sonchus oleraceus*, *Chenopodium album* and *Erodium cicutarium*). Additionally, species from the erosion mix (*Nassella pulchra*, *Hordeum californicum*, and *Bromus arizonicus*) appear throughout the swale.

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March 30, 2001

Mr. Brian Currier, P.E.,
California Department of Transportation
Environmental Program (MS27)
1120 N. Street, P.O. Box 942874
Sacramento, CA 94274-0001

Subject: CDS Units Pilot Project - I 210 Freeway, District 7

Dear Mr. Currier:

Thank you for meeting with me on March 8, 2001 and allowing CDS Technologies, Inc. to address current operations and maintenance issues with the CDS pilot installations on the I-210 freeway in District 7. As we discussed in our field meeting, CDS Technologies, Inc. recommends minor modifications to the existing installations and to the BMP Operations, Maintenance and Monitoring Plan, Volume II, Appendix I-H, Continuous Deflective Separation Units, dated September 1999. The items addressed in this letter included hydraulic performance, vector issues and maintenance requirements.

Field observations at both CDS locations (Filmore & Orcas) were performed by CDS staff during and after several significant rainfall events between Nov. 1, 2000 and February, 26, 2001. Based on physical evidence at both sites, it appears that at one time the drainage system at both locations pressurized during very intense rainfall and over-topped causing water to flow out of the top of the weir box and separation chamber. A very large flow and downstream hydraulic impedance may be responsible for the excessive pressurization. Unfortunately, since the water surface rose above the internal riser of the CDS unit, floatable material was released downstream. The debris bag downstream captured a portion of this material which may have caused a backwater condition and additional pressurization. CDS recognizes that changes to the downstream debris bag have been implemented which should alleviate the backwater condition during high flow conditions. CDS units will not allow the re-suspension of captured material during pressurization since the internal riser acts as a solid boundary between the inlet and the outlet side of the screen. Unfortunately, the amount of flow was substantially greater than the system design capacity and the HGL during the bypass event was above the top of the internal riser. ***CDS recommends extending the internal riser of the separation chamber or providing a physical barrier between the internal riser and the outlet side of the screen so floatable material cannot be released downstream during overtopping caused by pressurization.*** This is a minor alteration and can be performed by CDS at no expense.

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CDS believes that the above grade installation of the drainage pipe accentuates vector issues. Drainage pipes are usually installed underground with a minimum earth cover over the pipe. The above grade pipes causes the standing water in the CDS units to be at or above finished grade making it easily accessible for mosquito breeding. In most CDS installations, access to the standing water of the separation chamber would be available only from the upstream catch basin or the downstream pipe outlet if the pipe outlets to an open channel. The distance to these access points will vary depending on the existing site conditions. CDS recognizes the measures taken to limit access to the standing water including sealing the lids over the CDS unit and weir box and installing mosquito netting on the downstream pipe. If these measures prove to be ineffective, CDS stands ready to assist in the resolution of this issue. We believe that a design solution minimizing access to the standing water is achievable. It has been our experience that below grade installations have not caused vector issues. ***CDS Technologies, Inc. recommends that vector monitoring at a below grade installation be included in the pilot study.*** A list of existing CDS installations in California is available upon request.

Currently, the Operations and Maintenance Plan calls for maintenance of the CDS units when the sump is 85% full. CDS typically recommends this 85% level since accumulation of settleable material above the sump and onto the separation screen will reduce the hydraulic capacity of the unit. Also, if a sump basket is utilized, accumulation of material above the top of the basket may make removing the basket difficult. After the first significant rainfall of this wet season, which occurred in late October, we observed that the sump baskets at both locations contained a significant amount of material. This is typical of most CDS installations in California since material collects in the drainage system for several months during the summer and is washed downstream during the first significant storm. The Orcas CDS unit was near capacity after the late October rain. The next significant rainfall event occurred approximately 60 days later and there was insufficient sump capacity remaining. Material accumulated above the sump and onto the screen at the Orcas site. CDS speculates that since a significant period of time elapsed between rains and material accumulated in the drainage system, the second rain event acted similarly to the first rain event. Also, there appears to be a larger volume of material present in the Orcas watershed relative to the Filmore watershed. Our observations indicate that when the sump is close to the 85% full threshold a subsequent rain event can generate material in excess of the available capacity and hydraulic performance will be reduced as material accumulates above the sump onto the screen. ***CDS recommends that an additional maintenance threshold be used as an indicator for required maintenance. Maintenance should be performed when the sump is 85% full or 45 days after the sump is 50% full.*** This should provide sump capacity if an extended dry period is experienced. Every watershed has unique characteristics and can produce variable amounts of pollutants. Typically, after two wet seasons, the pollutant load generation characteristics of a

particular watershed are better understood and a proper maintenance interval can be developed. Also, the sump capacity of all CDS units can be modified to accommodate the variable characteristics of individual watersheds. In other words, if a particular area or land use is known to generate excessive material, the installation should be designed to provide sump capacity to accommodate the expected pollutant loading. Our standard sump designs typically require maintenance to be performed 2 to 4 times per year.

Thank you for the opportunity to recommend modifications to the current CDS applications. If you have any questions or would like to discuss this matter in greater detail, please do not hesitate to contact me at (562) 424-6334.

Sincerely,

Mark Cuneo, P.E.
Senior Engineer